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General Information

Registration and Information

Your ACPA registration and information desk is located in the Marriott Ballroom foyer on the second floor of the Indianapolis Downtown Marriott Hotel. Days and hours of operation are listed below. A message board has been provided for your convenience. Please check the board periodically for messages from other attendees or important telephone calls. Please have callers leave messages at your room if the messages are not urgent.

Registration Desk Hours

Date	Hours of Registration
Sunday, March 23	4:00PM - 7:00PM
Monday, March 24	7:30AM - 5:30PM
Tuesday, March 25	7:30AM - 7:30PM
Wednesday, March 26	6:30AM - 6:30PM
Thursday, March 27	6:30AM - 6:00PM
Friday, March 28	7:00AM - 5:30PM
Saturday, March 29	7:30AM - 5:00PM

Program, Badge, and Ticket Policy

When you register, you will receive your badge as well as appropriate tickets for social events, CPF's "Good Sports" Event at the ***NCAA Hall of Champions,*** eye openers, and study sessions. If you are not attending a social event, please donate your tickets to students and residents. You may leave tickets with ACPA staff at the registration desk.

It is essential that you keep your tickets with you for entrance into each of the above short courses and social events. Volunteers will take your tickets at the doors. The tickets have cash value and can be purchased but not replaced at the registration desk. We suggest you put your tickets behind your badge in the badge holder.

You must wear your badge at all times during the meeting. Your badge gains you entrance to the general, concurrent, keynote, and poster sessions of the annual meeting. Special badge markings are needed for the pre-conference symposia. The **"BADGE POLICE"** will be watching!

One program is provided for each registered attendee. If your program is lost or if additional copies are desired, they may be purchased at the registration desk for $15 each.

Social Packages for Guests

Additional tickets to social events are available at the registration desk. The $135 Social Package includes the Welcoming Reception, the Annual Luncheon, and Thursday's Gala – ***A Night of Wonder*** – at the Indiana Roof Ballroom. Tickets may be purchased separately at $25 for the Welcoming Reception, $35 for the Luncheon, and $75 for the Thursday night Gala.

AV Instructions and Speaker Ready Room

(Audiovisual Preview)

Speakers may preview their presentations in the Phoenix Room located on the second floor. Look for directional signs in the Marriott Ballroom Foyer.

General and Concurrent Session speakers should pre-load their PowerPoint presentations at the podium prior to the beginning of their session, e.g., first thing in the morning or during coffee or lunch breaks.

Eye Opener and Study Session speakers are responsible for operating their own AV equipment.

Laser Pointers should be picked up by Session Co-Chairs just prior to their session and returned immediately afterwards to the ACPA Registration Desk.

All speakers must pick up their materials immediately following their presentation. Do not leave them with the technicians. ACPA and the AV staff will not accept responsibility for lost or damaged materials.

Journal Manuscripts

Manuscripts to be submitted to the ***Cleft Palate-Craniofacial Journal*** should be left at the registration desk with an ACPA staff member to be given to Dr. Jack C. Yu, Editor.

Poster Sessions, Exhibits and Coffee Breaks

Exhibits and posters will be displayed during the times specified in the Summary of Events. There will be five poster sessions: Poster Sessions A and B will be on Wednesday, Session C on Thursday, and Sessions D and E on Friday. All exhibits, poster sessions, and coffee breaks will be held in the Marriott Ballroom Foyer.

Welcome to New Members and Non-Members

Look for the **LIGHT BLUE RIBBON** affixed to the badge of individuals who have joined ACPA in the past year. Please take a moment to welcome them to ACPA and to introduce them to colleagues. Also, as you meet non-members **(BLUE BADGES)**, you might take a moment to discuss the goals and activities of the organization and the benefits of ACPA membership. Membership applications are available at the ACPA/CPF information desk in the Marriott Ballroom Foyer on the second floor.

ACPA/CPF Authorized Photographs

Candid photos will be taken throughout the week in which you may be included. It is understood and agreed that these photos may be reprinted in our newsletter, on our website or in other publications. If you do not want your picture used, please inform the ACPA staff at the registration desk.

Unauthorized Recording

Please Do Not Take Photographs or Otherwise Record Any Meeting Proceedings

Taking photographs, audiotaping, or videotaping any annual meeting proceedings, oral presentations, or on screen images is STRICTLY PROHIBITED. Audience members who attempt to do so will be asked to leave the meeting rooms.

Please be Courteous to Other Attendees

Mobile devices: Turn off – or put in silent mode – your cell phones and/or pagers while sessions are in progress.

Children: Children under 13 years of age are not permitted in lecture areas.

2015 Annual Meeting

April 20-25 2015 ACPA's 72nd Annual Meeting and Pre-Conference Symposium
Westin Mission Hills Resort and Spa
Palm Springs, California
Program Chair: Robert J. Havlik, MD

April 20-21 2015 Pre-Conference Symposium
What is a "Good" Outcome for a Child with a Cleft?
Co-Chairs: Mary Michaeleen Cradock, PhD and Thomas D. Samson, MD

General Information (cont)

Educational Objectives

The overall educational objectives of the Annual Meeting are (1) to make concerned professionals aware of new clinical and research information through the organized presentation of original papers and poster sessions, and (2) to provide an opportunity for the involved professionals to update their knowledge and skills of their own and related disciplines through exhibits, and focused short courses. Specific educational objectives for each component of the meeting are presented throughout the agenda.

Continuing Education Credits

	ASHA	ACCME	Nursing*	Instructional Level
Convention	1.65 CEUs	16.75 hours	16.75 hours	Variable
Study Sessions (2 sessions)	0.15 CEU each (.3 for 2)	1.5 hours ea	1.5 hours ea	Variable
Eye Openers (2 sessions)	0.10 CEU each	1.0 hour ea	1.0 hour ea	Variable
Pre-Conference Symposium	0.9 CEUs	9.5 hours	9.5 hours	Intermediate
Post-Conference	0.6 CEUs	N/A	N/A	Beginner

* Contact hours have been applied for from the North Carolina Nurses Association, but have not been confirmed. NCNA is an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

American Speech-Language-Hearing Association

This program is offered for 3.65 CEUs (Various Levels, Professional Area).

Instructions for ASHA: When you check in to the meeting, you will be given an ASHA participant form and the date and time of your arrival will be noted. Complete the form and return it to an ACPA staff member at the registration desk after you attend your last session. You are also required to complete **online evaluation forms** (see section below) in order to receive credit.

Continuing Medical Education:

Accreditation Statement: The American Cleft Palate–Craniofacial Association (ACPA) is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Designation Statement: ACPA designates this educational activity for a maximum of ***31.25 AMA PRA Category 1 Credits™.*** Physicians should only claim credits commensurate with the extent of their participation in the activity.

Instructions for ACCME: When you register, the date and time of your arrival will be noted. At the end of the meeting or time of your departure, you must return the completed continuing education form to an ACPA staff member at the registration desk. You will also need to complete **online evaluation forms** (see section below) for each component of the meeting for which you are seeking credit (i.e., annual meeting, symposia, study sessions, and eye openers). Approximately 4 weeks after the meeting, a continuing education certificate will be mailed to you. If the continuing education form and evaluation forms are not completed, we will not be permitted to award credits.

Online Evaluation Forms

Help us improve future programs while fulfilling requirements to obtain your continuing education credits. Complete the online evaluation form for each component for which you are seeking credit. Links can be found here: http://www.acpa-cpf.org/am-feedback starting Friday, March 28th.. You will need the registration ID number found on your meeting badge to log-in.

Full Disclosure Policy

The American Cleft Palate-Craniofacial Association, in compliance with the Accreditation Council for Continuing Medical Education (ACCME) Standards for Commercial Support, has adopted the following Full Disclosure Policy:

Presentations made at continuing medical educational activities sponsored or jointly sponsored by the American Cleft Palate-Craniofacial Association must include information regarding all commercial or industrial funding, consulting, or equity holdings by the presentations' author(s) and/or anyone related to the author(s) which could be affected by or could have an effect on the content of the presentation. This information is requested during the abstract submission process and will be disclosed to participants through statements in printed meeting materials and declared by the faculty member at the beginning of his/her presentation.

Faculty Disclosure Statements: It is the policy of ACPA to ensure its programs are fair, balanced, independent, objective, and scientifically rigorous. In support of this policy, ACPA requires that: 1. Trade names are to be avoided during presentations. 2. Presentations made at continuing medical educational activities sponsored or jointly sponsored by ACPA, in compliance with standards for accreditation by ACCME, must include: a. information regarding off-label use(s); b. all commercial or industrial funding, consulting, or equity holdings by the authors of this presentation and/or anyone related to the authors which could be affected by or could have an effect on the content of the presentation. 3. This information will be disclosed to meeting participants through printed materials and must be declared verbally by the presenter at the beginning of the presentation. See Abstracts, page 52, for indication of disclosures.

Disclaimer

The scientific material presented at this meeting has been made available by the American Cleft Palate-Craniofacial Association for educational purposes only. The material is not intended to represent the only, nor necessarily the best, methods or procedures appropriate for the health care situation discussed, but rather is intended to present an approach, view, statement, or opinion of the presenter which may be helpful to others who face similar situations.

The American Cleft Palate-Craniofacial Association disclaims any and all liability and injury or other damage resulting to any individual attending a course and for all claims which may arise out of the use of the techniques demonstrated therein by such individuals, whether these claims shall be asserted by members of the health care professions or any other person.

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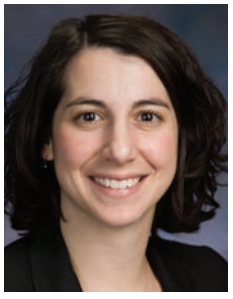
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Kaiden Solen
– Tamara Eveler, York, PA

Adelheid Steele
– Ellie Machado, Morehead City, NC

Angeline "GiGi" EmaRosa Thompson
– Renee McCollum, Fayetteville, GA

Nevaeh Trombley
– Debbie Trombley, Rutland, VT

Oona Vagnoni
– Karen-Ann Lichtenstein, Annapolis, MD

Grace Van Til and her parents, Leslie and Jim
– Karen Schultz, Saint Paul, MN

Chandler and Cole Walker
– Kathryn Walker, Durham, NC

David Weber
– Martha Weber, Vienna, VA

IN MEMORY OF:

Chris Beauvais
– Baranof Island Brewing Co. LLC, Sitka, AK

Frank E. Bradley
– June Lesowski, Mansfield, MA

Dianne and Ray
– Robert Thompson, Vancouver, BC

Ry Heng
– Naren Kan, Carson, CA

Jonathon Alexander Jarrell
– Lawrence and Sharon Luzadder, Winchester, VA

Kristina, Mama, Spencer, Star, Dorothy
– Kelley Marable, Stockton, CA

Catherine Ann McLean
– Stanley and Joan Cross, Tuscola, IL
– June Derr, Reston, VA
– Adelia Hanson, Stillwater, OK
– Julie Klement, Alexandria, VA
– Catherine and John Reardon, Newberg, OR
– Mark Salow, Vienna, VA
– David and Janet Stephenson, Ames, IA

Mother
– Delores Macera, Oakhurst, CA

Mother
– Ed Munson, Brea, CA
Becky Reilly
– LisaWarren Winslow, Wildomar, CA

Doreen Riess
– Support Air Inc., Miamisburg, OH
– Daniel Bieniek, Davie, FL
– Jeanne Meade,Pompano Beach, FL
– Randy Murdock, Morrow, OH
– Michelle Murphy, Weston, FL
– John Peil, Boring, OR
– Jim Prince, Miami, FL
– Tighe Racobs, Tucson, AZ
– Daniel Radice, Pembroke Pines, FL
– Mary Rankin, Burbank, CA
– Connie Schaeffer, Lake Worth, FL
– Cynthia Seldin, Coral Springs, FL
– Jim Sensale, Miami, FL
– John Siemon, Oakland Park, FL
– Leslie Suedkamp, Sylmar, CA

Jacob Robinson
– Olivia Mead, Lutz, FL

Martin Thomas Savage
– Suzanne Brown, Colleyville, TX

Anita Polsky Wexler
– Jacques and Marsha Silberman, Yorktown Heights, NY

James A. Wortley
– Bobby Lee Boatright, Springfield, MO
– Jamie Long, Winona Lake, IN

Jeanette R. Wright
– Betty Blackburn, LaGrange, GA

Annual Business Meeting Minutes – April 20, 2012

I. President's Call to Order and Welcome
The meeting was called to order at 9:05 AM by President H. Saal.

II. Declaration of a Quorum
Communications Officer R. Kirschner declared a quorum was present.

III. Approval of Minutes
The minutes of the April 8, 2011 Annual Business Meeting were approved by the members present.

IV. Election of Nominating Committee Members
There were five nominations from the floor. Kelly Nett Cordero (Speech) and Lynn Marty Grames (Speech) were elected.

V. Treasurer's Report (B. Costello)
B. Costello reviewed the FY2011 audited financial reports as presented in the Annual Meeting program. ACPA net assets increased $288,537 to $1,565,988. Investments increased $77,234. In addition, the 2011 Annual Meeting, which was a record attendance, realized a profit.

CPF realized a $17,101 deficit, but $108,626 investment income for a net $91,525 increase in assets to $1,054,231.

VI. ACPA/CPF Executive Director's Remarks (N. Smythe)
Nancy Smythe announced that Todd Pfeiffer has joined the national office staff in the role of Member Services Manager and Jill Galuten as CPF Director of Family Services.

VII. CPF President's Remarks (E. Seaver)
E. Seaver highlighted the changes in the National Office staff and recognized the work of Emily Kiser. The CPF Board has added two new members, Lori Cilley and Amy Mackin. Marilyn Cohen has been elected President-Elect and will begin her term as President in January 2013. The Scholarship Committee, under the leadership of Chair Ginger Hinton, currently has funding for fifteen scholarships. Five CPF research grants were awarded this year, and funding the grant program will remain an important part of the Foundation's efforts. The Foundation is currently in the process of changing the design of its website. Members should provide feedback regarding the new site to Emily Kiser. The Foundation continues to translate its publications into other languages and has a contractual agreement with an independent company to do this, thereby broadening the audience for CPF literature. This year's Connections conference was very successful. The Connections conference will be offered every other year, and the Foundation is now exploring the possibility of sponsoring regional conferences for families. Social media (Facebook and Twitter) are becoming increasingly important for Foundation outreach and communications. Finally, E. Seaver thanked the members for their continued support through donations, volunteerism, and referrals.

VIII. ACPA President's Remarks (H. Saal)
H. Saal thanked the members for their support of the organization as well as the national office staff. He noted that the ACPA strategic plan will be revised this year, and that this will bring new challenges. The committees and task forces will play an essential role as they carry out new charges.

IX. Necrology
President H. Saal asked for a moment of silence in honor of ACPA members who passed away since the last annual meeting in Fort Worth: Julia May Avert, Raymond O. Brauer, Patrick E. Brookhouser, Douglas L. Buck, Hugh Howard Crawford, John Curtin, Marion D. Meyerson, D. Ralph Millard, Jr., D.C. Spriestersbach, and Lisa Vecchione.

X. CPCJ Editor (J. Yu)
CPCJ Editor J. Yu reported that there has been a steady increase in the number of manuscripts submitted. The turnaround time has been improving. J. Yu thanked all of the section editors, the reviewers, and Editorial Assistant Debbie Ogle for their efforts. 2013 will mark the Journal's 50th anniversary. The Journal will remain committed to the publication of quality manuscripts, and efforts will continue to speed the process of review and publication. Each issue will feature two open access manuscripts and approximately 20 online-only publications.

XI. Committee Reports
Task Force on Economic Models of Team Care Chair R. Kirschner described the focus of the task force. A survey of all teams in the U.S. will be soon be conducted in order to define the spectrum of financing models as well as the advantages and challenges associated with each.

XII. Old Business
There was no old business.

XIII. New Business
There was no new business.

XIV. Adjournment
The meeting was adjourned by President H. Saal at 9:45 AM.

Respectfully submitted,

Richard E. Kirschner, MD, FACS, FAAP
ACPA Communications Officer

Following are the audited financial reports prepared by the firm of Maher Duessel.
Additional information will be provided at the Annual Business Meeting in Indianapolis, IN on Friday, March 28, 2014.

Copies of the audits are available through the National Office.

Statement of Financial Position
June 30, 2013

ASSETS	
CURRENT ASSETS:	
Cash and cash equivalent	979,141
Accounts receivable	22,797
Due from Cleft Palate Foundation	229,568
Deposits	3,070
Total Current Assets	**$1,234,576**
Investments	741,518
FIXED ASSETS:	
Building	451,586
Office furniture and equipment	141,418
Less accumulated depreciation – bldg	(142,155)
Less accumulated depreciation – office furniture and equipment	(121,213)
Total Fixed Assets	**$329,636**
TOTAL ASSETS	**$2,305,730**
LIABILITIES	
CURRENT LIABILITIES:	
Accounts payable	135,397
Accrued liabilities	37,763
Due to Cleft Palate Foundation	72,406
Deferred revenue	192,785
Total Liabilities	**$438,351**
NET ASSETS	
Unrestricted	1,867,379
Total liabilities and net assets	**$2,305,730**

Statement of Activities
For the year ended June 30, 2013

	Unrestricted Funds	Temporarily Restricted Funds	Total
REVENUE			
Member Dues and fees	384,702	0	384,702
Annual Meeting			
- Exhibits	82,150	0	82,150
- Commerical Support	112,000	0	112,000
- Registration	772,891	0	772,891
- Other	42,660	0	42,660
Miscellaneous Receipts	39,075	0	39,075
Cleft Palate-Craniofacial Journal	47,550	0	47,550
CAT Application Fees	21,625	0	21,625
Grant Revenue	13,497	0	13,497
Net assets released from restriction	2,725	(2,725)	0
Total Revenues	**$1,518,875**	**$(2,725)**	**$1,516,150**
EXPENSES			
Programs:			
- Membership Services	174,112	0	174,112
- Annual Meeting	881,018	0	881,018
- Symposia	36,604	0	36,604
- Cleft Palate-Craniofacial Journal	81,287	0	81,287
- Communications	57,541	0	57,541
- Commission on Approval of Teams	32,331	0	32,331
Total Program Expenses	$1,262,893	0	$1,262,893
Management and General	51,568	0	51,568
Total Operation Expenses	**$1, 314,479**	**0**	**$1, 314,479**
Excess (deficiency) of operating revenues and other support over operating expenses	204,396	(2,725)	201,671
NONOPERATING SUPPORT AND REVENUES			
Investment Income	44,236	0	44,236
CHANGES IN NET ASSETS	248,632	(2,725)	245,907
NET ASSETS			
Beginning of year	1,618,747	2,725	1,621,472
End of year	1,867,379	0	1,867,379

Statement of Financial Position
June 30, 2013

ASSETS	
CURRENT ASSETS:	
Cash and cash equivalent	543,874
Accounts Receivable	17,656
Due from ACPA	72,406
Total Current Assets	**$633,936**
Investments	848,573
FIXED ASSETS:	
Building	149,435
Less accumulated depreciation	(49,458)
Total Fixed Assets	**99,977**
TOTAL ASSETS	**$1,582,486**
LIABILITIES	
Due to ACPA	229,568
NET ASSETS	
Unrestricted	
- Unrestricted, board designated for endowment	23,353
- Unrestricted, undesignated	529,330
Total unrestricted	**$552,683**
Temporarily restricted	
- Temporarily restricted – program purposes	279,046
- Temporarily restricted – accumulated endowment earnings	179,395
Total temporarily restricted	458,441
Permanently restricted	341,794
Total Net Assets	$1,352,918
Total Liabilities and Net Assets	**$1,582,486**

Statement of Activities
For the year ended June 30, 2013

	Unrestricted	Temporarily Restricted Funds	Permanently Restricted Funds	Total
REVENUE AND OTHER SUPPORT				
Member Contributions	49,179	0	0	49,179
Non-Member Contributions	102,402	4,516	0	106,918
Pamphlet and bear sales	32,703	0	0	32,703
Education Income	260	0	0	260
Research and Foundation Grants	0	37,709	0	37,709
Net assets released from restriction	119,087	(119,087)	0	0
Total Revenue and other support	**$303,631**	**(76,862)**	**0**	**$226,769**
EXPENSES				
Programs:				
- Communication and Public Education	160,188	0	0	160,188
- Inter-organizational Activities	7,942	0	0	7,942
- Scholarship and Research Grants	61,841	0	0	61,841
Total program expenses	$229,971	0	0	$229,971
Management and General	30,546	0	0	30,546
Fundraising	15,776	0	0	15,776
Total Expenses	**$276,293**	**0**	**0**	**$276,293**
Excess (deficiency) of operating revenues and other support over operating expenses	27,338	(76,862)	0	(49,529)
NONOPERATING SUPPORT AND REVENUES				
Investment income	8,143	48,790	0	56,933
CHANGES IN NET ASSETS	35,481	(28,072)	0	7,409
NET ASSETS:				
Beginning of year, as reclassified	$517,202	$486,513	$341,794	$1,345,509
End of year	$552,683	$458,441	$341,794	$1,352,918

Facial Asymmetries...More or Less – Dysplasias, Hyperplasias, Hypoplasias

Overview: Craniofacial teams are often confronted with individuals with progressively deforming conditions caused by overgrowth or progressive loss of tissue resulting in asymmetric presentations. Since many of these conditions are individually uncommon, no consensus exists as to the optimum approach to care. This preconference symposium will tackle this problem by presenting a framework through which these disparate conditions may be understood predicated upon emerging understanding of the molecular pathogenesis and goals for therapy. In addition to the considerable challenges faced in surgical reconstruction, dental and orthodontic management in the midst of change, alimentation and communication disorders and psychological well-being, affected individuals and families have to adapt often to the reality of a progressive condition. Contemporary diagnostic tools and protocols for management of these challenges will be presented. It is hoped this symposium will stimulate discussions of possible registries for the study of outcomes in some of these rare disorders with world-wide collaboration amongst centers.

Educational Objectives: At the conclusion of the symposium, the attendee should be familiar with:

1) The broad array of craniofacial hypo- and hyperplastic entities and growth disorders which present to the craniofacial clinic.
2) The evaluation of each individual from a patho-genetical and medical perspective and be able to identify major tissue deformities at hand.
3) The need for and implementation of both comprehensive and focused dental, orthodontic, surgical, medical, speech, psychological and other perioperative management schemes for challenging growth disorders and asymmetries of the craniofacial region.
4) Speech evaluation for the patient with gnathic growth disorders, tongue overgrowth, and other palato-pharyngeal tissue asymmetries.
5) Contemporary surgical decompression for skeletal overgrowth impingement of foramina and airway concerns in neurofibromatoses, vascular anomalies and tongue hyperplasias.
6) Medical and surgical management of vascular anomalies of the craniofacial region.

Symposium Co-Chairs:
Bruce B. Horswell, MD, DDS, MS
FACES, Charleston, WV

Marilyn C. Jones, MD
Rady Children's Hospital of San Diego, San Diego, CA

Symposium Faculty:
*Adriane L. Baylis, PhD, CCC-SLP **
Nationwide Children's Hospital, Columbus, OH

James P. Bradley, MD
UCLA Plastic and Reconstructive Surgery, Los Angeles, CA

Marilyn J. Bull, MD
Riley Hospital for Children, Indianapolis, IN

Patricia D. Chibbaro, RN, MS, CPNP
NYU Langone Medical Center, New York, NY

Canice E. Crerand, PhD
Nationwide Children's Hospital, Columbus, OH

Amelia F. Drake, MD
University of North Carolina Craniofacial Center , Chapel Hill, NC

Arin K. Greene, MD, MMSc
Boston Children's Hospital, Boston, MA

*Ann W. Kummer, PhD, CCC-SLP **
Cincinnati Children's Hospital Medical Center, Cincinnati, OH

Janice Lee, DDS, MD
NIH/NDCR, Bethesda, MD

*Donald R. Mackay, DDS, MD **
Milton S. Hershey Medical Center, Hershey, PA

Jeffrey L. Marsh, MD
Mercy Children's Hospital, St. Louis, MO

Mark P. Mooney, PhD
University of Pittsburgh, Dept. of Oral Biology, Pittsburgh, PA

Kirt E. Simmons, DDS, PhD
Arkansas Children's Hospital, Roland, AR

Bryan J. Williams, DDS, MSD, Med
Seattle Special Care Dentistry, Seattle, WA

Featured Speaker:
Jamie M. Verdi, Esq.

*An asterisk indicates the presenter made a disclosure. Please see symposium faculty listings on pages 22-23 for disclosure.

Symposium Support
With grateful appreciation to:
KLS-Martin and
Mohammad Mazaheri, MDD, DDS, MSc
for their support through educational grants.

MONDAY, March 24, 2014

9:00 AM-5:30 PM
Room: Marriott 6

9:00 AM **INTRODUCTION**
Bruce B. Horswell, MD, DDS, MS
Marilyn C. Jones, MD

9:15 AM **A PATIENT'S JOURNEY**
Jamie M. Verdi, Esq.

9:30 AM **THE GENETICS OF TISSUE GROWTH DISORDERS**
Marilyn C. Jones, MD

This presentation will set forth a clinical framework in which to understand disorders of asymmetric overgrowth and undergrowth in the broader context of craniofacial anomalies. Much has been learned recently about the molecular pathogenesis of many of these conditions, some of which involve non-traditional genetic mechanisms such as somatic mosaicism, imprinting, and second molecular hits. At the end of the session attendees should be able to recognize some of the more common craniofacial disorders associated with altered tissue growth and asymmetry and to understand the molecular mechanism that produced the unique phenotype.

10:00 AM **GROWTH DISORDERS — ANATOMICALLY SPEAKING**
Mark P. Mooney, PhD

Physical growth (i.e., proportionate changes in size) and development (i.e. increasing complexity) are natural processes occurring during the life history of biological organisms. Occasionally, mechanisms that regulate normal growth and development are circumvented through genetic or environmental perturbations resulting in growth disorders and disturbances. This presentation will cover topics related to normal plastic and trophic growth processes and abnormalities in these processes referred to as dyplasias or dystrophies. The dysmorphologies in a number of clinical disorders (e.g., Neurofibromatosis, Parry-Romberg syndrome, Acromegaly, Dwarfism,) will be reviewed and current research findings from transgenic or naturally occurring animal models will be presented. Such "experiments of nature" are very important in understanding the control mechanisms underlying these processes and may be useful in designing therapies to treat such disorders in the future. Attendees will be able to describe normal and dysmorphic growth processes which can produce recognizable dysplastic or dystrophic morphologies.

10:30 AM **BREAK**

10:50 AM **INTRODUCTION TO FIBROUS DYSPLASIAS**
Marilyn C. Jones, MD

11:00 AM **FIBROUS DYSPLASIA OF THE ZYGOMATICOMAXILLARY REGION: OUTCOMES OF SURGICAL INTERVENTION**
James P. Bradley, MD

Fibrous dysplasia is the most common craniofacial tumor, presenting in both monostotic and polyostotic forms with varying degrees of severity. No consensus exists regarding the surgical management of craniofacial fibrous dysplasia, particularly in the zygomaticomaxillary region. This presentation will report on a study that compared long-term outcomes of limited reduction burring vs. radical resection of zygomaticomaxillary fibrous dysplasia. While different approaches have been advocated to treat fibrous dysplasia, the conclusions of this study support a more aggressive management for zygomaticomaxillary disease with radical resection and cranial bone graft reconstruction for more involved disease.

11:30 AM **ENDOSCOPIC DECOMPRESSION — WHEN NERVES GET SQUEEZED**
Amelia F. Drake, MD

This talk addresses compressive complications of hyperplasias and illustrates endoscopic decompression as surgical therapy.

11:45 AM **GNATHIC FD - GROWING JAWS AND THEN SOME**
Janice Lee, DDS, MD

Fibrous dysplasia is a benign bone tumor and associated with a GNAS mutation. It is commonly found in the facial bones or skull base and may be monostotic or polyostotic with involvement of contiguous bones in the face. FD of the facial and jaw bones may expand to dramatic proportions resulting in significant asymmetry. The growth is often gradual though rapid expansion may occur, particularly when FD is associated with another lesion (such as an aneurysmal bone cyst). The tumor may require contouring, debulking, or resection, and occasionally orthognathic reconstructive surgery to restore symmetry and normal facial proportions. In this presentation, I will discuss the evaluation and management of the asymmetry that results from the growth of FD in the facial and jaw bones.

12:15 PM **PANEL Q&A**

12:30 PM **LUNCH BREAK**

1:55 PM **INTRODUCTION TO HYPERPLASIAS**
Bruce B. Horswell, MD, DDS, MS

Hyperplasias of the Craniofacial skeleton and soft tissue include a broad spectrum of recognized disorders and syndromes. These disorders are predominantly congenital with genetic etiologies, affecting the skeletal system, such as fibrous dysplasia, or soft tissue, such as the neurovascular disorders of neurofibromatosis or vascular anomalies and hemangiomas. The pathogenesis, evaluation and management of some of these entities will be presented.

2:00 PM **BECKWITH-WIEDEMANN**
Jeffrey L. Marsh, MD

Macroglossia was identified as one of the initial defining manifestations of the Beckwith-Wiedemann syndrome (BWS) phenotype in the 1960's. An appreciation of the frequency and

magnitude of concomitant dento-skeletal deformities is much more recent. Based on personal examination of 460 individuals with BWS, the distribution of their orofacial dysmorphology will be presented. What the relationship between macroglossia and dentoskeletal deformities is and whether surgical tongue reduction affects these deformities will be documented by review of 340 patients who underwent a single tongue reduction by one surgeon using one technique. Outcome of tongue reduction surgery will be presented for breathing, speech, taste and anterior occlusion.

2:30 PM **HEMANGIOMAS AND OTHER VASCULAR ANOMALIES**
Arin K. Greene, MD, MMSc

Vascular anomalies are common lesions, affecting approximately 5% of the population. The field is confusing because different lesions look similar, and incorrect terminology is commonly used. Vascular anomalies are divided into 2 broad categories: tumors and malformations. The most common tumors include infantile hemangioma, congenital hemangioma, kaposiform hemangioendothelioma, and pyogenic granuloma. The major types of malformations are capillary malformation, lymphatic malformation, venous malformation, and arteriovenous malformation. Vascular anomalies also can be associated with overgrowth syndromes (e.g., Klippel-Trenaunay, Sturge-Weber). Treatment of vascular anomalies is specific to the type of lesion, which may include pharmacotherapy, laser, sclerotherapy, embolization, and/or resection. This presentation will describe the classification, diagnosis, and management of the major types of vascular anomalies. Attendees will be able to use correct terminology when describing vascular anomalies, diagnose the 8 major types of lesions, and understand treatments for these patients.

3:00 PM **IMPACT ON THE EARS, AIRWAY AND NASAL CAVITIES**
Amelia F. Drake, MD

This talk discusses hyperplasias of the head and neck, including vascular malformations, fibrous dysplasia and others. Illustrative examples will be presented, as well as challenges in diagnosis and treatment of these clinical problems.

3:30 PM **PANEL Q&A**

3:45 PM **BREAK**

4:15 PM **INTRODUCTION TO HYPOPLASIAS**
Bruce B. Horswell, MD, DDS, MS

This presentation will address hypoplastic asymmetries of the craniofacial region, both the skeletal and soft tissue components. The etiology, evaluation, particularly during growth, and the management of these challenging entities will be presented.

4:25 PM **HYPOPLASIA AND ATROPHY STATES — "BULKING UP"***
Donald R. Mackay, DDS, MD

Plastic surgeons have had the good fortune of being able to take advantage of the techniques learned from training in aesthetic surgery to improve the outcomes in our reconstructive work. The wide range of conditions that result in facial asymmetries can frequently be improved by applying these techniques. Fat grafting in particular is a simple procedure that is particularly well suited to improving the treatment of asymmetries due to hypoplasia and atrophic conditions. Fat grafting has for many of us transformed the way we treat Romberg's hemifacial atrophy where large volume grafts have replaced the need for free tissue transfers. Fat grafting also has a wide application to asymmetries primarily treated bony osteotomies, repositioning and bone grafts. A patient with a great bony result will often still have soft tissue deficiencies where fat can help.

5:00 PM **DYSPLASIAS AND SPEECH/SWALLOWING DISORDERS: FROM FACE TO PHARYNX ***
Adriane L. Baylis, PhD, CCC-SLP, Ann W. Kummer, PhD, CCC-SLP

Hypoplasia, hyperplasia and other forms of dysplasia can affect the craniofacial skeleton, and also the orofacial muscles and soft tissue structures. These dysplasias may occur as an isolated congenital anomaly or as part of a complex craniofacial syndrome. In this presentation, the authors will review various types of orofacial growth abnormalities and their impact on speech sound production, resonance, velopharyngeal function, and swallowing. This session will include many video case examples to illustrate the consequences of orofacial dysplasias on speech and swallowing, as well as to show the remarkable adaptation that children with these conditions display as they acquire these skills.

5:30 PM **ADJOURN**

TUESDAY, March 25, 2014

8:00 AM-11:45 PM
Room: Marriott 6

8:00 AM **INTRODUCTION**
Bruce B. Horswell, MD, DDS, MS
Marilyn C. Jones, MD

8:15 AM **THE PEDIATRICIAN AND GROWTH DISORDERS**
Marilyn J. Bull, MD

Families of children with craniofacial anomalies present many challenges to their pediatric care providers. Significant medical problems must be addressed in early infancy and multiple

pediatric and surgical specialists must contribute to ensure optimal outcome for the child. The child's problems add stress to the family and the primary physician must become familiar with an often rare condition and help communicate the care needs to the parents. As the child grows, normal stages of development are encountered with needs that require special attention and when addressed proactively, can help minimize secondary disability. Recommendations addressing these issues will be discussed and cases will be presented to amplify the discussion. Conference attendees will develop an understanding of the challenges faced by the primary care provider, the importance of communication among everyone involved in the patient's care and each person's role in providing a medical home for the child with a craniofacial anomaly.

8:45 AM **DENTAL MANAGEMENT IN TEAM CARE OF CHILDREN WITH ASYMMETRIES AND OTHER COMPLEX CRANIOFACIAL ANOMALIES**
Bryan J. Williams, DDS, MSD, Med

Timely and appropriate dental evaluation and management is a key foundation for successful craniofacial team management of children with asymmetries and other craniofacial anomalies. This presentation will focus on the complex dental disease and dental morphology issues which can impact the quality of overall team outcomes. Team based strategies for enhancing both dental health and the dental component of team outcomes will be reviewed. At the conclusion of the lecture attendees should have an understanding of the primary dental diseases which can affect these complex patients and an integrated approach to the management of these diseases. Attendees should also have an understanding of the range of strategies which integrate dental management approaches into the overall team care plan.

9:15 AM **ORTHODONTIC MANAGEMENT — BALANCING IMBALANCE**
Kirt E. Simmons, DDS, PhD

This presentation is intended to briefly familiarize non-dental Craniofacial Team members with the role and thought processes involved in the orthodontic and dental care of individuals affected by facial asymmetry problems. Paramount to providing ideal care to these patients is the presence of a good dentition, and the role of all Team members in this regard will be reviewed. Also dependent on a good outcome is a proper diagnosis and treatment plan, not a simple proposition in many of these complex cases. The role and thought processes of the dental professionals in determining a three dimensional diagnosis and the development of an interdependent treatment plan, with not just three dimensional but also temporal goals and objectives, will be explored. Lastly, examples of the clinical means by which dental professionals can contribute to the correction of these asymmetry problems will be provided.

9:45 AM **PANEL Q&A**

10:00 AM **BREAK**

10:30 AM **HELPING CHILDREN (AND THEIR FAMILIES) WITH FACIAL DIFFERENCES — THE NOW AND NOT YET**
Canice E. Crerand, PhD

The experience of having a facial disfigurement can present numerous challenges for children and their families. Facial disfigurement can affect not only how children view themselves but how they are perceived of and treated by others. Children and adolescents with facial disfigurements are vulnerable to psychosocial problems, including poor self-esteem, body image dissatisfaction, depression, social anxiety, and social difficulties, including stigmatization, discrimination, and rejection. Despite these challenges, there is growing recognition that positive changes can result from having a visible difference. This presentation will examine factors that impact psychosocial adjustment to facial disfigurement with an emphasis on body image and its role in psychosocial functioning and quality of life. Intervention strategies that can be used to help children and their families successfully navigate disfigurement-related challenges will also be reviewed, and future directions for clinical care will be offered.

11:00 AM **THE TEAM'S JOURNEY AND THE ROAD HOME**
Patricia D. Chibbaro, RN, MS, CPNP, *Jamie M. Verdi, Esq.*

Rare craniofacial conditions, including Craniofrontonasal or Fibrous Dysplasia, Vascular Anomalies, Beckwith-Wiedemann Syndrome and Hemifacial Atrophy, present significant challenges to the patient and family. Their journey often requires years, if not a lifetime, of medical, surgical and psychosocial interventions, requiring constant, consistent support from an experienced craniofacial team. Each patient is unique, not only in terms of the severity of their condition, but also regarding their family structure, socioeconomic background, cultural beliefs ,coping mechanisms and resilience. The nurse/team coordinator is often their "air traffic controller" - the lifeline between the patient/family and all who participate in their care, giving us a unique perspective. This presentation will highlight the road that we all travel together, guided by our primary goal of helping our patients to become an accepted and productive member of society.

11:30 AM **PANEL Q&A**

11:45 AM **ADJOURN**

Symposium Faculty

***Adriane Baylis, PhD, CCC-SLP**,is the Director of the Velopharyngeal Dysfunction Program and Co-Director of the 22q Center at Nationwide Children's Hospital, in Columbus, OH. She is also Assistant Professor of Clinical Plastic Surgery, Speech and Hearing Science, and Pediatrics at The Ohio State University. She is actively involved in ASHA Special Interest Group 5 (Speech Science and Orofacial Anomalies) and serves on Council for the American Cleft Palate-Craniofacial Association. Her clinical and research interests include perceptual and instrumental assessment of velopharyngeal dysfunction in children with cleft palate, craniofacial anomalies and 22q11.2 deletion syndrome. Disclosures: Consulting Fees (e.g., advisory boards): National Advisory Council for ETS Praxis SLP Exam. Contracted Research: NIH NIDCR grant funding.

James P. Bradley, MD. Dr. Bradley's research focuses on basic science studies and translational research related to bone biology, bone tissue engineering, and wound healing. In clinical outcome investigations, the research team focuses on refining surgical protocols and innovative surgical procedures. All of these studies aim to improve surgical outcomes for patients with craniofacial syndromes (i.e. Treacher Collins, Apert, Crouzon, Nager etc.) or Craniofacial injuries.

Marilyn J. Bull, MD, is the Morris Green Professor of Pediatrics at Riley Hospital for Children at Indiana University Health. She is a neurodevelopmental pediatrician and geneticist and serves as consultant to the Craniofacial Program. Dr. Bull is a frequent speaker nationally and internationally and has served on the American Academy of Pediatrics Committee on Genetics and is currently on the Board of Directors. She is a longstanding member of the ACPA.

Patricia D. Chibbaro, RN, MS, CPNP, has been the Pediatric Nurse Practitioner at the Institute of Reconstructive Plastic Surgery, NYU Langone Medical Center for the past 26 years. Pat received the Donna Pruzansky Memorial Fund Award from the Cleft Palate Foundation in 1992, and since that time, has been a very active nursing member of the American Cleft Palate-Craniofacial Association. She is also the host of The Nurse Practitioner Show on Doctor Radio, Sirius/XM Channel 81.

Canice E. Crerand, PhD, is an Assistant Professor of Pediatrics, Department of Pediatrics, The Ohio State University College of Medicine and Center for Biobehavioral Health, The Research Institute at Nationwide Children's Hospital (NCH). As a clinical psychologist, she works closely with the Cleft Lip and Palate Center at NCH, providing psychological assessment and treatment for patients and conducting research on psychosocial adjustment and body image in youth with craniofacial conditions. She previously served as a craniofacial team psychologist at The Children's Hospital of Philadelphia and was an Assistant Professor in the Department of Surgery at the University of Pennsylvania's Perelman School of Medicine.

Amelia F. Drake, MD, is Executive Associate Dean of Academic Programs, Newton D. Fischer Distinguished Professor of Otolaryngology/Head & Neck Surgery, and Director of the UNC Craniofacial Center. Dr. Drake, a pediatric otolaryngologist, has clinical and research interests which focus on pediatric airway disorders and craniofacial anomalies. She has been named on both "America's Top Doctors" and "America's Best Doctors" lists for many years. She received the Gabriel F. Tucker Award, for significant contributions to the field of pediatric laryngology, from the American Laryngological Association.

Arin K. Greene, MD, MMSc, is a plastic surgeon at Boston Children's Hospital. He received his BA from the University of Chicago and his MD from the University of Illinois. He completed his plastic surgery residency in the Harvard Training Program, followed by a craniofacial fellowship at Boston Children's Hospital. Dr. Greene is an Associate Professor of Surgery at Harvard Medical School. He is a member of the Vascular Anomalies Center, Co-Directs the Lymphedema Program, and Directs the Department of Plastic Surgery research laboratory. His clinical and research focus is in the fields of vascular anomalies and lymphedema.

Bruce B. Horswell, MD, DDS, MS, is a native Minnesotan where he took his dental degree and oral and maxillofacial surgical training. He then received his medical degree and general surgery training at the University of Connecticut. Fellowship training in Cranio-Maxillofacial Surgery was abroad at the Royal Children's Hospital in Melbourne, Australia and Alder Hey Children's Hospital in Liverpool, England. He has had academic appointments at the Universities of Connecticut, Maryland, Minnesota and currently is Associate Clinical Professor of Surgery at the West Virginia School of Medicine. He also is Director of FACES, the regional craniofacial-cleft center at CAMC in Charleston, West Virginia. He is very active in the American Cleft Palate-Craniofacial Association as well as his specialty organizations. Dr. Horswell is married and has five children.

Marilyn C. Jones, MD, is Professor of Pediatrics at the University of California, San Diego and Director of the Cleft Palate and Craniofacial Treatment Teams at Rady Children's Hospital. She is past president of ACPA and of the American College of Medical Genetics. She has served the Association in many capacities, most recently as Chair of the Committee on Accreditation of Teams. She is interested in normal and abnormal morphogenesis as well as the the etiology and pathogenesis of cleft and craniofacial disorders. She has been a member of ACPA for 29 years.

Symposium Faculty

***Ann W. Kummer, PhD, CCC-SLP,** is the Senior Director of the Division of Speech-Language Pathology at Cincinnati Children's Hospital Medical Center. She is also Professor of Clinical Pediatrics and Professor of Otolaryngology-Head and Neck Surgery at the University of Cincinnati. Dr. Kummer does lectures and seminars on a national and international level in the areas of cleft palate and craniofacial anomalies, resonance disorders, velopharyngeal dysfunction, and even on business practices in speech-language pathology. She has written numerous professional articles and 22 book chapters in speech pathology and medical texts. She is an author of the SNAP test of nasometry and an inventor of the patented Nasoscope. She is the author of the book entitled Cleft Palate and Craniofacial Anomalies: The Effects on Speech and Resonance, 2nd edition (Delmar Cengage Learning, 2008). Dr. Kummer has received numerous honors and was elected Fellow of the American Speech-language –Hearing Association in 2002. Disclosures – Royalty: For textbook entitled Cleft Palate and Craniofacial Anomalies: The Effects on Speech and Resonance, Cengage Learning; also for the Oral & Nasal Listener, Super Duper Publications. Receipt of Intellectual Property Rights/Patent Holder. Patent for the Nasoscope.

Janice Lee, DDS, MD, joined the NIH in August 2013 as the NIDCR Deputy Clinical Director. She is an oral & maxillofacial surgeon with expertise in craniofacial anomalies, orthognathic reconstruction, and benign bone tumors, such as fibrous dysplasia. She received her DDS and MS from UCLA, her MD from Harvard, and completed her OMFS training at the MGH in Boston. She completed a 2-year fellowship in the Craniofacial and Skeletal Diseases Branch, NIDCR. Prior to returning to the NIH, she was at UCSF as Professor of Clinical OMFS, Vice Chair of OMFS, and an active member of the Craniofacial Anomalies Team.

***Donald R. Mackay, DDS, MD**, , is the William P Graham III Professor of Plastic Surgery and Vice Chair of Surgery at PennState. He is the past-president of the American Association of Pediatric Plastic Surgeons and serves on the Education Committee of ACPA. He co-chaired this symposium in 2009. He serves on a number of society boards and is currently a director of the American Board of Plastic Surgery and a member of the Plastic Surgery RRC. Disclosures: Receipt of Intellectual Property Rights/Patent Holder – Synthes: rib fracture fixation system. Consulting Fees (e.g., advisory boards)\: Synthes. Professional: Operation Smile - Chief Medical Office.

Jeffrey L. Marsh, MD, is Director of Pediatric Plastic Surgery and the Cleft Lip/Palate and Craniofacial Deformities Center at Mercy Children's Hospital, St. Louis MO. A graduate of Johns Hopkins University and School of Medicine, Dr. Marsh received the Hopkins Alumni Association's "Knowledge for the World" award in 2011 for his international cleft care volunteerism. He has assisted training of healthcare providers in multidisciplinary cleft-care in Bhutan, Cambodia, China, Israel, Laos, Taiwan, and Thailand as well as the USA. He is a past-President of American Cleft Palate-Craniofacial Association and the Cleft Palate Foundation.

Mark P. Mooney, PhD, is Professor and Chair, Department of Oral Biology, University of Pittsburgh with appointments in Anthropology, Plastic Surgery, Orthodontics, and Communication Sciences and Disorders. He is immediate past president of the American Cleft Palate-Craniofacial Association and was recently awarded the Distinguished Scientist Award in Craniofacial Biology from the International Association of Dental Research. Dr. Mooney's research interests include factors that affect growth and development and the development of animal models of craniofacial.

Kirt E. Simmons, DDS, PhD, did an NIH fellowship in craniofacial anomalies at University of North Carolina. After teaching 10 years at the Universities of Indiana and North Carolina, he became the first Director of Orthodontics at Arkansas Children's Hospital, providing all orthodontic services for their cleft, craniofacial and special needs patients. Currently President of Southwest Society of Orthodontists, he is orthodontic consultant for The MAGIC Foundation and a Section Editor of the Cleft Palate-Craniofacial Journal. His career-long interest has been treatment of patients with cleft lip/palate/craniofacial anomalies. He has contributed multiple chapters on orthodontic treatment of patients with cleft/craniofacial conditions.

Bryan J. Williams, DDS, MSD, Med, is a Pediatric Dentist and Orthodontist practicing in the Seattle area. He is an Affiliate Professor in the Departments of Pediatric Dentistry and Orthodontics at the University of Washington and a member of the active medical staff at Seattle Children's Hospital and Swedish Medical Center. After 16 ½ years as an active member he now continues to have a strong working relationship with the Craniofacial Center at Seattle Children's Hospital.

Jamie Verdi, Esq., of Rochester, Michigan was born with a facial cleft and underwent her first intracranial surgery at the young age of two. Forty years worth of reconstructive procedures followed, but Verdi's craniofacial condition didn't prevent her from being an activist on behalf of others. In 2008, Verdi founded her own law firm, MI-PAL (Michigan Patient Advocacy Liaison) where she provides pro bono legal services to veterans and their widows, advocates for the insurance and health care needs of the elderly, and provides legal services to people with mental and physical illnesses and their family members. In addition to her full-time position as a probate attorney, she is actively involved with many community organizations including the Rochester Regional Chamber of Commerce, the National Citizen's Coalition for Nursing Home Reform, the Michigan Campaign for Quality Care, Professional Patient Advocate Institute and Citizens for Better Care.

TUESDAY, March 25, 2014

ACPA Primer For Cleft Care Providers
The 2014 Program Committee is pleased to announce the addition of an exciting new pre-conference symposium, The 2014 Team Care Primer. This program is designed for newer members of ACPA and for those who are simply interested in learning more about optimizing team care. *Continuing Education credit is not available for this program.

Room: Marriott 3-4

8:00 AM-12:00 PM

8:00 AM **WELCOME**
Nancy C. Smythe, ACPA/CPF Executive Director

8:05 AM **THE 5 FUNDAMENTAL LAWS OF TEAM CARE**
Richard E. Kirschner, MD, Nationwide Children's Hospital

We all know that teamwork is essential to providing optimal care to cleft-affected children. But how does a successful team really work? What makes some teams excel while others fail to thrive? What separates great teams from groups of individuals that struggle to reach their full potential? The 5 Fundamental Laws of Team Care will discuss the basic principles and strategies that are essential to building a winning cleft-craniofacial team. Understanding and applying these ideas, including The Law of Significance (Yes, It Takes a Team), The Law of Purpose (It Really is the Vision Thing), and the Law of the Helm (The Team Sinks or Sails on Leadership), will not only help your team fulfill its mission but also empower your team to achieve greatness. This session is designed for all team members and team leaders (which, on successful teams are truly one and the same). Learning and practicing these laws will enhance your capacity to unlock your potential and to function effectively as a team builder, allowing you to provide your patients with the best in comprehensive cleft and craniofacial care.

8:35 AM **ORIGINS OF TEAM CARE: THE LANCASTER CLEFT PALATE CLINIC**
Ross E. Long, Jr., DMD, MS, PhD, Lancaster Cleft Palate Clinic

ACPA's mission is based on the concept of multi/ interdisciplanry team care. The original application of team care as applied to management of patients with clefts and craniofacial anomalies, was first developed by a Lancaster, PA orthodontist in 1938, Dr. HK Cooper. Seventy-five years later, while technology and procedures have continued to improve our treatment capabilities, the underlying principle of team care remains the same. This presentation will summarize the history and concepts of team care.

8:45 AM **INTRODUCTION TO THE AMERICAN CLEFT PALATE-CRANIOFACIAL ASSOCIATION (ACPA)**
Helen M. Sharp, PhD, Western Michigan University, Dept. of Speech Pathology & Audiology

Welcome to ACPA! This session will deliver an overview of what makes ACPA an exceptional interprofessional organization. We will take a look at what ACPA does, the many disciplines and countries represented in the association, and our future directions and plans. Whether you are a first time attendee or a seasoned member, you will learn something new about ACPA.

8:55 AM **UNDERSTANDING THE CLEFT PALATE FOUNDATION (CPF)**
Marilyn A. Cohen, LSLP, Cooper University Hospital, Regional Cleft-Craniofacial Program

The Cleft Palate Foundation was originally established in 1973 as the American Cleft Palate Educational Foundation. Its goal at that time was to provide special educational symposia, both as a part of the annual ACPA meeting and as separate freestanding educational programs. That goal has evolved over the years and is now focused on patient, and public education about cleft, and craniofacial conditions. This presentation will highlight the major services, projects and products of the Cleft Palate Foundation and its mission. Particular emphasis will be placed on how it supports team care, and a description of the foundation's educational materials and programs including student scholarships for both undergraduate and graduate specialty education. In addition, the types of research funding available will be described. The goal of this presentation will be to familiarize the attendees with the scope of programs available through the CPF. Attendees following this presentation will be able to discuss the basic mission and function of the Cleft Palate Foundation.

9:05 AM **PARAMETERS OF CARE AND THE COMMISSION ON APPROVAL OF TEAMS (CAT)**
David Kuehn, PhD, University of Illinois at Urbana-Champaign, Dept. of Speech and Hearing Science

The six standards adopted by the ACPA for team approval will be discussed in relation to the Parameters for Evaluation and Treatment of Patients with Cleft Lip/Palate or Other Craniofacial Anomalies.

9:20 AM **Q&A**

9:35 AM **BREAK**

9:50 AM **ABC'S OF TEAM CARE**
Lynn M. Fox, MA, MEd, CCC-SLP, University of NC at Chapel Hill Craniofacial Center, School of Dentistry

This presentation will deconstruct, describe, and discuss craniofacial team formation, mission, composition, leadership, decision-making, roles, collaboration skills, communication, goals, conflict, ethics, and the team process.

10:20 AM **FUNDAMENTALS OF CLINICAL RESEARCH**
Carrie L. Heike, MD, MS, Seattle Children's

We have the opportunity to improve cleft and craniofacial care by contributing to high quality research. This presentation will provide a review of clinical study designs, highlight considerations for participation in research, and offer tips to get started.

10:45 AM **CLINICAL AUDITS AND OUTCOMES RESEARCH**
Ross E. Long, Jr., DMD, MS, PhD, Lancaster Cleft Palate Clinic

Internal audit of our clinical outcomes is an obligation we have as part of quality assurance and improvement. If carried out with agreed-upon standards for records and record taking to measure outcomes of significance, an additional opportunity presents itself for intercenter outcomes comparisons and research. Such collaboration can provide insight into the processes and outcomes of treatment or comparable services elsewhere and the exchange of clearly successful practices.

11:10 AM **GLOBAL ASPECTS OF TEAM CARE: HURDLES TO SUCCESS**
John A. van Aalst, MD, Div. of Plastic & Reconstructive Surgery, University of NC at Chapel Hill

Becoming involved in the global aspects of team cleft care is a natural outgrowth of team care at our home institutions: we are likely to meet international cleft practitioners and are aware of home team members with international affiliations. To start, be true to your skill set: do globally what you do locally. Identify a need, and go with teams that have established relationships in a region. Go as a teacher. Go with an exit timetable: how long do you plan to teach your skillset? Go to a place where you know the language — if not, consider learning the language. Make a long-term commitment. Encourage local colleague independence. Build in-country cleft organizations. Think of regional partnerships. Then exit. Repeat algorithm.

11:35 AM **THE 5TH LAW**
Richard E. Kirschner, MD, Nationwide Children's Hospital

11:45 AM **Q&A**

12:00 PM **ADJOURN**

1:00 PM **2014 Team Care Primer Luncheon (Optional)**
Room: Marriott 2

DISCIPLINE FORUMS

Back by popular demand, these informal professional networking opportunities will be held Wednesday afternoon from 4pm-6pm. First organized at the 2013 International Congress last May, reports from forum leaders indicated a wide range of topics and information was exchanged, but even more importantly, connections were made. This is your opportunity to 'meet and greet' colleagues in your discipline from around the world. Forum specialties and room assignments are:

- Genetics/Pediatrics — Columbus
- Mental Health — Denver
- Nursing/Coordination — Marriott 5
- Oral-Maxillofacial Surgery — Lincoln
- Orthodontics/Prosthodontics — Marriott 3
- Otolaryngology — Marriott 4
- Pediatric Dentistry — Austin
- Plastic Surgery — Marriott 2
- Research — Boston
- Speech-Language Pathology/Audiology — Marriott 1

TUESDAY, March 25, 2014

7:30 AM-7:30 PM
REGISTRATION
Room: Marriott Foyer

SPEAKER READY ROOM
Room: Phoenix

8:00 AM-12:00 PM
PRE-CONFERENCE SYMPOSIUM (CONTINUED):
FACIAL ASYMMETRIES...MORE OR LESS — DYSPLASIAS, HYPERPLASIAS, HYPOPLASIAS
Room: Marriott 6

8:00 AM-12:00 PM
ACPA PRIMER FOR TEAM CARE PROVIDERS (w/Optional Lunch)
Room: Marriott 3-4

12:00 PM-1:30 PM
ACPA/CPF COMMITTEE CHAIR LUNCHEON
Room: Santa Fe

1:30 PM-6:30 PM
ACPA/CPF COMMITTEE MEETINGS
(see page 127 for schedule)

3:00 PM-5:00 PM
Exhibit Set-up

5:30 PM-6:30 PM
NEW MEMBER ORIENTATION
Room: Santa Fe

6:30 PM-8:30 PM
PRESIDENT'S WELCOMING RECEPTION
Join ACPA President Helen Sharp, PhD and CPF President Marilyn Cohen, LSLP for cash bar and light hors d'oeuvres. Supported in part by KLS Martin and Medical Modeling
Room: Marriott Ballroom 5

WEDNESDAY, March 26, 2014

6:30 AM-6:30 PM
REGISTRATION/SPEAKER READY ROOM OPEN

7:00 AM-1:00 PM
POSTER SESSION A

7:00 AM-5:00 PM
EXHIBITS

1:30 PM-6:00 PM
POSTER SESSION B

EYE OPENERS — GROUP I
7:00 AM-8:00 AM

**Separate registration fee required.*

Codes:

Instruction Level	Format
B=Beginner	L=Lecture
I=Intermediate	H=Hands-on
A=Advanced	P=Panel
V=Varied	R=Roundtable

1
*1 **COMMISSION ON APPROVAL OF TEAMS: REVIEW AND DISCUSSION OF THE TEAM APPROVAL PROCESS**
A review and discussion of the team approval process moderated by the Commission on Approval of Teams. Members of teams that have applied for approval will have the opportunity to discuss the application, Standards and impact of the approval process. (*B, P*)
David Kuehn, PhD
Room: Marriott 1

2
*2 **JOURNAL MANUSCRIPT PREPARATION AND SUBMISSION**
This Eye Opener will be given by members of the "Cleft Palate-Craniofacial Journal" Editorial Board, Section Editors from a variety of disciplines will discuss what constitutes a good scientific manuscript, what kinds of manuscripts are accepted, and what is required by the ***Cleft Palate-Craniofacial Journal.*** Common problems in manuscript preparation and ways of avoiding them will be addressed. (*B, P*)
Jack C. Yu, MD, DMD, MSEd
Room: Marriott 2

3
3 **THE AMERICLEFT PROJECT: GUIDELINES FOR PARTICIPATION IN COLLABORATIVE INTERCENTER OUTCOMES STUDIES**
The purpose of this eye opener is to 1) provide an update on the current status of the Americleft Project; 2) provide details about carrying out actual outcomes comparisons of internal quality assurance audits; 3) encourage participation by other individuals, centers, and disciplines; and 4) discuss the requirements necessary for other centers to collaborate and participate in the project. The presentation will include background information about the inception and growth of the project and progress made by the Orthodontic Group. Information will also be provided about the progress made by the Speech Group in developing standard procedures for data collection and analysis and conducting reliability studies to allow for reliable rating of speech data as well as the progress of a newly formed Psychosocial Group. In addition to providing these updates on progress with data collection across participating centers, goals for the next phase of these three working groups will be presented. *(I,P)*
Ross Long, Jr, *Judith Trost-Cardamone, Kathy Chapman, Debbie Sell, Adriane Baylis, Angela Dixon, Kelly Nett Cordero, Cindy Dobbelsteyn, Anna Thurmes, Kristina Wilson; Kathy Kapp-Simon*
Room: Marriott 3

4

4 **VPD MANAGEMENT IN SYNDROMIC POPULATIONS: ASHA SIG 5 CHALLENGING CASES**
This session explores the decision-making process involved with management of VPD in syndromic populations. ASHA Special Interest Group 5, Speech Science and Orofacial Disorders, offers this case-based panel presentation to SLPs, surgeons, and other ACPA attendees involved in treatment of VPD. Audience participation will be encouraged. At the conclusion of the session, attendees will be able to identify several syndrome-specific considerations involved with VPD management. (*I, P*)
***Adriane Baylis**, Angela Dixon, Sara Kinter, Kristen DeLuca*
Room: Marriott 4

OPENING CEREMONIES - CELEBRATE THE WONDER
Room: Marriott 6-10

8:30 AM
Welcome and Opening Remarks
Helen M. Sharp, PhD, ACPA President
Richard E. Kirschner, MD, ACPA Vice President and Program Committee Chair
Ronald R. Hathaway, DDS, MS, MS, Local Arrangements Committee Chair
Marilyn Cohen, LSLP, President, Cleft Palate Foundation

GENERAL SESSION I — KEYNOTE ADDRESS — R. J. Palacio
9:00 AM
Room: Marriott 6-10

Session Chair: Helen M. Sharp, PhD
Session Co-Chair: Richard E. Kirschner, MD

R. J. Palacio

THE WONDER OF *WONDER*

R. J. Palacio was an art director and graphic designer for more than 20 years, while waiting for the perfect time to start writing her own novel. When she had a chance encounter with an extraordinary child in front of an ice cream store, she realized the time had come to tell Auggie's story, a boy born with a craniofacial anomaly.

In the spring of 2012, *Wonder* inspired a movement based on the importance of empathy and acceptance known as ***Choose Kind.*** At ChooseKind.tumblr.com, users can pledge to choose kind; watch the trailer for *Wonder;* download educational resources; and read about *Wonder* and R. J. Palacio. The home page features a weekly spotlight of a reader, classroom, or community that has responded to the story.

Wonder has been the recipient of numerous starred reviews, awards, and accolades, including several "Best of 2012" lists. With over 700,000 copies of *Wonder* sold, Palacio continues to travel the country speaking about the novel that has inspired countless children, educators, and families. She has been interviewed by national media outlets such as NPR's *Morning Edition, Time Out Chicago Kids,* and *Slate.com.* Over 100 schools and communities have chosen *Wonder* for their One Book, One Read Programs, including citywide reads in Santa Monica, CA; Fairfield, CT; Memphis, TN; Naperville, IL; and others.

10:00 AM **POSTER SESSION A, EXHIBITS, COFFEE BREAK**

GENERAL SESSION I — ETIOLOGY, OUTCOMES, QUALITY OF CARE I
10:30 AM-12:30 PM
Room: Marriott 6-10

Goal: To expose attendees to the state-of-the-art research in the etiology of cleft and craniofacial conditions, outcomes, and improvement of quality of care for individuals with orofacial cleft or craniofacial anomalies.
Objective: Attendees will be able to identify the contemporary contributions of three or more disciplines to the diagnosis, treatment, and improvement in care for individuals with orofacial cleft or craniofacial conditions.

Session Chair: Mark P. Mooney, PhD
Session Co-Chair: Ronald R. Hathaway, DDS, MS, MS

10:30 AM
5 **ORAL HEALTH RELATED QUALITY OF LIFE (OHRQOL) AND SELF-RATED SPEECH IN CHILDREN WITH EXISTING FISTULAS IN MID-CHILDHOOD AND ADOLESCENCE**
***Barry Grayson**, Pradip Shetye, Hillary Broder, Maureen Wilson-Genderson, Ross Long, Jr*

10:40 AM
6 **DEMOGRAPHIC FACTORS ASSOCIATED WITH SURGICAL RECOMMENDATION AND QUALITY OF LIFE AMONG YOUTH WITH CLEFTS**
***Janine Rosenberg**, Hillary Broder, Leanne Magee, Maureen Wilson-Genderson*

10:50 AM

7 **VISUAL-MOTOR FUNCTIONS AMONG SCHOOL AGE CHILDREN WITH AND WITHOUT SINGLE SUTURE CRANIOSYNOSTOSIS (SSC)**
Lauren Buono, *Kathleen Kapp-Simon, Kristen Gray, Brent Collett, Mary Michaeleen Cradock, Matthew Speltz*

11:00 AM **DISCUSSION**

11:10 AM

8 **COMPARATIVE OUTCOMES OF TWO NASOALVEOLAR MOLDING TECHNIQUES FOR BILATERAL CLEFT NOSE DEFORMITY**
Yu-Fang Liao, *Yi-Chin Wang*

11:20 AM

9 **VELOPHARYNGEAL OUTCOMES AT AGE SIX FOR THREE TYPES OF PALATOPLASTY**
Lynn Grames, *Jeffrey Marsh, Gary Skolnick, Dennis Nguyen, Rachel Skladman, Albert Woo*

11:30 AM

10 **ROBIN SEQUENCE: MORTALITY, RISK STRATIFICATION, AND CLINICAL OUTCOMES**
Melinda Costa, *Michael Tu, Michael Friel, Sunil Tholpady, Roberto Flores*

11:40 AM **DISCUSSION**

11:50 AM

11 **THE AMERICLEFT PROJECT: BURDEN OF CARE FROM SECONDARY SURGERY IN PATIENTS WITH CUCLP**
Thomas Sitzman, *Ross Long, John Daskalogiannakis, Kathleen Russell, Ana Mercado, Ronald Reed Hathaway, Jennifer Fessler*

12:00 PM

12 **COMPARATIVE ANALYSIS OF ANTERIOR MAXILLARY DISTRACTION WITH CONVENTIONAL LEFORT I OSTEOTOMY IN THE MANAGEMENT OF CLEFT MAXILLA**
Mustafa Khader

12:10 PM

13 **AIRWAY OUTCOMES FOLLOWING CLEFT PALATE REPAIR IN ROBIN SEQUENCE**
Melinda Costa, *Kariuki Murage, Michael Tu, Michael Friel, Sunil Tholpady, Robert J. Havlik, Roberto Flores*

12:20 PM **DISCUSSION**

12:30 PM-2:00 PM
Lunch Break (On Your Own)
POSTER SESSION B, EXHIBITS

2015 PROGRAM COMMITTEE MEETING/LUNCHEON
Room: Marriott 2

ETHICS ROUNDTABLE — REGISTRATION REQUIRED (OPTIONAL LUNCH AVAILABLE)
Room: Marriott 3-4

COMMISSION ON APPROVAL OF TEAMS/ MEETING LUNCHEON
Room: Columbus

1:30 PM-6:00 PM
POSTER SESSION B

GENERAL SESSION II — MEASURING OUTCOMES PANEL

2:00 PM-3:30 PM
Room: Marriott 6-10

Goal: To provide an overview to the science of measuring patient-reported outcomes and to the CLEFT-Q, a PRO instrument designed for patients with cleft lip and/or palate.
Objective: Attendees will be able to 1) understand the potential impact of measuring PROs in a clinically significant manner, 2) understand the concepts that should be evaluated in both adult and pediatric patients with clefts, and 3) understand how to use the various scales within the CLEFT-Q.

Panel Moderator: Karen Wong, MD, MSc, FRCS(C)

14 **MEASURING OUTCOMES THAT MATTER TO PATIENTS WITH CLEFT LIP AND/OR PALATE**
The objective of this symposium is to outline our international team approach to developing PRO instruments (BREAST-Q, FACE-Q) using modern psychometric methods. The CLEFT-Q is our newest measure, developed following interviews with 151 patients in Canada, USA, UK, Philippines, India, and Kenya. We will explain the importance of meaningful measurement of PROs and how these concepts are applied in the CLEFT-Q.
Karen Wong, Elena Tsangaris, Timothy Goodacre, Christopher R. Forrest, Sophie Ricketts, Jeff Fialkov, Andrea Pusic, Stefan Cano, Anne Klassen

4:00 PM-6:00 PM

DISCIPLINE FORUMS

Back by popular demand, these informal professional networking opportunities have been scheduled during the 2014 ACPA Annual Meeting in Indianapolis. First organized at the 2013 International Congress last May, reports from forum leaders indicated a wide range of topics and information was exchanged, but even more importantly, connections were made. This is your opportunity to 'meet and greet' colleagues in your discipline from around the world! **See room assignments on Summary of Events, Page 128.**

6:00 PM-7:00 PM

THE VOYAGE OF DISCOVERY THROUGH LEADERSHIP FORUM

Room: Santa Fe

** Separate Registration Required*

Join us as a panel of speakers explains exciting, uncharted territory for ACPA in leadership development. Our organization aims to create a culture that trains current and future leaders to fulfill the mission of the ACPA. Creating strong leaders with a shared vision within the organization will ensure long-term growth and provide professional and personal benefits to each member. These benefits will translate into improved care for the children and communities that we serve. Panel speakers will explain the pathways to leadership development within the organization and will elicit audience participation as we undertake a voyage in leadership development. Beer, soda and pretzels will be provided!

7:30 PM-10:00 PM

CPF "GOOD SPORTS" EVENT — NCAA HALL OF CHAMPIONS

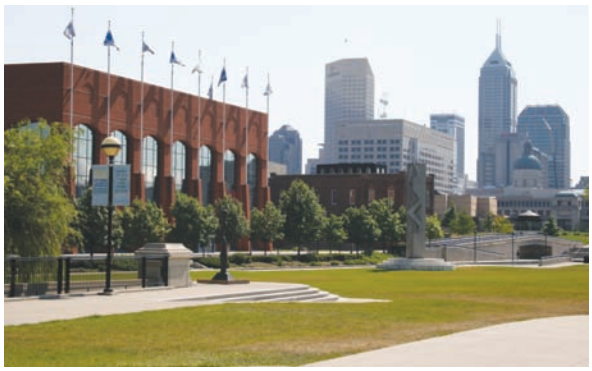
CLEFT PALATE FOUNDATION GOOD SPORTS EVENT

Join us for an evening of March Madness fun while supporting the programs of the Cleft Palate Foundation!

The 23rd Annual CPF Good Sports Event will be held Wednesday, March 26 from 7:30-10:00 PM at the NCAA Hall of Champions.

Come get your hands on two levels of interactive exhibits that create a true-to-life understanding of what it takes to make the grade:

Arena, on the first level, hosts all 23 NCAA sports and includes a novice to historian trivia challenge, current team rankings, video highlights, and artifacts donated from colleges around the nation.



Play, on the second level, is a fully interactive area to compete virtually and hands-on, a media room displaying current games on seven television screens, and a 1930's retro basketball gymnasium.

This is the place to fully appreciate the trials and triumphs of the student-athlete as well as the NCAA attributes:

Learning, Balance, Spirit, Community, Fair Play, and Character. Sound familiar?

IT TAKES A TEAM!!

THURSDAY, March 27, 2014

6:30 AM-6:00 PM
REGISTRATION/SPEAKER READY ROOM OPEN

7:00 AM-5:00 PM
EXHIBITS, POSTER SESSION C

EYE OPENERS — GROUP II
7:00 AM-8:00 AM

**Separate registration fee required.*

Code:	Instruction Level	Format
	B=Beginner	L=Lecture
	I=Intermediate	H=Hands-on
	A=Advanced	P=Panel
	V=Varied	R=Roundtable

5

15 **SPEECH OUTCOME DATA: OVERCOMING BARRIERS AND USING TECHNOLOGY**
Implementing a systematic protocol to monitor speech outcomes is critical to cleft team care. This session will present various methods for collecting, storing, and analyzing speech outcome data. A range of technologies to increase efficiency, including web-based products and a database, will be discussed. Attendees will describe strategies to overcome barriers to collecting speech outcome data, including challenges related to cost and time, selecting valid and reliable tools, and equipment. (*V,P*)
***Anna Thurmes**, Kelly Nett Cordero, Kristina Wilson, Adriane Baylis, Kathy Chapman, Angela Dixon, Cindy Dobbelsteyn, Debbie Sell, Judith Trost-Cardamone*
Room: Utah

6

*16 **SPEECH THERAPY: STRATEGIES FOR CORRECTION OF ERRORS SECONDARY TO VELOPHARYNGEAL DYSFUNCTION AND VARIOUS ORAL ANOMALIES**
In this session, specific speech therapy techniques for correction of compensatory errors due cleft palate, VPI, and other structural anomalies will be described and demonstrated. Short video clips of these techniques will be presented for clarity. There will be a discussion of methods for achieving carry-over once normal production is achieved. Participants will receive a handout of techniques, including those that can be used before and after velopharyngeal surgery. (*I, L*)
Ann Kummer
Room: Santa Fe

7

17 **PRENATAL CLEFT COUNSELING FOR BEGINNERS: ANSWERING THE CALL**
The goal of this session is to promote competence and confidence in basic prenatal cleft counseling. Typical scenarios will be presented and recommendations will be made regarding the purpose, content and structure of a prenatal counseling session. Suggestions will also be made regarding handouts and visual aids to facilitate teaching during the counseling session.
***Karla Haynes**, Irene Klecha*
Room: Columbus

8

*18 **USING PLAY-BASED THERAPY APPROACHES AND HOME PROGRAMMING FOR REDUCING COMPENSATORY ARTICULATION**
The aims of this presentation are: to review Play-based therapy approaches for decreasing Compensatory articulation; instruct how to use drill, repetitive practice, and motor-programming in sessions; review home programming and how to assist parents in being more active in monitoring their child's speech and progress. Finally, patients with common Craniofacial syndromes that may have coexisting speech deficits. Learners will be able to identify the key components of a speech therapy home program. (*B, L*)
***Tambi Braun**, Kelly Moll, Kristen DeLuca*
Room: Lincoln

9

19 **SYNDROMIC VERSUS NONSYNDROMIC CLEFTING: THE ROLE OF GENETICS IN THE INTEGRATED CLEFT TEAM APPROACH**
A significant proportion of individuals who have a cleft lip with or without cleft palate (CL/P) can have an underlying genetic syndrome. In this session, Power point slides will be utilized to review the role of a genetic counselor and a geneticist in the fetal and postnatal evaluation for CL/P. Participants will have an understanding of genetic contribution to nonsyndromic and syndromic clefting. Inheritance patterns and current technologies for genetic testing will be highlighted. Specific cases will be presented to emphasize the value of incorporating genetic counselors and geneticists to improve the overall healthcare provided by the interdisciplinary team. (*I, L*)
***Susan Starling Hughes**, Nicole Safina, Shao Jiang, Alison Kaye*
Room: Denver

10

21 **ESSENTIAL ELEMENTS OF MULTISITE NURSING RESEARCH: OPERATIONAL STUDY IMPLICATIONS**
Strategies for design and planning of a nurse led multicenter research study, an overview of the background, purpose, research questions, methods, plan for analysis of a proposed multicenter study and proposed data collection tool will be discussed. Learners will: recognize need for further study in use of arm restraints after cleft palate repair, list essential strategies in planning a multicenter research study, and discuss development of electronic data collection tool. (*V, L*)
Jennifer Huth
Room: Austin/Boston

PAUL BLACK JUNIOR INVESTIGATOR SESSION

8:00 AM-10:00 AM
Room: Marriott 6-10

Goal: To encourage and support multidisciplinary research by investigators in or recently graduated from training programs dealing with cleft and craniofacial evaluation and treatment.
Objective: Attendees will be able to identify and discuss three research questions related to cleft and craniofacial care.

Session Chair: Mohammad Mazaheri, MDD, DDS, MSc
Session Co-Chair: S. Alex Rottgers, MD

8:00 AM
22 **SPECTRUM OF DENTAL PHENOTYPES IN OROFACIAL CLEFTING**
***Brian Howe**, Lina Moreno, Margaret Cooper, Judith Resick, Alexandre Vieira, Nichole Nidey, George Wehby, Mary Marazita*

8:10 AM
23 **THE EFFECTS OF TIMING OF PALATOPLASTY IN FACIAL GROWTH AND OCCLUSAL RELATIONSHIPS: A COMPARATIVE STUDY**
***Koichi Otsuki**, Tadashi Yamanishi, Chihiro Sugiyama, Wakako Tome, Tetsuya Seikai, Taku Yamamoto, Takeshi Harada, Emiko Isomura, Koji Ishihama, Mikihiko Kogo*

8:20 AM
24 **DECREASED SECONDARY BONE GRAFTING BUT POORER MIDFACE GROWTH AFTER PRIMARY ALVEOLAR CLEFT REPAIR WITH GINGIVOPERIOSTEOPLASTY AND RHBMP-2**
***Kristen Yee**, Justine Lee, Brian Andrews, James Bradley*

8:30 AM **DISCUSSION**

8:40 AM
25 **WHITE MATTER STRUCTURE IN INDIVIDUALS WITH ISOLATED CLEFT LIP AND/OR PALATE: A DIFFUSION TENSOR IMAGING STUDY**
***Ian DeVolder**, Amy Conrad, Lynn Richman, Vincent Magnotta, Peg C. Nopoulos*

8:50 AM
26 **HMGB1 SIGNALING IS ESSENTIAL FOR GRAFT-INDUCED BONE FORMATION**
***Liliana Camison,** Dan Wang, James Gilbert, Melissa Shaw, Sameer Shakir, Adam Kubala, **Liliana Camison**, Joseph Losee, Timothy Billiar, Gregory Cooper*

9:00 AM
27 **MODULATION OF BMP2-INDUCED CALVARIAL DEFECT HEALING USING ADIPOSE, BONE MARROW, AND MUSCLE-DERIVED STROMAL CELLS**
***Sameer Shakir**, Dan Wang, Melissa Shaw, Darren Smith, Sanjay Naran, Joseph Losee, Gregory Cooper*

9:10 AM **DISCUSSION**

9:20 AM
28 **A SURVEY OF THE ACPA MEMBERSHIP. THE CONTROVERSIAL SIMONART'S BAND: ITS AFFECT ON CLEFT CLASSIFICATIONS, AND IMPLICATIONS ON BILLING AND REIMBURSEMENT. SHOULD THE TERM BE RETIRED?**
***Sanjay Naran**, Richard Kirschner, Matthew D. Ford, Mark Mooney, Joseph Losee*

9:30 AM
29 **NASOLABIAL CHANGES AFFECTED BY 2 DIFFERENT ALAR BASE CINCH SUTURE TECHNIQUES AFTER MAXILLARY LEFORT I OSTEOTOMY IN CLASS III MALOCCLUSIONS: RANDOMIZED CONTROLLED TRIAL**
***YiHsuan Chen**, Cheng-Hui Lin, Ellen Wen-Ching Ko*

9:40 AM
30 **EVALUATING THE NEED FOR ROUTINE ADMISSION FOLLOWING PRIMARY CLEFT PALATE REPAIR: AN ANALYSIS OF 100 CONSECUTIVE CASES**
***Benjamin Wood**, Keshav Magge, Tina Sauerhammer, Michael Boyajian, Gary F. Rogers, Albert Oh*

9:50 AM **DISCUSSION**

10:00 AM
POSTER SESSION C, EXHIBITS, COFFEE BREAK
PAUL BLACK JUNIOR INVESTIGATOR AWARD PANEL MEETING

GENERAL SESSION III — QUALITY OF LIFE PANEL

10:30 AM-11:45 AM
Room: Marriott 6

Goal: To describe the significance of QoL research; how we do it; and what we have learned from it. Data from an ongoing six-center longitudinal research project exploring how specialists can contribute to a patient-centered approach to clinical care are addressed.
Objective: Attendees will define QoL; and identify two key findings from this QoL research, two useful sources for this research, and gaps in the public health research literature.

Panel Moderator: Hillary Broder, PhD, MEd

31 **ORAL HEALTH-RELATED QUALITY OF LIFE: THE WHY, HOW, WHAT WE KNOW AND WHERE WE GO**
The rationale for treatment interventions for individuals with clefts is to improve and enhance their quality of life (QoL). While QoL research has been incorporated into medical care across many conditions, QoL has been largely unexplored in individuals with clefts. Patient-reported QoL outcomes in cleft lip and palate treatment are critical as we advance evidence-based care.
Panel members will consist of investigators from the NIH-research team, including clinical and health services research specialists from academia, and from the Centers for Disease Control and Prevention. Data

from the ongoing NIH-supported six-center observational, longitudinal project entitled "Quality of Life in Children with Cleft" will be presented, with assessments from clinicians, patients and caregivers. Panelists will share salient findings and discuss potential implications for patient care, outreach, and public health.
Hillary Broder, Margot Stein, Canice Crerand, Cynthia Cassell, John Riski

11:30 AM **DISCUSSION**

11:45 AM **BREAK FOR LUNCH**

12:00 PM-2:00 PM
ACPA/CPF ANNUAL AWARDS LUNCHEON
Presentation of ACPA Honors and Distinguished Service Awards, CPF Leadership Award, announcements of CPF Research Grant, Junior Investigator, Journal, and Scholarship Recipients; ASCFS Award Winners
Room: Marriott Ballroom 5

2:15 PM EXHIBITS, POSTER SESSION C

SHORT COURSES — GROUP I
2:30 PM-4:00 PM

**Separate registration fee required.*

Codes:	**Instruction Level**	**Format**
	B=Beginner	L=Lecture
	I=Intermediate	H=Hands-on
	A=Advanced	P=Panel
	V=Varied	R=Roundtable

A.

32 **AN INTRODUCTION TO FEEDING AND SWALLOWING CONCERNS IN THE CHILD WITH CLEFT PALATE OR CRANIOFACIAL SYNDROMES**
This presentation will begin with a brief overview of cleft anatomy and physiology related to swallowing. Next, specific feeding practices for children with CLP on the typical developmental course of feeding skills will be emphasized. Demonstration and hands-on experence with specific cleft feeders will be provided. Finally, feeding issues specific to cleft related syndromes will be addressed, emphasizing team evaluation process and management approach. (*B, R*)
Scott A. Dailey, *Brandon Viet, Kerry Mandulak*
Room: Santa Fe

B.

33 **ESTABLISHING MENTAL HEALTH SERVICES ON CRANIOFACIAL TEAMS**
This course will address the various mental health services typically provided in a team clinic setting, as well as determining which services are feasible to implement, given clinical demands and available resources. Information will be presented on establishing a role within the team and educating team members about services. Objective: Participants will be able to identify at least two common challenges for new mental health providers on craniofacial teams. (*B, P*)
Celia Heppner, *Amy Conrad, Canice Crerand, Kathleen Deidrick, Sandra Sinclair, Heather Snyder*
Room: Marriott 7

C.

34 **UNILATERAL CLEFT LIP REPAIR**
The complexity of the cleft lip and nasal deformity, the variability within the spectrum of the deformity, and our high expectations all contribute to the surgical challenge. Over the past centuries, numerous techniques have been described; advancing the craft as newer techniques adopt the principles of previously described repairs while addressing their deficiencies. The purpose of this session is to review the anatomy of the cleft lip and nasal deformity, to review the history of left lip repair, to review principles of repair, and to highlight the keys to successful repair using the Anatomic Subunit Approximation Technique.
David Fisher
Room: Denver

D.

35 **ORTHOPEDIC AND ORTHODONTIC TREATMENT FOR PATIENTS WITH CLEFTS OF THE LIP AND PALATE: FROM BIRTH TO MIXED DENTITION**
This course will provide the audience with a detailed description of the use of Nasoalveolar Molding Technique for infants born with unilateral and bilateral cleft deformities. The course will also discussed maxillary arch preparation for a secondary bone grafting procedure during the mixed dentition. Educational Objective: The participant should be able to introduce the discussed principles into his/her daily orthopedic/orthodontic practice. (*V, L*)
Pedro Santiago
Room: Utah

E.

36 **CLEFT ORTHOGNATHIC SURGERY**
This course will be given in a multidisciplinary fashion by practitioners involved in cleft orthodontics and surgery, and orthognathic surgery. The focus will be for the practicing orthodontist and surgeon who treats these patients from infancy through adulthood. We will focus both on orthodontic and surgical challenges. Considerations will include the unilateral deformity, bilateral deformity, technical modifications, dealing with residual fistulae, segmental osteotomies, simultaneous bone grafting, management of existing posterior pharyngeal flap, and impact on sleep apnea and speech postoperatively. Additional emphasis will be placed on preoperative planning, including conventional model surgery, splint type and fabrications, virtual surgical planning, and speech and airway assessments. Final considerations of orthodontic finishing will be discussed as well
Anand Kumar, *Lindsay Schuster, Derek Steinbacher*
Room: Marriott 8

F.

37 **MEDICAL MANAGEMENT AND SURVEILLANCE PROTOCOLS FOR COMPLEX CRANIOFACIAL CONDITIONS**
A panel of experts will discuss the development of management protocols for patients with four conditions: fibrous dysplasia, Robin sequence, syndromic craniosynostosis, and craniofacial microsomia. For each condition, participants will: 1) define diagnostic criteria, differential diagnoses, and confirmatory studies, 2) identify health concerns that could impact readiness for surgery or increase risk for adverse outcome, and 3) provide critical appraisal of a health care supervision timeline. (*V, P*)
Anne Hing, *Howard Saal, Yvonne Gutierrez, Kelly Evans, Emily Gallagher, Ophir Klein, Robert Byrd, Katrina Dipple, Charlotte Lewis, Michael Cunningham*
Room: Austin/Boston

G.

38 **IMPROVING OUTCOMES BY TREATING THE WHOLE PATIENT: INTEGRATING LANGUAGE, COGNITIVE AND PSYCHO-SOCIAL ISSUES IN TEAM CARE**
This course will enable participants to understand and apply concepts, strategies and techniques drawn from the fields of language, cognition and social-emotional development to enhance craniofacial team care and patient outcomes. The discussion presents an overview of relevant current research, including special populations. The methodology includes case studies, discussion, demonstrating assessment tools, and role play. Small groups will design formal team protocols to assess these domains. (P)
Margot Stein, *Patricia Stone, Lynn Fox*
Room: Marriott 9

H.

39 **SURGICAL MANAGEMENT OF VPD IN 22Q11.2 DELETION SYNDROME: MASTERS CLASS FOR THE SURGEON AND SLP**
The nature of VPD in 22q11DS is complex, thus treatment planning and surgical technique must be tailored to syndrome-specific and patient-specific factors to optimize outcome. This masters' class will provide a comprehensive overview of the multifactorial nature of VPD in 22q and algorithms for successful surgical-speech management. Attendees will be able to describe syndrome-specific considerations for pre-surgical, perioperative, and post-surgical VPD management and outcomes assessment. *(I, L)*
Adriane Baylis, *Richard Kirschner*
Room: Lincoln

I.

40 **LINKING THE BRIDGE BETWEEN VIRTUAL AND ACTUAL ORTHOGNATHIC SURGERY (OGS): THE INTRODUCTION OF SURGICAL POSITIONING GUIDES (SPG)**
Virtual surgical planning (VSP) has revolutionized pre-operative treatment planning for orthognathic surgery. In this session, the presenters will demonstrate the application of VSP surgical work-ups in cleft and syndromal orthognathic surgical cases. Participants experience with hands-on virtual surgical planning and design of OPS is the central purpose of this course.
John Polley, *Alvaro Figueroa*
Room: Columbus

J.

41 **PLASTIC SURGERY FOR THE REST OF THE TEAM**
This course will use an interactive format to review common procedures offered to patients with cleft lip and palate. Procedures reviewed will include cleft lip repair, cleft palate repair, pharyngeal flap and sphincter pharyngoplasty. Drawings, models, and other visual aids will be used to give participants an understanding of how these procedures are done. Three dimensional understanding will be emphasized. Correlations will be drawn between specific techniques and the theoretical advantages and disadvantages among them. Common postoperative complications and how they link with surgical techniques will also be discussed. After taking this course, participants will have a better understanding of what happens in the operating room. The course assumes knowledge of the anatomy of the face and mouth but does not require advanced medical or surgical knowledge.
Martha Matthews, *Marilyn Cohen*
Room: Marriott 10

4:00 PM-4:30 PM
POSTER SESSION C, EXHIBITS, COFFEE BREAK

SHORT COURSES — GROUP II
4:30 PM-6:00 PM

**Separate registration fee required.*

Codes:	**Instruction Level**	**Format**
	B=Beginner	L=Lecture
	I=Intermediate	H=Hands-on
	A=Advanced	P=Panel
	V=Varied	R=Roundtable

K.

42 **THE FURLOW PALATOPLASTY: SURGICAL TECHNIQUE AND OUTCOMES IMPROVEMENT**
The Furlow Z-palatoplasty may be used to achieve excellent results both in primary cleft palate repair and in secondary management of velopharyngeal dysfunction. This course will provide a review of the detailed step-by-step surgical technique while providing tips on how to optimize surgical outcomes through patient selection and technical precision. At the completion of the course, participants will be able to discuss methods by which to optimize outcomes with the Furlow repair. (*I, L*)
Richard Kirschner
Room: Austin/Boston

L.

*43 **SPEECH EVALUATION, THERAPY, AND COLLABORATION FOR THE CLEFT TEAM SPEECH-LANGUAGE PATHOLOGIST**

This course will provide tools and information for the SLP to conduct an efficient perceptual speech evaluation and to categorize speech production errors. Indications for additional velopharyngeal management vs. speech therapy will be discussed. Articulation therapy techniques and methods for collaborating with the local SLP will be addressed. Objective: The participant will describe the role of the SLP with the cleft palate team. (*B, L*)

Lynn Marty Grames

Room: Denver

M.

44 **DENTAL AND ORTHODONTIC PREPARATION FOR SECONDARY ALVEOLAR BONE GRAFT SURGERY**

The course will include an historical review of secondary alveolar bone grafts and diagnostic factors necessary to determine the nature and timing of dental and orthodontic treatment for optimum surgical outcome. The educational objective is to understand the role of the orthodontist/ pediatric dentist in surgical outcome assessment and post-surgical treatment. Clinical cases will illustrate the important considerations in effectively managing patients who require secondary alveolar bone grafts. (*B, L*)

***Peter Spalding**, Ana Mercado, Pearson Gregory, Ashok Kumar*

Room: Marriott 7

N.

45 **CARE OF THE CHILD WITH A CLEFT: PRENATAL DIAGNOSIS THROUGH THE FIRST YEAR OF LIFE**

A multidisciplinary panel will describe their roles in caring for children and families affected by clefting. We will introduce family centered team care, emphasizing nursing and care coordination. We will highlight delivery of culturally competent care and address socioeconomic needs. ACPA Team Standards will be incorporated. Psychosocial issues and interventions will be discussed. Our objective is to orient new providers to team care in the first year of life. (*B, L*)

***Noreen Clarke**, Alexis Johns, Karla Haynes, Daniela Schweitzer, Lori Howell, Yvonne Gutierrez*

Room: Santa Fe

O.

46 **ADVANCED SKILLS FOR MENTAL HEALTH PROVIDERS ON CRANIOFACIAL TEAMS**

This course will educate mental health providers on advanced themes for craniofacial care. Topics will include cognitive/learning and psychological assessment; interventions for psychosocial concerns (bullying and self-image); and implementing clinical research. Educational Objective: describe at least 1 evaluation method for cognitive, learning, and social-emotional functioning; identify at least 1 intervention for psychosocial concerns; and describe key components of a clinical research plan.

***Amy Conrad**, Canice Crerand, Kathleen Deidrick, Celia Heppner, Sandra Sinclair, Heather Snyder*

Room: Marriott 10

P.

47 **NASOALVEOLAR MOLDING AND COLUMELLA ELONGATION**

This course will take an in depth view of NasoAlveolar Molding, the biomechanics, advanced techniques and patient management. Registered students may submit a well documented case showing pretreatment and clinical progress records through the end NAM therapy for discussion by the presenters. Due to time limitations, not all submitted cases will be discussed. Cases should be sent via email to Barry.grayson3@gmail.com up to two weeks prior to the course, March 27, 2014. (*V,L*)

***Barry Grayson**, Pradip Shetye, Lawrence E. Brecht*

Room: Marriott 8

Q.

48 **TECHNIQUE OF PALATE REPAIR**

A presentation of a technique of palate repair with radical muscle dissection including: 1. A description of the anatomy - the basis of the repair; 2. Hints on the use of the operating microscope; 3. A detailed description of the operative technique with videos; 4. An analysis of outcomes - of both primary and secondary repair; The session will be interactive with discussion encouraged. Educational objective: Participants should leave with a better understanding of the technique and its outcomes. (*V, L*)

Brian Sommerlad

Room: Marriott 9

R.

49 **PIERRE ROBIN SEQUENCE: FEEDING MANAGEMENT ACROSS INTERVENTIONS**

Pierre Robin Sequence is recognized today as a condition characterized by micrognathia and/or retrognathia, glossoptosis, respiratory distress, and cleft palate. The respiratory difficulties resulting from the upper airway obstruction lead to impairments in the newborn's ability to feed effectively. The basis of the feeding problems have been explained as an over-expenditure of energy on breathing, leading to further difficulty in attempts to feed. The upper airway obstruction interferes with the infant's ability to engage in the suck-swallow-breathe synchrony that comprises normal feeding. This presentation will review the feeding challenges of children with PRS and present feeding options and techniques based upon treatment modalities; from tracheostomy to mandibular distraction osteogenesis. Case studies and hands-on demonstrations of feeding techniques will be presented in lecture format. *(I, L)*

***Kelly Mabry,** Kerri Langevin*

Room: Utah

S.

50 **PRACTICAL GUIDELINES FOR MANAGING PATIENTS WITH COPY NUMBER VARIANTS INVOLVING CHROMOSOME 22Q11.2**

22q11.2 deletion syndrome is the most common cause of syndromic palatal anomalies; nonetheless, systematic guidance for clinical management is limited. Thus, The International 22q11.2DS Consortium established practical guidelines with a goal of

transcending nationalities, health care systems, and subspecialty biases. These recommendations will be shared to include an overview of the condition, the approach to speech and language, associated behavioral differences, surgical interventions, and coordinated multidisciplinary perioperative care. (A,P)
***Donna McDonald-McGinn**, Cynthia B. Solot, Meg Maguire, Oksana Jackson, Anne Bassett*
Room: Columbus

T.
51 **A KEEN EYE TOWARDS EFFECTIVE TEAM COORDINATION**
This is for cleft/craniofacial team coordinators/directors wanting to optimally manage their interdisciplinary team. This often requires creative thinking, willingness to try something new, and critical analysis of current clinical and team management practices. Topics include handling team growth, team politics, referral protocols, and utilizing process mapping to evaluate patient and clinical flow. Learners will identify effective practices for improving team coordination. (V,L)
***Iris Sageser**, Jamie Idelberg*
Room: Lincoln

7:00 PM-11:00 PM
ACPA 71st ANNUAL GALA — *A NIGHT OF WONDER*
Champagne reception, sit down dinner, music and dancing to the popular local band "Souled Out"
-supported in part by KLS Martin LP and Medical Modeling Inc.

Indiana Roof Ballroom

FRIDAY, March 28, 2014

7:00 AM-8:00 AM
ASCFS BREAKFAST
Room: Santa Fe

7:00 AM-5:00 PM
EXHIBITS, POSTER SESSIONS D & E

7:00 AM-5:30 PM
REGISTRATION/SPEAKER READY ROOM OPEN

8:00 AM-12:30 PM
POSTER SESSION D

CONCURRENT GENERAL SESSIONS (GROUP 1)

SESSION A: ASCFS LINTON WHITAKER LECTURE
8:00 AM-9:00 AM
Room: Marriott 6

Session Chair: Kant Y.K. Lin, MD

Goal: To provide a comprehensive overview and discussion of craniofacial microsomia.
Objective: Attendees will be able to examine the common features and discuss recent observations related to craniofacial microsomia. Attendees will learn and discuss the etiology, pathogenesis and treatment of craniofacial microsomia.

THOUGHTS AND OBSERVATIONS ON CRANIOFACIAL MICROSOMIA
The 2014 ASCFS Linton Whitaker Lecture, "Thoughts And Observations On Craniofacial Microsomia," will be presented by Scott Bartlett, MD. The Lecture, named in honor of Linton A. Whitaker, recognizes Dr. Whitaker's years of service to the specialty of craniofacial surgery and his mentorship and education of a generation of plastic surgeons.
Scott Bartlett, MD

SESSION B: ALVEOLAR BONE GRAFT PANEL
8:00 AM-9:00 AM
Room: Marriott 5

Panel Moderator: Sidney Eisig, DDS

Goal: To recognize complicated alveolar bone grafting cases, and identify appropriate alternatives to traditional flap designs.
Objective: Attendees will be able to compare alternative techniques for alveolar bone grafting, identify restorative options of the alveolar cleft site, and manage the alveolus and the pre-maxilla in the bilateral alveolar cleft.

53 **UPDATES IN ALVEOLAR BONE GRAFTING**
Alveolar bone grafting can be complex and may require alternative techniques to the more traditional treatment options. This program will include presentations on autologous bone graft reconstruction of the cleft maxilla and use of recombinant human BMP-2 in the cleft patient, reconstruction of bilateral cleft defects, and restorative options of the alveolar cleft site.
Barry Steinberg, Sidney Eisig, Bonnie L. Padwa, Lawrence E. Brecht

SESSION C: BARRIERS TO CLEFT CARE PANEL
8:00 AM-9:00 AM
Room: Marriott 7-8

Panel Moderator: Margot Neufield, MA

Goal: To provide a forum to discuss barriers to accessing care for children with orofacial clefts in the United States.
Objective: Attendees will be able to identify two gaps in the literature addressing barriers to care; list two proposed strategies under development for parents; and understand two ways the accessibility and quality of information can be improved for parents.

54 **ADDRESSING BARRIERS IN ACCESS TO PRIMARY CLEFT AND CRANIOFACIAL CARE**
While many children and families affected by orofacial clefts in the United States may benefit from available information and resources on accessing health care, many do not due to difficulties in obtaining and utilizing these items. Panelists will summarize the various types of barriers these families and children face on a daily basis and present possible strategies to improve access to care.
Margot Neufeld, Cynthia Cassell, George Wehby, Michael VanLue

SESSION D: MEDICAL ADHERENCE IN THE CRANIOFACIAL TEAM PANEL
8:00 AM-9:00 AM
Room: Marriott 9-10

Panel Moderator: Karla Haynes, RN, MPH, MS, CPNP

Goal: The purpose of this presentation is to describe strategies for improving patients' adherence to Craniofacial Team recommendations and delineate the decision making process for referring to a child welfare agency.
Objective: Participants will be able to identify families in need of assistance in improving adherence, list three barriers that may contribute to diminished adherence, and describe different resources and agencies to consult when collaborating with families.

55 **STRATEGIES AND TOOLS TO HELP IMPROVE MEDICAL ADHERENCE IN THE CRANIOFACIAL TEAM**
This course will outline the steps Teams can take to help optimize patient adherence to multiple medical recommendations that comprise care of the child with a craniofacial diagnosis. Pertinent cases will be presented. Participants will be able to describe different resources and agencies to consult when collaborating with families.
Karla Haynes, Noreen Clarke, Laura Garcia, Amy Goodier, Alexis Johns, Sally Ward, Yvonne Gutierrez

9:00 AM-10:00 AM
ACPA ANNUAL BUSINESS MEETING
Open only to ACPA members
Room: Marriot Ballroom 6

10:00 AM-10:30 AM
POSTER SESSION D, EXHIBITS, COFFEE BREAK

FRIDAY, March 28, 2014

CONCURRENT SPECIALTY SESSIONS (Group 1)
10:30 AM-12:00 PM

CONCURRENT I: ASCFS PART I
Room: Marriott 6

Goal: To provide those who treat craniofacial conditions surgically with a forum to discuss new concepts and share information.
Objective: Attendees will be able to discuss and evaluate at least three new surgical management techniques which can be used for a variety of craniofacial conditions.

Session Chair: Steven Buchman, MD
Session Co-Chair: Mark Urata, MD, DDS

10:30 AM
56 **A SINGLE CENTER'S EXPERIENCE WITH ISOLATED UNICORONAL CRANIOSYNOSTOSIS RECONSTRUCTION: LONG-TERM OUTCOMES OF 182 PATIENTS OVER 35 YEARS**
James Paliga, Ari Wes, Jesse Goldstein, Linton Whitaker, Scott Bartlett, Jesse Taylor, ***Youssef Tahiri***

10:40 AM
57 **THE PREVALANCE OF STRABISMUS IN PATIENTS WITH UNICORONAL SYNOSTOSIS**
Fares Samra*, J. Thomas Paliga, Linton Whitaker, Scott Bartlett, Brian Forbes, Jesse Taylor*

10:50 AM
58 **THREE-DIMENSIONAL ORBITAL DYSMORPHOLOGY IN METOPIC SYNOSTOSIS**
Harib Ezaldein*, Philipp Metzler, John Persing, Derek Steinbacher*

11:00 AM
59 **AGE AT TIME OF SURGERY AND MAINTENANCE OF HEAD SIZE IN NON-SYNDROMIC SAGITTAL CRANIOSYNOSTOSIS**
Curtis Bergquist*, Nathan Selden, Allison Nauta, Anna Kuang*

11:10 AM **DISCUSSION**

11:20 AM
60 **ARE ENDOSCOPIC AND OPEN TREATMENTS OF METOPIC SYNOSTOSIS EQUIVALENT IN TREATING TRIGONOCEPHALY AND HYPOTELORISM?**
Dennis Nguyen, *Andrew H. Huang, Kamlesh Patel, Gary Skolnick, Sybill Naidoo, Matthew Smyth, Albert Woo*

11:30 AM
61 **CRANIAL BASE ASYMMETRY AFTER OPEN AND ENDOSCOPIC REPAIR OF ISOLATED LAMBDOID CRANIOSYNOSTOSIS**
Ema Zubovic, *Albert Woo, Gary Skolnick, Sybill Naidoo, Matthew Smyth, Kamlesh Patel*

11:40 AM
62 **IMPACT OF AGE AND OPERATION ON ADVERSE EVENTS AFTER CRANIOSYNOSTOSIS REPAIR**
Michael DeLong, *Kyle Halvorson, John Gallis, Carrie Muh, Shivanand Lad, Jeffrey Marcus*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
LUNCH BREAK (ON YOUR OWN)

ASCFS LUNCHEON/BUSINESS MEETING
(separate registration fee required)
Open only to members of the American Society of Craniofacial Surgery
Room: Marriott 1-2

CONCURRENT 2: CLEFT LIP AND PALATE SURGERY
Room: Marriott 5

Goal: To provide a forum focused on research and surgical techniques used in the management of patients with cleft lip and palate.
Objective: Attendees will be able to discuss at least three research findings related to techniques or outcomes of surgical techniques used in cleft lip and palate surgery.

Session Chair: Robert J. Havlik, MD
Session Co-Chair: Gregory Pearson, MD

10:30 AM
63 **UNILATERAL CLEFT LIP REPAIR USING THE ANATOMIC SUBUNIT APPROACH: MODIFICATIONS AND ANALYSIS OF EARLY RESULTS IN 93 CONSECUTIVE CASES**
Raymond Tse, *Samuel Lien, Clinton Morrison*

10:40 AM
64 **USE OF AN INFERIOR PENNANT FLAP DURING UNILATERAL CLEFT LIP REPAIR IMPROVES LIP SYMMETRY**
Aaron Russell, *Kamlesh Patel, Gary Skolnick, Albert Woo*

10:50 AM
65 **A MODIFIED V-Y CHONDROMUCOSAL COMPOSITE FLAP FOR CORRECTION OF SECONDARY CLEFT NASAL DEFORMITY: A PHOTOGRAMMETRIC ANALYSIS**
Marten Basta, *Jesse Goldstein, Anthony Wilson, Jesse Taylor*

11:00 AM
66 **A THREE DIMENSIONAL ANALYSIS OF NASAL AESTHETICS FOLLOWING LE FORT I ADVANCEMENT IN PATIENTS WITH CLEFT LIP AND PALATE**
Edward Davidson, *Lino Miele, Oluwaseun Adetayo, Anand Kumar*

11:10 AM **DISCUSSION**

11:20 AM
67 **SKELETAL STABILITY AFTER MAXILLARY DISTRACTION WITH A RIGID EXTERNAL DEVICE (RED) IN ADULT PATIENTS WITH CLEFT LIP AND PALATE**
Shashwat Magarkar, *Sherry Peter*

11:30 AM
68 **INCIDENCE OF POSITIVE SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH ISOLATED CLEFT LIP AND PALATE**
Jason Silvestre, *J. Thomas Paliga, Youssef Tahiri, Scott Bartlett, Jesse Taylor*

11:40 AM
69 **THE RATE OF ORONASAL FISTULA FOLLOWING PRIMARY CLEFT PALATE SURGERY: A META-ANALYSIS**
Michael Bykowski, *Daniel Winger, Sanjay Naran, Joseph Losee*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
LUNCH BREAK (ON YOUR OWN)

CONCURRENT 3: PERSPECTIVES
Room: Marriott 9-10

Goal: To provide those who treat patients with cleft lip and palate with a forum to discuss the impact the cleft lip and palate condition can have on every day social interactions and the importance multi disciplinary care can have on developing healthy coping skills.

Objective: Attendees will be able to discuss, in psychological terms, what actually transpires in daily social interactions. Attendees will be able to identify 3 common coping mechanisms used.

Session Chair: Robert Mann, MD

10:30 AM-11:50 AM

70 **NAVIGATING SOCIAL CHALLENGES: LIFE WITH A CLEFT LIP AND PALATE**
***Robert Mann**, Alan McEvoy, Tony Meyer*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
LUNCH BREAK (ON YOUR OWN)

CONCURRENT 4: SPEECH
Room: Marriott 3-4

Goal: To provide a forum focused on research and clinical aspects of speech evaluation and treatment related to individuals with orofacial clefts and other craniofacial conditions.
Objective: Attendees will be able to identify and discuss at least three speech evaluation and treatment techniques relevant to research or management of patients with cleft and craniofacial conditions.

Session Chair: David Zajac, PhD
Session Co-Chair: Anna Thurmes, MA, CCC-SLP

10:30 AM

71 **PHONETIC DETERMINANTS OF AUDIBLE NASAL EMISSION (VELAR FLUTTER) IN CHILDREN WITH REPAIRED CLEFT PALATE**
***David Zajac**, Kate Winterbottom, John Preisser*

10:40 AM

72 **ARTICULATION OUTCOMES IN CHILDREN WHO ARE INTERNATIONALLY ADOPTED**
***Amy Morgan**, Claudia Crilly Bellucci, Mary O'Gara, Brent Collett, Pravin Patel, Eva Kowalewicz, Kathleen Kapp-Simon*

10:50 AM

73 **LANGUAGE DEVELOPMENT IN CHILDREN WITH OROFACIAL CLEFTS ADOPTED FROM NON-ENGLISH SPEAKING COUNTRIES**
***Claudia Crilly Bellucci**, Brent Collett, Amy Morgan, Arthur Curtis, Eva Kowalewicz, Jody Coppersmith, Kathleen Kapp-Simon*

11:00 AM

74 **THE INFLUENCE OF SPEAKING RATE ON NASALANCE IN TYPICAL ADULT SPEAKERS**
***Rachel Whitney**, Stephen Tasko, Helen Sharp, Greg Flamme*

11:10 AM **DISCUSSION**

11:20 AM

75 **DEVELOPING A NOVEL SPEECH INTERVENTION IPAD GAME FOR CHILDREN WITH CLEFT PALATE: A PILOT STUDY**
***Jamie Funamura**, Yen Hsieh, Sri Kurniawan, Zachary Rubin, Christina Roth, Susan Goodrich, Travis Tollefson*

11:30 AM

76 **STRUCTURAL AND FUNCTIONAL ASSESSMENT OF SPEECH IN YOUNG CHILDREN USING DYNAMIC MAGNETIC RESONANCE IMAGING**
***Jamie Perry**, David Kuehn, Bradley Sutton*

11:40 AM

77 **USE OF DYNAMIC MRI TO QUANTIFY VELOPHARYNGEAL CONTACT LENGTH AND DIFFERENTIATE VELOPHARYNGEAL CONTACT CONFIGURATIONS AMONG PHONEMES**
***Catherine Pelland**, Josh Inouye, Xue Feng, Craig Meyer, Kathleen Borowitz, Kant Y.K. Lin, Silvia Blemker*

11:50 AM **DISCUSSION**

12:00 PM-1:30 PM
LUNCH BREAK (ON YOUR OWN)

CONCURRENT 5: PIERRE ROBIN SEQUENCE
Room: Marriott 7-8

Goal: To provide a forum focused on research and clinical aspects of Pierre Robin Sequence.
Objective: Attendees will be able to identify at least three evaluation and management strategies for individuals with Pierre Robin Sequence.

Session Chair: Carrie Heike, MD, MS
Session Co-Chair: Marilyn Cohen, LSLP

10:30 AM

78 **AN OUTCOMES ANALYSIS OF MANDIBULAR DISTRACTION OSTEOGENESIS FOR THE TREATMENT OF NEONATAL TONGUE-BASED AIRWAY OBSTRUCTION**
***Jesse Goldstein**, Cyndi Chung, Christopher Cielo, Carol Marcus, Janet Lioy, Scott Bartlett, Jesse Taylor*

10:40 AM

79 **A SIMPLE MANDIBULAR DISTRACTION PROTOCOL TO AVOID TRACHEOSTOMY IN PATIENTS WITH PIERRE ROBIN SEQUENCE**
***Jessica Ching**, Sergio Alvarez, Cathy Conley, Ernesto Ruas*

10:50 AM
80 **EVALUATION OF SURGICAL TREATMENT OF SYMPTOMATIC PIERRE ROBIN SEQUENCE: A COHORT COMPARISON STUDY BETWEEN FURLOW PALATOPLASTY VS. RADICAL INTRAVELAR VELOPLASTY**
***Brian Gander**, Wesley Sivak, Zoe MacIsaac, Lorelei Grunwaldt, Anand Kumar*

11:00 AM
81 **MAPPING THE MANDIBULAR LINGULA IN SYMPTOMATIC PIERRE ROBIN SEQUENCE: A GUIDE TO THE INVERTED L-OSTEOTOMY**
***Wendy Chen**, Edward Davidson, Zoe MacIsaac, Anand Kumar*

11:10 AM **DISCUSSION**

11:20 AM
82 **EVALUATION OF OTOLOGY OUTCOMES AFTER SURGICAL TREATMENT OF SYMPTOMATIC PIERRE ROBIN SEQUENCE: A COHORT COMPARISON STUDY BETWEEN FURLOW PALATOPLASTY VS. RADICAL INTRAVELAR VELOPLASTY**
***Kavita Dedhia**, David Chi, Anand Kumar, Deepak Mehta*

11:30 AM
83 **NASOPHARYNGEAL INTUBATION FOR SEVERE CASES OF ROBIN SEQUENCE: A FOLLOW UP OF THREE YEARS WITH EVALUATION OF NEUROLOGICAL DEVELOPMENT**
***Ilza Lazarini Marques**, Tatiane Romanini, Alvaro Bertucci, Rosana Prado-Oliveira*

11:40 AM
84 **CARDIAC AND NEUROLOGIC ANOMALIES IN ROBIN SEQUENCE: INCIDENCE AND CLINICAL IMPLICATIONS**
***Melinda Costa**, Michael Tu, Robert J. Havlik, Sunil Tholpady, Roberto Flores*

11:50 AM` **DISCUSSION**

12:00 PM-1:30 PM
LUNCH BREAK (ON YOUR OWN)

FRIDAY, March 28, 2014

CONCURRENT SPECIALTY SESSIONS (Group 2)

1:30 PM-3:00 PM

CONCURRENT 6 ASCFS PART II

Room: Marriott 6

Goal: To provide a forum focused on research and surgical management of individuals with craniofacial anomalies.
Objective: Attendees will be able to discuss and evaluate at least three new surgical management techniques for a variety of craniofacial conditions.

Session Chair: Joseph Losee, MD
Session Co-Chair: John A. van Aalst, MD

1:30 PM
85 **A CURRENT ASSESSMENT OF CRANIOFACIAL FELLOWSHIP TRAINING**
***Niyant Patel**, Kanlaya Ditthakasem, Jeffrey Fearon*

1:40 AM
86 **RETRIEVAL OF A FULL FACIAL ALLOGRAFT BASED ON THE MAXILLARY ARTERY: INDICATIONS AND TECHNIQUE**
***Bahar Bassiri Gharb**, Gaby Doumit, Antonio Rampazzo, Frank Papay*

1:50 AM
87 **AUTOLOGOUS BONE-ASSISTED CRANIOPLASTY FOLLOWING DECOMPRESSIVE CRANIECTOMY IN PEDIATRIC PATIENTS: RISK FACTORS AND RATES OF RESORPTION**
***Nicholas Berlin**, Brooke French, Frederic Deleyiannis, Austin Badeau*

2:00 PM
88 **PEDIATRIC FACIAL FRACTURE PATTERNS: TRAJECTORIES AND RAMIFICATIONS IN 151 PATIENTS**
***Sanjay Naran**, Christopher Kinsella, Zoe MacIsaac, Evan Katzel, Michael Bykowski, Sameer Shakir, Roee Rubinstein, Joseph Losee*

2:10 PM **DISCUSSION**

2:20 PM
89 **EARLY DISTRACTION AT PIERRE ROBIN SYNDROME PATIENTS: 15 YEARS FOLLOW UP**
***Carmen Morovic**, Claudia Vidal*

2:30 PM
90 **5 YEAR FOLLOW-UP OF MIDFACE DISTRACTION IN GROWING CHILDREN WITH SYNDROMIC CRANIOSYNOSTOSIS**
***Parit Patel**, Pradip Shetye, Stephen Warren, Barry Grayson, Joseph G McCarthy*

2:40 PM
91 **SUCCESSFUL NEONATAL MANDIBULAR DISTRACTION OSTEOGENESIS IN PATIENTS WITH CONCOMITANT LARYNGOMALACIA**
***Melinda Costa**, Michael Tu, Kariuki Murage, Robert J. Havlik, Roberto Flores, Sunil Tholpady*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

CONCURRENT 7: ALVEOLAR BONE GRAFTS
Room: Marriott 5

Goal: To provide a forum focused on alveolar bone graft research, clinical care, and outcomes.
Objective: Attendees will be able to discuss three clinical or research topics related to alveolar bone grafting.

Session Chair: Joli Chou, DMD, MD
Session Co-Chair: Ana Mercado, DMD, PhD

1:30 PM
92 **MINORITY AND PUBLIC INSURANCE STATUS: IS THERE A DELAY TO ALVEOLAR BONE GRAFTING SURGERY?**
***Jason Silvestre**, Giovanni Greaves, Kristen Lowe, Rosario Mayro, Oksana Jackson*

1:40 PM
93 **CRANIAL BONE GRAFTING FOR ALVEOLAR CLEFTS: A 25- YEAR REVIEW OF OUTCOMES**
***Kristen Hudak**, Patrick Hettinger, Arlen Denny*

1:50 PM
94 **QUALITATIVE ANALYSIS OF MESIAL AND DISTAL ALVEOLAR BONE OF MAXILLARY CANINES MOVED TO GRAFTED ALVEOLAR CLEFT: A TOMOGRAPHIC EVALUATION**
***Marília Yatabe**, Camila Massaro, Daniela Gamba Garib*

2:00 PM
95 **PERIODONTAL MORPHOLOGY OF CENTRAL INCISORS OF PATIENTS WITH UNILATERAL ALVEOLAR CLEFT: A CBCT ASSESSMENT**
***Marília Yatabe**, Gabriela Natsumeda, Daniela Gamba Garib*

2:10 PM **DISCUSSION**

2:20 PM
96 **NEW PERSPECTIVES TO PERFORM BONE TISSUE ENGINEERING FOR ALVEOLAR BONE GRAFT TO CLEFT LIP AND PALATE PATIENTS USING NON INVASIVE SOURCES OF STEM CELL**
***Daniela Bueno**, Carla Cristina Pinheiro, Daniela Tanikawa, Rita Martins, Diogenes Rocha, Luiz Fernando Reis*

2:30 PM
97 **UTILIZING A SURGICALLY CREATED ALVEOLAR CLEFT MODEL IN JUVENILE SWINE TO TEST STEM CELL-BASED TREATMENT STRATEGIES**
***Jeyhan Wood**, Montse Caballero, Alex Halevi, Justin Morse, Michael Pharaon, Luiz Pimenta, Enrique Pretti, Jesse Goldstein, John Van Aalst*

2:40 PM
98 **IS PLATLETS RICH FIBRIN (PRF) ENHANCING MAXILLARY ALVEOLAR CLEFT RECONSTRUCTION**
Sameh Monier

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

CONCURRENT 8: CRANIOFACIAL BIOLOGY
Room: Marriott 9-10

Goal: To provide a forum focused on cell biology, craniofacial biology, and genetics as they relate to orofacial clefts and craniofacial conditions.
Objective: Attendees will be able to discuss at least three molecular, genetic, morphological, and surgical factors affecting growth and development in individuals with orofacial clefts and craniofacial conditions.

Session Chair: Michael Cunningham, MD, PhD
Session Co-Chair: Seth Weinberg, PhD

1:30 PM
99 **DIFFERENTIAL EFFECTS OF INFLAMMATORY MEDIATORS TNFA, TGFB1 ON CELLULAR DIFFERENTIATION IN A MURINE IN VITRO MODEL OF HETEROTOPIC OSSIFICATION**
***S. Alex Rottgers**, Laura Meszaros, Anand Kumar*

1:40 PM
100 **TGFB1 INHIBITS BMP2 MEDIATED OSTEOGENIC DIFFERENTIATION IN A PRIMARY MURINE MUSCLE CELL IN VITRO MODEL OF HETEROTOPIC OSSIFICATION**
***S. Alex Rottgers**, Laura Meszaros, Anand Kumar*

1:50 PM
101 **TGF-BETA 3 AND FGF ANTAGONIZE BMP-2-INDUCED OSTEOGENIC DIFFERENTIATION**
***Rick Mai**, James Gilbert, Joseph Losee, Gregory Cooper*

2:00 PM
102 **VIBRATORY STIMULUS ELICITS BOTH OSTEOGENESIS AND CHONDROGENESIS IN UMBILICAL CORD MESENCHYMAL STEM CELLS**
***Justin Morse**, Montse Caballero, Zach Cashion, Robert Dennis, John Van Aalst*

2:10 PM **DISCUSSION**

2:20 PM
103 **MANDIBULAR AND MAXILLARY LENGTHS IN FIVE SUBGROUPS OF CLEFT PALATE WITH OR WITHOUT CLEFT LIP**
***Nuno V. Hermann**, Tron A. Darvann, Sven Kreiborg*

2:30 PM
104 **MICROESTHETIC DENTAL ANALYSIS IN PARENTS OF CHILDREN WITH ORAL CLEFTS**
***Chloe Hoppens**, Steven Miller, Judith Resick, Nichole Nidey, George Wehby, Mary Marazita, Lina Moreno*

2:40 PM
105 **AN EXPERIMENTAL STUDY OF PARTICULATE BONE GRAFT FOR SECONDARY INLAY CRANIOPLASTY OVER SCARRED DURA**
***Reid Maclellan**, Aladdin Hassanein, John Mulliken, Gary Rogers, Arin Greene*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

CONCURRENT 9: PSYCHOSOCIAL
Room: Marriott 3-4

Goal: To provide a forum focused on psychological issues and outcomes for individuals with orofacial cleft and other craniofacial conditions.
Objective: Attendees will be able to list and discuss at least three psychological and educational issues or outcomes for individuals with orofacial cleft or other craniofacial conditions.

Session Chair: Canice Crerand, PhD
Session Co-Chair: Margot Stein, PhD

1:30 PM
106 **BODY IMAGE DIMENSIONS IN YOUTH WITH CRANIOFACIAL CONDITIONS: GENDER DIFFERENCES AND PARENT VS. SELF RATINGS OF APPEARANCE**
***Canice Crerand**, Alexandra Clarke, Anne Kazak, David Sarwer, Nichola Rumsey*

1:40 PM
107 **QUALITY OF LIFE AMONG YOUTH WITH CLEFT: DEVELOPMENTAL INFLUENCES ON PSYCHOSOCIAL FUNCTIONING**
***Leanne Magee**, Margot Stein, Janine Rosenberg, Hillary Broder, Maureen Wilson-Genderson*

1:50 PM
108 **MODIFIERS AND TRAJECTORIES OF ACADEMIC ACHIEVEMENT OF CHILDREN AND ADOLESCENTS WITH ORAL CLEFTS COMPARED TO CLASSMATES**
***George Wehby**, Brent Collett, Sheila Barron, Paul A. Romitti, Timothy Ansley, Matthew L. Speltz*

2:00 PM
109 **PATIENT-REPORTED OUTCOMES FOLLOWING CLEFT SURGERY: A SYSTEMATIC REVIEW**
***Kavitha Ranganathan**, Steven Buchman, Jennifer Waljee, Seth Warschausky*

2:10 PM **DISCUSSION**

2:20 PM
110 **PRENATAL DIAGNOSIS OF ORAL CLEFTS, EARLY LIFE HEALTHCARE EXPERIENCES, AND MATERNAL WELLBEING**
***Nichole Nidey**, George Wehby*

2:30 PM
111 **MOTHERS OF CHILDREN WITH AN OROFACIAL CLEFT: SATISFACTION WITH MOTHERHOOD AND EXPERIENCED STRESS**
***Annemieke Bos,** Charlotte Prahl*

2:40 PM
112 **FAMILY SUPPORT NETWORK NEEDS ASSESSMENT**
***Suzanne Woodard**, Jennifer Fessler*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

CONCURRENT 10: SYNDROMES
Room: Marriott 7-8

Goal: To provide a forum for discussion of cleft-related syndromes.
Objective: Attendees will be able to describe at least three aspects of clinical care related to syndromic clefts.

Session Chair: Howard Saal, MD
Session Co-Chair: Donna McDonald-McGinn, MS, CGC

1:30 PM
113 **CRANIOFACIAL ABNORMALITIES IN ASSOCIATION WITH THE 22Q11.2 DELETION SYNDROME (22Q11.2DS): BEYOND CLEFTING**
***Donna McDonald-McGinn**, Christina Passick, Elaine Zackai, Oksana Jackson, David W. Low, Jesse Taylor, Patricia Schultz, Brian Forbes, Scott Bartlett, Linton Whitaker*

1:40 PM
114 **PHYSICAL FUNCTION IN INDIVIDUALS WITH 22Q11.2 DELETION SYNDROME**
***Dianne Altuna**, Kanlaya Ditthakasem, Hao Liu, Yasser Salem*

1:50 PM
115 **SPEECH CHARACTERISTICS IN VCFS (22Q11.2DS)**
***Ariela Nachmany**, Yehuda Finkelstein, Doron Gothelf*

2:00 PM
116 **SELF-REPORTED SPEECH PROBLEMS IN ADOLESCENTS AND YOUNG ADULTS WITH 22Q11.2 DELETION SYNDROME**
***Nicole Spruijt**, Jacob Vorstman, Moshe Kon, Aebele Mink van der Molen*

2:10 PM **DISCUSSION**

2:20 PM
117 **IRF6-RELATED MUTATIONS IN VAN DER WOUDE SYNDROME AND POPLITEAL PTERYGIUM SYNDROME FAMILIES FROM NIGERIA AND ETHIOPIA**

***Azeez Butali**, Peter Mossey, Wasiu Adeyemo, Mekonen Eshete Abebe, LauRen Gaines, Ramat Braimoh, Babatunde Aregbesola, Christian Emeka, Jennifer Rigdon, Fikre Abate, Jeffrey Murray*

2:30 PM
118 **POSITIVE SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH SYNDROMIC CLEFT LIP AND PALATE**
***Jason Silvestre**, J. Thomas Paliga, Youssef Tahiri, Scott Bartlett, Jesse Taylor*

2:40 PM
119 **A 35-YEAR EXPERIENCE WITH SYNDROMIC CLEFT PALATE REPAIR: OPERATIVE OUTCOMES AND LONG-TERM SPEECH *RESULTS***
***Marten Basta**, Jason Silvestre, Cynthia B. Solot, Marilyn Cohen, Elaine Zackai, Donna McDonald-McGinn, Richard Kirschner, David W. Low, Don LaRossa, Oksana Jackson*

2:50 PM **DISCUSSION**

3:00 PM **POSTER SESSION E, EXHIBITS, COFFEE BREAK**

FRIDAY, March 28, 2014

CONCURRENT SPECIALTY SESSIONS(Group 3)
3:30 PM-5:00 PM

CONCURRENT 11 — CRANIOSYNOSTOSIS
Room: Marriott 6

Goal: To provide a forum for the discussion of the clinical care of infants with craniosynostosis.
Objective: Attendees will be able to discuss at least three aspects of the evaluation and surgical management of infants with craniosynostosis.

Session Chair: Kant Y.K. Lin, MD
Session Co-Chair: Roberto Flores, MD

3:30 PM
120 **DURAL TEARS IN CRANIOSYNOSTOSIS REPAIR ARE MORE COMMON IN PATIENTS WITH UNICORONAL CRANIOSYNOSTOSIS**
***Alexander Lin,** Michael Del Core, Jonathan Kneib, Mark Markarian, Raghuram Sampath, Samer Elbabaa*

3:40 PM
121 **FACIAL ASYMMETRY IN CHILDREN SURGICALLY TREATED FOR UNICORONAL SYNOSTOSIS IN INFANCY**
***Louise Owall**, Tron A. Darvann, Per Larsen, Hanne Dahlgaard Hove, Nuno V. Hermann, Lars Bøgeskov, Sven Kreiborg*

3:50 PM
122 **EVALUATING THE EFFICACY OF AIRWAY EXPANSION USING TRANSCRANIAL VERSUS SUBCRANIAL FACIAL OSTEOTOMIES: A COHORT COMPARISON STUDY BETWEEN MONOBLOC FRONTOFACIAL ADVANCEMENT AND LE FORT III FACIAL ADVANCEMENT**
***Oluwaseun Adetayo**, S. Alex Rottgers, Lino Miele, Zoe MacIsaac, Edward Davidson, Anand Kumar*

4:00 PM
123 **OPTIMIZING TREATMENT OF SAGITTAL SYNOSTOSIS USING DYNAMIC CRANIOPLASTY: A COHORT COMPARISON STUDY BETWEEN REVERSE PI CRANIOPLASTY AND EXTENDED STRIP CRANIOPLASTY**
***S. Alex Rottgers**, Christopher Bonfield, Zoe MacIsaac, Ian Pollack, Mandeep Tamber, Anand Kumar*

4:10 PM **DISCUSSION**

4:20 PM
124 **OPEN STRIP CRANIECTOMY, TOTAL CRANIAL VAULT RECONSTRUCTION, AND ENDOSCOPIC STRIP CRANIECTOMY: A RETROSPECTIVE STUDY INCLUDING COST ANALYSIS**
***Maria Helena Lima,** Sarah Garber, Barbu Gociman, Jay Riva-Cambrin, Faizi Siddiqi*

4:30 PM
125 **IS THE NEED FOR CRANIOPLASTY DEPENDENT UPON PATTERN OF CRANIOSYNOSTOSIS?**
***Lisa Morris**, Louis Morales, Rodney E. Schmelzer*

4:40 PM
126 **AN EVALUATION OF A NOVEL CRANIOFACIAL SKILLS LABORATORY CURRICULUM: AN AID TO PLASTIC SURGERY RESIDENT MILESTONE ACHIEVEMENT**
***Sameer Shakir**, Nicole Jarrett, Anand Kumar*

4:50 PM **DISCUSSION**

CONCURRENT 12 — SPEECH SURGERY/VPD
Room: Marriott 5

Goal: To provide a forum for discussion of research, diagnostic, and surgical techniques for the management of velopharyngeal insufficiency.
Objective: Attendees will be able to discuss at least three different evaluation and treatment techniques for the management of individuals with velopharyngeal insufficiency.

Session Chair: Jamie Perry, PhD, CCC-SLP
Session Co-Chair: Sherard Tatum, MD

3:30 PM
127 **ADULT QUALITY OF LIFE POST CLEFT PALATE REPAIR: A COMPARISON OF TWO TECHNIQUES**
***Rachel Skladman**, Lynn Grames, Gary Skolnick*

3:40 PM
128 **10 YEAR EXPERIENCE OF SURGICAL TREATMENT OF VELOPHARYNGEAL INSUFFICIENCY IN THE PATIENT WITHOUT A CLEFT PALATE**
***Michael Golinko**, Sameer Kapadia, Katie Nett, Kazlin Mason, Joseph Williams*

3:50 M
129 **SPEECH OUTCOME FOLLOWING TONGUE REDUCTION SURGERY IN CHILDREN WITH BECKWITH-WIEDEMANN SYNDROME**
***Renee Diomis**, Earl Gage, Dana Kiley, Jeffrey Marsh*

4:00 PM
130 **PROSTHETIC OBTURATORS FOR MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION (VPD)**
***Barbara Sheller**, Steve Tseng, Linda Eblen, Elizabeth Velan, JoAnna Scott*

4:10 PM **DISCUSSION**

4:20 PM
131 **THREE-DIMENSIONAL COMPUTER SIMULATIONS DEMONSTRATE THAT INCREASING SURGICAL OVERLAP OF THE LEVATOR VELI PALATINI IMPROVES VELOPHARYNGEAL CLOSURE**
***Silvia Blemker**, Josh Inouye, Catherine Pelland, Kant Y.K. Lin, Kathleen Borowitz*

4:40 PM
132 **A MATHEMATICAL MODEL PREDICTS THAT ANATOMICAL VARIABILITY INFLUENCES THE EFFICACY OF PALATE REPAIR PROCEDURES**
***Joshua Inouye**, Jamie Perry, Jillian Nyswonger, Catherine Pelland, Kant Y.K. Lin, Kathleen Borowitz, Silvia Blemker*

4:50 PM **DISCUSSION**

CONCURRENT 13 — DEFORMATIONAL PLAGIOCEPHALY
Room: Marriott 9-10

Goal: To provide a forum for the discussion of the diagnosis, evaluation, and management of infants with deformational plagiocephaly.
Objective: Attendees will be able to describe at least three methods for the evaluation and treatment of infants with deformational plagiocephaly.

Session Chair: Alex Kane, MD
Session Co-Chair: Yvonne Gutierrez, MD

3:30 PM
133 **LONG-TERM HEAD SHAPE AFTER TREATMENT FOR DEFORMATIONAL PLAGIOCEPHALY: A LONGITUDINAL COHORT STUDY**
***Sybill Naidoo**, An-Lin Cheng*

3:40 PM
134 **THE EFFECT OF TORTICOLLIS ON HELMET THERAPY FOR DEFORMATIONAL PLAGIOCEPHALY**
***Alexander Lin**, Emma Kulig, Sarah Donigian, Chelsea Horwood*

3:50 M
135 **DIAGNOSTIC YIELD OF CERVICAL RADIOGRAPHS IN INFANTS WITH DEFORMATIONAL PLAGIOCEPHALY**
***Min-Jeong Cho**, Loa Borchert, Alex Kane*

4:00 PM
136 **DEFORMATIONAL SCAPHOCEPHALY RESULTS IN INCREASED THERAPY DURATION AND LESS EFFECTIVE CRANIAL INDEX CORRECTION THAN OTHER TYPES OF DEFORMATIONAL PLAGIOCEPHALY**
***Alexander Lin**, Emma Kulig, Sarah Donigian, Chelsea Horwood*

4:10 PM **DISCUSSION**

4:20 PM
137 **LONG-TERM SATISFACTION AND PARENTAL DECISION MAKING ABOUT TREATMENT FOR DEFORMATIONAL PLAGIOCEPHALY**
***Sybill Naidoo**, An-Lin Cheng*

4:30 PM
138 **A COMPARISON OF DIRECT AND DIGITAL MEASURES OF CRANIAL VAULT ASYMMETRY FOR ASSESSMENT OF PLAGIOCEPHALY**
***Gary Skolnick**, Sybill Naidoo, Kamlesh Patel, Albert Woo*

4:40 PM
139 **AGE OF INITIATION OF HELMET THERAPY FOR DEFORMATIONAL PLAGIOCEPHALY DOES NOT SIGNIFICANTLY AFFECT TREATMENT DURATION, CORRECTION RATE, OR FINAL OUTCOME**
***Alexander Lin**, Emma Kulig, Sarah Donigian, Chelsea Horwood*

4:50 PM **DISCUSSION**

CONCURRENT 14 — NURSING
Room: Marriott 3-4

Goal: To provide an educational forum for the discussion of infant nutritional assessment and the improvement of patient-centered outcomes through nursing research.
Objective: Attendees will be able to Identify infants with clefts who are at risk for poor weight gain, and to discuss a preliminary design for a nursing research study which could evaluate initial nutritional interventions for the infant with a cleft.

Session Chair: Patricia Chibbaro, RN, MS, CPNP
Session Co-Chair: Patricia Terrell, MSN, CPNP

3:30 PM
154 **INITIAL NUTRITIONAL ASSESSMENT OF INFANTS WITH CLEFT LIP AND/OR PALATE: INTERVENTIONS AND RETURN TO BIRTH WEIGHT**
***Alison Kaye**, Kristi Thaete, Audrey Snell, Connie Chesser, Claudia Goldak, Helen Huff, Shao Jiang*

3:45 PM
140 **"BROWNIE-OLOGY": AN INTRODUCTION TO NURSING RESEARCH AND STUDY DESIGN**
***Judy Marciel**, Lauren Lisa, Lindsay Harris, Monica Nelson*

4:50 PM **DISCUSSION**

CONCURRENT 15 — NAM/ORTHODONTICS
Room: Marriott 7-8

Goal: To provide a forum focused on orthodontic research and aspects of management for individuals with orofacial clefts and other craniofacial conditions.
Objective: Attendees will be able to identify and discuss at least three issues which influence dental and facial development as they relate to orthodontic treatment.

Session Chair: Luiz Pimenta, DDS, MS, PhD
Session Co-Chair: Snehlata Oberoi, BDS, MDS, DDS

3:30 PM
141 **USE OF A STANDARDIZED OUTCOME MEASURE OF DENTAL ARCH RELATIONSHIPS (GOLSON) TO ALLOW INTERNATIONAL, INTER-STUDY COMPARISONS**
***Ronald Reed Hathaway**, Ross Long, Jr, John Daskalogiannakis, Ana Mercado, Kathleen Russell, Gunvor Semb, William Shaw*

3:40 PM
142 **SKELETAL AND DENTOALVEOLAR CHANGES FOLLOWING THE USE OF A NOVEL BONDED PROTRACTION HEADGEAR APPLIANCE IN PATIENTS BORN WITH CLCP**
***Daniel Segal**, Barry Grayson, Pradip Shetye*

3:50 PM
143 **PRESURGICAL UNILATERAL CLEFT LIP ANTHROPOMETRICS AND THE PRESENCE OF DENTAL ANOMALIES**
***Gregory Antonarakis**, David M. Fisher*

4:00 PM
144 **THE STABILITY OF COMBINED MAXILLARY AND TRANSPALATAL DISTRACTION IN PATIENTS WITH CLEFT LIP AND PALATE**
***Prasad Nalabothu**, Ithaf Hussain Syed, Arun Chitharanjan, Jyotsna Murthy*

4:10 PM **DISCUSSION**

4:20 PM
145 **COMPARISON OF CEPHALOMETRIC MIDFACE FORM IN UCLP PATIENTS TREATED WITH TRADITIONAL OR NO PSIO (AMERICLEFT AND EUROCLEFT STUDIES) AND PATIENTS TREATED WITH NASOALVEOLAR MOLDING**
***Yousef Alawadhi**, Barry Grayson, Pradip Shetye*

4:30 PM
146 **INITIAL SEVERITY OF PATIENTS WITH CUCLP TREATED BY NAM AND SURGERY DOES NOT PREDICT DENTOALVEOLAR AND CRANIOFACIAL MORPHOLOGY**
Supakit Peanchitlertkajorn

4:40 PM
147 **EFFECTS OF NASOLALVEOLAR MOLDING IN PATIENTS WITH UCLAP — RESULTS OF A PROSPECTIVE INTERDISCIPLINARY TRIAL**
***Jan-Hendrik Lenz**, Ilze Akota, Ann Dieckmann, Karsten K.H. Gundlach, Marianne Soots, Franka Stahl de Castrillon, Linas Zaleckas*

4:50 PM **DISCUSSION**

SATURDAY, March 29, 2014

7:30 AM-5:00 PM
REGISTRATION, SPEAKER READY ROOM OPEN

CONCURRENT GENERAL SESSIONS (Group 2)
8:00 AM-10:00 AM

SESSION E: ETIOLOGY, OUTCOMES, QUALITY OF CARE II
Room: Marriott 6

Goal: To expose attendees to the state-of-the-art research in the etiology of cleft and craniofacial conditions, outcomes, and improvement of quality of care for individuals with orofacial cleft or craniofacial anomalies.
Objective: Attendees will be able to identify the contemporary contributions of three or more disciplines to the diagnosis, treatment, and improvement in care for individuals with orofacial cleft or craniofacial conditions.

Session Chair: Adriane Baylis, PhD, CCC-SLP
Session Co-Chair: Patricia Glick, DMD, MS

8:00 AM
148 **THE TWO-ALTERNATIVE FORCED-CHOICE PARADIGM: THE MODERN Q-SORT**
***Rollin Reeder**, Kevin Calder, Maryanne Koech, William Magee*

8:10 AM
149 **THE AMERICLEFT PROJECT: COMPARISON OF RATINGS USING 2D VS 3D IMAGES FOR EVALUATION OF NASOLABIAL APPEARANCE IN PATIENTS WITH CUCLP**
Christine Jones, *Ana Mercado, Kathleen Russell, John Daskalogiannakis, Thomas Samson, Ronald Reed Hathaway, Gunvor Semb, Andrea Smith, Jennifer Fessler , Ross Long, Jr*

8:20 AM
150 **A MODIFICATION OF ASHER-MCDADE METHOD FOR RATING NASOLABIAL ESTHETICS IN PATIENTS WITH CUCLP**
Kathleen Russell, *Alicia Stoutland, John Daskalogiannakis, Ana Mercado, Ronald Reed Hathaway, Ross Long, Jr, Gunvor Semb, William Shaw, Jennifer Fessler*

8:30 AM **DISCUSSION**

8:40 AM
151 **USING EXCEPTIONAL CHILDREN'S SERVICES: THE EXPERIENCE OF CHILDREN IN NORTH CAROLINA BORN WITH ISOLATED OROFACIAL CLEFTS**
Stephanie Watkins, *Robert Meyer, Ronald Strauss*

8:50 AM
152 **TOWARD REALTIME PATIENT-CENTERED OUTCOMES ASSESSMENT AND CONTINUOUS QUALITY IMPROVEMENT: A CLEFTKIT PROGRESS REPORT**
Alexander Allori, *Jeffrey Marcus, Amy Abernethy, John G. Meara, Karen Wong, Lynn Fox, Patricia Chibbaro, Ann M. Mabie-DeRuyter, Pedro Santiago, Eileen Raynor*

9:00 AM
153 **HOSPITAL RESOURCE USE AND PAYER TYPE IN A 10-YEAR POPULATION-BASED STUDY OF CHILDREN WITH OROFACIAL CLEFTS**
Cynthia Cassell, *April Dawson, Russell Kirby, Richard Olney, Jane Correia, Scott Grosse*

9:10 AM **DISCUSSION**

9:30 AM
155 **FACTORS AFFECTING PARENTAL ANXIETY AND POSTOPERATIVE PAIN IN INFANTS UNDERGOING CLEFT LIP OR PALATE REPAIR**
Patricia Chibbaro, *Rachael Clark, Xiao Lou Jiang, Asha Mahajan, David A. Staffenberg, Stephen Warren, Alan Mendelsohn, Rebecca Rosenberg*

9:40 AM
156 **MANAGEMENT OF PRENATAL CONSULTATIONS IN THE CLEFT LIP AND PALATE PROGRAM**
Marlee Klaiman, *Emily Ho, Cindy Guernsey, David Fisher, Christopher R. Forrest*

9:50 AM **DISCUSSION**

SESSION F: ASCFS DYNAMIC FORCE ON THE SKULL FOR TREATMENT OF SYNOSTOSIS PANEL

8:00 AM-10:00 AM
Room: Marriott 5

Goal: To expose attendees to a debate style discussion among panelists on the current role of dynamic forces to treat the skull anomaly of craniosynostosis.
Objective: Attendees will be able to understand the indications and contraindications for the use of distraction osteogenesis in the treatment of patients with single suture and multiple suture craniosynostosis. Attendees will be able to understand the technical differences of using spring compared to distraction devices to exert dynamic forces on the cranial skeleton for the treatment of craniosynostosis.

Session Chair: Richard A. Hopper, MD, MS

158 **THE ROLE OF DISTRACTION OSTEOGENESIS IN THE MANAGEMENT OF CRANOSYNOSTOSIS: A SYSTEMATIC REVIEW**
Owen Johnson

157 **EARLY EXPERIENCE WITH 30 CASES OF ENDOSCOPIC SPRING ASSISTED SURGERY FOR SAGITTAL CRANIOSYNOSTOSIS**
Lisa David

ANTERIOR DISTRACTION FOR UNILATERAL CORONAL SYNOSTOSIS - AN EARLY EXPERIENCE
Jesse Taylor

EARLY MONOBLOC DISTRACTION — WHAT ARE THE INDICATIONS?
Richard Hopper

PANEL DISCUSSON
Owen Johnson, Lisa David, Jesse Taylor, Richard Hopper

10:00 AM-10:30 AM Break

10:30 AM-12:00 PM
CLOSING GENERAL SESSION: BACK OF THE BOOK
Have you ever wondered what happens to all of those great ideas that our members jot down in the back of their program books during the national meeting? Come join us for an open forum discussion of these too-often-forgotten pearls of wisdom, insight, and collaborative opportunity in our first-ever "**Back of the Book Forum.**"

WEDNESDAY, March 26 thru FRIDAY, March 28, 2014

POSTER SESSION

March 26-28, 2014
Room: Marriott Foyer

There will be five poster sessions (sessions A through E). Two (2) sessions are scheduled per day *except Thursday*. On Wednesday, Poster Session A will run from 7:00 AM-1:00 PM, and Poster Session B will run from 1:30 PM-6:30 PM. On Thursday, Poster Session C will run from 7:00 AM-6:30 PM. And on Friday, Poster Session D will run from 8:00 AM-12:30 PM, and Poster Session E will run from 1:00 PM-5:30 PM. The posters will be located in the Marriott Foyer.

Goal: To create a discussion-based visual forum for exchanging new findings in interdisciplinary research, team care, assessment, and treatment of individuals with orofacial cleft or other craniofacial conditions.

POSTER SESSION A

WEDNESDAY, MARCH 26
7:00 AM-1:00 PM

1. 159 **A NOVEL METHOD OF PHOTOGRAMMETRY AND ANALYSIS OF FACIAL AND NASAL LANDMARKS FOLLOWING CLEFT LIP/PALATE REPAIR**
Rebecca Barnett, *Kristen Aliano, Rachel Ruotolo*

2. 160 **WHAT TO DO WHEN PEOPLE STARE WORKSHOP TEACHES INDIVIDUALS WITH DISFIGURING CONDITIONS TO CONTEND WITH STARING AND TAKE MORE CONTROL OF SOCIAL INTERACTIONS**
Patricia Charlene Pell

3. 161 **PUBLIC AWARENESS OF CLEFT PALATE IN DULUTH AND SURROUNDING AREAS**
Michelle Marnich, *Dana Collins, Linda Vallino*

4. 162 **PAIN MANAGEMENT IN ALVEOLAR BONE GRAFTING SURGERY**
Kaitlyn Paine, *Anthony Taglienti, Anthony Wilson, Michael Mirzabiegi, David W. Low, Jesse Taylor, Scott Bartlett, Oksana Jackson*

5. 163 **READING ACHIEVEMENT, NEUROPSYCHOLOGICAL SKILLS, AND NEUROCIRCUITRY IN BOYS WITH NON-SYNDROMIC CLEFT PALATE ONLY**
Amy Conrad, *Peg C. Nopoulos, Lynn Richman*

6. 164 **DIFFERENTIAL GENE EXPRESSION OF CALVARIAL COMPARTMENTS WITH DIFFERENT EMBRYONIC ORIGINS**
Negar Homayounfar, *Sarah Park, Michael Cunningham*

7. 165 **DESIGN AND FABRICATION OF A NOVEL CAD/CAM SURGICAL GUIDES COMBINED WITH SINGLE-SPLINT TECHNIQUE FOR CLEFT-ORTHOGNATHIC SURGERY**
Chien-Hsuan Wang, Hsiu-Hsia Lin, Sam Sheng-Pin Hsu, YaFang Chuang, ***Lun-Jou Lo***

8. 166 **CRANIOFACIAL TRAINING FOR CLEFT TEAM SLPS: A MODEL FOR SLP EDUCATION AND EXPANDING ACCESS TO SPEECH THERAPY SERVICES**
Katie Garcia, *Adriane Baylis*

9. 167 **THE EFFECTS OF ANCHORS ON THE RELATIONSHIP BETWEEN NASALITY RATINGS AND NASALANCE SCORES**
Kristine Galek, *Thomas Watterson*

10. 168 **RENAL AND SPINE SCREENING IN SUB-PHENOTYPIC POPULATIONS OF PATIENTS WITH CRANIOFACIAL MICROSOMIA**
Laura Stueckle, *Babette Saltzman, Daniela Luquetti, Anne Hing, Kelly Evans*

11. 169 **HOW AN AUDIT INTO THE AGE AT WHICH CHILDREN WITH CLEFTS STOP USING A BOTTLE TO DRINK HAS LED US TO A NEW STRATEGY FOR ENCOURAGING THEM TO STOP BY THE RECOMMENDED 12 MONTHS**
Jacqueline Smallridge, *Susan O'Connell*

12. 170 **THE EFFECTIVENESS OF PARENT-IMPLEMENTED INTERVENTION FOR YOUNG CHILDREN WITH CLEFT PALATE**
Seungeun Jung, *Heewon Moon, Kyung S. Koh*

13. 171 **FEEDING OUTCOMES FOLLOWING MANDIBULAR DISTRACTION OSTEOGENESIS IN PIERRE ROBIN SYNDROME**
Katherine Rose, *John Girotto*

14. 172 **RACIAL/ETHNIC DIFFERENCES IN BULLYING, AGGRESSION, AND SOCIAL SUPPORT AMONG SCHOOL-AGE CHILDREN IN A PEDIATRIC CRANIOFACIAL CLINIC**
Dailyn Martinez, Lauren Smith, Crista Donewar, ***Celia Heppner***

15. 173 **FACIAL SOFT-TISSUE ASYMMETRY IN 3D CONE BEAM COMPUTED TOMOGRAPHY IMAGES OF CHILDREN WITH SURGICALLY CORRECTED UNILATERAL CLEFTS**
John Starbuck, *Ahmed Ghoneima, Katherine Kula*

16. 175 **DELETIONS OF EFTUD2 IN PATIENTS WITH FACIAL DYSOSTOSIS: A USEFUL CONSIDERATION IN A DIFFERENTIAL DIAGNOSIS**
Julie Kaylor, Larry Hartzell, Yuri Zarate, ***Lauren Kilpatrick***

17. 176 **EXPLORING COMMUNICATION ATTITUDE AND ITS RELATIONSHIP TO COMMUNICATION APPREHENSION, AND SPEECH SEVERITY IN CHILDREN WITH VELOPHARYNGEAL INSUFFICIENCY (VPI)**
Agnieszka Dzioba*, Philip Doyle, Elizabeth Skarakis-Doyle, Murad Husein, R. Anne Dworschak-Stokan*

18. 177 **QUANTIFICATION OF MAXILLARY SINUSITIS IN UNILATERAL CLEFT LIP AND PALATE**
John Starbuck*, Lindsay Hale, Ahmed Ghoneima, Katherine Kula*

19. 178 **CRANIAL BASE IN HEMIFACIAL MICROSOMIA: AN OBJECTIVE CRANIOMETRIC ANALYSIS**
Youssef Tahiri*, J. Thomas Paliga, Scott Bartlett, Jesse Taylor*

20. 179 **IMPACT OF VISIBILITY ON PSYCHOSOCIAL FUNCTIONING AMONG YOUTH WITH CRANIOFACIAL DIFFERENCES**
Jaee Bodas*, Jennifer Rhodes, Ruth Trivelpiece*

21. 240 **IMPROVING MANDIBULAR ASYMMETRY ASSOCIATED WITH CONGENITAL MUSCULAR TORTICOLLIS USING AN EARLY INTERVENTION PROTOCOL**
Regina Fenton*, Susan Gaetani, S. Alex Rottgers, Lorelei Grunwaldt, Anand Kumar*

POSTER SESSION B

WEDNESDAY, MARCH 26
1:30 PM-6:00 PM

1. 180 **POSTERIOR CRANIAL VAULT ASYMMETRY IN LAMBDOID CRANIOSYNOSTOSIS AFTER OPEN AND ENDOSCOPIC REPAIR**
Ema Zubovic*, Albert Woo, Gary Skolnick, Sybill Naidoo, Matthew Smyth, Kamlesh Patel*

2. 181 **VOLUMETRIC COMPARISON OF MAXILLARY SINUSES IN PATIENTS WITH UNILATERAL CLEFT**
Luiz Pimenta, *Henrique Pretti, Jason Roberts, Christine Klatt-Cromwell, Brent Golden, Amelia Drake*

3. 182 **EXPERIENCE WIT[illegible]COCHOEA SPHIN[illegible]LASTY IN OVER 200** Withdrawn
M[illegible] Larley*, Anne Mc Gillivary, Triona Sweeney*

4. 183 **THE PATH OF THE SUPERIOR SAGITTAL SINUS IN UNICORONAL SYNOSTOSIS**
Aaron Russell*, Kamlesh Patel, Gary Skolnick, Matthew Smyth, Albert Woo*

5. 184 **COMPARATIVE EVALUATION OF NASOPHARYNGEAL AIRWAYS OF UNILATERAL CLEFT LIP AND PALATE PATIENTS USING THREE-DIMENSIONAL METHOD**
Henrique Pretti, ***Omri Emodi*** *, Amelia Drake, Emile Rossouw, David Zajac, John Van Aalst, Luiz Pimenta*

6. 185 **USING SYNCHRONIZED AUDIO MAPPING TO PREDICT VELAR AND PHARYNGEAL WALL LOCATIONS DURING DYNAMIC MRI SEQUENCES**
Pooya Rahimian, ***Jamie Perry****, Nasseh Tabrizi*

7. 186 **INTEGRATING THREE-DIMENSIONAL DIGITAL DENTAL MODEL INTO CRANIOFACIAL SKULL COMPUTED TOMOGRAPHY BY AUTOMATIC SUPERIMPOSITION OF INTRA-ORAL FIDUCIAL MARKERS**
Wei-Min Yang*, Cheng-Ting Ho, Huey-Ling Chen, Sam Sheng-Pin Hsu, Ellen Wen-Ching Ko, Lun-Jou Lo*

8. 187 **CHANGES IN MANDIBULAR PROXIMAL SEGMENT AFTER SURGICAL CORRECTION OF MANDIBLE DEVIATION AND THE RELATION WITH MANDIBULAR FUNCTIONAL ALTERATION**
Ellen Wen-Ching Ko*, Chiung Shing Huang, Abdelmounem Issam*

9. 188 **VELOPHARYNGEAL INSUFFICIENCY IN CHILDREN WITH PRADER-WILLI SYNDROME AFTER ADENOTONSILLECTOMY**
David Crockett*, Saqib Ahmed, Derrick Sowder, Steven Goudy*

10. 189 **SENSORY RETRAINING FACILITATE SENSORY RECOVERY AFTER BILATERAL SAGITTAL SPLIT OSTEOTOMY — PRELIMINARY STUDY**
Yea Ling Yang*, Chiung-Shing Huang, Yu-Ray Chen*

11. 190 **CRANIOFACIAL AND DENTAL DEVELOPMENT IN CARDIO-FACIO-CUTANEOUS (CFC) AND COSTELLO SYNDROME (CS)**
Alice Goodwin, *Snehlata Oberoi, Maya Landan, Cyril Charles, Jessica Massie, Cecilia Fairley, Katherine Rauen, Ophir Klein*

12. 191 **EFFECTS OF NASOALVEOLAR MOLDING (NAM) ON INFANT GROWTH VELOCITY AND TIMING OF PRIMARY BILATERAL CLEFT LIP REPAIR**
***Michael Pharaon**, Jeyhan Wood, Jesse Goldstein, Pedro Santiago, John Van Aalst*

13. 192 **EFFECTS OF NASAL ALVEOLAR MOLDING (NAM) ON INFANT WEIGHT GAIN AND TIMING OF PRIMARY UNILATERAL CLEFT LIP REPAIR**
***Jeyhan Wood**, Michael Pharaon, Ipek Cakmak, Seda Cakmak, Jesse Goldstein, Pedro Santiago, John Van Aalst*

14. 193 **STOP-GAP DURATION OF PERSIAN PLOSIVES IN MID AND FINAL WORD POSITIONS IN THE SPEECH OF CHILDREN WITH CLEFT LIP AND PALATE**
***Marziye Eshghi**, David Zajac, Mahmood Bijankhan, Sheila Pratt*

15. 249 **VOICE ONSET TIME OF PERSIAN WORD-INITIAL PLOSIVES IN CHILDREN WITH CLEFT LIP AND PALATE**
***Marziye Eshghi,** David Zajac, Mahmood Bijankhan*

16. 195 **NASAL CHANGE WITH MAXILLARY REPOSITIONING: A NOVEL THREE-DIMENSIONAL CT-BASED METHOD FOR ASSESSMENT**
***Belinda Daniel**, Linping Zhao, David Morris*

17. *197 **CURVILINEAR BONE TRANSPORT OSTEOGENESIS DEVICES FOR TREATMENT OF LARGE CALVARIAL DEFECTS: AN ALTERNATIVE TO CONVENTIONAL CALVARIAL RECONSTRUCTION AND LINEAR BONE TRANSPORT IN A PRE-CLINICAL SHEEP MODEL**
***Nadya Clarke,** Jason Wink, Patrick Gerety, Rami Sherif, Gregory Heuer, J. Thomas Paliga, Hyun-Duck Nah, Jesse Taylor*

18. 198 **MINIMAL ACCESS CRANIAL VAULT REMODELING FOR SAGITTAL CRANIOSYNOSTOSIS: ANALYSIS OF SURGICAL RESULTS AND ESTHETIC OUTCOMES**
***M. Barbera Honnebier,** Chunqiao Luo, Todd Nick, Rongsheng Cai, Eylem Ocal, Gregory Albert*

19. 199 **OPERATIVE AND POST-OPERATIVE OUTCOMES FOLLOWING USE OF DENTO MAXILLARY APPLIANCE FOR INFANT ORTHODOPEDIC TREATMENT IN PATIENTS WITH UNILATERAL COMPLETE CLEFT LIP AND PALATE**
Veerasathpurush Allareddy, Min Kyeong Lee, Elizabeth Ross, Richard A. Bruun, ***Stephen Shusterman***

20. 200 **CONNECTING FAMILIES PEER TO PEER MENTOR PROGRAM**
Lisa Repaske

POSTER SESSION C

THURSDAY, MARCH 27
7:00 AM-6:00 PM

1. 201 **THE ROLE OF DISTRACTION OSTEOGENESIS IN THE SURGICAL MANAGEMENT OF CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW**
***Owen Johnson III,** Anne Tong Jia Wei, Christopher Wallner, Amir H. Dorafshar*

2. 202 **AN INVESTIGATION OF RELATIONSHIP BETWEEN ARTICULATION AND MOTOR COORDINATION IN INDIVIDUALS WITH UCLP**
***Chihiro Sugiyama**, Kanji Nohara, Akemi Hikage, Ayako Hishikawa, Etsuko Takai, Mikihiko Kogo, Takayoshi Sakai*

3. 204 **SPECTRAL ANALYSIS OF WORD-INITIAL /S/ AND /SH/ IN PERSIAN SPEAKING CHILDREN WITH BILATERAL CLEFT LIP AND PALATE AND MAXILLARY COLLAPSE**
***Marziye Eshghi**, David Zajac*

4. 205 **CHILDREN BORN WITH CLEFT LIP AND PALATE DEFORMITIES EXPERIENCE FELT, INTERNALIZED, ENACTED, FELT NORMATIVE, AND SYMBOLIC STIGMA**
***Wasiu Adeyemo**, Olutayo James, Azeez Butali, Mobolanle O. Ogunlewe, Akinola L. Ladeinde*

5. 206 **SECONDARY CRANIAL VAULT REMODELING WITH DISTRACTION**
***Christian Albert El Amm**, Omar Beidas, Wyatt Ho, Thomas Howard, Aaron Morgan*

6. 207 **LEVATOR VELI PALATINI MUSCLE MORPHOLOGY IN ADULTS WITH REPAIRED CLEFT PALATE**
Jillian Nyswonger, ***Jamie Perry***

7. 209 **APPLICATION OF GAME-BASED 3D SCANNING IN CRANIOFACIAL ANALYSIS**
***Christian Albert El Amm**, John Dyer, Ian le*

8. 210 **EVALUATION OF VENTILATION TUBE PLACEMENT AND AUDIOLOGIC OUTCOME IN CHILDREN WITH CLEFT PALATE**
***Elissa Kim**, Milan Dang-Vu, Daniela Carvalho, Marilyn Jones, Taz Zhou, Jennifer Cui, Aline Yaghsezian, David Chang, Amanda Gosman*

9. 211 **INTERNAL CAROTID ARTERY VARIATIONS IN VELOCARDIOFACIAL SYNDROME PATIENTS AND IT'S IMPLICATIONS FOR SURGERY**
***Baek-kyu Kim**, Rongmin Baek*

10. 212 **MIDFACE GROWTH FOLLOWING SEVERE PEDIATRIC FACIAL TRAUMA: A CEPHALOMETRIC STUDY**
***Edward Davidson**, Lindsay Schuster, Sanjay Naran, Anand Kumar, Joseph Losee*

11. *213 **EFFECTIVENESS OF DYNACLEFT FOR PRESURGICAL ORTHOPEDICS FOR PATIENTS WITH UNILATERAL CLEFT LIP AND PALATE**
***LaQuia Walker**, Roberto Flores, George Eckert, Marvin Thomas*

12. 214 FACTORS INF[illegible]NG OF ALVEOLAR CL[illegible]ON
Withdrawn
[illegible], Corban Stettler, James Swift

13. 215 **RELATIONSHIPS AMONG BULLYING AND OTHER PSYCHOSOCIAL FACTORS IN CHILDREN WITH CRANIOFACIAL CONDITIONS**
*Lauren Smith, Dailyn Martinez, **Celia Heppner**, Crista Donewar*

14. 216 **PRIMARY NOSE REPAIR IN UNILATERAL CLEFT LIP PATIENTS: "CLOSED TRIPLE SUTURE" TECHNIQUE**
***Ozhan Celebiler**, Hakan Şirinoğlu, Burak Ersoy, Ayhan Numanoglu*

15. *217 DEVELOPMENT OF [illegible]PHONE APPLICATION FOR PATI[illegible]P & PALATE AND T[illegible]
Withdrawn
J[illegible]ark, Jeongeun Kim, James G. Boram Kim, Yeram Jang, Kiwhan Ahn, Sukwha Kim

16. 218 **TREATMENT OF CLINICAL CONGENITAL ANOPHTHALMIA WITH AN INTRA-ORBITAL EXPANDER**
***Brad Morrow**, William Albright, Rogerio Neves, Michael Wilkinson, Thomas Samson*

17. 219 **CLEFT LIP STANDARDIZED PATIENT EXAMINATIONS: THE ROLE IN PLASTIC SURGERY RESIDENT EDUCATION**
*Eric Wright, **Rohit Khosla**, Lori Howell, Gordon Lee*

18. 220 **THE OCCURRENCE OF PREMAXILLARY REPOSITIONING SURGERY IS DECREASED IN PATIENTS WITH COMPLETE BCLP TREATED WITH NAM AND PRIMARY GINGIVOPERIOSTEOPLASTY**
***Douglas Olson**, Barry Grayson, Stephen Warren, Court Cutting, Pradip Shetye*

19. 221 **POSTOPERATIVE STEROIDS IMPROVE HOSPITAL STAY IN CLEFT PALATE AND SPEECH SURGERY WITHOUT AFFECTING WOUND HEALING AND SPEECH OUTCOMES**
*Mary Reagan, Michelle Eagan, **Alexander Lin***

POSTER SESSION D
FRIDAY, MARCH 28
8:00 AM-12:00 PM

1. *222 **EVALUATION AND TREATMENT OF SPEECH DISORDERS ASSOCIATED WITH CLEFT PALATE**
***Angela Dixon**, Adriane Baylis, Anne Bedwinek, Kristen DeLuca, Sara Kinter, Kerry Mandulak, Jamie Perry*

2. 223 **ALVEOLAR BONE GRAFTING SURGERY: CURRENT PRACTICES AND PATIENT OUTCOMES**
*Anthony Wilson, **Kaitlyn Paine**, Anthony Taglienti, Michael Mirzabiegi, Rosario Mayro, Kristen Lowe, David W. Low, Jesse Taylor, Scott Bartlett, Oksana Jackson*

3. 224 **A QUALITY IMPROVEMENT INITIATIVE TO IMPROVE FEEDING EDUCATION FOR FAMILIES OF INFANTS WITH CLEFT PALATE**
***Nancy Neal**, Lauren Keil, Tamela Thompson, Teresa Gueth, Christina Stocker, Adriane Baylis*

4. 225 **OPTIMIZING THE SURGICAL TREATMENT OF THE INTERNATIONALLY ADOPTED CHILD WITH CLEFT LIP AND/OR PALATE — UNDERSTANDING THE FAMILY EXPERIENCE**
***Maren Shipe**, Kelly Evans, Carolyn Schook, Dawn Leavitt, Ashley Peter, Julian Davies, Todd Edwards, Raymond Tse*

5.
226 **MSX1 GENE C330T (P. [illegible]G) AND G817T (P. G273C) POLY[illegible] INDONESIAN PA[illegible]NDROMIC CLEFT PALATE [illegible]** Withdrawn
S[illegible] Nasroen, Ani Maskoen

6.
228 **GROWTH OF CHILDREN WITH CLEFT-LIP PALATE FROM 2 TO10 YEARS OLD**
***Gabriela Miranda**, Ilza Lazarini Marques*

7.
229 **REDUCTION OF FACIAL SWELLING AFTER ORTHOGNATHIC SURGERY: A RANDOMIZED CONTROLLED TRIAL COMPARING TWO DIFFERENT DOSES OF DEXAMETHASONE**
***Sun Goo Kim**, Hye-Young kim, Lun-Jou Lo*

8.
230 **THE FUNCTION OF IRF6 IN TGFB3-DEPENDENT PALATAL FUSION**
***Chen-Yeh Ke**, Ho Ying, Mei-Chun Pan, Fen-Hwa Wong, Lun-Jou Lo*

9.
231 **DIGITAL IMAGING ANALYSIS OF NASOPHARYNGOSCOPY: ADVANCING THE SCIENCE OF MEASURING VELOPHARYNGEAL FUNCTION FOR SPEECH**
***Angela Chen**, Caitlin Cummings, Adriane Baylis*

10.
232 **INTERNET SEARC[illegible]EADABILITY OF INFORM[illegible]S PARENTING OF A C[illegible]LEFT** Withdrawn
A[illegible]ar, Nanci De Felippe

11.
*233 **CRANIOFACIAL MICROSOMIA: INVESTIGATING SPEECH OUTCOMES**
***Sara Kinter**, Babette Saltzman, Carrie Heike*

12.
234 **VALIDATION OF 3D GAND CLASSIFICATION OF LESSER SEGMENT CONSIDERING THE VOLUMETRIC SHAPE OF THE ALVEOLAR CLEFT**
***Gabriella de Rezende Barbosa**, Henrique Pretti, Omri Emodi, John van Aalst, Solange Almeida, Donald Tyndall, Luiz Pimenta*

13.
235 **GROWTH AND PUBERTY OF PATIENTS WITH CLEFT PALATE FROM 10 TO 18 YEARS OLD**
***Maria Cristina Cres**, Ilza Marques*

14.
*236 **COMPUTED TOMOGRAPHIC GENERATED ANTHROPOMETRIC MEASUREMENTS OF ORBITAL RELATIONSHIPS IN NORMAL INFANTS AND CHILDREN**
***Garrett Pool**, Matthew Lewis, Ryne Didier, Dianna Bardo, Anna Kuang*

15.
*237 **GENETIC MEDICINE IN THE MULTIDISCIPLINARY CLEFT CLINICS: A PERSONALIZED MEDICINE APPROACH TO OPTIMIZE DIAGNOSIS, MANAGEMENT AND REVENUE**
*Julie Hoover-Fong, **Carrie Blout**, Natalie Beck, Colleen Gioffreda, Kim Seifert, Richard J. Redett, III*

16.
238 **UNSTEADY NASALANCE TRACES AMONG SUSTAINED VOWELS IN TYPICAL ADULT SPEAKERS: PREVALENCE AND POTENTIAL CAUSES**
***Catherine Hearit**, Helen Sharp, Stephen Tasko, Gregory Flamme*

17.
239 **MEMORY, LANGUAGE AN[illegible]OGNITIVE FUNCTIONS OF C[illegible]H CLEFT LIP AND PALAT[illegible]** Withdrawn
***M[illegible] Tabaquim, Márcia Ferro**, Ana Ve[illegible]querito, Ana Paula Razera*

18.
241 **SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN TREATED AT A MAJOR CRANIOFACIAL CENTER**
***Jason Silvestre**, J. Thomas Paliga, Youssef Tahiri, Scott Bartlett, Jesse Taylor*

19.
242 **ANALYSIS OF THE PERCENTAGE OF PATIENTS RETURNING FOR CLEFT PALATE REPAIR FOLLOWING CLEFT LIP REPAIR**
***Nicholas Sinclair**, Michael Capata, Alex Campbell, Bjorn Schonmeyr, Lisa Wendby, Donald Laub*

POSTER SESSION E
FRIDAY, MARCH 28
1:00 PM-5:00 PM

1.
243 **THE MATERNAL RISK FACTORS FOR CLEFT LIP WITH OR WITHOUT CLEFT PALATE IN THE PHILIPPINES**
***Jonald Nadal,** Glenn Angelo Genuino, Bernard Tansipek*

2.
244 **THREE-DIMENSIONAL COMPUTED TOMOGRAPHY ANALYSIS OF PHARYNX IN ADULT PATIENTS WITH UNREPAIRED ISOLATED CLEFT PALATE**
Yi Xu

3.
245 **COST ANALYSIS OF PALATAL REPAIR IN INTERNATIONAL ADOPTEES**
Sandra Tomlinson-Hansen*, Kaitlyn Paine, J. Paliga, Jesse Taylor*

4.
247 **EFFECT OF SURGICAL TECHNIQUE ON MAXILLARY GROWTH IN PATIENTS WITH UNILATERAL CLEFT LIP AND PALATE: A SYSTEMATIC REVIEW**
Steven Rueda, *Gaby Doumit*

5.
248 **SAFETY OF IBUPROFEN IN POSTOPERATIVE PAIN AFTER PALATOPLASTY**
Brandon Cardon*, Robert Glade*

6.
263 **EFFECT OF LOUDNESS VARIATION ON VELOPHARYNGEAL FUNCTION IN CHILDREN WITH 22Q11.2 DELETION SYNDROME: A PRELIMINARY REPORT**
Caitlin Cummings, *Adriane Baylis, Rebecca McCauley*

7.
250 **PARENTAL AND CHILDREN'S SATISFACTION WITH CLEFT REPAIR AND RELATED ASPECTS IN MONGOLIA**
Shagdar Batsukh, *Myagmar Bat-Erdene, Bulgan Baasan, Bazar Amarsaikhan, Gombosuren Davaa, Nagato Natsume, Ariuntuul Garidkhuu*

8.
251 **CULTURE AND BELIEFS ON ETIOLOGY AND TREATMENT OF CLEFT LIP AND PALATE**
Ejike Ezeja, *Peter Okwereku, Nanci De Felippe*

9.
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ABSTRACTS

The Scientific Program Agenda lists abstract titles with the primary author listed first, followed by co-authors, if any. The presenter's name is bolded.

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Otherwise, all remaining authors, presenters, and session chairs and co-chairs indicated they had nothing to disclose.

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Abstracts

*1 COMMISSION ON APPROVAL OF TEAMS: REVIEW AND DISCUSSION OF THE TEAM APPROVAL PROCESS

David Kuehn, PhD

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A review and discussion of the team approval process moderated by the Commission on Approval of Teams. Members of teams that have applied for approval will have the opportunity to discuss the application, Standards and impact of the approval process.

Disclosure: Chair: Commission on Approval of Teams

*2 JOURNAL MANUSCRIPT PREPARATION AND SUBMISSION

Jack Yu, MD, DMD, MSEd

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This Eye Opener will be given by members of the "Cleft Palate-Craniofacial Journal" Editorial Board, Section Editors from a variety of disciplines will discuss what constitutes a good scientific manuscript, what kinds of manuscripts are accepted, and what is required by the "Cleft Palate-Craniofacial Journal." Common problems in manuscript preparation and ways of avoiding them will be addressed.

Disclosure: Editor-in-Chief, Cleft Palate-Craniofacial Journal

3 THE AMERICLEFT PROJECT: GUIDELINES FOR PARTICIPATION IN COLLABORATIVE INTERCENTER OUTCOMES STUDIES

Ross Long, Jr, DMD, MS, PhD (1), Judith Trost-Cardamone, PhD (2), Kathy Chapman, PhD (3), Debbie Sell, PhD, (4), Adriane Baylis, PhD, CCC-SLP (5), Angela Dixon, MA (6), Kelly Nett Cordero, PhD, CCC-SLP (7), Cindy Dobbelsteyn, MSc (8), Anna Thurmes, MA, CCC (9), Kristina Wilson, PhD (10). (1) Lancaster Cleft Palate Clinic, Lancaster, PA, (2) California State University at Northridge, Northridge, CA, (3) University of Utah, Salt Lake City, UT, (4) Great Ormond Street Hospital for Children NHS Foundation Trust, London, United Kingdom, (5) Nationwide Children's Hospital, Columbus, OH, (6) Riley Hospital for Children at Indiana University Health, Indianapolis, IN, (7) Center for Craniofacial Services, St. Paul, MN, (8) Nova Scotia Hearing and Speech Centres, Halifax, NS, (9) University of Minnesota, Minneapolis, MN, (10) Texas Children's Hospital, Houston, TX

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BACKGROUND & PURPOSE: The purpose of this eye opener is to 1) provide an update on the current status of the Americleft Project; 2) provide details about carrying out actual outcomes comparisons of internal quality assurance audits; 3) encourage participation by other individuals, centers, and disciplines; and 4) discuss the requirements necessary for other centers to collaborate and participate in the project. The presentation will include background information about the inception and growth of the project and progress made by the orthodontic group in the area of alveolar bone grafting. Information will also be provided about the progress made by the speech group in developing standard procedures for data collection and analysis and conducting reliability studies to allow for reliable rating of speech data. In addition to providing an update on progress with data collection across participating centers, goals for the next phase of the speech project will be presented.

METHODS: Will provide attendees with information for participation in intercenter outcome studies, based on the experiences of those who have successfully executed such studies as part of the Americleft Project. The steps to initiate those projects, records required and methodologies to insure scientifically valid and reliable comparisons will be discussed. Accomplishments to date illustrate the benefits of these studies. Emphasis will be placed on the progress of the Americleft Speech Group.

4 VPD MANAGEMENT IN SYNDROMIC POPULATIONS: ASHA SIG5 CHALLENGING CASES PANEL

Adriane Baylis, PhD, CCC-SLP (1), Angela Dixon, MA (2), Sara Kinter, MA, CCC-SLP (3), Kristen DeLuca, MS, CCC-SLP (4).

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BACKGROUND & PURPOSE: Speech outcomes are of paramount importance to members of cleft/craniofacial teams. Children with craniofacial syndromes pose a particular challenge to team members, especially for management of velopharyngeal dysfunction (VPD). Speech outcomes for syndromic populations have been widely reported to be less optimal than those of nonsyndromic populations with cleft palate/VPD. This session explores some of the more common syndromes associated with VPD and the decision-making process involved with the management of challenging cases of VPD in these syndromic populations. ASHA Special Interest Group 5, Speech Science and Orofacial Disorders, offers this case-based panel presentation to surgeons, SLPs, and other ACPA attendees involved in management of VPD.

METHODS: The panel includes SLPs from various cleft/craniofacial teams in the US who are part of the ASHA SIG5 Continuing Education Committee. They will present a variety of cases of VPD in syndromic populations including 22q11.2 deletion syndrome (velocardiofacial syndrome), Moebius syndrome, Neurofibromatosis, hemifacial microsomia, and Stickler syndrome. Syndromic-specific speech, velopharyngeal, medical, and other related factors will be discussed. Each stage of the diagnostic and treatment process will be reviewed including information on case history, diagnostic protocol and speech findings, instrumental assessment choices and findings, VP imaging studies, treatment options, and outcome. Both speech therapy and surgical treatment approaches will be presented, as well as other factors related to the child's syndromic diagnosis (e.g., cardiac, cognitive, airway, etc.), which may influence treatment decision-making. Cases will be presented in both audio and video format and audience participation is strongly encouraged.

5 ORAL HEALTH RELATED QUALITY OF LIFE (OHRQOL) AND SELF-RATED SPEECH IN CHILDREN WITH EXISTING FISTULAS IN MID-CHILDHOOD AND ADOLESCENCE

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BACKGROUND & PURPOSE: Residual fistulas following primary cleft repair may impact patients' speech and quality of life. Surgical repair is usually considered necessary by the cleft team, to improve speech and QOL. But surgery represents an additional burden to patients with little evidence that the benefits assumed by care providers, result in measurable changes from the patient's perspective. The purpose of this investigation was to assess the OHRQOL and self-rated speech in children who were candidates for fistula repair.

METHODS: 1199 children with clefts (mean age=11.6 years) from 6 centers participated in an observational study of QOL. Cross-sectional baseline data included:cleft type, presence of alveolar cleft, previously repaired/unrepaired, and presence of fistulas. For this investigation, any communication between oral (palatal or labial) and nasal cavities was considered a fistula even if related to an unrepaired alveolar cleft. Presence of fistulas was examined in three Groups:(1)alveolar cleft present-not previously repaired(n = 273);(2) alveolar cleft present-prior surgical repair(n = 545);and (3)no alveolar cleft (n = 381). At baseline, patients completed the Child Oral Health Impact Profile (COHIP). Frequency and chi-square tests were used to compare presence of fistulas between groups. Mean scores for patient-reported OHRQOL and self-rated speech were compared within groups for presence/absence of fistula.

RESULTS: Fistulas were present in 11.4% of Group 1(n = 31), 4.4% of Group 2 (n = 24), and 1.8% of Group 3(n = 7) ($\chi 2(2) = 30.6$, $p < 0.0001$). Group 1 scores were significantly lower when fistula was present for functional($F(10, 255) = 6.44$, $p < .02$)), socioemotional($F(10, 255) = 5.01$, $p < .03$)), school($F(10, 255) = 7.24$, $p < .008$)) and the overall OHRQOL COHIP score($F(10, 255) = 5.92$, $p < .02$)). These participants also rated their speech as significantly different from their peers when fistula was present ($F(10, 255) = 4.47$, $p < .05$)). In Groups 2 and 3, only functional well-being for Group 3 was significantly different ($F(10, 357) = 4.07$, $p < .05$)).

CONCLUSIONS: Comparisons between three groups revealed that alveolar cleft present-unrepaired had significantly higher fistula rate and lower OHRQOL scores on all dimensions except for self-esteem and the highest ratings for speech difference.

6 DEMOGRAPHIC FACTORS ASSOCIATED WITH SURGICAL RECOMMENDATION AND QUALITY OF LIFE AMONG YOUTH WITH CLEFTS

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BACKGROUND & PURPOSE: Oral health-related quality of life (QoL) is an essential factor for determining treatment needs in youth with clefts and is also linked to surgical recommendations. This study sought to investigate demographic factors (i.e., race/ethnicity) associated with surgical recommendation and QoL in youth with clefts.

METHODS: Data come from a five-year longitudinal study examining outcomes in youth (ages 7 to 18) with cleft and their caregivers Participants were 1200 youth (43.28% female) recruited from six U.S. cleft centers. They averaged 11.6 years old (sd=3.1), and 16.5% were recommended for surgery within one year. The majority of the sample was white (67.7%), 16% were Hispanic, 10.7% Asian, 9.7% Black/African American, and 11.8% other/mixed. At baseline, participants completed self-report questionnaires to assess demographic factors and QoL. QoL was assessed with the Child Oral Health Impact Profile (COHIP), a 34-item, self-report measure with five discrete subscales: Oral Health; Functional Well-being; Socio-Emotional Well-being; School; and Self-esteem. Surgeons also provided recommendations for surgery within a year time span.

RESULTS: Chi-square analyses revealed that more Hispanic youth (46%) were recommended for surgery within the year compared to non-Hispanic youth (34%). p<.004. Comparisons of racial differences showed that only 33% of white youth were recommended for surgery, compared to 48.7% of African-American and 41% of mixed/other race, p < .004. GLM models separately examined race and ethnicity differences in COHIP, controlling for age, gender, diagnosis (CP or CLP), and clinical rating of the severity of defect. Results showed significant racial differences across all subscales, except for self-esteem, such that African-American and other/mixed race participants reported lower QoL compared to other groups. Significant ethnicity differences were also observed across COHIP subscales, except for functional well-being, showing that Hispanic youth reported lower QoL compared to non-Hispanic participants.

CONCLUSIONS: Significant racial and ethnic differences were observed in QoL among youth with cleft. In addition, minority races/ethnicity youth were much more likely to have surgical needs than white youth. The importance of racial and ethnic differences when considering treatment needs of children with cleft will be discussed.

7 VISUAL-MOTOR FUNCTIONS AMONG SCHOOL AGE CHILDREN WITH AND WITHOUT SINGLE SUTURE CRANIOSYNOSTOSIS (SSC)

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BACKGROUND & PURPOSE: Children with SSC (cases) score lower than unaffected children (controls) on cognitive and motor measures in infancy. School age data suggest average IQs overall, with cases scoring lower than controls. No studies have investigated visual-motor functioning: age 7 is a critical period for these skills. The purpose of this presentation is to examine the visual-motor performance of children with/without SSC and sub-group differences as a function of sex and SSC diagnosis.

METHODS: Data came from the age 7 assessment (mean age=7.4 years, SD=0.43) of children followed from infancy and included 166 cases (sagittal: N=75, metopic: N=48, unilateral coronal: N=43) and 152 controls. Visual-motor tests included the Beery-Buktenica Developmental Test of Visual Motor Integration (VMI), Visual Perception (VP) and Motor Coordination (MC), and the Purdue Pegboard Test (Purdue). Linear regression with robust standard errors was used to assess associations between visual motor skills and (1) case/control status; 2) case/control status by sex; and 3) affected suture. Case-control analyses were adjusted for maternal IQ, age at assessment, race, SES and when appropriate, sex of child; analyses for suture groups were adjusted for maternal IQ, age at assessment and sex of child.

RESULTS: Handedness in both groups matched population estimates (right-handed: 89% cases, 87% controls). Cases performed worse than controls on all measures, though differences were small and mostly statistically non-significant (p=0.03 to 0.70). In analyses by sex, both male and female cases scored lower than same-sex controls; however, differences were largest for male cases versus controls. Among cases, males performed worse than females on VMI and VP and on the Purdue Non-Preferred Hand, Both Hands, and Assembly (p's=0.08 to <0.001). Children with sagittal SSC outperformed children with metopic and unilateral coronal SSC on the VMI (p=0.02, 0.03). For all SSC diagnoses, females outperformed males on all but two subtests.

CONCLUSIONS: Children with SSC evidenced modestly lower performance than controls on fine motor and visual motor measures. Case males demonstrated greatest vulnerability in visual perception, visual motor integration and bimanual hand function.

8 COMPARATIVE OUTCOMES OF TWO NASOALVEOLAR MOLDING TECHNIQUES FOR BILATERAL CLEFT NOSE DEFORMITY

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BACKGROUND & PURPOSE: Bilateral cleft nose deformity is increasingly being treated before primary repair with nasoalveolar molding (NAM). The Grayson technique starts nasal molding when the alveolar gap is reduced to 5 mm, while the Figueroa technique performs nasal and alveolar molding at the same time. Both techniques significantly lengthen columella, but their comparative efficacy, efficiency, and incidence of complications have not been investigated.

METHODS: In this blinded, retrospective study of 58 patients with complete bilateral cleft lip-cleft palate, 27 received Grayson NAM and 31 received Figueroa NAM. Outcomes were compared by analyzing pretreatment and posttreatment facial photographs and clinical charts for efficacy (columella length ratio, alar width ratio, alar base width ratio, nostril shape, nasal tip angle, nasolabial angle, nasal base angle), efficiency (molding frequency), and incidence of complications (facial irritation, oral mucosal ulceration).

RESULTS: Grayson and Figueroa NAM did not differ in treatment efficacy for columellar length ratio (0.12±0.04 vs. 0.12±0.06), alar width ratio (1.19±0.13 vs. 1.21±0.12), alar base width ratio (1.13±0.16 vs. 1.15±0.16), nostril shape (0.30±0.07 vs. 0.32±0.16), nasal tip angle (118.5±24.4 deg vs. 119.0±23.1 deg), nasolabial angle (109.2±26.3 deg vs. 102.2±22.9 deg), and nasal base angle (40.6±8.4 deg vs. 35.4±11.2 deg) (all p>0.05). Grayson NAM was less efficient, i.e., required more adjustments (10.8±4.1 vs. 7.6±1.5, p=0.001), and had a higher incidence of oral mucosal ulceration (26% vs. 3%, p<0.05).

CONCLUSIONS: Both Grayson and Figueroa NAM similarly improve nasal deformities and reduce alveolar gaps; however, the Figueroa technique is associated with less oral mucosal complication and more efficiency.

9 VELOPHARYNGEAL OUTCOMES AT AGE SIX FOR THREE TYPES OF PALATOPLASTY

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BACKGROUND & PURPOSE: In 1989, The Cleft Palate and Craniofacial Journal published the first prospective surgical trial comparing two types of palatoplasty for velopharyngeal outcomes. That publication, and later follow up publications concerning that surgical cohort, indicated that there was no difference between the surgery types in need for secondary velopharyngeal management. In 1997, the primary investigator of that study altered the surgical procedure to a "radical intravelar veloplasty" as described by Cutting and Sommerlad. The purpose of this study was to evaluate the need for secondary velopharyngeal management in patients receiving the radical IVV, and compare the results to those obtained from the earlier prospective surgical trial.

METHODS: Charts of 71 patients who received the radical IVV by the same surgeon were reviewed. Patients were eliminated from the study using the same elimination criteria from the previous prospective trial (syndromes, developmental delay, dehissence, sensorineural hearing loss, or palatoplasty after 18 months of age.) The remaining 54 Radical IVV outcomes were compared with outcomes of the 95 non-IVV and the 105 Krien's IVV patients. Fisher's Exact Test was employed to compare outcomes between the three groups. ANOVA (and Tukey's HSD post-hoc analysis) were used to compare the mean age at repair between the groups.

RESULTS: There was no significant difference in the proportions of different cleft types receiving the three different repairs (p = 0.202) ANOVA found significant differences between groups for age of repair, with the Radical cohort to be younger than both the non-IVV (p <0.001) and the Kriens cohorts (p = 0.006). There was no significant difference in the proportion of subjects requiring secondary surgery by age six following the three different repairs (p = 0.267), although the radical group trended lower (19%, vs. 26% and 31% for the non-IVV and Krien's IVV respectively.) Additional analysis of hearing sensitivity data at age three revealed better hearing in the Radical group.

CONCLUSIONS: Although there was a trend for the radical IVV patients to require secondary velopharyngeal surery less frequently, there was no significant difference between the three surgical groups for need for velopharyngeal management by age 6.

10 ROBIN SEQUENCE: MORTALITY, RISK STRATIFICATION, AND CLINICAL OUTCOMES

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BACKGROUND & PURPOSE: The purpose of this study is to analyze causes of and risk factors associated with mortality in infants with Robin Sequence (RS). We hypothesize that in the background of modern airway monitoring devices, the cause of death due to airway obstruction is low. In addition, long-term clinical outcomes are reported.

METHODS: An 11-year (2001-2012) retrospective review of infants with RS admitted to the neonatal intensive care unit (NICU) at a tertiary care children's hospital was performed. Variables assessed included gravid drug exposure, prematurity, intrauterine growth restriction, syndromic diagnosis, isolated RS, cardiac, central nervous system (CNS), pulmonary anomalies, gastrointestinal abnormalities [gastrointestinal reflux disease (GERD), Nissen fundoplication, gastrostomy tube (GT)], and abnormality of ≥ 2 organ systems (pulmonary, cardiac, CNS, GI). Additional variables were collected by treatment modality: nonoperative (NONOP) and surgical intervention (SURG). The primary outcome was mortality rate. Cause of death was identified by a neonatalogist. Secondary outcomes were emergency room (ER) visit and hospital admission rates. Univariate analysis was performed to identify risk factors for outcomes.

RESULTS: 181 infants were identified. Mean follow up was 35 months. 33.2% of patients possessed a syndromic diagnosis, 32.6% isolated RS, 30.9% cardiac, 26.5% CNS, 32.6% pulmonary, and 67.4% GI anomalies. Distribution by treatment modality was 51.9% NONOP and 48.1% SURG. Overall mortality was 16.6% (30 patients); two deaths in 181 patients (1%) were related to airway problems (pneumonia and spontaneous loss of breathing). There were no deaths in patients with isolated RS ($p=0.002$). Variables associated with an increased mortality rate were cardiac ($p<0.001$), CNS ($p=0.001$), and 2 or more organ system abnormalities($p<0.001$). Variables associated with an increased number or ER visits were cardiac anomalies ($p=0.04$), GT ($p<0.001$), and patients with ≥ 2 organ system abnormalities ($p=0.04$). Variables associated with an increased number of admissions were GT ($p<0.001$), ≥ 2 organ system abnormalities ($p=0.04$), and SURG ($p=0.02$).

CONCLUSIONS: Mortality in infants with RS is associated with non-pulmonary organ system disease. Risk stratification for this complex disorder should consider abnormalities in non-pulmonary organ systems. Mortality was not increased in patients with isolated RS.

11 THE AMERICLEFT PROJECT: BURDEN OF CARE FROM SECONDARY SURGERY IN PATIENTS WITH CUCLP

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BACKGROUND & PURPOSE: The burden of care for children with cleft lip and palate extends beyond primary lip and palate surgery. Specifically, children may undergo additional surgery to improve their appearance or speech. Current understanding of the burden of secondary surgery in North America is limited to reports from single centers. To address this deficiency, we performed an inter-center comparison of secondary surgery rates among centers participating in Americleft.

METHODS: Retrospective chart review was performed to identify all secondary surgeries among children included in the initial Americleft outcomes studies. Three of the original five centers participated (Center A, n=20; Center C, n=39; Center E, n=36). All children had complete, nonsyndromic unilateral cleft lip and palate and data were at least through age six. Incidence of secondary surgery was calculated for lip, palate and nasal surgeries. To account for censoring from variable follow-up, outcome was defined as duration of survival without revision surgery. Survival without revision surgery was compared between centers using the log-rank test. Fisher exact test was used for categorical analyses.

RESULTS: The duration of survival without revision lip surgery was significantly different between centers ($p<0.0001$). Rates of revision lip surgery at 10 years after primary repair ranged from 6 to 60%. Survival without secondary palate surgery was significantly different between centers ($p=0.0275$). Rates of revision palate surgery at 10 years after primary repair, including re-repair and pharyngeal flap, ranged from 6 to 26%. The duration of survival without secondary rhinoplasty was significantly different between centers ($p<0.0001$). Rates of secondary rhinoplasty by 20 years of age ranged from 52 to 74%. Revision lip surgery was associated with a GOSLON score ≥ 4 ($p=0.0209$). No association was detected between revision palate surgery and GOSLON score ≥ 4 ($p=0.7474$).

CONCLUSIONS: Survival without cleft lip revision, secondary palate surgery, and secondary rhinoplasty is significantly different between centers. This variation may contribute to differences in aesthetic and speech results between centers.

12 COMPARATIVE ANALYSIS OF ANTERIOR MAXILLARY DISTRACTION WITH CONVENTIONAL LEFORT I OSTEOTOMY IN THE MANAGEMENT OF CLEFT MAXILLA

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BACKGROUND & PURPOSE: 1) To compare the stability and relapse between anterior maxillary distraction and conventional LeFort I Advancement Osteotomy 2) To compare the soft tissue profile between the 2 groups. 3) To assess the speech outcome in the 2 groups.

METHODS: 40 patients with hypoplastic maxilla in the age group of 18-25 years who needed maxillary advancement were randomly assigned to 2 groups Group 1: 20 patients were subjected to Conventional Orthognathic Surgery(CO);All patients underwent lefort 1 osteotomy; 8 patients underwent mandibular setback as well. Group 2: 20 patients were subjected to Anterior Maxillary distraction(AMD) All 40 patients underwent alveolar bone grafting and presurgical orthodontics sparing 3 in group 2 Lateral Cephalograms were taken for all patients Standard surgical assessment and cephalometric analysis was carried out followed by dental model surgery AMD was performed in group 2 patients as per standard protocol. Rhythm-morning 3 turns; evening 2 turns Pitch-0.25mm/turn; 1mm/day 3 months of consolidation period Lateral Cephs repeated; for group1 :-3rd post op day and 6 & 12 months postoperatively; for group 2 :-On completion of distraction,4,6 & 9 months postoperatively. Changes in the soft tissue profile were assessed by measuring the most anterior point of the upper lip from the true vertical line in both the groups. The relapse rate between the groups and the difference in soft tissue profile was statistically analysed using the unpaired 't' test, whereas the speech variables like nasality, articulation, intelligibility and acceptability were compared between the 2 groups by Mann Whitney U test and Wilcoxon Signed Ranks Test.

RESULTS: Mean relapse of 0.35mm for AMD Vs 2.15mm for CO Mean changes in soft tissue profile of 5.85mm for AMD Vs 2.65 mm for CO Independent samples test was performed for both the variables and derived a p value of <0.005, hence statistically significant. The speech variables were subjected to Wilcoxon Signed Ranks test and derived a p value that was statistically significant in Group 2, whereas not significant in Group 1.

CONCLUSIONS: 1) The relapse rate in AMD was found to be much lesser as compared to CO and hence more stable. 2) The soft tissue profile changes in AMD were more promising making the concave profile convex, normalizing the nasolabial angle and making the upper lip more prominent thereby improving the lip esthetics and minimizing the residual deformity and the stigma of the cleft. 3) There was a subtle improvement in speech outcome in AMD patients, improving the frontal consonants, thus improving the articulation and acceptability of speech. 4) AMD is cost effective, the device is easy to fabricate and is inexpensive and moreover well tolerated by patients in our study. All these factors make AMD the treatment of choice for cleft hypoplastic maxilla. However long term studies would help us to give conclusive evidence for the same.

13 AIRWAY OUTCOMES FOLLOWING CLEFT PALATE REPAIR IN ROBIN SEQUENCE

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BACKGROUND & PURPOSE: Prior studies report increased airway complications following cleft palate repair in infants affected by Robin sequence (RS). The primary objective of this study is to compare airway complications after palatoplasty in RS to cleft palate only (CPO). Secondary objectives are to compare patients with RS who underwent neonatal mandibular distraction osteogenesis (RS-MDO) to those with CPO and identify risk factors for airway complications in these patients.

METHODS: A 12-year (Jan 2000 - Dec 2012) retrospective review of patients with CPO or RS undergoing palatoplasty was performed. CPO patients were Veau types I and II matched controls. RS patients consisted of RS-MDO or RS-

Nonop (managed nonoperatively). Preoperative variables included gestational age (GA), birth weight (BW), age at palate repair, syndromic diagnosis, and central nervous system (CNS), cardiac, and lower airway anomalies. Airway complications were defined as reintubation, readmission, or emergency room (ER) visit for airway compromise within 3 months of CP repair.

RESULTS: 93 patients met inclusion criteria: 40.9% had CPO, 59.1% had RS, and 36.6% had RS-MDO. Mean follow up was 18 months, mean GA 37.4 weeks, and mean BW 3 kg. Mean age at palate repair was greater in RS (15.7 months) than CPO (13.3 months), p=0.032. Variables that occurred more frequently in RS versus CPO were syndromic diagnosis (10.9% vs. 0%, p=0.04) and lower airway anomalies (12.7% vs. 2.6%, p=0.03). 6.4% of patients had an airway complication: RS (7.3%) and CPO (5.3%), p=0.71. 2.2% required reintubation: RS-MDO (5.9%), CPO (0%) and RS-Nonop (0%), p=0.07. Chi=square analysis demonstrated an increased reintubation rate associated with syndromic diagnosis (16.7%, p=0.01), cardiac anomalies (14.3% p=0.02), and lower airway anomalies (14.3%, p=0.02). In isolated RS, the reintubation rate was 0%.

CONCLUSIONS: Patients with RS have comparable risks for airway compromise following CP repair compared to those with CPO. Syndromic diagnosis, cardiac, and lower airway anomalies are associated with reintubation following repair in the RS population.

14 MEASURING OUTCOMES THAT MATTER TO PATIENTS WITH CLEFT LIP AND/OR PALATE

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BACKGROUND & PURPOSE: The CLEFT-Q is a cross-cultural patient-reported outcome (PRO) instrument for patients with cleft lip and/or palate (CLP). In patient-centered care, it is important to measure the patient's perspective of their outcome in a scientifically sound manner. PROs should assess all relevant domains of outcomes, such as function, appearance, and health-related quality of life. Selecting a PRO instrument can be a daunting task. Understanding the science behind PRO measurement is necessary to measure outcomes of cleft care accurately. This panel aims to describe the science of PRO measurement and the CLEFT-Q in a simple, accessible manner.

METHODS: PANEL DESCRIPTION (90 min.) 1. Measuring PROs in Cleft Care (15 min.) Evaluating PROs is becoming increasingly important from the perspectives of both quality improvement and research. The challenges and opportunities in measuring PROs in cleft care will be highlighted, using an example of a PRO instrument developed for women undergoing breast surgery (BREAST-Q). 2. Choosing an Instrument – A Simple Primer to a Complex Science (15 min.) It is important to select a PRO instrument that is clinically meaningful and sensitive to change. An inappropriate instrument will not reflect the patient's perspective accurately. An introduction to the science of measurement, the FDA standards for instrument development, and a simple approach to choosing PRO instruments to answer specific research questions will be presented. 3. Measuring what matters to children with CLP (25 min.) We performed 138 qualitative interviews with children with CLP in six countries and developed 13 CLEFT-Q scales. Cognitive debriefing interviews were then performed, and the scales were further adapted. These scales will be discussed in detail. 4. Measuring what matters to adults with CLP (15 min.) Qualitative interviews with adults with CLP were performed to determine what health concepts are important to adults seeking treatment. The similarities and differences between adults and children with CLP, and the implications on measuring PROs with the CLEFT-Q, will be discussed. 5. Conclusions (5 min.) and Questions (15 min.) Key points about the measurement of PROs, the selection of instruments, and the indications for use of the CLEFT-Q will be highlighted.

15 SPEECH OUTCOME DATA: OVERCOMING BARRIERS AND USING TECHNOLOGY

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BACKGROUND & PURPOSE: Monitoring short-term and long-term speech outcomes and having a quality management system in place are critical components of cleft team care, both to ensure the best possible patient outcomes and to meet standards in place by professional organizations and funding sources. Clinicians conducting speech outcome studies for quality improvement or research, face numerous challenges related to data collection, analysis, and reporting. Strategies to overcome barriers related to cost and time, issues of reliability, and access to equipment and technology will be addressed. This session shares practical methods and will allow for discussion on issues related to collecting, storing and analyzing speech outcome data. This session's content has grown out of the Americleft Speech Group's experience. The target audience includes speech-language pathologists, surgeons, and any other professionals on cleft teams involved in quality improvement or research.

METHODS: This session will provide an overview of the implementation of a systematic protocol to measure speech outcomes, whether it is for quality improvement or research studies. The development and refinement of protocols will be discussed; including use of a standard speech sample. Recording equipment and strategies for obtaining a quality recording will be illustrated. A range of technologies will be discussed, including web-based products and a database that increases efficiency while maintaining compliance with HIPAA and the IRB. Presenters will share their experiences overcoming barriers of collecting speech outcome data within busy clinical practices, including the addition of instrumentation and patient surveys as outcome measure. Audience discussion will be facilitated to share successes and challenges related to speech outcome studies.

*16 SPEECH THERAPY: STRATEGIES FOR CORRECTION OF ERRORS SECONDARY TO VELOPHARYNGEAL DYSFUNCTION AND VARIOUS ORAL ANOMALIES

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BACKGROUND & PURPOSE: Children with a history of cleft lip/palate or other oral anomalies are at risk for certain speech and resonance disorders. These may be secondary to velopharyngeal insufficiency (abnormal structure), velopharyngeal incompetence (abnormal neurophysiology), oral anomalies (i.e., macroglossia, small oral cavity, fistula, or large tonsils), and dental malocclusion. Even with early surgical repair, a large number of preschoolers with cleft lip/palate demonstrate difficulties with speech production. Any type of structural anomaly in the vocal tract can cause obligatory distortions or compensatory errors. Obligatory distortions are those that occur when function (i.e., articulation) is normal, but the structure is abnormal and causes distortion of speech. In contrast, compensatory errors are those that occur when articulation placement (function) is altered in response to the abnormal structure. It is important for the speech-language pathologist to determine the underlying cause of each of the child's speech characteristics in order to determine if correction will require physical management (i.e., surgery or orthodontics), speech therapy, or both. In addition, when speech therapy is indicated, the speech-language pathologist must be skilled in employing techniques that are most effective with these types of errors. The purpose of this session is to provide methods for determining when speech therapy will be effective in correcting the presenting speech errors. In addition, this session is designed to help participants apply effective speech therapy techniques for correction of errors due to a history of cleft palate, VPI, or other structural anomalies.

METHODS: In this session, the presenter will discuss and give examples of obligatory distortions and compensatory errors due to VPI and other anomalies. The presenter will explain how to determine which errors will respond to speech therapy, and which will require physical management. Specific speech therapy techniques will be described and demonstrated for the correction of a variety of speech errors that are typical in this population. Short video clips of the use of these techniques with patients will be presented for further clarity. There will be a discussion of methods for achieving carry-over once normal production is achieved. Finally, the participants will receive a handout with specific instructions on a variety of techniques, including those that can be used before and after velopharyngeal surgery.

Royalty: Royalties from the textbook: Kummer, AW. (2014). Cleft Palate and Craniofacial Anomalies: Effects on Speech and Resonance, 3rd Edition. Clifton Park, NY: Delmar Cengage. Receipt of Intellectual Property Rights/Patent

Holder: Kummer- Patent for Nasoscope and Royalties from deriviative called the Oral & Nasal Listener, Super Duper Inc.

17 PRENATAL CLEFT COUNSELING FOR BEGINNERS: ANSWERING THE CALL

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BACKGROUND & PURPOSE: Many providers on Craniofacial teams will be asked to speak to a family expecting a baby with a cleft at some point, either formally or informally, possibly without ever having been trained to provide this type of sensitive counseling. It is optimal for this counseling to be provided in conjunction with a Perinatology team to confirm the cleft diagnosis and to provide education to decrease fear and anxiety, however this team approach is not always possible. This talk will prepare team members to provide basic counseling to families seeking information about the diagnosis of cleft lip and/or palate in a variety of settings.

METHODS: The goal of this session is to promote competence and confidence in basic prenatal cleft counseling. Typical scenarios will be presented and recommendations will be made regarding the purpose, content and structure of a prenatal counseling session. Suggestions will also be made regarding handouts and visual aids to facilitate teaching during the counseling session.

*18 USING PLAY-BASED THERAPY APPROACHES AND HOME PROGRAMMING FOR REDUCING COMPENSATORY ARTICULATION

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BACKGROUND & PURPOSE: Many graduate students and new clinicians do not have the advantage of completing a Craniofacial Anomaly course within their degree program. The treatment approaches for VPI and Compensatory Articulation are often discussed minimally during Voice Disorders class or Articulation/Phonology class. There then seems to be a lack of knowledge about treating Compensatory Articulation and the generalization of the therapy progress. Parents report that many clinicians do not know how to identify and reduce Glottalizations and other Compensatory Articulation and how to encourage parents to work on this at home. Although Drill-based therapy is needed, Play-based therapy approaches are motivating and encourage patient and parent participation. A discussion on how to use drill, repetitive practice, and motor-programming techniques will be evaluated. The goal of this presentation will be to review Play-based therapy approaches to Compensatory Articulation, a review of home programs and home programming techniques, and how to assist parents in being more active in monitoring speech progress if the child is receiving speech therapy within the school setting as well as private speech therapy. A discussion of patients with common Craniofacial syndromes that may have speech deficits will also be reviewed to assist clinicians in identifying compensatory articulation and articulation changes based on changed anatomy and resonance disorders.

METHODS: The presentation will be both lecture style and interactive learner participation. An overview of Compensatory Articulation will be provided and then specific approaches and cases will be reviewed. Videos of actual therapy segments will be observed and then discussions of the play-based techniques will follow. Home programming theory and use will be examined and parent feedback on ease of use and time needed to implement these programs will be discussed. Learners will receive resources on how to develop Play-based therapy sessions, home program approaches, and information associated with more common Syndromes that may have speech deficits.

Salary: Braun- Nova Southeastern University. Moll - Progressive Pediatric Therapy Inc. DeLuca - Joe DiMaggio Children's Hospital. Professional: All authors are members of American Speech Language Association. Braun: Past president of the Florida Cleft Palate Association (FCPA). Deluca: Speech Board Member for FCPA

19 SYNDROMIC VERSUS NONSYNDROMIC CLEFTING: THE ROLE OF GENETICS IN THE INTEGRATED CLEFT TEAM APPROACH

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BACKGROUND & PURPOSE: A significant proportion of individuals who have a cleft lip with or without cleft palate (CL/P) can have an underlying genetic syndrome. Over 200 genetic conditions can be characterized by a specific pattern of congenital anomalies, in addition to CL/P. The etiology of syndromic CL/P in the majority of individuals is monogenic or chromosomal. Multifactorial inheritance plays a significant role for nonsyndromic CL/P. Genetic counselors and geneticists are trained healthcare providers that assist in the evaluation of individuals for possible genetic conditions. At Children's Mercy Hospital, genetic counselors and geneticists participate in many aspects of the overall evaluation, including the prenatal assessment, inpatient consultation and outpatient comprehensive team approach. This aids in establishing a correct diagnosis, which will guide future medical management for individuals with CL/P. Additionally, this continuity of care allows for evolving conversations with the families with respect to genetic counseling and recurrence risk estimates.

METHODS: Power point slides will be utilized to review the role of a genetic counselor and a geneticist in the fetal and postnatal evaluation for CL/P. Participants will have an understanding of genetic contribution to nonsyndromic and syndromic clefting. Inheritance patterns and current technologies for genetic testing will be highlighted. Specific cases will be presented to emphasize the value of incorporating genetic counselors and geneticists to improve the overall healthcare provided by the interdisciplinary team.

21 ESSENTIAL ELEMENTS OF MULTISITE NURSING RESEARCH: OPERATIONAL STUDY IMPLICATIONS

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BACKGROUND & PURPOSE: Results of 2008 and 2012 surveys of North American surgeon members of the American Cleft Palate Association demonstrate existing variations and rationales in the use of arm restraints after cleft palate repair. Concerns related to the use of restraints include monitoring of skin integrity, education on safe use, and compliance. Recently, a pilot prospective randomized trial and a retrospective chart review demonstrated no significant difference in occurrence of postoperative complications in children whether or not arm restraints were prescribed. Both publications called for studies with a larger sample size. A multisite study of children after cleft palate repair that would provide an adequate sample size is proposed.

METHODS: The goal of this presentation is to describe the development of a multisite nurse led research study. Strategies for design and planning of a multisite study will be reviewed and will include: 1. Value of a pilot, 2. Elements of the research team, 3. Importance of a steering committee, 4. Processes for communication between team members, 5. Site responsibilities, 6. Protocol adherence, 7. Plan for data collection and analysis, 8. Budget considerations, and 9. Establishment of a writing team. The presentation will include an overview of the background, purpose, research questions, methods, and plan for analysis of a proposed multisite study. The proposed data collection tool will be discussed. Implications: Despite the movement toward conducting multisite research, little information is available in the literature about the individual knowledge, skills, and abilities necessary to conduct such studies. This presentation will provide an overview of the fundamental elements identified in the literature as part of the operational implementation of a multisite study.

22 SPECTRUM OF DENTAL PHENOTYPES IN OROFACIAL CLEFTING

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BACKGROUND & PURPOSE: Children with oral clefts often present with dental anomalies adding complexity to the phenotypic spectrum of orofacial clefting and resulting in more intricate oral rehabilitation procedures. Such dental abnormalities can also be seen in seemingly unaffected family members of children with clefts and include: Hypodontia, delayed dental development, microdontia, supernumerary teeth, excess mammelons, incisal fissures, hypoplasia, hypercalcification, dental malpositions and a slightly higher caries risk. The purpose is to expand and further define the spectrum of dental phenotypes in children with orofacial clefts, their parents and siblings.

METHODS: Samples were recruited from 5 sites including Pittsburgh, Texas, Iowa, Philippines and Hungary for a total of 3202 subjects. Of these, 605 are

affected, 1721 are unaffected relatives, and 876 are controls. Multiple intraoral photographs were taken per subject and rated with forms including the DFT/dft index and variables such as hypoplasia, hypercalcification, microdontia, malpositions, mammelons, and incisal fissures. Descriptive statistics and regression analysis on affection status were performed.

RESULTS: Inter and intrarater reliability were completed and we obtained intraclass correlations (ICC) of >0.8 indicating excellent reliability. All data has been collected. Sample sizes for the U.S. sites combined include 1027 individuals processed already. Of these 257 are controls (149 probands, 71 parents and 37 siblings) and 770 belong to affected families (199 are affected probands, 322 are unaffected parents and 249 are unaffected siblings). Amongst affected probands, 41 have a cleft lip, 132 have a cleft lip and cleft palate and 26 have a cleft palate only. Preliminary results for DFT and dft indexes in affected case probands (n=199) vs. control probands (n=149) comparisons for the primary, mixed and permanent dentition indicated significant differences for the primary (p=0.005) and the mixed dentition (p=0.0005). Also, preliminary comparison of DFT/dft indexes between parents and siblings of cases vs. parents and siblings of controls for the Iowa sample showed no significant differences (p >0.05). Efforts are ongoing to complete processing and analyses of the total sample for our presentation.

CONCLUSIONS: This is the largest study to date evaluating dental phenotypes in children with clefts, parents and siblings in an effort to enhance our understanding of cleft lip and palate etiology.

23 THE EFFECTS OF TIMING OF PALATOPLASTY IN FACIAL GROWTH AND OCCLUSAL RELATIONSHIPS: A COMPARATIVE STUDY.

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BACKGROUND & PURPOSE: While two-stage palatoplasty appears to warrant a favorable palatal growth, efforts have been made to find the ideal timing of hard palate closure to achieve the best balance between speech and facial development. Since 1998, we have been conducting an early-two stage palatoplasty for patients with complete unilateral cleft lip and palate (CUCLP), in which surgery for the soft and hard palate is carried out at 1, and 1.5 years of age, respectively. The aim of the present study is to assess facial growth, palatal development, and occlusal relationships of patients with CUCLP who received the early-two stage protocol (ETS group) and to compare the results with those obtained from age-matched subjects who underwent conventional one-stage pushback palatoplasty performed at 1 year of age (PB group). Evaluations were conducted at the patient's age of 8 years.

METHODS: Seventy-six patients with non-syndromic CUCLP who were consecutively treated in our department were enrolled in the study. The subjects were divided into 2 groups (ETS; n=40, PB; n=36) based on the type of palatoplasty they received as described above. We performed cephalometric analysis and morphological assessments of cast models of the upper dental arch. The Goslon Yardstick was used for occlusal evaluation.

RESULTS: Cephalometric analysis revealed that PTM-A/PP (ETS; 44.6±2.8 mm, PB; 43.4±2.9mm, P<0.05), PTM-ANS/PP (ETS; 47.8±2.7mm, PB; 46.2±2.9mm, P<0.01), and SNA (ETS; 77.9±4.4°, PB; 76.3±3.6°, P<0.05) were significantly larger in ETS than those in PB, suggesting that ETS showed better anterior-posterior maxillary development than PB. Cast model analysis demonstrated that ETS showed significantly larger dental arch width measured at inter-deciduous cuspid (ETS; 28.1±3.2mm, PB; 24.1±4.0mm, P<0.01) and inter-second deciduous molor (ETS; 43.7±4.1mm, PB; 38.6±3.9mm, P<0.01) than did PB. Average Goslon Yardstick scores of ETS and PB were 3.60±1.2, and 3.85±1.2 (P<0.05), respectively. Distributions in each Goslon score also showed apparent improvements of occlusal relationship in ETS.

CONCLUSIONS: The present results demonstrated that ETS provided better outcome in anterior-posterior maxillary length, dental arch widths, and occlusal relationships than PB. The results supported our previous report showing that at the patient's age of 4 years palatal growth following ETS was better than that after PB (Kitagawa et al. 2004 CPCJ).

24 DECREASED SECONDARY BONE GRAFTING BUT POORER MIDFACE GROWTH AFTER PRIMARY ALVEOLAR CLEFT REPAIR WITH GINGIVOPERIOSTEOPLASTY AND RHBMP-2

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BACKGROUND & PURPOSE: Studies from NYU revealed that following nasoalveolar molding/gingivoperiosteoplasty (GPP) 60% of patients did not require an alveolar bone graft. In our lab midface animal growth was not detrimentally affected after BMP-2 healing of alveolar clefts. In this study, we performed a similar procedure to NYU with alveolar molding/GPP but with BMP-2 on a resorbable matrix for primary alveolar repair in the infant. We compared long-term follow-up (10 years) for 1) No GPP, 2) GPP only or 2) GPP with BMP-2 by analyzing alveolar bone, tooth eruption, and maxillary growth.

METHODS: For the three primary unilateral cleft repair patient groups: 1) No GPP (n=15), 2) GPP only (n=15) or 2) GPP with BMP-2 (n=10) we performed follow-up studies at least 10 years after the procedure. There was one GPP patient lost to follow-up. We recorded need for secondary alveolar bone grafting, timing of tooth eruption, and clinical evidence of maxillary hypoplasia. New-Tom scans were used to analyze dentition, bone volume and bone density.

RESULTS: For dentition, there was absent cleft lateral incisor in 40% of patient (40%, 46%, 50%). Cleft site secondary tooth eruption was variable but occurred at a mean of 1.8+0.4 years earlier in Groups 2 and 3 (GPP and GPP/BMP-2, respectively) compared to Group 1 (No GPP). Greater bone graft volume/density was seen at the cleft site in Group 3 (GPP/BMP-2) compared to Group 2 (GPP only) (86% vs 42% bone fill). Secondary alveolar bone grafting after expansion was necessary in Group 1 (100%); Group 2 (73%); Group 3 (20%). Two patients in Group 3 (GPP/BMP-2) underwent Le Fort I distraction at age 13. In the other groups there were no patients, to date, who have undergone Le Fort I distraction. Clinical evidence of maxillary hypoplasia was seen in Group 1 (40%); Group 2 (53%); Group 3 (60%). We are in the process of collecting and recording our lateral cephalogram data.

CONCLUSIONS: In a long-term follow-up, after mid-childhood but prior to skeletal maturity, GPP/BMP-2 primary alveolar cleft repairs showed similar tooth eruption, improved bone fill of the cleft site, less need for secondary alveolar grafting. However, data thus far shows poorer midface growth compared to No GPP at primary cleft repair. This study documents our group's IRB approved study primary alveolar clefts with the use of gingivoperiosteoplasty, BMP-2 and a collagen scaffold as an alternative technique to traditional care.

25 WHITE MATTER STRUCTURE IN INDIVIDUALS WITH ISOLATED CLEFT LIP AND/OR PALATE: A DIFFUSION TENSOR IMAGING STUDY

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BACKGROUND & PURPOSE: The development of the face and the brain are intimately linked. Abnormal craniofacial development, such as is seen in isolated clefts of the lip and/or palate (ICLP), is likely to also be accompanied by abnormal brain development. Our laboratory has been evaluating brain structure and function in persons with ICLP using Magnetic Resonance Imaging (MRI). We have previously reported on abnormalities in brain structures in individuals with ICLP. However, structure of the white matter in the brain (myelinated axons that connect neurons within and between different brain regions) has not been examined in this group. We anticipated that similar to the neuroanatomical findings, development of white matter would be disrupted and abnormal in individuals with ICLP.

METHODS: 67 persons with ICLP (42 males, 25 females) were compared to 69 healthy controls (31 males, 38 females). Age ranged from 7-25 years old. Diffusion tensor imaging (DTI) was used to obtain measures of white matter structure and integrity. The primary measure obtained via DTI was Fractional Anisotropy (FA), a measure of how water diffuses within tissues. Higher FA values are indicative of healthier white matter. Average FA for each of the four lobes of the brain (both right and left hemisphere) along with the cerebellum and subcortical structures were compared between groups, while controlling for the effects of age, socioeconomic status, and whole brain FA. Males and females were analyzed separately.

RESULTS: For males with ICLP, FA was significantly lower in the left temporal lobe (p=.01). This was the only brain region in which FA was different for males with ICLP. No significant differences in FA were found for females with ICLP.

CONCLUSIONS: White matter structure appears abnormal only in males with ICLP and only within the left temporal lobe. Axonal development and myelination may be disrupted within the left temporal region. This brain area is critical for language and reading abilities. This disruption in white matter

integrity within the left temporal lobe may be related to the increased incidence of reading disabilities and language problems in individuals with ICLP.

26 HMGB1 SIGNALING IS ESSENTIAL FOR GRAFT-INDUCED BONE FORMATION

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BACKGROUND & PURPOSE: The high mobility group box 1 (HMGB1) chromatin protein is released by damaged tissues and can initiate tissue regeneration. HMGB1 plays a complex role in musculoskeletal repair, acting as a chemotactic factor for osteoclasts and osteoblasts during endochondral ossification and protecting damage-associated cell death within scaffolds. Here we tested the role of HMGB1 signaling during bone healing with and without bone allograft.

METHODS: Morselized bone grafts were obtained from femora and tibiae of WT mice. Four groups were generated: 1) bone graft suspension, “graft group”; 2) bone graft with anti-HMGB1 peptide, “graft+anti-HMGB1 group”; 3) anti-HMGB1 suspension, “anti-HMGB1 group”; and, 4) PBS control, “control group”. All suspensions were encapsulated in fibrin glue before surgery. Circular parietal bone defects were made using a 1.8mm trephine in WT mice. Implants were placed within calvarial defects and healing was assessed at weekly intervals for 28 days using µCT and histology.

RESULTS: Significantly less bone healing was observed in the graft+anti-HMGB1 group compared to the graft group based upon µCT analyses on postoperative day 28. No significant difference was observed between the anti-HMGB1 group and the control group.

CONCLUSIONS: These data suggest that HMGB1 provides a signal which is essential for bone allograft -induced calvarial bone repair.

27 MODULATION OF BMP2-INDUCED CALVARIAL DEFECT HEALING USING ADIPOSE, BONE MARROW, AND MUSCLE-DERIVED STROMAL CELLS

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BACKGROUND & PURPOSE: Current methods of tissue engineering for craniofacial reconstruction focus on implantation of bioresorbable scaffolds seeded with proteins and/or osteogenic progenitor cells. It remains unclear whether specific stromal cell types are better suited for use in craniofacial reconstruction. This study aims to determine the healing capacity of adipose (ADSC), bone marrow (BMDSC), and muscle-derived (MDSC) stromal cell populations augmented with bone morphogenetic protein 2 (BMP2) in a calvarial defect model.

METHODS: ADSCs, BMDSCs, and MDSCs were harvested from 10-week old wildtype mice (n=8). Cells were seeded overnight onto 5mm acellular dermal matrix (ADM) discs (100,000 cells/disc) and were osteoinduced with 150ng BMP2. Unseeded ADM discs treated with either BMP2 or vehicle served as controls. Discs were placed into 5mm circular calvarial defects. Mice were euthanized 4 weeks postoperatively. Regenerate tissue was analyzed by 3D microCT and histology.

RESULTS: Differences in percent healing (mean ± SE) were observed between vehicle (31.5%±8.8), BMP2 control (71.9%±7.0), ADSC + BMP2 (31.4%±1.8), MDCS + BMP2 (21.9%±4.9), and BMDSC + BMP2 (38.5%±20.2) groups. One-way ANOVA revealed a statistically significant main group effect ($F=3.988$, $p<0.02$). Percent healing was significantly decreased in osteoinduced stromal cell constructs when compared to unseeded, BMP2 therapy. Pentachrome staining revealed endochondral ossification in all treatment groups. BMP2 treated defects regenerated vascularized, thick woven bone with large marrow spaces. Osteoinduced stromal cell-treated defects regenerated less bone that was also thinner than BMP2-regenerated bone.

CONCLUSIONS: Low-dose BMP2 potently stimulates local osteoprogenitors to heal osseous deficiencies within the calvaria. We observed significant modulation of BMP2-induced osteogenesis with the addition of stromal cells; unlike BMP2 therapy alone, osteoinduced stromal cell therapies do not improve defect healing beyond that of vehicle in this model. This calls into question the role of progenitor cells in tissue engineering strategies for calvarial repair, and suggest that engrafted cells may be susceptible to environmental influences that determine their ability to contribute to cranial regeneration. Based upon these findings, we suggest that the inherently heterogeneous population of cells within the stroma of adipose, bone marrow, and muscle tissues may restrict BMP2-induced calvarial defect healing.

28 A SURVEY OF THE ACPA MEMBERSHIP. THE CONTROVERSIAL SIMONART’S BAND: ITS AFFECT ON CLEFT CLASSIFICATIONS, AND IMPLICATIONS ON BILLING AND REIMBURSEMENT. SHOULD THE TERM BE RETIRED?

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BACKGROUND & PURPOSE: Accurate classification of a cleft lip is important in comparability of data and maximizing reimbursement. While oftentimes there is consensus in defining types of clefts, the presence of Simonart’s band muddies the classification. Our objective was to survey cleft care providers to determine the affect of a Simonart’s band on cleft lip classification.

METHODS: A multiple-choice survey was e-mailed to 1815 ACPA members. Classification of clefts was drawn from the ICD-9, as these would be the ultimate diagnosis billing codes. Descriptive analysis was performed.

RESULTS: 373 providers completed the survey (20.5% response rate). The majority (61.5%) were surgeons. 87.1% agreed with Millard’s definition that a Simonart’s Band is “any soft tissue bridge located at the base of the nostril or more internally, between the segmented ridges”. However, only 41.8% felt that the presence of a Simonart’s Band made a cleft lip incomplete. 54.4% felt that an alveolar cleft was the defining difference between complete and an incomplete cleft lip. When asked to define the child who has a cleft involving the upper lip that extends into the naris, but interrupted with a soft tissue bridge located at the base of the nostril or more internally, between the segmented ridges, without a cleft of the alveolar ridge and palate, 61.4% classified this as an incomplete cleft lip, 32.7% as a complete, and 5.9% as an unspecified cleft lip.

CONCLUSIONS: Responses revealed wide discrepancy in the classification of cleft phenotypes and the interpretation of the significance of anatomical components in the classification of a cleft lip. We discuss the difficulty in aligning classification based on not only anatomic parameters, but also from a treatment protocol perspective. Reimbursement differs if a cleft lip is coded as complete versus incomplete. We highlight this issue in the face of increased treatment and procedural costs, declining reimbursement, and need for comparability in clinical evidence-based practices. Our recommendation is to no longer use the term Simonart’s band. We propose a change of the LAHSHAL system to L-NS-A-H-S-H-A-NS-L, where NS is the nostril sill, and a change to the ICD-9 classification to enable accurate coding and reimbursement.

29 NASOLABIAL CHANGES AFFECTED BY 2 DIFFERENT ALAR BASE CINCH SUTURE TECHNIQUES AFTER MAXILLARY LEFORT I OSTEOTOMY IN CLASS III MALOCCLUSIONS: RANDOMIZED CONTROLLED TRIAL

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BACKGROUND & PURPOSE: The alteration of the nasolabial soft tissue after maxillary Le Fort I osteotomy is one of the most common complaints of patients after surgery. This study compared the effectiveness of a modified and conventional alar base cinch technique on changes over the nasolabial morphology after maxillary Le Fort I osteotomy.

METHODS: The prospective randomized controlled study recruited 50 skeletal Class III patients who received maxillary Le Fort I osteotomy to correct skeletal discrepancies. During the intraoral wound-closing procedure, patients were equally separated into 2 groups. C group (25 patients) received the conventional alar base cinch technique; M group (25 patients) received the modified technique. 3dMD stereogrammetry was taken preoperatively and postoperative 6 months. 3D CBCT data was taken preoperatively and 4-6 weeks after operation. Three dimensional soft tissue changes 6 months after operations were measured and corresponded to the skeletal movement during surgery.

RESULTS: Six months after operation, most of the intergroup difference showed no significant difference, except nasal width widening was significantly reduced by 1.40 mm in the C group than in the M group. Most of

the intragroup difference also showed no significant difference, except nasal tip protrusion significantly increased 0.75 ± 1.56 mm and nasal width decrease 1.19 ± 1.93 mm in C group; and overall upper lip height significantly increased 1.05 ± 1.57 mm in M group.

CONCLUSIONS: Both C and M alar base cinch suture techniques are effective to control the nasal width, alar base width, and nostril vertical dimension show. Three dimensional stereogrammetry, 3dMD and 3D CBCT combined, is a viable tool for providing accurate results of the soft tissue changes around nasolabial region and maxillary skeletal movement.

30 EVALUATING THE NEED FOR ROUTINE ADMISSION FOLLOWING PRIMARY CLEFT PALATE REPAIR: AN ANALYSIS OF 100 CONSECUTIVE CASES

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BACKGROUND & PURPOSE: Routine admission following primary cleft palate repair (PCPR) is the standard of care at most institutions. The postoperative length of stay (LOS) is typically determined by the need for intravenous fluids (IVF), pain medication, and supplemental oxygen. Insurance companies have demonstrated increasing resistance to hospitalization longer than a 'short stay' (23 hour) observation period following PCPR. The purpose of this study is to identify the factors related to LOS following PCPR.

METHODS: Retrospective chart review was conducted for 100 consecutive patients undergoing PCPR from May 2009 to February 2013. Demographic and perioperative data were collected, and two-sample t-test, univariate and multivariate linear regression models were performed to assess for correlation.

RESULTS: The male:female ratio was 47:53 and mean age at time of surgery was 12.7 months. There were 62 infants with a complete cleft palate (CP), and 12 patients with a syndromic diagnosis. The mean duration of surgery and general anesthesia was 1.7 hours and 2.8 hours, respectively. Mean LOS was 47.6 hours; 76% of patients required IVF greater than 23 hours after admission. Postoperative intravenous (IV) narcotics were required in 91% of patients, and the last dose was given on average 19.8 hours after admission. Of the 17 infants requiring postoperative supplemental oxygen, 13 (77%) patients required oxygen greater than 23 hours following admission. A correlation was identified between increased LOS and age at time of surgery, female gender, complete CP, syndromic diagnosis, longer duration of surgery and general anesthetic, and complete CP without presurgical orthodontia.

CONCLUSIONS: The majority of infants in this study required IVF greater than 23 hours until adequate PO intake could be established, and nearly all patients required postoperative IV narcotics. Postoperative supplemental oxygen was also necessary for greater than 23 hours in most of the infants for whom it was required. Factors identified in association with increased LOS may guide opportunities for reducing postoperative hospitalization; however, these findings would oppose the safety of routine outpatient or short-stay observation following PCPR.

31 ORAL HEALTH-RELATED QUALITY OF LIFE: THE WHY, HOW, WHAT WE KNOW AND WHERE WE GO

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BACKGROUND & PURPOSE: The rationale for treatment interventions for individuals with clefts is to improve and enhance their quality of life (QoL). While QoL research has been incorporated into medical care across many conditions, QoL has been largely unexplored in individuals with clefts. Patient-reported QoL outcomes in cleft lip and palate treatment are critical as we advance evidence-based care. The overall purposes of this panel are to present: the importance of QoL research; why we do it; how we do it; and what we know from it. The panel objectives are to identify methods used to assess patient-reported outcomes in plastic surgery, speech, and psychological outcomes, namely oral health-related quality of life (OHRQoL).

METHODS: Panel members will consist of investigators from the NIH-research team, including clinical and health services research specialists from academia, and from the Centers for Disease Control and Prevention. Data from the ongoing NIH-supported six-center observational, longitudinal project entitled "Quality of Life in Children with Cleft" will be presented, with assessments from clinicians, patients and caregivers. Certain family characteristics (e.g., expressiveness, cohesion, and conflict) have been examined as risk and protective factors for adjustment within the broader pediatric illness and child development literatures. Findings on QoL and evaluation of standardized judgment scales from speech and plastic surgeon's facial appearance ratings and patient and caregiver reported perceptions will be presented for 1,200 participants (7-20 years old), who are evaluated and followed per standards of care. Findings regarding the association among teams' surgical recommendations and patient-reported factors like depression, resilience, self-concept and OHRQoL will be presented, using descriptive statistics and modeling methodology. Suggestions for modifying current techniques will be expanded. Methodological issues from varying perspectives and different data sources will be discussed. Clinical care versus research goals and how specialists can contribute to a psychologically-based research project will be addressed. Panelists will share salient findings and discuss potential implications for patient care, outreach, and public health.

32 AN INTRODUCTION TO FEEDING AND SWALLOWING CONCERNS IN THE CHILD WITH CLEFT PALATE OR CRANIOFACIAL SYNDROMES

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BACKGROUND & PURPOSE: While cleft lip and palate (CLP) is the most prevalent birth defect in the United States (CDC, 2006), very little research is available regarding the best practices for feeding in this population. A review of the available literature on feeding interventions revealed vague recommendations that primarily consisted of the use of squeezable versus rigid bottles, and no evidence for the use of maxillary plates (Bessell et al., 2011; Reid, 2004). Currently, no recommendations exist for the best use of specific bottles or nipples, or how to best instruct parents. Infants who have cleft palate as part of a syndrome may have additional feeding and swallowing difficulties due to the other associated characteristics within a particular syndrome or association. Feeding modifications may include those typically used for infants with isolated cleft palate, with additional positioning compensations, nipple modifications, and supplemental feedings. The scope of practice for the SLP has been gradually increasing over the past ten years, which has had the unfortunate impact of decreasing the amount of training students receive for CLP and related craniofacial syndromes. Consequently, there are fewer professionals who can provide this training and fewer graduate programs that are even offering such coursework. The combined issues of a lack of practice standards and hesitant clinicians results in a population that has the potential to be underserved. The purpose of this presentation will be to provide foundational knowledge and hands-on experience with special bottles / feeding equipment related to feeding practices for clinicians working with children with CLP and other cleft related syndromes and disorders.

METHODS: The presentation will begin with a brief overview of cleft anatomy & physiology related to swallowing. Next, specific feeding practices for children with CLP will be separated into four age-related stages. Within each stage, the effect of CLP on the typical developmental course of feeding skills will be emphasized. Demonstration and hands-on experience with specific cleft feeders will be provided. Finally, feeding issues specific to cleft related syndromes will be addressed, including a focus on the evaluation process and a team management approach. Our hope is that sharing our own practice-based evidence and experience will help clinicians identify what is both similar and different between feeding children with SLP and typically developing children, in addition to encouraging clinicians to feel confident and competent working with this population. Participants will be able to: 1. Identify the feeding and swallowing difficulties that may be associated with CLP and cleft related syndromes; 2. Identify feeding and swallowing compensations that may be needed for infants with CLP and cleft related syndromes; 3. Identify when referral for a more extensive feeding evaluation or swallow study would be appropriate.

33 ESTABLISHING MENTAL HEALTH SERVICES ON CRANIOFACIAL TEAMS

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BACKGROUND & PURPOSE: Mental health providers serve numerous functions within craniofacial teams (Hood et al., 2011). Because of these roles, mental health services are included as a critical part of team care in The American Cleft Palate-Craniofacial Association's (ACPA) 2009 Parameters for Evaluation and Treatment of Patients with Cleft Lip/Palate or Other Craniofacial Anomalies. The purpose of this course is to orient new craniofacial mental health providers to the types of services typically implemented in a team clinic setting and provide information about screening tools and strategies that can be used in team clinics. Additionally, this course aims to educate participants about common issues and challenges experienced by mental health providers who are new to their role on a craniofacial team, as well as possible solutions.

METHODS: This course will address the various mental health services and psychosocial screenings typically provided in a team clinic setting, as well as determining which services are feasible to implement, given clinical demands and available resources. Information will be presented on establishing a role within the team and educating team members about available services. Mental health providers from different craniofacial teams also will discuss common challenges and themes, and will provide information on resources for craniofacial mental health providers.

34 UNILATERAL CLEFT LIP REPAIR

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BACKGROUND & PURPOSE: The complexity of the cleft lip and nasal deformity, the variability within the spectrum of the deformity, and our high expectations all contribute to the surgical challenge. Over the past centuries, numerous techniques have been described; advancing the craft as newer techniques adopt the principles of previously described repairs while addressing their deficiencies. The purpose of this masters class is to review the anatomy of the cleft lip and nasal deformity, to review the history of left lip repair, to review principles of repair, and to highlight the keys to successful repair using the Anatomic Subunit Approximation Technique.

METHODS: By way of a review of the anatomic features of the cleft lip and nasal deformity and a historical review of previously described techniques, the learner will identify the principles of successful cleft lip repair. The key elements of the Anatomic Subunit Approximation Technique will be demonstrated. Learners will become familiar with the finer points of this technique so that they may apply it successfully for all cases of unilateral cleft lip.

35 ORTHOPEDIC AND ORTHODONTIC TREATMENT FOR PATIENTS WITH CLEFTS OF THE LIP AND PALATE: FROM BIRTH TO MIXED DENTITION

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BACKGROUND & PURPOSE: Children born with clefts of the lip and palate present a wide variety and complexity of skeletal and dental anomalies. Timely attention to these issues is critical for the functional and psychosocial development of the affected child. It is imperative that the orthodontist and pediatric dentist understand the biological rationale and treatment options available in order to minimize interventions and maximize results. The learners will evaluate various orthopedic and orthodontic techniques used in the treatment of infants and children in the mixed dentition and will be able to recognize the adequate timing of their implementation. They will also be able to assess the feasibility and need to include these treatment modalities into their treatment portfolio for their patients.

METHODS: Through a series of case presentations, the learners will be able to describe in detail Nasoalveolar Molding pre-surgical infant orthopedic technique, face mask therapy for maxillary protraction, maxillary and mandibular expansion appliances, orthodontic therapy in the mixed dentition and maxillary arch preparation for a secondary alveolar bone graft surgical procedure.

36 CLEFT ORTHOGNATHIC SURGERY

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BACKGROUND & PURPOSE: Maxillary growth restriction is evident in a significant proportion of the repaired cleft-lip and palate population. In these cases, the resultant concave profile, poor upper lip and piriform support, anterior crossbite, and class III malocclusion require orthognathic surgery, at least a Le Fort I osteotomy, for correction. Orthognathic surgery in this setting is challenging given the altered vascularity and scar contracture, frequent necessity for concurrent bone grafting, possible fistulae closures, and impact on postoperative speech. It is incumbent upon any cleft team member, especially the orthodontist and surgeon, to appropriately diagnose, understand the presurgical orthodontic phase, effectively perform the surgical procedure, and understand the pitfalls, post-surgical finishing, and additional procedures that may be required.

METHODS: Description: This course will be given in a multidisciplinary fashion by practitioners involved in cleft orthodontics and surgery, and orthognathic surgery. The focus will be for the practicing orthodontist and surgeon who treats these patients from infancy through adulthood. We will devote 30 minutes to the orthodontic challenges, and setup necessary to adequately prepare these patients for surgery. We will devote 60 minutes to considerations in the unilateral deformity, bilateral deformity, with requisite attention to technical modifications, dealing with residual fistulae, segmental osteotomies, simultaneous bone grafting, management of existing posterior pharyngeal flap, and impact on sleep apnea and speech postoperatively. Additional emphasis will be placed on preoperative planning, including conventional model surgery, splint type and fabrications, virtual surgical planning, and speech and airway assessments. Final considerations of orthodontic finishing will be discussed as well. Main Objectives Each learner: -will understand the presurgical orthodontic phase and considerations needed to deem a patient ready for surgery -will understand the objectives and rationale of preoperative surgical planning using both conventional methods and virtual surgical planning -will be capable of constructing and deciding on appropriate intra- and postoperative splints for cleft orthognathic surgery -will recognize technical steps and modifications when performing cleft orthognathic surgery (short video clips will be shown). Conventional and distraction osteogenesis techniques with be discussed, compared and contrasted -will obtain strategies to deal with particular challenges of cleft othognathic surgery (large magnitude of advancement, significant scarring, residual fistulae, need for bone grafts, segmental surgery, dealing with PPFs, postoperative airway and speech concerns) -will understand the postop phase, and orthodontic finishing required. This will include analysis of long-term skeletal stability, occlusal results, speech and airway outcomes, and need for additional procedures.

37 MEDICAL MANAGEMENT AND SURVEILLANCE PROTOCOLS FOR COMPLEX CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Although many patients cared for by multidisciplinary cleft and craniofacial teams have isolated cleft lip and/or cleft palate and single suture craniosynostosis for whom there are published guidelines for health care supervision, few management protocols are available for patients with less common craniofacial conditions, and this may result in variability in care. In the absence of guidelines, this variability makes it difficult to evaluate outcomes or to conduct comparative effectiveness research in craniofacial care. The goals of this forum are to 1) address the need for the development and integration of nonsurgical management and surveillance protocols for patients with less common craniofacial conditions into multidisciplinary team setting and 2) create a shared resource for tracking and improving patient outcomes.

METHODS: A panel of experts in Craniofacial medicine (pediatricians and geneticists) will discuss the development and implementation of nonsurgical management protocols for patients with complex craniofacial conditions. We will focus craniofacial conditions such as: fibrous dysplasia, PHACES syndrome, Robin sequence, syndromic craniosynostosis, craniofacial microsomia, and Neurofibromatosis type 1 with plexiform neurofibromas of the head and neck. For each condition, the panel member will provide a timeline for clinical assessments and radiographic studies, including the evidence-based rationale when possible. The audience will be encouraged to participate and contribute to the discussion of each protocol.

38 IMPROVING OUTCOMES BY TREATING THE WHOLE PATIENT: INTEGRATING LANGUAGE, COGNITIVE AND PSYCHO-SOCIAL ISSUES IN TEAM CARE

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BACKGROUND & PURPOSE: As craniofacial teams, we pride ourselves on improving children's lives that have craniofacial conditions. We time our surgeries for maximal aesthetic and functional impact with the goal of helping to normalize our patients' lives. We strive to make our patients look, speak, breathe, and smile like their peers. Even if we are successful with these goals, however, we may not make a meaningful difference in our patients' lives if we neglect their cognitive, language, and social-emotional development. A patient who shows few scars from a cleft lip may be socially ostracized or bullied due to poor pragmatic language skills. A patient who has the physical ability to achieve perfect velopharyngeal closure may not be able to communicate his or her wants and needs due to limited language or cognitive development. A patient who is in need of braces prior to orthognathic surgery may not be a candidate due to limited cognitive or behavioral skills or a difficult family situation. Therefore, cognitive, language, and psychosocial factors can and do impact craniofacial care and should be a significant portion of the team evaluation. The purpose of this short course is to enable the participant to understand and apply concepts, strategies and techniques drawn from the fields of language, cognition, and social-emotional development to enhance craniofacial team care and patient outcomes.

METHODS: This course will begin with an overview of current research on the impact of language, cognitive, and social-emotional development on medical/surgical patient outcomes, particularly with respect to the craniofacial population. Our discussion will include special populations such as international adoptees, second language learners, patients with velocardiofacial and other syndromes. The teaching methodology will include case studies, discussion and demonstration of appropriate assessment tools, and use of role play to practice interpreting these tools for parents and other craniofacial team members. Through small group discussion, participants will design a formal team protocols for incorporating these aspects of patient evaluation and decision-making.

39 SURGICAL MANAGEMENT OF VPD IN 22Q11.2 DELETION SYNDROME: MASTERS CLASS FOR THE SURGEON AND SLP

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BACKGROUND & PURPOSE: It is well-recognized that management of velopharyngeal dysfunction (VPD) in children with 22q11.2 deletion syndrome (22q11DS) poses a challenge to surgeons and SLPs. Multiple reports in the literature confirm that even for clinicians with extensive cleft/craniofacial experience , speech surgery outcomes for 22q11DS are often less optimal than that of children with cleft palate or other causes of VPD. The nature of VPD in 22q11DS is complex, and thus treatment planning and surgical technique must be tailored to syndrome-specific and patient-specific factors to optimize outcome. The purpose of this masters' class is to provide a comprehensive overview of the multifactorial nature of VPD in 22q and an algorithm for successful surgical-speech management.

METHODS: This course will cover (1) presurgical speech assessment and guidelines for VP imaging, (2) preoperative medical evaluation and surgical planning for 22q11DS, (2) surgical techniques and modifications, (3) perioperative airway management, and (4) post-operative monitoring and speech outcomes assessment. Discussion of the various risks and benefits, as well as a summary of the current literature base, regarding pharyngeal flap vs sphincter vs Furlow palatoplasty procedures, will be included. This course will be presented by a plastic surgeon and SLP who currently direct a large 22q Center at a pediatric academic medical center with over 25 years of combined experience in the treatment of VPD in 22q11DS, haved conducted clinical research on 22q11DS and have published and presented at the national and international level on this topic. Format of this course includes a combination of lecture, video and audio case examples, and extensive audience participation.

40 LINKING THE BRIDGE BETWEEN VIRTUAL AND ACTUAL ORTHOGNATHIC SURGERY (OGS): THE INTRODUCTION OF SURGICAL POSITIONING GUIDES (SPG)

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BACKGROUND & PURPOSE: Virtual surgical planning (VSP) has revolutionized pre-operative treatment planning for orthognathic surgery. VSP technology has increased the accuracy of preoperative treatment planning in orthognathic surgery, eliminating traditional techniques of indirect measurements, 2-dimensional cephalometry, face bow transfer, utilization of articulated model surgery and exposure to laboratory chemicals. In addition to pre-operative planning, VSP-derived intra-operative occlusal positioning systems (OPS) are now used to translate the VSP surgical plan to the operating room to perform exact repositioning of the maxilla and mandible. The use of intra-operative OPS eliminates the most difficult steps during OGS such as: the need for intra-operative intermaxillary fixation; intra-operative auto-rotation of the maxillary and mandibular complex; guessing intra-operative condylar centric relation, and guessing final vertical, horizontal and transverse positioning of osteotomized skeletal segments. The purpose of this study session is to expand participant's knowledge and abilities in VSP orthognathic surgical planning. A firm background in orthognathic surgery is recommended for this course.

METHODS: The authors will demonstrate the application of VSP surgical work-ups in cleft and syndromal orthognathic surgical cases. Participants experience with hands-on virtual surgical planning and design of OPS is the central purpose of this course.

41 PLASTIC SURGERY FOR THE REST OF THE TEAM

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BACKGROUND & PURPOSE: This course will use an interactive format to review common procedures offered to patients with cleft lip and palate. Procedures reviewed will include cleft lip repair, cleft palate repair, pharyngeal flap and sphincter pharyngoplasty. Drawings, models, and other visual aids will be used to give participants an understanding of how these procedures are done. Three dimensional understanding will be emphasized. Correlations will be drawn between specific techniques and the theoretical advantages and disadvantages among them. Common postoperative complications and how they link with surgical techniques will also be discussed. After taking this course, participants will have a better understanding of what happens in the operating room. The course assumes knowledge of the anatomy of the face and mouth but does not require advanced medical or surgical knowledge.

METHODS: This course will use an interactive format to review common procedures offered to patients with cleft lip and palate. Procedures reviewed will include cleft lip repair, cleft palate repair, pharyngeal flap and sphincter pharyngoplasty. Drawings, models, and other visual aids will be used to give participants an understanding of how these procedures are done. Three dimensional understanding will be emphasized. Correlations will be drawn between specific techniques and the theoretical advantages and disadvantages among them. Common postoperative complications and how they link with surgical techniques will also be discussed. After taking this course, participants will have a better understanding of what happens in the operating room. The course assumes knowledge of the anatomy of the face and mouth but does not require advanced medical or surgical knowledge.

42 THE FURLOW PALATOPLASTY: SURGICAL TECHNIQUE AND OUTCOMES IMPROVEMENT

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BACKGROUND & PURPOSE: The Furlow double-opposing Z-palatoplasty may be used to achieve excellent results both in primary cleft palate repair and in secondary management of velopharyngeal dysfunction. This course will provide a review of the detailed step-by-step surgical technique while providing tips on how to optimize surgical outcomes through patient selection and technical precision.

METHODS: Using a standard lecture format, the history and key concepts of the Furlow Z-palatoplasty will be reviewed. A video presentation will then illustrate the technique in a step-by-step fashion, providing attendees with an understanding of how to simply and successfully perform the operation while optimizing surgical outcomes. Ample time will be devoted to audience participation, including a question-and-answer session at the conclusion of the course.

*43 SPEECH EVALUATION, THERAPY, AND COLLABORATION FOR THE CLEFT TEAM SPEECH-LANGUAGE PATHOLOGIST

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BACKGROUND & PURPOSE: This course is intended for the speech-language pathologist (SLP) new to cleft palate care. It is the speech pathologist's job to

analyze the speech production of a child with a cleft, to determine what aspects of the speech disorder can be treated with speech therapy, and what aspects require medical or surgical intervention. Then, the SLP must advise medical/surgical care providers accordingly, but also coordinate with local SLPs who may have little or no background with cleft palate speech disorder. This course will provide tools and information for the SLP regarding how to conduct an efficient perceptual speech evaluation, how to categorize and describe speech production errors, how and when to refer for imaging studies or additional managment. Articulation therapy techniques and methods of collaborating with the local SLP will be addressed.

METHODS: The course will follow the outline as follows: I. The oral mechanism exam: What's important? II. The Perceptual Speech Exam III. Categorizing Articulation Errors from the Perceptual Speech Exam IV. Making Decisions a. What can be treated with speech therapy? b. What errors indicate that further medical/surgical/dental management is needed? V. Therapy for articulation errors associated with cleft palate or velopharyngeal dysfunction VI. Collaboration with the school/community SLP VII. Questions and Answers.

Salary: Grames - Drawn as a member of a cleft palate team and for providing assessment and treatment for children with cleft palate. Professional: Grames - I am a member of the Education Committee of the ACPA and also a member of ASHA SIG 5: Speech Science and Orofacial Disorders.

44 DENTAL AND ORTHODONTIC PREPARATION FOR SECONDARY ALVEOLAR BONE GRAFT SURGERY

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BACKGROUND & PURPOSE**:** The rationale for this presentation is to provide orthodontists/pediatric dentists who are new to cleft care with basic knowledge of their role in the team management of patients who require a secondary alveolar bone graft. The general goals of the presentation are to improve the learners' knowledge of the important considerations for the orthodontist/pediatric dentist in managing secondary alveolar bone grafts, and to improve their competence in assessment and preparation of the affected patient, resulting in enhanced surgical outcomes and optimized effectiveness of post-surgical orthodontic management.

METHODS: The presentation will include a lecture review of the history of the development of secondary alveolar bone grafts since their inception as well as the diagnostic factors necessary to determine the appropriate nature and timing of dental and orthodontic treatment for optimum surgical outcome. The role of the orthodontist/pediatric dentist in surgical outcome assessment and post-surgical treatment will be reviewed. Finally, clinical cases will be presented to illustrate the important considerations in effectively managing patients who require secondary alveolar bone grafts.

45 CARE OF THE CHILD WITH A CLEFT: PRENATAL DIAGNOSIS THROUGH THE FIRST YEAR OF LIFE

Noreen Clarke, RN, MSN (1), Alexis Johns, PhD (1), Karla Haynes, RN, MPH, MS, CPNP (1), Daniela Schweitzer, MD (1), Lori Howell, MD (1), Yvonne Gutierrez, MD (2). (1) Children's Hospital Los Angeles, Los Angeles, CA, (2) Childrens Hospital Los Angeles, Los Angeles, CA

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BACKGROUND & PURPOSE: Children born with cleft lip and/or palate receive optimal care when they are assessed and treated by a multidisciplinary team of providers. Disciplines often involved in the care of children with clefts include: nursing, plastic surgery, genetics, pediatrics, pulmonology, otolaryngology, audiology, speech language pathology, dentistry, orthodontics, nutrition, psychology, and social work. There are many challenges in the first year of life, including possible feeding and breathing issues, frequent appointments, and multiple surgeries. Families' understanding and ability to follow through with treatment plans can be influenced by cultural and socioeconomic factors. The first year of life is a critical time for team members to coordinate medical and surgical care, provide cleft education, address genetic concerns, and assist with support and coping skills.

METHODS: A multidisciplinary panel of experts will describe the role each discipline plays in the care of children and families affected by clefting. We will introduce family centered multidisciplinary team care for the child who was diagnosed prenatally or neonatally with a cleft, with an emphasis on the role of nursing and care coordination. ACPA Standards for Cleft Palate and Craniofacial Teams will be incorporated across disciplines. Common psychosocial issues and corresponding interventions will be discussed. Information about the delivery of culturally competent care to diverse families and socioeconomic groups will be addressed.

46 ADVANCED SKILLS FOR MENTAL HEALTH PROVIDERS ON CRANIOFACIAL TEAMS

Amy Conrad, PhD (1), Canice Crerand, PhD (2), Kathleen Deidrick, PhD (3), Celia Heppner, PsyD (4), Sandra Sinclair, RN, PhD (5), Heather Snyder, PhD (6). (1) The University of Iowa Hosptials and Clinics, Iowa City, IA, (2) Nationwide Children's Hospital, Columbus, OH, (3) University of Missouri, Columbia, MO, (4) Children's Medical Center; UT Southwestern Medical Center, Dallas, TX, (5) N/A, Honolulu, HI, (6) Department of Psychology, Edinboro, PA

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BACKGROUND & PURPOSE: In response to the drive for evidence-based research, mental health providers strive to develop an understanding of what needs their patients have and the best ways to identify and address those needs. As part of a craniofacial team, providers encounter complex, multifactorial problems, including cognitive or learning concerns, psychosocial concerns such as bullying and self-image, as well as coping with ongoing medical interventions. The purpose of this course is to educate experienced mental health providers on these more advanced skills and functions within craniofacial teams, as well as to introduce methods of incorporating research within their own clinic setting. Mental health providers from different craniofacial teams will share perspectives on these topics and guidance on assessment and intervention approaches.

METHODS: This course will provide information on advanced themes for craniofacial mental health providers. Topics presented will include cognitive, learning, and neuropsychological assessment; interventions for psychosocial concerns such as bullying and self-image difficulties; and implementing clinical research in the team clinic setting.

47 NASOALVEOLAR MOLDING AND COLUMELLA ELONGATION

Barry Grayson, DDS (1), Pradip Shetye, DDS, MDS (2), Lawrence E. Brecht, DDS (3). (1) New York University, New York, NY, (2) New York University Institute of Reconstructive Plastic Surgery, New York, NY, (3) New York University Langone Medical Center, Institute of Reconstructive Plastic Surgery, New York, NY

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BACKGROUND & PURPOSE: This in-depth instructional course provides a detailed clinical protocol for the implementation and practice of NasoAlveolar Molding (NAM). Drawing on a 20-year clinical experience with NAM and columella elongation in infants born with unilateral (UCLP) and bilateral (BCLP) cleft lip and palate, this Master Class will address advanced clinical issues and techniques. The goal of this Master Class is to go beyond basics and explore issues that arise during clinical practice.

METHODS: This presentation will include advanced topics such as ways to retract and align the protrusive and rotated premaxilla,, how to level the upturned end of the greater cleft alveolar segment, the management of clinical complications and the provision of improved nasal airway in the collapsed nostril. The Master Class will begin with an overview of basic NAM principles prior to launching into mastery level topics. The insertion and maintenance of post-surgical nasal stents will be discussed. The presentation will employ lectures, video tape presentations and interactive dialogue between the presenters and the learners.

48 A TECHNIQUE OF PALATE REPAIR

Brian Sommerlad, MB, BS, FRCS (1). (1) Great Ormond Street Hospital for Children NHS Foundation Trust, Chelmsford, Essex, UK

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BACKGROUND & PURPOSE: The author has developed a technique for cleft palate repair, which has been adopted in many centres but is also controversial. The technique involves minimising dissection of the hard palate mucoperiosteum (by avoiding any incisions in 90% of cases) and radical dissection and reconstruction of the palate musculature using the operating microscope. The aim of the presentation is to present the technique and the evidence for its efficacy.

METHODS: The Master Class will include: • A description of the anatomy which is the basis of the repair • Hints on the use of the operating microscope • A detailed description of the operative technique with videos • An analysis of outcomes – of both primary repair and re-repair • Comparison with other techniques – where possible • Discussion of unresolved questions The session will be interactive with debate encouraged.

49 PIERRE ROBIN SEQUENCE: FEEDING MANAGEMENT ACROSS INTERVENTIONS

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BACKGROUND & PURPOSE: Pierre Robin Sequence is recognized today as a condition characterized by micrognathia and/or retrognathia, glossoptosis, respiratory distress, and cleft palate. The respiratory difficulties resulting from the upper airway obstruction lead to impairments in the newborn's ability to feed effectively. The basis of the feeding problems have been explained as an over-expenditure of energy on breathing, leading to further difficulty in attempts to feed. The upper airway obstruction interferes with the infant's ability to engage in the suck-swallow-breathe synchrony that comprises normal feeding. Purpose: This presentation will review the feeding challenges of children with PRS and present feeding options and techniques based upon treatment modalities; from tracheostomy to mandibular distraction osteogenesis.

METHODS: This Master Class program will be presented in lecture format with case studies and hands-on demonstrations of feeding techniques.

50 PRACTICAL GUIDELINES FOR MANAGING PATIENTS WITH COPY NUMBER VARIANTS INVOLVING CHROMOSOME 22Q11.2

Donna McDonald-McGinn, MS, CGC (1), Cynthia B. Solot, MA, CCC-SLP (2), Meg Maguire, MS, CRNP (3), Oksana Jackson, MD (4), Anne Bassett, MD (5). (1) The Children's Hospital of Philadelphia and Perelman School of Medicine of the University of PA, Philadelphia, PA, (2) Children's Hospital of Philadelphia, Philadelphia, PA, (3) N/A, Wallingford, PA, (4) N/A, Wynnewood, PA, (5) University of Toronto, Toronto, PA

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BACKGROUND & PURPOSE: The 22q11.2 deletion syndrome is the most common cause of syndromic palatal anomalies; nonetheless, systematic guidance for clinical management is limited.

METHODS: Based on these needs, The International 22q11.2 Deletion Syndrome Consortium established practical guidelines, developed in multiple stages, including three international consensus meetings where participants with broad expertise (18 subspecialties representing >15 countries) determined best practice based on experiences, data and review of 239 relevant publications with a goal of transcending nationalities, health care systems, and subspecialty biases. These recommendations were published in the Journal of Pediatrics in 2011 and will be shared with the audience during this session including specifics regarding assessment and treatment of palatal abnormalities, speech and language difficulties, intellectual and behavioral deficits and the approach to coordinated medical and surgical care. In addition, it is now clear that these recommendations are applicable to patients with other copy number variants including the 22q11.2 duplication and those patients with an atypical nested 22q11.2 deletion, all of which will be presented and shared with the audience in the setting of an interactive workshop.

51 A KEEN EYE TOWARDS EFFECTIVE TEAM COORDINATION

Iris Sageser, RDH, MS (1), Jamie Idelberg, RDH, BS (2).

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BACKGROUND/PURPOSE: This interactive session is for new and experienced coordinators or directors of a cleft and/or craniofacial team who are interested in optimally managing their team. The presenters have worked for over 20 years as team coordinators at two urban pediatric hospitals.

METHODS: Successful management of an interdisciplinary team is an ongoing challenge that often requires creative thinking, willingness to try something new, and critical analysis of current clinical and team management practices. Keeping both families and team members satisfied, handling team growth, insurance/reimbursement issues, patient referral protocols, organizing social events, the power of connecting, using the business tool of process mapping patient and clinical flow, and other topics will be discussed interactively with the audience.

53 UPDATES IN ALVEOLAR BONE GRAFTING

Barry Steinberg, PhD, DDS, MD, FACS (1), Sidney Eisig, DDS (2), Bonnie L. Padwa, DMD, MD (3), Lawrence E. Brecht, DDS (4). (1) University of Florida/Dept of OMFS, Jacksonville, FL, (2) New York Presbyterian Hospital/Columbia University, New York, NY, (3) Children's Hospital Boston, Boston, MA, (4) New York University Langone Medical Center, Institute of Reconstructive Plastic Surgery, New York, NY

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BACKGROUND & PURPOSE: Alveolar cleft bone grafting is one of the most common procedures performed by cleft care professionals. These can be complicated and require alternatives to traditional flap designs. Complicated alveolar cleft surgery will be discussed. The use of autogenous bone remains the gold standard. However, the use of bone stimulating substances such as BMP are increasingly being used. The panel will discuss bone and BMP in alveolar cleft reconstruction. Final reconstruction following grafting will also be discussed.

METHODS: The Panel would be for 90 minutes and include presentations on: Autologous Bone Graft Reconstruction of the Cleft Maxilla Use of Bone Morphogenetic Protein (BMP-2) in the Cleft Patient Reconstruction of Bilateral Cleft Defects; Flap Options and Management of the Premaxilla Restorative options of the alveolar cleft site (implants, crown and bridge, orthodontic substitutions) The 4 presentations above would be for 20 minutes each, followed by 10 minutes for question and answer.

54 ADDRESSING BARRIERS IN ACCESS TO PRIMARY CLEFT AND CRANIOFACIAL CARE

Margot Neufeld, MA (1), Cynthia Cassell, PhD, MA (2), George Wehby, MPH, PhD (3), Michael VanLue, PhD (4). (1) Operation Smile, Virginia Beach, VA, (2) National Center on Birth Defects and Developmental Disabilities, CDC, Atlanta, GA, (3) University of Iowa, Iowa City, IA, (4) Children's Hospital of Wisconsin, Milwaukee, WI

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BACKGROUND & PURPOSE: While children and families affected by orofacial clefts (OFC) may benefit from available information and resources on accessing health care, these items may be difficult to obtain and utilize. Many families still face challenges obtaining essential treatment and services for their children with OFC. Potential barriers include families' lack of information or misinformation about eligibility and availability of health insurance coverage, cultural or communication barriers, misperceptions of medical need, cost, and geographical factors. Panel members will address gaps in knowledge regarding barriers to care for children with OFC and discuss possible strategies to improve the accessibility and quality of information on treatment for OFC for affected families.

METHODS: Panelists will include participants from academic institutions, cleft and craniofacial teams, organizations dedicated to cleft care, and the Centers for Disease Control and Prevention. Panelists will discuss past and current studies examining barriers to care among children with OFC, using data from population-based state birth defects registries, parental surveys, hospital discharge, and geographical information systems. Geographical barriers, including travel time and distance to cleft care accessibility compared to utilization of cleft and craniofacial teams, in various states will be examined. Panelists also will discuss the findings of a collaborative and comprehensive analysis of the existing literature on barriers to cleft care undertaken to identify the knowledge gaps. Panelists' experiences observing perceived or actual barriers to access OFC care and treatment during their work with children with OFC, their families, and cleft and craniofacial teams will be presented.

55 STRATEGIES AND TOOLS TO HELP IMPROVE MEDICAL ADHERENCE IN THE CRANIOFACIAL TEAM

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BACKGROUND & PURPOSE: Comprehensive care of patients with Craniofacial differences involves multiple health disciplines and entails interdisciplinary care. Treatment plans are often complex with various providers, including specialists outside the multidisciplinary Craniofacial team, and require adherence to timelines. It is crucial to partner with families, primary care providers/medical homes, schools, and community organizations to provide comprehensive family centered care. Our team uses a range of strategies and tools, including care notebooks, to empower families to advocate for their child and actively participate in his/her healthcare through optimizing communication and effective coordination. Some families have difficulties adhering to recommendations and medical treatment is delayed or disrupted with potentially negative impact on child health. Team members develop customized plans for improved adherence through addressing barriers and providing tools, with efforts to help families understand the importance of treatment plans and consequences of nonadherence. These efforts are not always enough to avoid referral to Child Welfare agencies for medical neglect. Decisions to collaborate with Child Welfare agencies involves consideration of multiple factors, including potential harm to child, team members' relationship to patient and family, and barriers to care, such as limited

resources or parental capacity to adhere to recommendations.

METHODS: Patient and family participation and follow through with care recommendations are impacted by several factors. Studies show that psychosocial factors, such as attitudes, cognition, perceptions, significance of illness and treatment, and motivation are key factors affecting compliance. Additional factors can include economic and concrete barriers. This presentation provides suggestions for common areas to assess when working with nonadherent patients and families. Guidelines are offered for the timing of forming customized team plans, organization strategies, teaching advocacy tools, community referrals, linking to resources, and requesting collaboration with Child Welfare agencies. A number of cases will be presented to illustrate recommendations and lessons learned in our team experience.

56 A SINGLE CENTER'S EXPERIENCE WITH ISOLATED UNICORONAL CRANIOSYNOSTOSIS RECONSTRUCTION: LONG-TERM OUTCOMES OF 182 PATIENTS OVER 35 YEARS

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BACKGROUND & PURPOSE: Assess long-term outcomes of patients with isolated unicoronal synostosis treated at our institution over a thirty-five year period.

METHODS: A retrospective review was performed of patients with unicoronal synostosis from 1977 to 2012. Patients were excluded with prior outside intervention, or diagnosis of syndromic or multisutural synostosis. Demographic, operative/post-operative data and outcomes were analyzed with chi-squared and Fisher's exact test for categorical data and Wilcoxon rank-sum and Kruskal-Wallis rank for continuous data.

RESULTS: Over 35 years, 182 patients were treated for unicoronal synostosis and 156 met inclusion criteria. The patient population was predominantly female(65%,n=101) with synostosis predominantly on the right(60%,n=93). Patients presented with supraorbital retrusion(95%,n=148), orbital dysmorphology(71%,n=110), compensatory bossing (51%,n=79), nasal root deviation(38%,n=59), occipital irregularity(12%,n=18), and midface asymmetry(8%,n=12). Primary intervention included 55(35%) unilateral fronto-orbital advancements(FOA) with unilateral frontal craniotomy, 54(35%) incomplete bilateral FOA with bilateral frontal craniotomy, 42(27%) unilateral FOA with bilateral frontal craniotomy, and 5(3%) bilateral FOA with bilateral frontal craniotomy at a mean age of 0.98±1.0 years. There were 3 acute surgical complications(3%). Mean follow up was 5.9±5.0 years, and in patients with ≥1 year follow-up(n=129), 57(44%) required second intervention. At definitive intervention, 70(54%) patients were Whitaker class I, 6(5%) class II, 50(39%) class III, and 3(3%) class IV. Recurrence of the preoperative abnormality was noted in 71(55%) patients at latest follow-up. Patients with ≥5 years follow-up were more often class III(p<.001) and less often class I(p<.001) and developed supraorbital retrusion following primary intervention more often than their counterparts with <5 year follow-up (p<.001).

CONCLUSIONS: In the largest outcome evaluation of isolated unicoronal synostosis, we critically evaluate outcomes to help shape expectations that may be useful when counseling patients and families.

57 THE PREVALANCE OF STRABISMUS IN PATIENTS WITH UNICORONAL SYNOSTOSIS

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BACKGROUND & PURPOSE: While there is a clear correlation between unilateral coronal synostosis (UCS) and ocular motility abnormalities, the literature provides little information as to the epidemiology of strabismus, or the etiology of this pathology. The purpose of this study is to investigate the risk of ocular motility problems associated with UCS and its management.

METHODS: A retrospective review of all patients identified to have single-suture, non-syndromic UCS treated at a tertiary craniofacial referral center from 1977 to 2013 was performed. Inclusion criteria mandated both pre- and post-operative ophthalmological examinations. Patients were evaluated for strabismus both pre-operatively and post-operatively and whether ophthalmological surgical intervention was performed.

RESULTS: 181 patients were identified of which 79 met the inclusion criteria. Of the 79 patients included, 29 patients (36.7%) had strabismus prior to any craniofacial surgical intervention. Following surgical intervention, 52 patients (65.8%) were diagnosed as having strabismus with 24 patients (30.4%) identified as developing new onset strabismus postoperatively. 1 patient (1.2%) had resolution of preoperative strabismus and 55 patients (67%) had no change in their pre-operative ocular examination. Of the 52 patients who had postoperative strabismus, 30 (38.0%) went on to have extraocular muscle surgery. Of the 24 patients who had new onset strabismus following fronto-orbital advancement, 11 (45.8%) required ocular surgery. There were no statistically significant differences in gender (p=0.44), race (p=0.360), or suture involvement (p=0.80) in comparing the group with new postoperative strabismus and those without. Age at intervention also did not correlate with the development of strabismus (p=0.83).

CONCLUSIONS: This observational study, representing the largest of its kind, sheds new light on the prevalence of strabismus in UCS, and more importantly, the risk of developing strabismus in the setting of fronto-orbital advancement. This data helps surgeons more accurately counsel families and reinforces the important role of ophthalmologists as members of the multidisciplinary team caring for these patients.

58 THREE-DIMENSIONAL ORBITAL DYSMORPHOLOGY IN METOPIC SYNOSTOSIS

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BACKGROUND & PURPOSE: Metopic synostosis is characterized by trigonocephaly, lateral supraorbital retrusion, and hypotelorism. Most phenotypic evaluations have focused on the forehead without much emphasis on the orbits. The study seeks to explore differences in orbital dysmorphology for metopic and control patients, along with different degrees of metopic synostosis.

METHODS: Demographic and craniometric data were compiled. CT scans were digitized (Materialise) and metopic and control groups were compared. Degree of trigonocephaly was classified into moderate and severe cases based on endocranial bifrontal angle. Orbital plane angle, width, depth, volume, and corneal projection were measured. Statistical two-paired t-tests were used, with significance determined as p<0.05.

RESULTS: Forty-six CT scans were analyzed (23 affected, 23 controls).Mean ages (6 months metopic, 7 months control) and genders (18 males metopic, 10 males control) were determined. Orbital plane angle measurements showed differences between the metopic and the control (p=0.0002), along with a correlation to trigonocephaly (p=0.0097). Orbital width and height were insignificant between controls and metopics, though height was less in severe metopics(p=0.046 left, p=0.0337 right). Orbital Depth was significant between control and metopics(p=0.0106 left, p=0.0025 right), and pronounced in severe cases p=0.0349 left, p=0.0071 right). Corneal Projection correlates with metopic severity (p<0.01 left, right), while orbital volume showed insignificant change between control and metopic cases.

CONCLUSIONS: Orbital dysmorphology worsens with increasing degree of trigonocephaly, but is an independent co-deformity. The relative exophthalmos most directly correlates with worsening trigonocephaly. Expanding and advancing the lateral orbital wall is a critical treatment element in correction.

59 AGE AT TIME OF SURGERY AND MAINTENANCE OF HEAD SIZE IN NON-SYNDROMIC SAGITTAL CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: An important goal of treatment for non-syndromic sagittal synostosis is to maintain appropriate intracranial volume to protect brain development and function. There is no consensus as to the type or timing of surgery. Regression in head circumference post-operatively is recognized in published data. It is possible that timing of surgery may play a role in regression. We aim to examine our experience with regard to age at time of surgery and maintenance of cranial expansion.

METHODS: We retrospectively reviewed all patients who underwent sub-total cranial vault reconstruction for non-syndromic sagittal craniosynostosis

between 2005 and 2011. Head circumference (HC) was recorded preoperatively, 3 months post-operatively, and then yearly until 6 years of age. Preoperative, and immediate- and 2 year- postoperative computed tomography (CT) imaging was also used to calculate the cranial index (CI). Head circumference percentile changes and CI were analyzed using one-way repeated measures analysis of variance (ANOVA).

RESULTS: We identified 61 patients and 33 met inclusion criteria. Eleven patients (33%) were >6 months old at the time of operation. Average age at operation was 6.4mo (3.2 to 40.9). The HC percentile was increased 3 months after surgery. One year after surgery, HC percentile was reduced compared to preoperative baseline. The average preoperative HC percentile was 87.5, which decreased to 75.6 at one year and to 69.7 at two years (*p<0.05). Patients who were >6 months old at time of operation experienced a smaller reduction in HC percentile two years after surgery than younger patients (-7.1 vs. -23.2, *p<0.05). In all patients, cranial index (CI) increased from an average of 76.7 to 86.5 approximately 2.4 years after surgery (*p<0.05). There was no significant effect of age at time of surgery on CI on 2-way ANOVA.

CONCLUSIONS: Subtotal cranial vault reconstruction to treat sagittal synostosis resulted in short- but not long-term over-correction in HC percentile. However, children operated >6 months of age, showed less regression in HC than children operated at <6 months of age. CI was improved in all patients. Older age at the time of cranial vault reconstruction for sagittal synostosis may play a role in the long-term maintenance of cranial expansion.

60 ARE ENDOSCOPIC AND OPEN TREATMENTS OF METOPIC SYNOSTOSIS EQUIVALENT IN TREATING TRIGONOCEPHALY AND HYPOTELORISM?

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BACKGROUND & PURPOSE: Patients with metopic craniosynostosis with associated hypotelorism and trigonocephaly are classically treated with fronto-orbital advancement. A less-invasive endoscopic treatment comprises narrow ostectomy of the fused suture followed by post-operative helmet molding. Here we compare the one-year post-operative results of our open versus endoscopically-treated patients in terms of their associated deformities.

METHODS: We reviewed pre-operative and one-year post-operative 3D reconstructed computed tomography scans of patients treated for non-syndromic metopic craniosynostosis by either open (n=15) or endoscopic (n=13) technique. Hypotelorism was assessed by interzygomaticofrontal distance (ZFD) and intercanthal distance (ID). Trigonocephaly was assessed by two independent angles: first, an axial-plane two-dimensional angle between frontotemporale bilaterally and the glabella (FTG); second, an interfrontal angle (IFA) between the most anterior point from a reconstructed midsagittal plane and supraorbital notch bilaterally. All images were oriented to the sella-nasion horizontal. Age-matched scans of unaffected patients (n=28) served as controls for each case.

RESULTS: Patients with open repair (9.5±1.8 months) were older at time of surgery than patients with endoscopic repairs (3.3±0.4 months) (p=0.004). Male to female ratios were equivalent at roughly 7:3 in both groups. Preoperatively, the endoscopic group had more severe hypotelorism and FTG than the open group (p≤0.04). After accounting for pre-operative differences, all of the postoperative measurements of the two groups were statistically equivalent ($p \geq 0.38$) except for ZFD ($p = 0.005$). Trigonocephaly was significantly improved post repair in both the open (8° (FTG) and 18° (IFA)) and endoscopic (13° (FTG) and 16° (IFA)) groups ($p < 0.001$). Postoperative measures in both groups were equivalent to controls ($0.08 < p < 0.98$). Intra-rater reliability ranged from 0.93 to 0.99 for all measurements.

CONCLUSIONS: Our retrospective series shows that endoscopic and open repair of metopic craniosynostosis are equivalent in normalizing hypotelorism and trigonocephaly at one year followup. In this small sample ZFD was greater post-endoscopic compared to open repair. Additional studies are necessary to better define minor differences in morphology which may result from the different techniques.

61 CRANIAL BASE ASYMMETRY AFTER OPEN AND ENDOSCOPIC REPAIR OF ISOLATED LAMBDOID CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Premature fusion of the lambdoid suture results in deformity of the cranial base characterized by deviation of foramen magnum to synostotic side, asymmetry of the petrous ridges and the external acoustic meatus, and a mastoid bulge ipsilateral to the synostosis with contralateral occipital bossing. Previous studies have shown that traditional open cranial vault remodeling does not fully address the endocranial deformity in patients with lambdoid synostosis. This study aims to compare endoscopic-assisted suturectomy with postoperative molding helmet therapy to traditional open reconstruction by quantifying changes in cranial base morphology.

METHODS: Anthropometric measurements were made on pre- and 1-year postoperative three-dimensionally reconstructed computed tomography scans of 12 patients with unilateral lambdoid synostosis: 8 patients underwent open posterior cranial vault reconstruction and 4 received endoscopic-assisted suturectomy with molding helmet therapy. Cranial base asymmetry was analyzed using previously defined measures: posterior fossa deflection angle (PFA), petrous ridge angle (PRA), mastoid cant angle (MCA), and vertical and anterior-posterior (A-P) displacement of external acoustic meatus (EAM). Postoperative comparisons were made between the open and endoscopic groups.

RESULTS: Preoperatively, patients in the open and endoscopic groups were statistically equivalent in PFA ($p=0.720$), PRA ($p=0.958$), MCA ($p=0.085$), and A-P EAM displacement ($p=0.591$). Postoperatively, open and endoscopic patients were statistically equivalent in all measures. Mean postoperative PFA for the open and endoscopic groups was 6.61 and 6.43 degrees ($p=0.939$), PRA asymmetry was 6.37 and 7.56 percent ($p=0.641$), MCA was 4.01 and 3.18 degrees ($p=0.387$), vertical EAM displacement was -2.28 and -2.25 millimeters ($p=0.974$), and A-P EAM displacement was 6.84 and 7.75 millimeters ($p=0.429$).

CONCLUSIONS: Patients treated with both open and endoscopic repair of isolated lambdoid synostosis show persistent postoperative cranial base asymmetry. Results of endoscopic-assisted suturectomy with postoperative molding helmet therapy are similar to those of open reconstruction.

62 IMPACT OF AGE AND OPERATION ON ADVERSE EVENTS AFTER CRANIOSYNOSTOSIS REPAIR

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BACKGROUND & PURPOSE: Surgical intervention for craniosynostosis varies widely with regards to type of repair and age at first operation. Postoperative adverse events and eventual reoperation rates secondary to this variability have not been completely defined, particularly as less invasive methods have gained popularity.

METHODS: All non-syndromic craniosynostosis patients who underwent surgical repair and had a recorded birth date were selected by CPT/ICD 9 codes from the Thompson Reuters Marketscan Database. Logistic regression models were used to compare 90-day adverse event rates according to age at surgery and procedure used. Relative reoperation events were assessed using Cox proportional hazards modeling. Fisher exact testing was used to determine impact of gender.

RESULTS: Of 1232 patients, 644 (52.3%) underwent surgical repair between 0 and 6 months, 471 (38.2%) between 6 and 12 months, and 117 (9.5%) between 1-3 years. Variations of strip craniectomy alone were performed in 515 (44.3%) cases, and cranial vault reconstruction (CVR) was performed in 647 (52.5%). Surgical intervention between 6 and 12 months of age was associated with increased incidence of ICD9-defined hemorrhagic events and transfusions compared to earlier repair (hemorrhagic 6.2% vs 3.0%, transfusion 26.3% vs 21.3%, both $p < 0.05$). Additionally, ICD9-defined hemorrhagic events were more frequently observed in male patients (5.0% vs 2.3%, $p = 0.03$). Lastly, repair with CVR was associated with an increased reoperation rate compared to repair with strip craniectomy (8.7% vs 2.9%, $p < 0.001$).

CONCLUSIONS: Repair between 6 and 12 months and male gender may increase the risk of adverse bleeding events in craniosynostosis patients. Additionally, CVR surgery appears to increase eventual reoperation rate compared to strip craniectomy.

63 UNILATERAL CLEFT LIP REPAIR USING THE ANATOMIC SUBUNIT APPROACH: MODIFICATIONS AND ANALYSIS OF EARLY RESULTS IN 93 CONSECUTIVE CASES

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BACKGROUND & PURPOSE: Fisher published early results of an anatomic subunit approach for unilateral cleft lip (uCL) repair in 2005. He has since presented favorable intermediate results; however, the experience using this approach by other surgeons has yet to be reported. The purpose of this study is to determine the early outcomes using the Anatomic Subunit Approach to uCL repair and to measure changes in outcomes with modifications.

METHODS: Ninety-three consecutive patients who underwent primary uCL repair by a single surgeon using the Anatomic Subunit approach were included. Pre- and post-operative anthropometric measurements on 3D images were used to determine cleft severity and objective outcome. Asher-McDade scores by a blinded independent surgeon on 2D photos were used to determine subjective outcomes. Differences in measurements were analyzed using 2-tailed t-tests and rating scores were compared using Mann-Whitney tests.

RESULTS: Male-to-female ratio was 1.3:1, 4% had associated syndromes, and right-to-left ratio was 1:2. Cleft presentation was: 3 microform, 42 incomplete, 12 complete with Simonart band, and 36 complete. Median age at surgery was 6 months (range 3-45). Mean pre-operative columellar angle was 30.7 degrees (range 5-70), nostril-width-ratio was 2.06 (range 1.13-5.50), and medial-lip-height-ratio was 0.59 (range 0.40-0.90). The mean inferior triangle used was 1.8 mm (range 0-4.5). All patients underwent caudal septoplasty. Modifications during the course of this series included more extensive nasal floor closure and conversion from non-absorbable to absorbable sutures. For the first 10 patients, post-operative measurements were significantly improved from pre-op ($p<0.05$) and normalized to: columellar angle 7.8 degrees, nostril-width-ratio 1.14, nostril-height-ratio 0.97, and medial-lip-height-ratio 1.24. Asher-McDade scores were 1.22 for nasal form, 1.44 for nasal deviation, 1.00 for vermilion border, and 1.22 for nasal profile. For the last 10 patients in the series, the post-operative measurements and Asher-McDade scores were not significantly different than for the first 10 patients. Images for the remaining 73 patients have been collected and will be measured for final detailed analysis.

CONCLUSIONS: The Anatomic Subunit Approach for unilateral cleft lip repair in a single surgeon series can be used to achieve improvements in anthropometric measures and early favorable post-operative form. Long-term follow-up is necessary.

64 USE OF AN INFERIOR PENNANT FLAP DURING UNILATERAL CLEFT LIP REPAIR IMPROVES LIP SYMMETRY

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BACKGROUND & PURPOSE: To improve the rotation of Cupid's bow and achieve sufficient vertical lip height, several variations of the Millard rotation-advancement have incorporated a small laterally-based triangular flap above the cutaneous roll. This study uses three-dimensional photographic analysis to evaluate the outcomes of unilateral cleft lip repairs with and without pennant flaps.

METHODS: Three-dimensional photographs were analyzed to assess postoperative asymmetry in 90 unilateral cleft lip patients (58 complete, 32 incomplete) treated between 2001 and 2012. Cleft lip repairs were performed by 3 pediatric craniofacial surgeons using different techniques. 39 of 90 (43%) procedures utilized an inferiorly placed triangular flap. All patients were photographed at least 9 months postoperatively (mean = 4.2 years). All images were obtained prior to secondary cleft lip revisions. Image reorientation set the horizontal axis to the line through the exocanthia. Lip height asymmetry was based on the vertical distances from the subnasale to the peaks of Cupid's bow.

RESULTS: A two-sided Fisher's exact test confirmed that the proportions of complete and incomplete clefts were equal in the repairs with and without pennant flaps ($p = 0.825$). Regression analysis indicated that repairs which used a pennant flap had significantly less lip height asymmetry ($\beta = 4.9\%$, $p = 0.014$). Patients with complete cleft lips had significantly greater asymmetry post-repair than patients with incomplete clefts ($\beta = 4.1\%$, $p = 0.038$). The surgeon performing the repair was also a significant factor ($\beta = 2.4\%$, $p = 0.030$), although subcategorization based on surgeon continued to demonstrate improved lip symmetry among patients who underwent pennant flap during reconstruction.

CONCLUSIONS: The outcomes of unilateral cleft lip repairs are affected by both the surgeon and the surgical technique. Procedures which utilized a pennant flap achieved better lip symmetry than non-pennant repairs. In addition, postoperative asymmetry was smaller in patients with incomplete clefts.

65 A MODIFIED V-Y CHONDROMUCOSAL COMPOSITE FLAP FOR CORRECTION OF SECONDARY CLEFT NASAL DEFORMITY: A PHOTOGRAMMETRIC ANALYSIS

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BACKGROUND & PURPOSE: Secondary cleft nasal deformity is encountered today as a combination of the inherent characteristic defects of the cleft and the effects of subsequent operations that attempt to address the primary nasal deformity. A number of operative techniques and variations on timing of surgery have been proposed, attesting to the challenge this patient population continues to present to even the most experienced surgeons. Here we revisit, in detail, a modified V-Y chondromucosal flap to restore symmetric nostril shape and balanced tip projection in unilateral cleft lip and palate.

METHODS: A retrospective case-control study was conducted of the senior author's experience with secondary cleft tip rhinoplasty utilizing the V-Y chondromucosal flap in patients with unilateral cleft lip. Patient demographics, including age at repair, gender, and ethnicity were collected. Pre and post-operative AP and Worm's Eye photographs were analyzed for photogrammetric measurements independently by three researchers, and results were compared with the control group. Interrater reliability was assessed using Pearson's coefficient.

RESULTS: Seventeen cases and twenty-four controls were included. Average age at repair was 9.3 +/- 3.6 years with average follow-up of 13 months. There were no significant differences in patient demographics between case and control groups. Photogrammetric analysis demonstrated postoperative increases in cleft-side columella length by a mean of 2.3mm +/- 1.3mm ($p=0.0001$) and nasal apex height by 1.3mm +/- 1.2mm ($p=0.003$), while non-cleft side measurements were statistically unchanged. Control group measurements were similar across the 1-year visit interval, and when compared to cases, patients undergoing tip rhinoplasty had significantly different cleft-side columella length postoperatively (Δ+2.31mm vs. Δ+0.15mm, $p=0.0002$) and nasal apex height (Δ+1.29mm vs. Δ+0.17mm, $p=0.03$). All other parameters were statistically similar to controls. Interrater reliability was 0.98 overall. No complications were encountered and no external nasal valve collapse was observed in follow-up.

CONCLUSIONS: The modified V-Y chondromucosal flap is an effective and safe operative approach to the repair of secondary unilateral cleft nasal deformity. It restores symmetry to nostril morphology, lengthens the deficient columella, and consistently achieves balanced tip projection, ultimately leading to an aesthetically pleasing result that is relatively easy to reproduce.

66 A THREE DIMENSIONAL ANALYSIS OF NASAL AESTHETICS FOLLOWING LE FORT I ADVANCEMENT IN PATIENTS WITH CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: The aim of this study is to evaluate changes in nasal tip position, tip rotation, and nostril shape changes using volumetric (3D) photography after Le Fort I advancement osteotomies in patients with non-syndromic cleft-related maxillary hypoplasia and class III malocclusion.

METHODS: A retrospective cohort study correlating cephalometric and 3D photographic data in cleft palate patients with maxillary hypoplasia treated with Le Fort 1 osteotomy (single- or two-piece) was performed. Cephalometric parameters were recorded pre- and postoperatively. Three dimensional photogrammetric imaging analyzed changes in nasal interalar width (IAW), internostril width (INW), nasal tip projection (NTP), collumelar length (CL), nasal labial angle (NLA), and nasal length (NL). Statistical significance between pre- and postoperative data was determined using T-tests for each parameter.

RESULTS: Eleven patients underwent either single piece Lefort I osteotomy and advancement, (3 bilateral, 4 unilateral cleft lip and palate), or two-piece advancement (2 bilateral, 2 unilateral). Average age at orthognathic surgery was 18.1 years. Average 3D photographic follow-up was 5.1 months. The average cephalometric advancement at maxilla central incisor edge was 6.4mm. There was no significant difference in age at surgery, follow up, or

cephalometric advancement between single and two piece osteotomy. The average nasal soft tissue changes were IAW 1.9mm (0.4-4.2), INW -0.2mm (-2.8-1.6), NTP -1.0mm (-4.0-2.0), CL -0.7mm (-2.9-1.5), NLA -0.2 degrees (-13.9-15.1) and NL -0.7mm (-4.3-1.5)(p=0.001, 0.6, 0..08, 0.01, 0.9, 0.2). For single-piece osteotomy alone changes were IAW 2.1mm (0.6-4.1), INW -0.6mm (-2.8-1.7), NTP -1.9mm (-4.0—0.3), CL -1.2mm (-2.9—0.03), NLA -1.3degrees (-13.9-15.0) and NL -1.1mm (-4.3-0.7)(p=0.007,0.3, 0.009, 0.0002, 0.7, 0.2). For two-piece osteotomy alone changes were IAW 1.6mm (-0.4-3.3), INW 0.5mm (0.4-1.6), NTP 0.5mm (-1.1-2.0), CL 0.2mm (-1.4-1.5), NLA 2.8 degrees (-7.6-10.1) and NL -0.1mm (-1.4-1.5)(p=0.2, 0.4, 0.5, 0.6, 0.5, 0.9).

CONCLUSIONS: Cleft-related nasal scarring and malposition affect changes in nasal aesthetics following maxillary advancement. Patients with cleft lip and palate demonstrate a predictable increase in interalar width and decrease in columellar length as well as a trend to decrease nasal tip projection following Le Fort 1 osteotomy. Two-piece Lefort I increases variability of changes in nasal aesthetics compared with single-piece advancement.

67 SKELETAL STABILITY AFTER MAXILLARY DISTRACTION WITH A RIGID EXTERNAL DEVICE (RED) IN ADULT PATIENTS WITH CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Purpose of this study was to assess the long term stability of the maxilla in non-growing patientswith cleft lip and palate deformity who underwent maxillary advancement with Rigid external distraction device.

METHODS: The study included 10 non-growing patients with maxillary hypoplasia in patients with cleft lip and palate with Class III skeletal relationship. There were 6 men and 4 women, with mean age at treatment of 21.4 years (range 16-32years). Mean follow up period was 36.6 months (range 12-70 months). The surgical treatment included a high Le Fort I osteotomy in combination with placement of an external distraction device. The titanium plate was fixed to the maxillary bone as an anchor during distraction. After 7 days of latency period, activation was done at the rate of 1mm per day. Consolidation period was observed for minimum of 3 months after which distractor was removed and maxilla was plated in its new position. Standardized Lateral cephalograms were obtained preoperatively (T1), immediately after the consolidation (T2), and during post distraction follow up period (T3). The horizontal and vertical maxillary skeletal changes at T1, T2, and T3 were assessed by various angular and linear cephalometric measurements. Horizontal movement of maxilla was assessed by using SNA(angular), FH-N-A(Maxillary depth angle) and N-A Horizontal. Vertical movement of maxilla was assessed by SN-Palatal plane angle, N-ANS (vertical), N-PNS (vertical), ANS-FH (vertical), PNS- FH (vertical), AFH (vertical). Median values were calculated for all the linear and angular measurements.

RESULTS: The maxilla was significantly advanced as indicated by horizontal movement of point A (median difference-12mm) and increase in SNA angle (median difference-13.65º). Similar change can be observed with Maxillary Depth angle (median difference -15.5º).The palatal plane angle showed a minimum increase (median Difference - 4.05º) showing minimum clockwise rotation. Vertical movement of PNS compared to ANS along FH plane and N (7 º reference plane- N) was less, indicating some amount of clockwise rotation. There was a wide variation in the vertical maxillary changes at the A point. The relapse in the horizontal position of point A was at the most 0.5 mm in 6 out of 10 cases (median difference:0.5 mm). There was a slight decrease in maxillary depth angle (median of difference: 1.05º) and SNA angle (median of difference: 0.65 º). Palatal plane angle was decreased (median difference: 0.25°) and in 6 out of 10 cases the relapse was at the most 0.50. The vertical distance between ANS, PNS and FH plane decreased with median of difference 1 and 0.85mm respectively. Similar decrease in vertical distance between ANS, PNS and N (7 º reference plane-N) was seen.

CONCLUSIONS: Maxillary Distraction Osteogenesis in a non-growing patient with cleft maxillary deformity using Rigid External Distraction device is highly effective, predictable and stable modality for managing severe maxillary hypoplasia.

68 INCIDENCE OF POSITIVE SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH ISOLATED CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Children with cleft lip and/or palate (CLP) are at increased risk for developing obstructive sleep apnea (OSA) due to abnormalities in oropharyngeal anatomy present either at birth or as a result of surgical intervention. Despite the high prevalence of children with CLP, little is known on the incidence of OSA in this high-risk group. The purpose of this study is to determine the incidence of positive screening for OSA in children with isolated, non-syndromic CLP.

METHODS: An IRB-approved, retrospective chart review was performed on consecutive patients seen by the cleft lip and palate team at a large, urban pediatric hospital between January 2011 and August 2013. Patient families completed the Pediatric Sleep Questionnaire (PSQ), a validated tool with a sensitivity of 85% and specificity of 87% in predicting moderate to severe OSA in otherwise healthy children. Patients were excluded if they had CLP with an underlying genetic syndrome or other craniofacial diagnosis. After stratifying by CLP type, ANOVA test with Tukey's method was utilized to compare the risk for positive OSA screening according to clinical diagnosis.

RESULTS: A total of 866 patients completed the PSQ during the study period and 491 children with isolated CLP met inclusion criteria. This cohort had an average age of 8.4 +/- 4.39 years (range = 0.46-21.37) and was comprised of 60% males (293/491). The overall incidence of positive screening was 13.6% (67/491) with the most commonly reported symptoms being mouth breathing (27.7%), interrupting or intruding on others (26.7%), and fidgeting with hands or feet (25.7%). A positive screen was seen in 0% of children with submucous cleft palate (0/14), 12.1% of children with soft palate cleft (4/33), 11.1% of children with soft and hard palate cleft (7/63), 14.3% of children with unilateral CLP (35/244), 13.2% of children with bilateral CLP (15/114), and 26.1% of children with isolated CL (6/23). There was no statistical difference in the rate of positive screening amongst cleft types.

CONCLUSIONS: Children with CLP are at phenotypic risk for OSA. Appropriate screening for OSA may lead to early diagnosis and treatment thereby limiting the natural history and long-term sequelae.

69 THE RATE OF ORONASAL FISTULA FOLLOWING PRIMARY CLEFT PALATE SURGERY: A META-ANALYSIS

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BACKGROUND & PURPOSE: The authors present a meta-analysis of studies that reported on primary cleft palate repair over a 12-year period to determine the rate of oronasal fistula, and to identify risk factors for their development.

METHODS: The Medline database was reviewed for English-written papers published between 2000 and 2012 with the search items: "cleft palate fistula" and "cleft palate surgery". Inclusion criteria included: 1) primary cleft repair; 2) average or median age at time of surgery of <4 years; 3) postoperative follow-up period of >3 months; and 4) a clear description of an oronasal fistula as a communication between oral and nasal cavities. Exclusion criteria included: 1) pre-clinical animal studies; 2) case reports; 3) patients with a type V-VII fistula, as defined by the Pittsburgh Fistula Classification System; and 4) repair of submucous cleft palates. A random effects meta-analysis of proportions and exact confidence intervals was performed. For Veau classifications, an extension of the Cochran-Mantel-Haenszel Test for a series of 2x4 tables was utilized.

RESULTS: Of the 17 studies that met our inclusion criteria, 6 more were rejected because they were deemed to be statistical outliers. This resulted in 11 studies, comprising 2505 children, which were incorporated into our analysis. These studies were found to be statistically comparable to each other, meeting the homogeneity assumption with an acceptable I-squared value of 25.3% and a non-significant heterogeneity chi-squared p-value (0.203). The primary outcome targeted for analysis was the occurrence of an oronasal fistula, which we found to be 4.9% (95% CI 3.8-6.1%). There was a significant relationship between Veau classification and the occurrence of a fistula (p<0.001) with fistulae most prevalent in patients with a Veau IV cleft. The rate of fistula occurrence did not correlate to the surgical technique utilized for palate repair. The location of fistula, based upon the Pittsburgh Fistula Classification System, were as follows: Type I, 0.0%; Type II 12.7%; Type III, 54.0%; Type IV, 27.0%; with the remaining reported as a combination of locations not otherwise specified. One study used decellularized dermis in cleft repair with a fistula rate of 3.2%.

CONCLUSIONS: Evaluation of the rate of occurrence of oronasal fistulae following primary cleft palate repair is hindered by inconsistency of reporting surgical outcome details, inclusion or exclusion of submucous cleft palate

repair, a wide range of patient populations, and differing surgical techniques. Utilizing 11 studies comprising 2505 children, we find the rate of fistula occurrence, defined as a true communication between the oral and nasal cavities, to be 4.9%. Furthermore, patients with a Veau IV cleft are significantly more likely to develop an oronasal fistula but use of decelluarized dermis may be protective. When fistulae do occur, they do so most often at the junction of the primary and secondary palate.

70 NAVIGATING SOCIAL CHALLENGES: LIFE WITH A CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: People born with a cleft lip and palate may struggle in social situations. Why does this happen and why do some people struggle more than others? As care givers we often lack the expertise to properly address these situations. Purpose: To improve understanding of the impact a cleft lip and palate can have on social interaction. To discuss the use of various coping techniques. To learn about social cues and how they are affected in different situations. To recognize how a cleft lip and palate can alter everyday perceptions.

METHODS: The presentation begins with a video that allows the viewer to empathize with four people born with cleft lip and palate as they share their experiences through a variety of life's situations. The audience will recognize different coping skills and how these skills influenced each individuals social growth. The video is followed by a didactic session during which a psychologist will define terms that can help create an effective learning forum for whole audience participation with the panel presenters, including a patient born with a cleft lip and palate and an oral cleft program director.

71 PHONETIC DETERMINANTS OF AUDIBLE NASAL EMISSION (VELAR FLUTTER) IN CHILDREN WITH REPAIRED CLEFT PALATE

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BACKGROUND & PURPOSE: Audible nasal air escape is a perceptual consequence of incomplete velopharyngeal (VP) closure during oral pressure consonants and can vary from a quiet hissing-like noise to a louder flutter (Trost, 1981). Although velar flutter (or rustle) is a common and distracting perceptual symptom, there is little information regarding its phonetic determinants. This study used perceptual and acoustic analysis to identify the occurrence of velar flutter in children with repaired cleft palate as a function of consonant (plosive versus fricative) and vowel (high-front versus mid-central) phonetic contrasts.

METHODS: Participants consisted of 32 consecutive children (12 boys, 20 girls, mean age= 8.6 years, range 4 to 13 years) with repaired cleft palate with or without cleft lip who exhibited visible and audible nasal air emission during clinical evaluation. All children were recorded using the oral and nasal microphones of the Nasometer while producing consonant-vowel (CV) syllables in the carrier phrase "Say CV CV CV again". The targeted syllables were "pee", "pah", "tee", "tah", "fee", "fah", "see", and "sah". The acoustic software program TF32 was used to isolate the stop gaps and fricative segments from the nasal audio signal of all targets. Using audio replay and inspection of the waveform and spectrograms, the segments were coded as having a) no velar flutter, b) flutter during part of the segment, or c) flutter during the entire segment.

RESULTS: Intra- and inter-judge reliability of coding for velar flutter was adequate. Percentages of syllables with velar flutter in at least part of the segment were: 58% plosive-high vowel, 42% plosive-mid vowel, 58% fricative-high vowel, and 51% fricative-mid vowel. Mantel-Haenszel tests for repeated measures indicated a significant effect of vowel (p=.0287) and no significant consonant or interaction effects.

CONCLUSIONS: Velar flutter occurs more often in CV syllables with high-front vowels regardless of consonant (plosive or fricative). Results are discussed relative to a) possible differences in velar height that might facilitate flutter, and b) diagnostic implications relative to speech samples used for either perceptual or instrumental assessment of nasal emission and/or resonance.

72 ARTICULATION OUTCOMES IN CHILDREN WHO ARE INTERNATIONALLY ADOPTED

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BACKGROUND & PURPOSE: Children with orofacial clefts are frequently adopted into U.S. homes from non-English speaking countries. Articulation and phonemic development may be compromised in these children due to variable access to surgical care and later immersion in English. This study compares articulation outcomes of non-adopted (NA) children with those internationally adopted (IA) from non-English speaking countries.

METHODS: Eighty-one children (69 cleft palate ± cleft lip; ages 3:0 to 8:11) were included in analysis. Mean age at adoption for IA children (N=32) was 24.4 months (range = 10-48 months). Subjects completed The Goldman-Fristoe Test of Articulation-2 (GFTA) and Differential Abilities Scale-II nonverbal subtests (DAS-II NV). Frequency of cleft related errors (CRE; backing and nasal substitutions) was calculated from GFTA. Linear regression analyses (LRA) with robust standard errors were used to assess associations between: 1) GFTA and adoption status after controlling for gender, age at assessment, parent SES and DAS-II NV; and 2) the association between CRE , adoption status and age of palate closure, after controlling for the same variables.

RESULTS: We found that IA children had poorer GFTA performance than NA children (adjusted mean difference = 15.5, [Confidence Intervals (CI) 3.8, 28.1, p=0.012)]. IA children had later palate repair than NA children (adjusted mean difference = -11.4. CI=-16.6, -6.2). Age at primary palate repair was not associated with frequency of CRE (beta=-.028, CI=-.405, 300, p=.854); however, adoption status continued to contribute meaningfully to the analysis (beta = .359, CI=.0.8, 20.4, p=.060). Older IA children had more CRE than same aged NA children.

CONCLUSIONS: Children adopted from non-English speaking countries are at risk for articulation impairment. Age at primary palatoplasty did not influence articulation outcomes.

73 LANGUAGE DEVELOPMENT IN CHILDREN WITH OROFACIAL CLEFTS ADOPTED FROM NON-ENGLISH SPEAKING COUNTRIES

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BACKGROUND & PURPOSE: Children with orofacial clefts (OFC) are frequently adopted from non-English speaking countries. As a part of a larger research project investigating reading achievement and speech and language development, this study compares language development between children with OFC exposed to English from birth (Early Exposure: EE) to children with OFC adopted into English speaking homes from non-English speaking countries (Late Exposure: LE).

METHODS: Sample included 81 children (39 males; 31 LE) with OFC, ages 3-8 years (Mean=6.1 yrs). Language skills were assessed using the CELF-P2 for the children ages 3-4 and the CELF-4 for the older children. We performed linear regression analyses (LRA) with bootstrapping to assess the association between English language exposure and language development for each of the index scores of the CELF: Core Language; Receptive Language; Expressive Language; Language Content; and Language Structure while controlling for parent SES and nonverbal cognitive abilities using Nonverbal Reasoning and Spatial Standard Scores of the Differential Abilities Scale (DAS-II). In follow-up LRA, we also examined associations between adoption age and time since adoption on CELF performance.

RESULTS: Mean age of adoption for LE children was 24.4 months (range=10-48 months) and mean length of time between adoption age and assessment (English Exposure Time; EET) was 50.9 months (range=19-83 months). LE children performed worse than EE children on all language measures with mean differences (MD) ranging from -6.7 to -10.4 (p-values = .015 to .004). EET, but not age of adoption, was associated with language outcomes [Beta = 1.001 (Expressive) to 0.549 (Receptive); all p's ≤0.009, except Receptive Language and Language Content (both p's=0.09)].

CONCLUSIONS: Children with OFC who are adopted from foreign countries and are learning the English language later in their development score significantly lower on assessments of language than children exposed to English since birth. English language skills improve significantly the longer children are in an English speaking environment regardless of age at adoption.

74 THE INFLUENCE OF SPEAKING RATE ON NASALANCE IN TYPICAL ADULT SPEAKERS

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BACKGROUND & PURPOSE: Nasometry is a non-invasive tool frequently used to measure speech resonance. Nasometry protocols do not provide detailed instructions for speaking rate control during data collection. Studies attempting to establish a relationship between speaking rate and nasalance have yielded mixed results (Gauster et al., 2010; Tasko et al., 2013). Therefore, it is important to identify the influence of speaking rate on nasalance in a variety of speaking tasks. The purpose of this research is to determine the degree to which natural variations in speaking rate influences nasalance measures for syllable repetition and paragraph reading tasks.

METHODS: Fifty-eight typical adult speakers (age 18-30 years) participated in a normative nasometry study. Subjects had normal hearing and no history of cleft palate. Participants produced 6 sustained vowels, 5 sentences, and 4 paragraphs presented in random order followed by 14 syllable repetitions from the SNAP-R (Kummer, 2005). This analysis focused on syllable repetitions and 4 paragraphs (Zoo, Nasal, Sibilant, and Rainbow passage). Speech waveforms were used to derive speaking rate in syllables per second. Mean percent nasalance was transformed into rationalized arcsine units (Studebaker, 1985). Multilevel linear regression was used to account for correlations among observations (i.e., observations nested within trials and subjects).

RESULTS: Syllable repetition rates ranged from 1.4 to 4.0 syllables per second and paragraph speaking rates ranged from 2.5 to 4.9 syllables per second. Faster speaking rate was predictive of lower nasalance for oral syllables and higher nasalance for nasal syllables containing the vowel /a/ ($p<.0005$). This effect was not observed for syllables containing /i/. On paragraphs, faster speaking rate was predictive of low nasalance values for the Zoo and Sibilant passages ($p<.05$).

CONCLUSIONS: Natural variations in speaking rate can influence nasalance values. These findings suggest that nasometry protocols should control for speaking rate, particularly for repeated syllable tasks and the Zoo and Sibilant passages. Detailed analysis of relationships between rate and nasalance will be presented.

75 DEVELOPING A NOVEL SPEECH INTERVENTION IPAD GAME FOR CHILDREN WITH CLEFT PALATE: A PILOT STUDY

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BACKGROUND & PURPOSE: Pediatric patients with cleft palate can have significant speech deficits even after surgical repair necessitating team treatment coordinated between speech-language pathologists and surgeons. Some of these children need additional speech interventions, but are limited by insufficient access and long travel distances. In response to this unmet need, we developed a multidisciplinary team to build a game-based program that reinforces accurate production of typical problematic sounds characteristic in some cleft speech. The purpose of this pilot study is to determine the feasibility and replay value of this supplementary speech therapy tool.

METHODS: In a multidisciplinary effort between otolaryngologists, speech-language pathologists, and computer engineers, novel speech software was developed for the iPad. This program requires the child to produce a series of intelligible speech commands in order to progress through the game story. The game was designed to address high-pressure sounds problematic in cleft speech in children (ages 2 to 7) after palatoplasty. The subjects completed the game with parental observation. Video was captured of the subject completing the standardized speech assessment tool for future comparison. After the encounter, the subject's parents completed a questionnaire (satisfaction and perceived effectiveness) using a 7-item Likert scale, ranging from 1(strongly disagree) to 5(strongly agree). Parental responses were analyzed using Kruskal-Wallis ANOVA. Specific feedback to the software engineers facilitated game adjustments.

RESULTS: Ten children were enrolled in this pilot study. All patients completed the game and video capture. The average time for a single play-through of the game was 3 minutes and 30 seconds. The majority of parents agreed/strongly agreed that the game was engaging to the player (70%), that the player perceived a sense of control of the game story (80%), and that the game was enjoyable to replay repeatedly (80%). No difference between the parental responses were found ($p> 0.05$).

CONCLUSIONS: This game-based speech software was engaging with high replay value. Implementation of this intervention modality offers a promising supplement to standard speech therapy in improving intelligibility in patients with cleft palates. Iterative game improvements will be based on investigator, parent, and children's input leading to phase 2 of the game development.

76 STRUCTURAL AND FUNCTIONAL ASSESSMENT OF SPEECH IN YOUNG CHILDREN USING DYNAMIC MAGNETIC RESONANCE IMAGING

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BACKGROUND & PURPOSE: Most dynamic magnetic resonance imaging of the levator veli palatini (levator) muscle has been limited to studies using sustained phonation (Yamawaki et al. 1996; Ettema et al. 2002; Tian et al., 2010a, 2010b; Kollara and Perry, 2013). Dynamic MRI sequences at near real-time using word-level productions have been described along the midsagittal image plane (Sutton et al., 2009; Bae et al., 2011; Scott et al., 2013) and oblique coronal image plane (Perry et al., 2013b, 2013c; Scott et al., 2013). The purpose of this study was to examine the velopharyngeal mechanism using dynamic MRI at the sentence-level production in children between 4-9 years of age with normal velopharyngeal anatomy.

METHODS: A high resolution, T2-weighted turbo-spin-echo 3D anatomical scan (SPACE) was used to acquire static velopharyngeal data on 11 children with normal velopharyngeal anatomy between 4-9 years of age. Dynamic speech assessment was successfully obtained on 8 out of 11 child subjects using a fast-gradient echo FLASH multi-shot spiral technique to acquire 15.8 fsp of the oblique coronal image plane.

RESULTS: There was no significant difference between males and females for levator muscle measures. Females had an overall mean levator length at rest of 39.3 mm and males had a mean length of 39.6 mm. Males displayed a slightly larger distance between muscle origin (52.4 mm) compared to females (50.2 mm). On average, high back vowels, /u/, displayed a larger angle of origin and longer levator muscle compared to high front vowels, /I/ and /i/. Coarticulatory effects were noted across the sentence for the plosive-p consonant.

CONCLUSIONS: This study demonstrates a potentially useful technique in dynamic MRI that does not rely on cyclic repetitions or sustained phonation and can provide dynamic information related to muscle function. It is likely that future developments and improvements in techniques may demonstrate the clinical usefulness of dynamic methods in assessing speech prior to secondary surgical management.

77 USE OF DYNAMIC MRI TO QUANTIFY VELOPHARYNGEAL CONTACT LENGTH AND DIFFERENTIATE VELOPHARYNGEAL CONTACT CONFIGURATIONS AMONG PHONEMES

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BACKGROUND & PURPOSE: Velopharyngeal insufficiency is a common issue for children with repaired cleft palates, preventing proper production of certain sounds, particularly plosives and fricatives. Velar elevation is commonly used to compare velopharyngeal closure between sounds. However, many non-plosive and non-fricative phonemes have similar elevations to plosives and fricatives but are easier for children with repaired palates to achieve. The goal of this study was to quantify velar elevation and the length of contact in the mid-sagittal plane between the velum and posterior pharyngeal wall, using dynamic magnetic resonance imaging (MRI). We hypothesized that contact length differs among phonemes with similar velar elevations.

METHODS: Five healthy subjects pronounced ten English phonemes: plosives (/b/, /k/, /p/, /t/), fricatives (/s/, /z/), and vowels (/a/, /æ/, /i/, /u/). Each phoneme was voiced three times during a real-time dynamic MRI scan on a Siemens Avanto 1.5T scanner with head and neck coil arrays. One two-dimensional, mid-sagittal slice of the velum was acquired. Spatial resolution is 1.2x1.2mm2 with 8mm slice thickness, 50x50mm2 field-of-view and temporal resolution of 18.2 frames-per-second. For the image corresponding to maximum velar elevation, the boundaries of the velum and posterior pharyngeal wall were manually outlined. From the outlines, we calculated two

variables of interest: contact length between the velum and posterior pharyngeal wall and velar elevation, measured from inferior edge of C2 vertebrae to the peak of velum-wall contact. For each subject, the maximum length and elevation were determined over all phonemes, and the measurements of each phoneme were normalized by the subject's maximum measurement.

RESULTS: Generally, contact length differed between phonemes, including ones with similar elevations. For example, elevation was not significantly different between /æ/ and /s/ ($p>0.05$), but contact length was significantly larger for /æ/ than /s/ ($p=0.0013$), based on two-sample, two-tailed t-tests of the normalized values.

CONCLUSIONS: The results suggest that contact length can be used to differentiate between phonemes with similar elevations. Future research will elucidate which velar muscles contribute to increased contact length (e.g., musculus uvulae, tensor veli palatini), how these relationships hold in children with mild-to-moderate velopharygneal insufficiency, and finally how this informs better surgical repair of cleft palates.

78 AN OUTCOMES ANALYSIS OF MANDIBULAR DISTRACTION OSTEOGENESIS FOR THE TREATMENT OF NEONATAL TONGUE-BASED AIRWAY OBSTRUCTION

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BACKGROUND & PURPOSE: Early post-natal tracheostomy for airway compromise is associated with high morbidity and cost. In certain patients, mandibular distraction-osteogenesis may be preferred. We present a comprehensive analysis of surgical, airway, and cephalometric outcomes in a large series of patients with tongue-based airway obstruction in the neonatal period.

METHODS: A retrospective review was performed of patients with larygnoscopically proven tongue-based airway obstruction who underwent mandibular distraction before one year of age at our institution. Demographic, operative, post-operative, polysomnographic and radiographic data were analyzed with chi-squared, Fisher's exact and Wilcoxan rank tests.

RESULTS: Between 2008 and 2013, 28 patients less than on year of age underwent mandibular distraction for tongue-based airway obstruction. Distraction was performed for documented obstructive sleep apnea and failure to thrive at an average age of 58 (range: 11-312) days with average distractor removal after 90 days. Pre-operative polysomnograms were obtained on 21 patients with an average apnea-hypopnea index (AHI) of 38.0/hr; the AHI on post-operative polysomnograms obtained after distraction completion was significantly reduced in all 13 patients in which it was measured (mean: 4.0/hr, $p<0.0001$). 19 patients were transitioned to oral feeding, and cephalometric and airway stripes were improved. Distraction was successful in all but 4 patients including all patients with GILLS scores of ≤ 2 and 66% of patients with GILLS scores of 3 or more.

CONCLUSIONS: Neonatal mandibular distraction is a powerful tool to treat critical obstructive apnea and avoid tracheostomy in patients with tongue-based airway obstruction. In contrast to tongue-lip adhesion, patients with a high GILLS score pre-operatively have high tracheostomy-avoidance rates with MDO.

79 A SIMPLE MANDIBULAR DISTRACTION PROTOCOL TO AVOID TRACHEOSTOMY IN PATIENTS WITH PIERRE ROBIN SEQUENCE

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BACKGROUND & PURPOSE: Historically, tracheostomy was the standard treatment for severe airway obstruction in patients with Pierre Robin Sequence (PRS). More recent treatment goals focus on avoiding tracheostomy through modalities such as mandibular distraction osteogenesis (MDO). Our practice utilizes a straightforward protocol to identify candidates for MDO, uniquely screening patients with a multipositional airway study (MPAS) and microlaryngoscopy and bronchoscopy (MLB). If the MPAS is consistent with significant obstructive sleep apnea or the airway is clinically unstable, then MLB is employed to exclude additional airway pathology before proceeding with MDO. In this study, we evaluated the efficacy of our MDO treatment protocol to resolve airway obstruction and avoid tracheostomy in patients with PRS.

METHODS: An IRB-approved, retrospective chart review was performed to assess our MDO treatment protocol. All patients were treated according to the MDO treatment protocol by a single surgeon using the same operative technique from 1999-2013. Patients without a diagnosis of PRS were excluded. The data assessed included: tracheostomy status (pre-MDO, post-MDO, or none), MLB findings, MPAS results, and clinical resolution of airway obstruction following MDO.

RESULTS: Thirty-eight patients were identified according to the inclusion and exclusion criteria. Prior to referral for MDO, five patients required urgent tracheostomy. Of patients without a pre-MDO tracheostomy (n=33), two patients required tracheostomy post-MDO, while 94% avoided tracheostomy with clinical resolution of airway obstruction (n=31). The first patient requiring post-MDO tracheostomy failed multiple extubations, despite clinical resolution of airway obstruction. The second patient requiring post-MDO tracheostomy was diagnosed by postoperative MLB with laryngomalacia that was not visualized by preoperative MLB. A preoperative MLB diagnosis of laryngomalacia or tracheal stenosis was associated with a higher overall incidence of tracheostomy (n=2/4). All patients who underwent a MPAS were categorized as having obstructive sleep apnea (n=30).

CONCLUSIONS: Our treatment protocol demonstrates MDO is a highly effective treatment modality for severe airway obstruction secondary to PRS and successfully avoids tracheostomy in the majority of patients. Patients diagnosed by MLB with laryngomalacia or tracheal stenosis are not candidates for MDO prior to tracheostomy; however, these patients may benefit from MDO after resolution of laryngomalacia or tracheal stenosis in order to expedite decannulation.

80 EVALUATION OF SURGICAL TREATMENT OF SYMPTOMATIC PIERRE ROBIN SEQUENCE: A COHORT COMPARISON STUDY BETWEEN FURLOW PALATOPLASTY VS. RADICAL INTRAVELAR VELOPLASTY

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BACKGROUND & PURPOSE: Comparative outcome studies of speech development, velopharyngeal insufficiency, and palatal fistula formation after treatment of wide cleft palate defects seen with severe Pierre Robin Sequence (PRS) are currently limited. This study aims to compare speech development, speech outcomes, and palatal fistula rates in PRS patients requiring early neonatal/infant airway surgery (Tongue Lip Adhesion (TLA) vs. Mandible Distraction (DOG)) and later treated with Furlow palatoplasty (FP) or radical intravelar veloplasty (IVV).

METHODS: A retrospective cohort study of symptomatic PRS patients (n=23) treated over 81 months was performed using clinical data to compare time to speech development, speech outcomes, and palatal fistula rates between FP (Group 1) and IVV (Group 2) treatment groups.

RESULTS: In Group 1, the FP cohort, 10 patients were identified from September 2005- November 2009, (4 male and 6 female patients, average age at palatoplasty 1.30 years, 1 syndromic). In Group 2, the IVV cohort, 13 patients were identified from July 2007 – June 2012 (5 male and 8 female patients, average age at palatoplasty 1.57 years, 10 syndromic). The average age at oldest speech sample for FP was 3.96 (years and for IVV was 2.48 (0.84 - 4.02) years. In Group 1 (FP), n=10 (100%) were treated with TLA and in Group 2 (IVV), n=12 (92%) were treated with DOG and n=1 (8%) with TLA. Conversion from TLA to mandible distraction for persistent sleep apnea occurred in 4 patients (25%). No patients initially treated with DOG converted to tracheostomy or TLA. Insertion of Alloderm at the time of palatoplasty in group 1, n=4 (40%) and in group 2, n=11 (85%) occurred. The palatal fistula rate in group 1 was none (0.0%) and in group 2 was none (0.0%) p=1.0. Delayed speech acquisition, velopharyngeal incompetence, adequate speech in group 1 was n=2 (20%), n=1 (10%), n=5 (50%) and in group 2 was n=11 (85%), n=1, (7.5%), n=1(7.5%). Average operative time in group 1 (FP) was 218 (146 – 309) minutes and in group 2 (IVV) was 139 (95 - 235) minutes.

CONCLUSIONS: Wide U-shaped cleft palates associated with severe symptomatic Pierre Robin Sequence are adequately repaired with either Furlow palatoplasty or radical intravelar veloplasty. Palatal fistulas were prevented using either technique with a higher rate of alloderm placement using IVV (85% vs. 40%). Persistent sleep apnea occurred more commonly in patients treated with TLA (25% vs 0%). Speech acquisition and subsequent speech delay was associated with syndromic status rather than type of palate repair. No significant differences in velopharyngeal incompetence were identified (10% vs. 7.5%). IVV operative time was significantly shorter than FP despite the increased time to implant alloderm.

81 MAPPING THE MANDIBULAR LINGULA IN SYMPTOMATIC PIERRE ROBIN SEQUENCE: A GUIDE TO THE INVERTED L-OSTEOTOMY

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BACKGROUND & PURPOSE: The inverted L osteotomy for mandibular lengthening in treatment of symptomatic Pierre Robin Sequence (PRS) is a useful technique for avoiding injury to the tooth root and inferior alveolar nerve. Identification of the position of the lingula relative to adjacent mandibular anatomic points is understudied and may decrease iatrogenic complications. This study aims to map the position of the lingula in the micrognathic mandible.

METHODS: A retrospective cohort study of symptomatic PRS patients was performed comparing 3D CT data of relative lingula position between PRS patients (Group 1) and control patients (Group 2). Patients undergoing operative treatment for PRS between August 2008 and 2011 were included in Group 1. Patients undergoing craniomaxillofacial CT for aetiologies not affecting the mandible from the same time period were included in Group 2. Data measured included overjet, the gonial angle (Condylion to Gonion to Menton), length of the horizontal ramus (Gonion to Pogonion), height (measured as condylion (Co) to gonion (Go)) and width (measured as anterior vertical ramus (AVR) to posterior vertical ramus (PVR)) of the vertical ramus, and the distance of the lingula (Li) from the anterior ramus and from the gonion. Relative lingula position, with correction for differences in mandible size between test subjects and controls, was calculated as Li-AVR/AVR-PVR on the x-axis, and Li-Go/Co-Go on the y axis. Data were subjected to Mann-Whitney U testing to determine statistical significance between groups.

RESULTS: Eleven patients were identified for Group 1 and four for Group 2 (controls). The average overjet was 9.99mm in Group 1 and 4.28mm in Group 2 ($p = 0.001$). The gonial angle was 132.64º in Group 1 and 123.5º in Group 2 ($p = 0.018$). The ave horizontal ramus length was 26.58mm in Group 1 and 40.62mm in Group 2 ($p = 0.001$). The ave vertical ramus height was 16.05mm in Group 1 and 23.04mm in Group 2 ($p = 0.003$). The average vertical ramus width was 15.16mm in Group 1 and 20.67mm in Group 2 ($p = 003$). The average horizontal lingula position (Li-AVR) was 7.25mm in Group 1 and 10.75mm in Group 2 ($p = 0.001$). Relative horizontal lingula position was 0.44 in Group 1 and 0.52 in Group 2 ($p = 0.138$). The average vertical lingula position was 9.02mm in Group 1 and 11.34mm in Group 2 ($p = 0.026$). Relative vertical lingula position was 0.57 in Group 1 and 0.49 in Group 2 ($p = 0.078$).

CONCLUSIONS: Mandibles of PRS patients display globally smaller dimensions, as well as increased gonial angle and overjet compared to normal counterparts. There is a resultant decrease in vertical and horizontal distance of the lingula from gonion and from the anterior vertical ramus. When micrognathia is accounted for, the relative anatomic position of the lingula is maintained and equivalent to normal mandibles. Accurate anatomic identification using these measured landmarks can assist with locating and avoiding injury to the inferior alveolar nerve during L-osteotomy for mandibular lengthening.

82 EVALUATION OF OTOLOGY OUTCOMES AFTER SURGICAL TREATMENT OF SYMPTOMATIC PIERRE ROBIN SEQUENCE: A COHORT COMPARISON STUDY BETWEEN FURLOW PALATOPLASTY VS. RADICAL INTRAVELAR VELOPLASTY

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BACKGROUND & PURPOSE: Comparative outcome studies of otology outcomes (hearing loss, middle ear disease, and myringotomy rates with or without tube placement)after treatment of wide cleft palate defects seen with severe Pierre Robin Sequence (PRS) are currently limited. This study aims to compare otology outcomes in PRS patients requiring early neonatal/infant airway surgery (Tongue Lip Adhesion (TLA) vs. Mandible Distraction (DOG)) and later treated with Furlow palatoplasty (FP) or radical intravelar veloplasty (IVV).

METHODS: A retrospective cohort study of symptomatic PRS patients (n=23) treated over 81 months was performed using clinical data to compare hearing loss, middle ear disease, and myringotomy rates with or without Armstrong tube placement rates between FP (Group 1) and IVV (Group 2) treatment groups. Statistical analysis between groups using a Wilcoxen signed–rank test and students unpaired t-test was performed using SPSS 2.0.

RESULTS: In Group 1, the FP cohort, 10 patients were identified from September 2005- November 2009, (4 male and 6 female patients, average age at palatoplasty 1.30 years, 1 syndromic). In Group 2, the IVV cohort, 13 patients were identified from July 2007 – June 2012 (5 male and 8 female patients, average age at palatoplasty 1.57 years, 10 syndromic). The average age at oldest speech sample for FP was 3.96 years and for IVV was 2.48 (0.84 - 4.02) years ($p>0.05$ for all demographic variables except syndromic status $p=0.003$). In Group1 (FP), n=10 (100%) vs. Group 2 (IVV), n=9 (69%) ($p=0.056$) were treated with tympanostomy with venting tubes at an average age of 1.03 years (0.33-1.63) vs. 1.01 years (0.45-1.44) respectively. The serous otitis, mucoid otitis, suppurative otitis media rates were 20%, 60%, and 20% in Group 1 (FP) and 11%, 78%, and 11% in Group 2 (IVV) respectively. The otorrhea rate was 30% in Group 1 and 31% in Group 2. The revision tube placement was in 20% in Group 1 and 30% in Group 2. The mean pure tone average(PTA) was 19.2db in Group 1(n=8) vs. 20.75 db in Group 2 (n=8). No patients required mastoidectomy during the study period. Delayed speech acquisition, velopharyngeal incompetence, and adequate speech in group 1 was n=2 (20%), n=1 (10%), and n=5 (50%) respectively and in group 2 was n=11 (85%), n=1, (7.5%), n=1(7.5%) respectively.

CONCLUSIONS: Symptomatic effusions were present during the first year of life in the majority of patients with severe symptomatic Pierre Robin Sequence. Typanostomy tube placement rate was reduced in our study in patients treated with IVV when compared to Furlow palatoplasty. Hearing outcomes were similar for patients requiring typanostomy tubes in either group. Speech acquisition and subsequent speech delay was associated with syndromic status rather than type of palate repair or rate of tympanostomy tube placement.

83 NASOPHARYNGEAL INTUBATION FOR SEVERE CASES OF ROBIN SEQUENCE: A FOLLOW UP OF THREE YEARS WITH EVALUATION OF NEUROLOGICAL DEVELOPMENT

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BACKGROUND & PURPOSE: The treatment of severe cases of Robin Sequence is controversial in the literature: Surgical X Non-surgical. Questions about the neurological development of severe cases treated with non-surgical treatment have emerged. Objective: To study the course of severe cases of Isolated Robin Sequence (IRS) treated exclusively with nasopharyngeal intubation (NPI) in the neonatal period and first months of life, with a follow up of three years. To evaluate the neurological development at 3 years of age.

METHODS: 38 children, considered being severe cases of Isolated Robin Sequence (IRS), treated exclusively with NPI and controlled with continuous oximetry during the first months of life, were followed up during three years. The length of time of use of NPI and nasogastric tube was measured. In order to evaluate the neurological development at three years of age, Denver II test and Evolutional Neurological Exam were performed.

RESULTS: The length of time of use of NPI was 89±44 days, the length of time of use of nasogastric tube was 74.35±44.10 days. Under both neurological tests all children had normal neurological (psico-social and motor) development at three years of age.

CONCLUSIONS: All children presented improvement of feeding and breathing problems without surgical procedures and presented normal neurological development at three years of age.

84 CARDIAC AND NEUROLOGIC ANOMALIES IN ROBIN SEQUENCE: INCIDENCE AND CLINICAL IMPLICATIONS

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BACKGROUND & PURPOSE: Although the association of syndromic, lower airway, and gastrointestinal anomalies in Robin sequence (RS) is well appreciated, the association of other anomalies is not well described. The purpose of this study is to evaluate the incidence of cardiac and central nervous system (CNS) anomalies in RS and determine whether screening for these anomalies should be recommended.

METHODS: An 11-year (2001-2012) retrospective review of infants with RS admitted to the neonatal intensive care unit (NICU) at a tertiary care children's hospital was performed. The presence and type of cardiac and CNS anomalies was assessed. Univariate analysis was used to determine the

association between mortality and these anomalies.

RESULTS: Of the 181 patients who met inclusion criteria, 30.9% had at least one cardiac anomaly and 26.5% at least one CNS anomaly. 45.9% of patients had either a CNS or cardiac anomaly. Cardiac anomalies included patent foramen ovale, patent ductus arteriosus, atrioseptal defect, ventriculoseptal defect, aortic coarctation, Tetralogy of Fallot, pulmonary hypertension, and right ventricular hypertrophy. CNS anomalies included encephalocele, holoprosencephaly, Dandy Walker, subdural hematoma, agenesis of the corpus callosum, cerebellar/brain stem hypoplasia, microcephaly, and hydrocephalus. The overall rate of mortality was 16.6% with a rate of 39.3% in patients with a cardiac anomaly and 33.3% in patients with a CNS anomaly. These differences were significant ($p<0.001$, $p=0.001$, respectively). The odds ratio (OR) for mortality was 2.37 for cardiac versus no cardiac anomaly and 2 for CNS versus no CNS anomaly.

CONCLUSIONS: There is a high incidence of cardiac and CNS anomalies in infants with RS. The presence of either a cardiac or CNS anomaly is associated with a significant, nearly two-fold increase in mortality. These data suggest that cardiac and cranial imaging should be performed during the initial evaluation of infants with RS.

85 A CURRENT ASSESSMENT OF CRANIOFACIAL FELLOWSHIP TRAINING

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BACKGROUND & PURPOSE: To evaluate the current status of craniofacial surgery training.

METHODS: An anonymous online survey was emailed to fellows completing a North American or Australian craniofacial fellowship in June of 2013.

RESULTS: Thirty of 33 craniofacial fellows (91%) completed the survey. All cited previously completing plastic surgery training. Of the respondents, only one U.S. trained plastic surgeon trained internationally, and five international plastic surgeons accepted U.S. fellowships. Only 14% of fellowships (4 of 29) offered the traditional apprenticeship model (single attending). Over half of the programs included some international experience, but only 19% stated this was necessary to address a case-type deficiency. The mean estimated number of cases reported were 380 (307-452, 95% CI). Based on case volume data, four main program types were identified: cleft/orthognathic, intracranial/orbital/midface, general pediatric plastics, and adult/trauma/reconstructive. Seventy-three percent of programs seemed to focus primarily on cleft/orthognathic surgery, 19% seemed focused on adult/trauma/reconstructive, and only 4% seemed to focus on intracranial/orbital/midface. Fellows were more likely to report feeling well prepared if greater than 12 cases in a particular category were performed. Eighty percent felt well prepared for a career in craniofacial surgery, 20% did not. Fifty percent believed craniofacial training could be improved by establishing core areas of exposure and case category minimums. Operative experience, the faculty, clinical diversity, autonomy and mentoring were considered strengths of their fellowship by most and in that order.

CONCLUSIONS: Given that all trainees had initially completed plastic surgery training, it would seem that craniofacial surgery is truly a subspecialty of plastic surgery. Historically, craniofacial fellowships began as apprenticeships but few fellowships today retain this model with most structured in the "residency model" of multiple attendings, higher case volumes, and more generalized clinical experiences. Although, craniofacial surgery has been previously defined as orbital/intracranial surgery, currently there seems to be a broader diversity of clinical exposures offered within fellowships considered "craniofacial." Today, the majority of fellowships focus on cleft/orthognathic and adult/trauma/reconstructive, with only a few focused on orbital/intracranial. Prospective applicants may wish to consider each fellowship's unique clinical offerings to match the specific type of educational experience they are seeking.

86 RETRIEVAL OF A FULL FACIAL ALLOGRAFT BASED ON THE MAXILLARY ARTERY: INDICATIONS AND TECHNIQUE

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BACKGROUND & PURPOSE: Maxillary artery has been traditionally considered the main blood supply of the facial skeleton. However, the deep and concealed location of the artery in the infratemporal and pterygopalatine fossae enclosed by the cranial base, mandible and maxilla makes the harvest of facial allografts based on this artery challenging. The purpose of this study was to modify the Le Fort III procedure in order to allow safe inclusion of the maxillary artery in the allograft.

METHODS: Sixteen fresh cadaver heads were used in this study. Ten full facial allografts containing mandible, maxilla, zygomatic and nasal bones were harvested through a traditional Le Fort III approach. In 6 cadaver heads, maxillary artery and internal jugular veins where injected with red and blue latex respectively. A modified Le Fort III approach was designed: the orbital floor osteotomy was performed at the posterior-most aspect of the orbit. The zygomatic arch was removed and the pterygomaxillary disjunction was performed under direct vision after excising the temporalis and lateral pterygoid muscles. Six full facial allografts were harvested through the modified approach. In all 16 allografts the maxillary artery and its branches were dissected to assess for damage during the procurement.

RESULTS: When the traditional Le Fort III approach was used to harvest the facial allograft, the terminal branches of the maxillary artery (the infraorbital and the terminal part of the sphenopalatine arteries) were injured constantly. The modified approach preserved these branches and allowed the dissection of the maxillary artery under direct vision. The pterygoid plexus veins were damaged in both cases.

CONCLUSIONS: Maxillary artery should be considered as the main blood supply of the facial allograft when a major portion of the facial bones is to be harvested along with limited amount of facial soft tissues. The described modified Le Fort III approach allowed the safe dissection of the maxillary artery, preserving the main blood supply to the facial skeleton.

87 AUTOLOGOUS BONE-ASSISTED CRANIOPLASTY FOLLOWING DECOMPRESSIVE CRANIECTOMY IN PEDIATRIC PATIENTS: RISK FACTORS AND RATES OF RESORPTION

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BACKGROUND & PURPOSE: The efficacy of autologous bone-assisted cranioplasty for children who have undergone decompressive craniectomy has been disputed in recent studies. Development of symptomatic resorption has been reported at 50%, with most patients undergoing a revision cranioplasty. Risk factors for resorption in children are not well established. Previous studies identified age ≤2.5 years, permanent ventriculoperitoneal (VP) shunt, comminuted skull fracture, size of defect and interval >6 weeks to be associated with resorption. The purpose of this study is to evaluate potential risk factors for resorption in children for future studies of efficacy and preoperative risk stratification.

METHODS: All pediatric patients who underwent decompressive craniectomy and autologous bone-assisted cranioplasty from 2006 to 2013 were identified at our institution. A retrospective cohort study was conducted to evaluate risk factors for bone flap resorption. The primary risk factors evaluated were age ≤2.5 years, permanent VP shunt, comminuted fracture (≥3 pieces), removal of ≥2 cranial bones, interval >6 weeks, size of defect, cranioplasty surgeon, and cranioplasty surgical site infection. Multivariate analyses were performed to identify independent predictors of outcomes.

RESULTS: Fifty-two patients met eligibility criteria with 20 patients (38.5%) developing resorption. Of the entire cohort, 57.7% were male, 21.2% were ≤2.5 years old, 63.5% suffered traumatic brain injury, 13.5% required a permanent VP shunt, 42.3% had a comminuted skull fracture, 64% had removal of ≥2 cranial bones, and 73.1% underwent craniectomy to cranioplasty interval >6 weeks. The mean time to resorption was 7 months and mean follow-up time was 19.5 months. Among patients with resorption, 11 (55%) underwent revision with 4 (36.3%) undergoing an additional revision procedure. Multivariate analyses demonstrated age ≤2.5 years (adjusted OR 17.0) and comminuted skull fracture (adjusted OR 12.1) as independent predictors of resorption.

CONCLUSIONS: Although the rates of bone resorption and accompanying revision in this cohort are less than previously reported, these complications remain important considerations from a standpoint of efficacy and safety. Age ≤2.5 years and comminuted skull fracture were independent predictors of resorption, thus warranting further investigation.

88 PEDIATRIC FACIAL FRACTURE PATTERNS: TRAJECTORIES AND RAMIFICATIONS IN 151 PATIENTS

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BACKGROUND & PURPOSE: The pediatric facial skeleton fractures in patterns distinct from those of the adult; this has implications in their diagnosis and management, which may go unrecognized. To highlight the mechanistic, anatomic, and diagnostic peculiarities of pediatric facial fractures, we reviewed the patterns of injury at our institution with respect to frequency and trajectory.

METHODS: A retrospective review of patients presenting with facial fractures to our pediatric institution between 2004-2007 was performed. Isolated fractures of the nose, mandible, or skull were excluded. Demographics, cause of injury, fracture patterns, associated injuries, management, and follow-up information was gathered. CT scans were reviewed, characterizing fracture length, displacement, trajectory and severity. Adverse outcomes were the subject of further subanalysis.

RESULTS: 1520 patients with craniofacial fractures over this period presented to our institution; 314 of these patients had combination fractures, involving at least two of the facial thirds; 151 of these patients had a complete data set with follow-up that could be reviewed, making up the cohort for this study. Average age at injury was 9.5±4.7 years, with a male predominance (66.9%). Mechanism of injury was predominantly motor vehicle (37.1%). Associated injuries included intracranial bleed (37.1%), ophthalmologic (27.2%), and CSF leak (3.3%). Patterns of fracturing displayed near consistent obliquity, with only eight patients (5.3%) displaying a LeFort type facial fractures. Five patients died as a result of their injuries. Treatment upon initial presentation was primarily conservative (61.3%). Follow-up averaged 2.4±2.3 years. Follow-up evaluations informed a decision to later operate on five patients for a diagnosis of a growing skull fracture. For these patients, the cranial limb of their fracture most often extended obliquely across the frontal bone, with an inferior extension that irregularly disrupted the orbital roof and walls.

CONCLUSIONS: This series of pediatric facial fractures near consistently demonstrated oblique fracture patterns, in contrast to the typical adult fracture patterns described by LeFort. The main determinant of these patterns is thought to be the immature anatomy of the pediatric skull and face. The rapidly growing skull and brain further predispose these patients to serious complications, in particular growing skull fractures.

89 EARLY DISTRACTION AT PIERRE ROBIN SYNDROME PATIENTS: 15 YEARS FOLLOW UP

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BACKGROUND & PURPOSE: Since the beginning of 90´s mandibular distraction (DO) was adopted as a useful tool to treat patients with severe mandibular hypoplasia. Unless many teams have been sceptic to perform DO at neonatal period because there were not long term follow up studies. Lip-tongue adhesion, nasopharyngeal tube, tracheotomy, between others has been used to management airway obstruction of Pierre Robin patients with not successful results. PURPOSE: To report our experience and results after long term follow up of Pierre Robin patients that were performed early distraction to improve airway obstruction

METHODS: This prospective study involved a consecutive PRS infants with severe mandibular hypoplasia and airway obstruction that were performed mandibular distraction between 1997 and 2012. After DO we registered: airway condition before and after cleft palate closure, oral feeding, presence of GER, dentition characteristic / eruption, skeletal growth evolution and language development.

RESULTS: 67 PRS patients were performed DO before 3 months age. 100% of the cases improving airway obstruction (even 3 previously tracheostomized patients). Mean age of cleft palate closure was 10 months with no cases of respiratory obstruction after surgery. None cases required a second DO procedure. Weight charts showed significant weight gain, improvement of oral feeding and GER. Language development and VPI was similar to patients with isolated cleft palate. Primary and permanent dentition evolution was normally in eruption and teeth characteristics. No alteration of mandibular morphology and growth direction was found in our series

CONCLUSIONS: Mandibular distraction at early age has shown to be a successful procedure to improve airway obstruction, oral feeding, language development with no alteration of dentition and mandibular growth, at long term follow up.

90 5 YEAR FOLLOW-UP OF MIDFACE DISTRACTION IN GROWING CHILDREN WITH SYNDROMIC CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Maxillary skeletal position in patients with syndromic craniosynostosis after midface distraction has been shown to be stable 1 year postoperatively. The purpose of this study is to assess midfacial position in the growing child with craniosynostosis 5 years after Le Fort III advancement with a rigid external device (RED).

METHODS: Seventeen patients were identified to have the diagnosis of syndromic craniosynostosis and who underwent a Le Fort III osteotomy with midface advancement. There were 10 males and 7 females, 7 patients had Crouzon syndrome, 5 had Apert syndrome, and 5 had Pfeiffer syndrome. A standard subcranial Le Fort III osteotomy was performed and the midface advanced using forces at the occlusal splint and the zygomatic/maxillary anchor screws. Cephalometric analysis was performed to assess the position of the maxilla over time.

RESULTS: Immediately after device removal, orbitale advanced 13.67 mm along the x axis and downward 1.70 mm along the y axis. Point A advanced 15.97 mm along the x axis and downward 1.14 mm along the y axis. The greatest average movement was at the level of the upper incisal edge, 16.5 mm along the x axis and downward 1.94 mm along the y axis. At 1 year post-distraction, both orbitale and point A had advanced an additional 0.47 mm and 0.24 mm along the x axis and downward 0.58 mm and 1.78 mm along the y axis respectively. The upper incisal edge moved posterior 0.60 mm along the x axis and downward 3.46 mm along the y axis. At 5 years post-distraction, orbitale moved posterior 0.58 mm, point A advanced an additional 2.08 mm and the upper incisal point advanced 1.93 mm along the x axis. Orbitale, point A and upper incisal point moved downward 3.23, 5.20, and 6.35 along the y axis respectively. We also found that the maxillary and mandibular skeletal discrepancy improved over the 5 year period.

CONCLUSIONS: After significant Le Fort III advancement, the maxillary position remains stable and continues to advance minimally along the x axis and demonstrates more growth along the y axis over the long term.

91 SUCCESSFUL NEONATAL MANDIBULAR DISTRACTION OSTEOGENESIS IN PATIENTS WITH CONCOMITANT LARYNGOMALACIA

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BACKGROUND & PURPOSE: Generalized protocols in the treatment of Robin Sequence (RS) consider the presence of laryngomalacia as a contraindication to mandibular distraction osteogenesis (MDO). Therefore, little data exist on outcomes in this setting. To avoid tracheostomy, distraction was performed in 11 infants with RS and laryngomalacia; this experience is reported here.

METHODS: An 8-year (2005-2013) retrospective review of infants with RS and laryngomalacia who underwent MDO at a tertiary care children's hospital was performed. Patients were excluded if they possessed a lower airway anomaly other than laryngomalacia, including tracheomalacia, tracheal web or ring, subglottic stenosis, and vocal cord paralysis. Laryngomalacia was identified on laryngoscopy prior to MDO. Laser supraglottoplasty was performed at the discretion of the otolaryngologist. Variables collected included age at distraction, preoperative and postoperative AHI, syndromic diagnosis or genetic anomalies, cardiac, central nervous system (CNS), and gastrointestinal (GI) abnormalities. The primary outcomes measured were avoidance or decannulation of tracheostomy and decrease in post-operative AHI.

RESULTS: Eleven infants met inclusion criteria. Mean follow up was 28 months. 18.2% of patients had a syndromic diagnosis, 36.4% cardiac, 9.1% CNS, and 72.7% GI abnormalities. Mean age at time of MDO for patients without prior tracheostomy was 1.7 mo. 60% of patients underwent supraglottoplasty. Mean preoperative AHI was 50.3±32.3 and mean postoperative AHI was 7.7±4.8 (p=0.002). The mean difference between preoperative and postoperative AHI was 42.7±35.2. All patients without a tracheostomy prior to intervention avoided tracheostomy after MDO. One

patient had a tracheostomy prior to MDO and was subsequently decannulated. One patient died 1 year after MDO due to complex congenital heart disease.

CONCLUSIONS: This study describes a series of patients with RS and laryngomalacia treated successfully with MDO. To our knowledge this is the first report of patients undergoing MDO in the setting of laryngomalacia. These data suggest that infants with laryngomalacia should not be discounted from having MDO to treat upper airway obstruction.

92 MINORITY AND PUBLIC INSURANCE STATUS: IS THERE A DELAY TO ALVEOLAR BONE GRAFTING SURGERY?

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BACKGROUND & PURPOSE: Clefts of the lip and palate are repaired in infancy, but full rehabilitation is not complete until alveolar bone grafting (ABG). ABG surgery affords many clinical advantages including stability of maxillary segments and bony support for tooth eruption. To achieve optimal results, ABG is performed prior to the eruption of permanent teeth into the cleft site. When delayed, ABG can delay orthodontic treatment, oral rehabilitation, and worsen overall aesthetic outcomes. Studies have documented disparities in access to cleft care, but few have investigated ABG surgery.

METHODS: We conducted a retrospective study of all patients receiving ABG surgery from January 2003 to January 2013 at a large, urban cleft center. Patient charts were reviewed for race/ethnicity, insurance type, as well as dates of birth and ABG surgery. Race/ethnicity data were defined as Caucasian, Hispanic, or African American. Minority race status included Hispanic and African American. Insurance status was defined as public or private payer. Patients were excluded from analysis if they had an underlying genetic syndrome or if they transferred from another institution prior to four years of age. For purposes of comparison, a two-tailed student's t test was employed with P values <0.05 considered significant.

RESULTS: A total of 419 patients underwent ABG surgery during the study period and 263 met inclusion criteria. The mean age of ABG surgery in our cohort was 8.10 +/- 2.32 years and 62.4% were male (164/263). Patients with minority status received delayed ABG surgery compared to white patients (9.33 vs 7.95 years, P<0.01). There was no difference in age at ABG surgery in patients with public insurance status compared to private insurance (8.62 vs 7.98 years, P=0.20).

CONCLUSIONS: This preliminary study shows a 16 month delay in ABG surgery for children with minority race status. Public payer status was not associated with delayed ABG surgery. Greater attention may be required to ensure patients with minority race status receive timely delivery of cleft care.

93 CRANIAL BONE GRAFTING FOR ALVEOLAR CLEFTS: A 25- YEAR REVIEW OF OUTCOMES

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BACKGROUND & PURPOSE: Cranial bone grafting for an alveolar cleft obtains membranous bone from a low morbidity donor site. Although iliac crest bone is the favored donor site there are no objective analysis of 3D radiological outcomes with cranial bone grafting and no studies evaluating complications and long-term outcomes in a large series of patients undergoing cranial bone grafting.

METHODS: A retrospective chart review was conducted on patients who underwent alveolar bone grafting from the cranium over a twenty-five year period by a single surgeon. Data collected included patient characteristics, complications and clinical outcomes. Radiological analysis of graft outcomes was determined using Amira volume-rendering software on the most recent ten consecutive patients.

RESULTS: Our study cohort was 308 patients, with an average age of 11.5 years. Complications involved harvesting the graft in 3.5%, donor site in 1% and recipient site in 17.2%. Regrafting was required in 7.1%, with a clinical success rate of 92.9%. The average alveolar defect was 1.19 mL preoperatively and 0.19 mL postoperatively with 85% fill of the cleft defect by radiologic analysis.

CONCLUSIONS: Cranial bone grafting for the alveolar cleft is a low morbidity operation and has similar success to iliac crest bone graft and should be considered more often as a viable option for the alveolar cleft patient.

94 QUALITATIVE ANALYSIS OF MESIAL AND DISTAL ALVEOLAR BONE OF MAXILLARY CANINES MOVED TO GRAFTED ALVEOLAR CLEFT: A TOMOGRAPHIC EVALUATION

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BACKGROUND & PURPOSE: The treatment protocol of patients with complete clefts is based on the primary plastic surgeries, the alveolar bone graft surgery followed by orthodontic treatment, which usually evolves the mesialization of the permanent canine to the missing lateral incisor region. Although it has been the main protocol for years, the surrounding alveolar bone healthiness remains the major concern for orthodontists. With a Cone-Beam computed tomography (CBCT) exam, it is possible to evaluate the periodontal morphology accurately. Purpose: the aim of this study was to qualitatively assess by means of CBCT imaging the mesial and distal alveolar bone of teeth orthodontically moved into the grafted area and compare it to the permanent canine in the non-cleft side.

METHODS: The sample comprised 30 CBCT exams of patients with unilateral alveolar clefts that had been submitted to alveolar bone graft surgery and comprehensive orthodontic treatment. The exams were assessed in the Nemoscan Software (Nemotec Inc., Madrid, Spain). The exams were positioned with the assessed tooth perpendicular to the horizontal plane for each axial image. The qualitative assessment was performed in three levels (3, 6 and 9mm) from the cement-enamel junction by means of indexes varying from 0 (total absence of bone) to 4 (anatomically normal bone morphology). Three previously calibrated evaluators assessed the images. The statistical analyzes were perfomed by the Wilcoxon test.

RESULTS: the mesial aspect of the canines in the non-cleft side showed statistically better results than the cleft side canine in all 3 levels. The distal aspect of the canines in the non-cleft side showed a statistically better result than the contralateral only 3mm from the cemento-enamel junction. The 6mm and 9mm levels showed similar results between the canines in the cleft and non-cleft side.

CONCLUSIONS: the results suggests that despite the bone graft provides a better bone condition to the teeth adjacent to the cleft it might occur significant bone defects that must be considered, proponing the importance of a very low forces and a rigid periodontal control.

95 PERIODONTAL MORPHOLOGY OF CENTRAL INCISORS OF PATIENTS WITH UNILATERAL ALVEOLAR CLEFT: A CBCT ASSESSMENT

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BACKGROUND & PURPOSE: The treatment protocol of patients with complete clefts is based on the primary plastic surgeries, the alveolar bone graft surgery followed by orthodontic treatment, which usually evolves the mesialization of the permanent canine to the lateral incisor region. Although it has been the main protocol for years, the buccal and lingual alveolar bone thickness and crest level of the central incisors adjacent to the grafted region remains uncertain. With a Cone-Beam computed tomography (CBCT) exam, it is possible to evaluate the periodontal morphology accurately. Purpose: the aim of this study was to assess by means of CBCT imaging the buccal and lingual alveolar bone thickness and crest level of the central incisor in the cleft side and compare it to the permanent central incisor in the noncleft side.

METHODS: the sample comprised 30 CBCT exams of patients with unilateral grafted cleft after comprehensive orthodontic treatment. The mean age was 20 years and 6 months. The exams were assessed in the Nemoscan Software (Nemotec Inc., Madrid, Spain). The buccal and lingual alveolar bone thickness were measured in the axial slice of the trifurcation of the right permanent first molar, and the alveolar bone crest level was measured in the parassagital slice passing through the center of each evaluated tooth. The statistical analyzes were performed by the student t test and the Wilcoxon test.

RESULTS: the central incisor in the cleft side presented a statistically thinner alveolar buccal bone thickness compared to contralateral central incisors. The lingual alveolar bone thickness showed no statistical differences between groups. The alveolar bone crest level showed values varying from 0mm to 3.81mm, however most of the measures were between 1mm and 3mm. There was no statistically difference between the cleft side and contralateral central incisors.

CONCLUSIONS: the central incisors adjacent to the grafted cleft region presents a thinner buccal bone thickness but similar lingual bone thickness and crest level compared to the contralateral central incisors.

96 NEW PERSPECTIVES TO PERFORM BONE TISSUE ENGINEERING FOR ALVEOLAR BONE GRAFT TO CLEFT LIP AND PALATE PATIENTS USING NON INVASIVE SOURCES OF STEM CELLS

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BACKGROUND & PURPOSE: Cleft lip and palate (CLP), one of the most frequent congenital malformations, affects the alveolar bone in the great majority of the cases, and the reconstruction of this defect still represents a challenge in the rehabilitation of these patients. The gold standard in alveolar bone reconstruction is autogenous bone grafts. However, these surgical procedures may be subjected to complications such as donor area morbidity, post-surgical reabsorption and infections. To circumvent these problems, researchers have been focusing on the development of bone tissue engineering strategies and osteogenic substances that may offer alternative methods with minimal or no donor site morbidity for perform bone grafts. The purpose of this study is identify non-invasive sources of mesenchymal stem cells with osteogenic potential to be used in bone tissue engineering for Cleft Lip and Palate patients.

METHODS: To isolate the mesenchymal stem cells from non invasive sources we used Orbicular Oris Muscle (OOM) and Levator Palatine Muscle (LPM) fragments , which are regularly discarded during surgery repair of Cleft lip and palate patients (cheiloplasty and palatoplasty). We also used dental pulp (DP) obtained from deciduous teeth of Cleft lip and palate patients to isolate the mesenchymal stem cells. The pre-plating technique was used to obtain mesenchymal stem cells from these tissues (OOM,LPM and DP) (Bueno et al, 2009). The mesenchymal stem cells were characterized through flow cytometry analysis. They were also induced, under appropriate cell culture conditions, to osteogenic, chondrogenic, adipogenic and skeletal muscle cell differentiation that were evidenced by immunohistochemistry. To evaluate “in vivo” osteogenic potential of these mesenchymal stem cells obtained from non invasive tissues they were associated with a collagen membrane and they were transplanted to craniofacial bone defect in animal model.

RESULTS: The flow cytometry analysis showed that the mesenchymal stem cells obtained from non invasive sources (OOM, LPM and DP) were mainly positively marked for five mesenchymal stem cell antigens (CD29, CD90, CD105, CD73,CD166), while negative for hematopoietic (CD45) and endothelial cell marker(CD31). After induction under appropriate cell culture conditions, these mesenchymal cells obtained from OOM, LPM and DP were capable to undergo chondrogenic, adipogenic, osteogenic, and skeletal muscle cell differentiation, as evidenced by immunohistochemistry. We also demonstrated that these cells together with a collagen membrane lead to bone tissue reconstruction in animal model.

CONCLUSIONS: The cells obtained from OOM, LPM and DP are Mesenchymal stem cells and they have osteogenic potential “in vitro “and “in vivo”. Therefore, they represent a promising source of stem cells to be used in alveolar bone grafting treatment (bone tissue engineering), particularly in young CLP patients. Recently we obtained ethical permission to start the clinical trials in using these cells.

97 UTILIZING A SURGICALLY CREATED ALVEOLAR CLEFT MODEL IN JUVENILE SWINE TO TEST STEM CELL-BASED TREATMENT STRATEGIES

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BACKGROUND & PURPOSE: Congenital craniofacial malformations involving bone occur in 1:250 live births. Historically, reconstruction of these defects has relied on autologous bone grafting. Tissue engineering offers a novel alternative to this strategy. Our engineering efforts utilize mesenchymal stem cells (MSCs) from the umbilical cord (UC) grown on nanofiber scaffolds. Our preference for large animal model is the swine; like humans, swine are omnivores, with similar size and function of the facial skeleton, making them ideal to test tissue engineered bone. In this study, we utilize a previously reported juvenile swine alveolar cleft model to test autologous UC MSC bone generation.

METHODS: MSCs were isolated for autologous implantation from swine umbilical cords (UC) using an explant technique, transduced using adeno-associated virus (AAV) green fluorescent protein (GFP), seeded onto electrospun poly-lactic co-glycolic acid (PLGA) nanofiber scaffolds, and cultured in either growth or osteoinduction media for 1week. Four-week-old pigs (n=7) underwent survival surgery to confirm the dimensions of a critical-sized alveolar cleft defect, to determine bone generation with cancellous bone grafting, and to test the efficacy of undifferentiated (n=2) or differentiated (n=2) MCS-generated bone within the maxillary defect. All pigs were sacrificed at 1 month. Computed tomography (CT) scans were obtained at initial surgery and at sacrifice. ITK Snap and MIMICs were used to calculate bone densities and volume fill in the surgically created clefts. Swine weight and maxillary length were determined to normalize bone formation in the surgically created cleft. Histological evaluation and mechanical testing were performed on bone samples.

RESULTS: All surgically created clefts healed without complication. Critical sized defects, which approached 2 cm did not heal without treatment. Volume for new bone formation was lowest for cancellous bone treatment (388 mm3), followed by undifferentiated MSCs (426.985 mm3), and differentiated MSCs (730.24 mm3). Histological evaluation confirmed bone formation in all three treatment modalities.

CONCLUSIONS: This study uses a previously developed juvenile porcine unilateral alveolar cleft model with critical-sized defect of 2 cm to determine efficacy of autologous UC MSC-based therapies for treatment of the maxillary cleft. Both differentiated and undifferentiated UC MSCs generated bone within the surgically created cleft that is comparable to cancellous bone treatment. Ex vivo osteoinduced MSCs appear to result in better bone formation, and may eventually provide an alternative treatment modality for the alveolar cleft.

98 IS PLATLETS RICH FIBRIN (PRF) ENHANCING MAXILLARY ALVEOLAR CLEFT RECONSTRUCTION

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BACKGROUND & PURPOSE: Recently, Platelet-rich fibrin (PRF) was described as a second-generation platelet concentrate. PRF is known as a rich source of autologous cytokines and growth factors and universally used for tissue regeneration in current clinical medicine. Objective: evaluation of the effect of platelet rich fibrin (PRF) on the quality and the quantity of bone formation in unilateral maxillary alveolar cleft reconstruction.

METHODS: Twenty four patients with unilateral alveolar cleft underwent reconstruction; Group I includes 12 patients grafted with PRF combined with autogenous anterior iliac crest bone graft (AIC). Group II includes 12 patients were grafted using autogenously AIC bone graft alone (control group). Computed tomography (C.T.) was made to assess the quality and quantity of the newly formed bone.

RESULTS: Sufficient bone bridging was achieved in both groups, The percentage of newly formed bone(quantity) in group A ranged from 79.74% to 88.4% with mean percentage of 82.6 %±3.9 %.While in group B, The percentage of bone formation ranged from 60.3 % to 76.4 % with mean percentage of 68.38 %± 6.67 %, the statistical results showed that there was a statistically significant increase in percentage of the newly formed bone in group A (PRF+AIC) than in group B (AIC), The mean bone density(quality) of the newly formed bone of group A was found to be lower than that of group B but not statistically significant, p=>or<0.05.

CONCLUSIONS: PRF in combination with autogenous bone was beneficial in improving the volume of the newly formed bone in alveolar cleft reconstruction.

99 DIFFERENTIAL EFFECTS OF INFLAMMATORY MEDIATORS TNFA, TGFB1 ON CELLULAR DIFFERENTIATION IN A MURINE IN VITRO MODEL OF HETEROTOPIC OSSIFICATION

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BACKGROUND & PURPOSE: Heterotopic ossification (HO) is a pathologic condition of bone formation in extremity muscles. Systemic and local inflammatory conditions acting on muscle-derived progenitor cells (MDCs) may either support or alter myogenic differentiation and promote pathologic chondrogenic or osteogenic differentiation. The aim of this study is to evaluate the effects of inflammatory mediators (TNFα, TGFβ1) on MDC myogenic, chondrogenic, and osteogenic differentiation.

METHODS: Primary mouse muscle cells were isolated from 8-week-old C57B/6J mice. Hindlimb muscles were sterilely processed and pre-plating on collagen-coated flasks for 2 hours to minimize fibroblasts. The non-adherent mixed population of MDCs was cultured in F-10 growth medium with no greater than 3-4 passages for amplification. Four populations of cells were analyzed via FACS for surface markers. 100,000 cells per well were cultured in

DMEM-based proliferation medium (PM) alone or with 1 ng/ml TNFα or with 5 ng/ml of TGFβ1 alone or in various combinations. Samples were collected after 3 days. RNA was isolated reverse transcribed to cDNA. Quantitative PCR analysis of MyoD, Sox9, and Osx, which are markers of myogenic, chondrogenic, osteogenic differentiation, was performed. Changes in target gene expression were expressed relative to untreated MDCs with expression normalized to GAPDH.

RESULTS: FACS analysis revealed a mixed population of cells, with high Sca-1 and CD34 expression and low CD31, CD 56, CD144 and CD146 expression. After 3 days, all isolations of MDCs cultured with TNFα demonstrated unaffected expression of MyoD (1.02±0.50), Sox9 (0.56±0.30) and decreased expression of Osx (0.19±0.07). TGFβ1 cultured cells demonstrated decreased expression of MyoD (0.236±0.017), Sox9 (0.151±0.023) and Osx (0.001±0.002). Cells cultured with combined with TNFα/ TGFβ1 demonstrated decreased expression of MyoD (0.158±0.036), Sox9 (0.131±0.020) and Osx (0.127±0.027).

CONCLUSIONS: We have demonstrated that systemic inflammatory mediators can significantly affect MDCs transcription of myogenic, chondrogenic, and osteogenic differentiation factors. TNFα may protect against pathologic differentiation as it did not significantly affect in vitro myogenic or chondrogenic differentiation but suppressed osteogenic differentiation. Cells cultured in TGFβ1 alone demonstrated decreased in vitro myogenic, chondrogenic, and osteogenic differentiation. Cells cultured with both TNFα/ TGFβ1 demonstrated similar in vitro myogenic, chondrogenic, and osteogenic suppression as cells treated with TGFβ1 alone.

100 TGFB1 INHIBITS BMP2 MEDIATED OSTEOGENIC DIFFERENTIATION IN A PRIMARY MURINE MUSCLE CELL IN VITRO MODEL OF HETEROTOPIC OSSIFICATION

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BACKGROUND & PURPOSE: Heterotopic ossification (HO) is pathologic bone formation in extremity muscles. Alterations in inflammatory mediators and bone morphogenetic proteins acting on muscle derived progenitor cells (MDCs) are thought to be critical for HO formation. The aim of this study is to evaluate the effects of bone morphogenetic protein (BMP2) and inflammatory mediators (TNFα, TGFβ1) on MDC osteogenic differentiation.

METHODS: Primary mouse muscle cells were isolated from 8-week-old C57B/6J mice. Hindlimb muscles were sterilely processed, followed by pre-plating on collagen-coated flasks for 2 hours to remove fibroblast. 100,000 cells per well were cultured in DMEM-based proliferation medium (PM) alone or with 50ng/mL of BMP2, with 1 ng/ml TNFα , with 5 ng/ml of TGFβ1 alone or in various combinations. Samples were collected after 3 days. RNA was isolated and reverse transcribed to cDNA. Quantitative PCR for Osx, Alp and Runx2 was performed. Changes in target gene expression were expressed relative to untreated MDCs with expression normalized to GAPDH.

RESULTS: FACS analysis revealed a mixed population of cells, with high Sca-1 and CD34 expression and low CD31, CD 56, CD144 and CD146 expression. Muscle cells cultured with BMP2 demonstrated increased expression of Osx (36.6±25.8), Alp (19.0±4.16) and Runx2 (2.26±0.61) relative to untreated cells. TNFα decreased expression of Osx (0.19±0.002), Alp (0.360±0.15) and Runx2 (0.75±0.18 fold). TGFβ1 demonstrated decreased expression of Osx (0.01±0.07), Alp (0.004±0.0005) and Runx2 (0.59±0.01). Cells cultured with BMP2/TNFα demonstrated increased expression of Osx (19.1±4.39) relative to untreated cells but significantly less than BMP alone (p=0.001). BMP-2 mediated expression of Alp (15.9±2.13) and Runx2 (1.64±0.10) was maintained. BMP2/TGFβ1 treatment demonstrated decreased expression of Osx (0.003±0.001), Alp (0.004±0.0005) and Runx2 (0.56±0.05) from baseline. Combined BMP2/TNFα/TGFβ1 treatment also decreased expression of Osx (1.58±0.52), Alp (0.021±0.006) and Runx2 (0.92±0.10).

CONCLUSIONS: Using a mixed population of primary MDCs we have demonstrated in vitro osteogenic differentiation following application of BMP2. TNFα significantly decreased BMP2 mediated osteogenic changes. We have demonstrated a more robust osteogenic inhibition of BMP2 mediated changes using TGFβ1. TGFβ1 and TNFα agonist therapy may represent a novel therapy for HO. Future studies evaluating changes within the intracellular SMAD pathway may elucidate the mechanism of inhibition.

101 TGF-BETA 3 AND FGF ANTAGONIZE BMP-2-INDUCED OSTEOGENIC DIFFERENTIATION.

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BACKGROUND & PURPOSE: Craniosynostosis is a congenital disorder resulting in premature fusion of the cranial sutures. The transforming growth factor (TGF)-beta superfamily, which includes the bone morphogenic proteins (BMPs) and TGF-beta isoforms, plays an essential role in normal craniofacial development. The relative abundance of TGF-beta superfamily members is thought to influence suture patency, and altered expression of these proteins has been observed in craniosynostotic patient samples and fusing animal sutures. In the present study, we evaluated the interplay between BMP-2 and other growth factors (TGF-beta 2 and 3 and fibroblast growth factor (FGF)) in vitro as a model for management of excessive bone formation as seen in craniosynostosis.

METHODS: Murine C2C12 myoblasts were used in this investigation. Cells were stimulated with BMP-2 (50 ng/mL) with and without TGF-beta2 (25 ng/mL), TGF-beta3 (25 ng/mL) or FGF (25 ng/mL) for 24 hours. Osteogenic differentiation was assessed by qualitative Alkaline Phosphatase (ALP) assay.

RESULTS: Stimulation of C2C12 cells with BMP-2 resulted in elevated ALP staining within 24 hr of culture. Co-stimulation with either TGF-beta3 or FGF, but not TGF-beta2, potently antagonized BMP-2-induced ALP staining.

CONCLUSIONS: These results indicate that TGF–beta3 and FGF can inhibit BMP-induced osteogenic differentiation. This finding may lead to the development of combinatorial growth factor therapies for the management of bone formation in patients with craniosynostosis.

102 VIBRATORY STIMULUS ELICITS BOTH OSTEOGENESIS AND CHONDROGENESIS IN UMBILICAL CORD MESENCHYMAL STEM CELLS

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BACKGROUND & PURPOSE: Previous work in stem cell phenotype manipulation has demonstrated the capacity of tensile strain to induce osteogenesis in mesenchymal stem cells (MSCs), and for compression to induce MSC chondrogenesis. No work has examined the capacity of direct vibratory stimuli on MSC phenotype changes. This study details the design of an in vitro programmable bioreactor to generate precise vibratory stimuli to umbilical cord (UC) MSCs and phenotype modulation with variations in delivered frequencies.

METHODS: Both human and porcine UC MSCs were harvested by explant technique with appropriate IRB and IACUC approval; cells were grown to subconfluence, and subjected to vibratory stimulus using an in vitro bioreactor programmed to deliver vibrations at 1 hertz (htz) or 100 htz for 15 hours per day for a period of 10 days. Positive controls were generated using standard osteogenic and chondrogenic media. At conclusion of the studies, cell cultures were stained with Alizarin red to determine calcium deposition and alcian blue to determine the presence of glycosaminoglycans (GAGS); reverse transcriptase polymerase chain reaction (RT-PCR) was utilized to assess changes in mRNA for BMP-2, Collagen I, and II.

RESULTS: Negative controls did not demonstrate either chondrogenesis or osteogenesis. MSCs subjected to vibratory stimulation at 1 htz stained positive for GAGS and negative for calcium. RT-PCR demonstrated significant up-regulation in the ratio of collagen II/I mRNA (greater than positive controls), suggesting an elastic chondrogenesis. BMP-2 mRNA did not change from baseline. MSCs subjected to 100 htz stimulation demonstrated calcium staining and elevation of BMP-2 mRNA, consistent with osteogenesis (and higher than positive controls). Findings were similar for both human and porcine MSCs.

CONCLUSIONS: Vibratory stimulation at low frequencies induces UC-MSC chondrogenesis; higher frequencies induce osteogenesis. These findings may provide strategies to induce osteogenesis or chondrogenesis in vivo, and importantly, may provide a strategy to inhibit bone formation in conditions of bone overgrowth. Large animal studies are underway to determine translation of these findings to a living host.

103 MANDIBULAR AND MAXILLARY LENGTHS IN FIVE SUBGROUPS OF CLEFT PALATE WITH OR WITHOUT CLEFT LIP

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BACKGROUND & PURPOSE: A short mandible and basal maxilla are common findings in infants with cleft palate with or without cleft lip (CP±CL); however, the possible relation between the extent of clefting and mandibular and maxillary lengths has not been studied. The purpose of the present study was to investigate mandibular and maxillary lengths in five subgroups of CP±CL, including both complete (C) and incomplete (I) clefts.

METHODS: Material: 71 infants with unrepaired UICL (control group) and 227 infants with unrepaired CP±CL: 51 CP and 176 CLP (81 UCCLP, 19 BCCLP, 49 CCP/ICL, 27 ICP/ICL) (age range: 70-100 days). Measurements: mandibular length (MaL: cd-pgn) and basal maxillary length (MxL: ci-pm) in lateral cephalometric X-rays. The method error was estimated by duplicate measurements. Differences between groups were tested using ANOVA and Student's t-test. The level of significance was set at 5%.

RESULTS: The method error was found to be within acceptable limits. Mean MaL: 53.8±3.3mm in controls, 49.1±3.4mm in isolated CP, and 49.8±2.8mm in CLP. MaL was significantly shorter in the total group with CP±CL compared to the controls, however, no significant differences were found between the five subgroups with CP±CL. Mean MxL: 12.5±1.7mm in the controls, 9.9±1.8mm in isolated CP, and 11.2±1.6mm in CLP. MxL was significantly shorter in all groups with CP±CL compared to the control group, and the group with isolated CP had a significantly shorter maxilla than the four subgroups with CLP; however, no significant differences were found between the subgroups with CLP.

CONCLUSIONS: It seems that the primary anomaly in isolated CP and in four subgroups with varying combinations of CLP is characterized by a significant and comparable foreshortening of the mandible in all groups. Furthermore, all groups have a significant foreshortening of the basal maxilla when compared to the norm, and this foreshortening is significantly more pronounced in subjects with isolated CP compared to subjects with varying combinations of CLP. Finally, no significant differences are seen in the length of the basal maxilla between the subgroups with CLP.

104 MICROESTHETIC DENTAL ANALYSIS IN PARENTS OF CHILDREN WITH ORAL CLEFTS

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BACKGROUND & PURPOSE: Nonsyndromic cleft lip and palate (NSCL/P) is a complex trait caused by genetic and environmental factors that interact to produce a wide spectrum of orofacial malformations, including dental anomalies, most of which affect the upper anterior dentition. The underlying genetic etiology of such dental anomalies remains elusive. The purpose of this study is to compare the shape of the maxillary anterior dentition between unaffected parents of children with NSCL/P (cases) and adult controls with no CL/P history to identify dental shape and microesthetic variation within the NSCL/P phenotypic spectrum.

METHODS: Intraoral photographs of 482 individuals (253 cases, 229 controls) collected from 5 sites (Iowa, Texas, Hungary, the Philippines, and Pittsburg, PA) were screened for healthy, non-restored maxillary anterior dentition and were digitized with 26 landmarks. The 2D coordinate data set was submitted to Procrustes analyses and residuals were analyzed via principal components separated by symmetric and asymmetric components of shape variation (Morpho J). Components explaining the most variation were regressed on case-control status via multivariate regression adjusting for age and gender.

RESULTS: Preliminary results indicate the 4 symmetric and 4 asymmetric components (displaying left-right variation) explain 71% and 67% of the variance in the upper anterior dentition respectively. Symmetric principal component 3 (SymmPC3) and asymmetric components 2 (AsymmPC2) and 4 (AsymmPC4), were significantly different ($p<0.05$) by case-control. For SymmPC3, explaining 7% of the variation, cases showed narrower intercanine width an increased inward dental angulation compared to controls. For AsymmPC2, explaining 11% of the variation, cases have more triangular shaped and apically located right laterals. For AsymmPC4, explaining 6% of the variation, cases displayed more diamond shaped left incisors and canines. Controls showed opposite morphology. Additional analyses of micro-esthetic parameters are underway.

CONCLUSIONS: Significant differences in anterior dental morphology were found between cases and controls. The identification of these dental features in carriers of NSCL/P genetic risk further characterizes the phenotypic spectrum of NSCL/P which can enhance the power of genetic studies.

105 AN EXPERIMENTAL STUDY OF PARTICULATE BONE GRAFT FOR SECONDARY INLAY CRANIOPLASTY OVER SCARRED DURA

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BACKGROUND & PURPOSE: Inlay cranioplasty in children is difficult because autologous bone is limited. Cranial particulate bone graft effectively closes defects when placed over normal dura. The purpose of this study was to determine if particulate bone graft will heal when used for secondary cranioplasty over scarred dura.

METHODS: A 17mm x 17mm critical-sized defect was made in the parietal bone of 12 rabbits and allowed to heal. Sixteen weeks post-operatively the 17mm x 17mm critical-sized defect was recreated and managed in two ways: Group I (no implant) (n=6) and Group II (particulate bone graft) (n=6). Particulate graft was obtained using a brace and bit from the frontal bone and placed over the scarred dura. Gross analysis and micro-computed tomography were performed 16 weeks following the cranioplasty to determine the: (1) area of critical-sized defect ossification and (2) thickness of the healed bone graft.

RESULTS: Critical-sized defects treated with particulate bone graft grossly exhibited superior ossification (96.0%; range, 86.5%-100%) compared to those managed without an implant (49.9%; range, 42.6%-54.6%) ($p < 0.0001$). MicroCT examination showed critical-sized defects treated with particulate bone graft healed 91.1% (range, 79.0-97.2%) of the area, while control defects demonstrated inferior ossification 56.9% (range, 40.0-68.3%) ($p < 0.0001$). Critical-sized defects treated with particulate bone graft exhibited thinner bone (2.42mm; range, 1.69-3.30mm) compared to the normal adjacent parietal cranium (4.33mm; range, 3.28-6.20mm) ($p < 0.0001$).

CONCLUSIONS: Particulate bone graft ossifies inlay calvarial defect area over scarred dura, although the bone is thinner than the normal cranium. Clinically, particulate bone graft may be efficacious for secondary inlay cranioplasty.

106 BODY IMAGE DIMENSIONS IN YOUTH WITH CRANIOFACIAL CONDITIONS: GENDER DIFFERENCES AND PARENT VS. SELF RATINGS OF APPEARANCE

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BACKGROUND & PURPOSE: Body image is relevant to understanding quality of life and psychosocial functioning in youth with craniofacial conditions. Previous studies of body image in this population have typically focused on appearance evaluations (e.g., satisfaction with appearance). However, other dimensions of body image, including investment in appearance (importance of appearance to self-worth) and body image disturbance (appearance-related distress and impaired functioning) have yet to be studied in this population. These dimensions can help to identify youth at risk for appearance-related psychosocial problems and potentially serve as intervention targets. The purpose of this study was to compare dimensions of body image in male and female adolescents with craniofacial conditions. A secondary aim was to examine differences in parent- and self-ratings of appearance.

METHODS: As part of a cross-sectional study, 74 adolescents (59% male; age 15.4 ± 1.4 years) completed questionnaires including the Derriford Appearance Scale-59 (DAS) and Body Image Disturbance Questionnaire (BIDQ) which measure body image disturbance; the Multidimensional Body Shape Relations Questionnaire (MBSRQ) which assesses appearance evaluations and investment; and the Satisfaction with Appearance Scale (SWA), a craniofacial-specific measure of appearance satisfaction that has parent and youth versions.

RESULTS: Compared to males, females reported significantly higher levels of body image disturbance on both the BIDQ (1.9 ± 0.7 vs. 1.6 ± 0.7, $p = 0.05$) and the DAS (131.9 ± 39.7 vs. 108.9 ± 29.4, $p = 0.007$) as well as greater investment in appearance (3.5 ± 0.6 vs. 3.0 ± 0.8, $p < 0.004$). No significant differences were found for appearance evaluations between genders or for parent-rated satisfaction with adolescents' appearance. However, parents' ratings on the SWA were significantly higher than adolescents' self-ratings (8.4 ± 1.3 vs. 7.0 ± 1.9, $p< 0.0001$).

CONCLUSIONS: Female adolescents with craniofacial conditions demonstrate differences in body image dimensions compared to males which may put them at greater risk for body image and psychosocial difficulties. These findings also emphasize the importance of obtaining patient ratings rather than parent ratings when measuring appearance outcomes.

107 QUALITY OF LIFE AMONG YOUTH WITH CLEFT: DEVELOPMENTAL INFLUENCES ON PSYCHOSOCIAL FUNCTIONING

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BACKGROUND & PURPOSE: Clinically, differences have been observed in psychosocial functioning over the course of adolescence among youth with cleft. This may reflect age-typical variations in social and emotional functioning based on models of adolescent development, such as those described by Erikson. This study explored the influence of stages of psychosocial development, as indicated by age, on depression, anxiety, self-concept, resilience, and health related quality of life (QOL) among youth with cleft.

METHODS: Six U.S. cleft centers participated in a longitudinal observational study of QOL among youth with cleft. Cross-sectional data were collected using Beck's Youth Inventories (Beck, et. al., 2005), the Pediatric Quality of Life Inventory (Varni, Seid & Rode, 1999), and the Resiliency Scale for Children and Adolescents (Prince-Embury, 2008). 1,200 youth (mean age=11.6 years old (SD=3.1)) were grouped by age: middle childhood (ages 8-11), n = 690; early adolescence (ages 12-15), n = 347; middle adolescence (ages 16-18), n = 124; and late adolescence (ages 19-21), n = 39. GLM was used to explore the association between age group and self-concept, anxiety, depression, resilience and QOL. Secondarily, we explored differences relative to cleft type and surgical status.

RESULTS: The two younger groups reported significantly lower anxiety ($F(3, 1159) = 4.69$, $p = 0.0029$) and depression ($F(3, 1159) = 11.16$, $p < .0001$) than the older groups. Age groups did not differ on self-concept, resilience, or quality of life. Cleft type was not associated with differences in outcomes by age group, but participants recommended for surgery within a year endorsed lower self-concept and resilience and higher anxiety and depression (all p's $< .04$).

CONCLUSIONS: Middle and older adolescence are associated with higher anxiety and depression among youth with cleft, as would be predicted by Erikson's stage of "Identity vs. Role Confusion," during which teens focus on social relationships and developing a sense of self. Coping with cleft may present unique emotional challenges to teens, particularly those undergoing surgical procedures.

108 MODIFIERS AND TRAJECTORIES OF ACADEMIC ACHIEVEMENT OF CHILDREN AND ADOLESCENTS WITH ORAL CLEFTS COMPARED TO CLASSMATES

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BACKGROUND & PURPOSE: Using a population-based sample, we recently showed that children with oral clefts scored lower than their classmates in multiple domains of academic achievement. The goal of this paper is to evaluate modifiers of these achievement gaps, and academic trajectories of children with oral clefts compared to unaffected classmates.

METHODS: The study sample included children with isolated oral clefts born in Iowa from 1983 through 2003 and ascertained by the Iowa Registry for Congenital and Inherited Disorders. A sample of unaffected classmates was matched by sex, school/school district, and month/year of birth. Academic achievement was measured using standardized tests developed by the Iowa Testing Programs. Household characteristics were measured from birth certificate data. The analytical sample included 588 children with clefts (3735 child-grade observations), and 1874 classmates (13159 child-grade observations). Regression models were used to evaluate interactions between achievement gaps and parental age, marital status, and education; maternal prenatal behaviors; and child birth weight and birth order. Trajectory analysis was used to model achievement over grade-level from elementary through high school.

RESULTS: Preliminary analyses showed that children of adolescent mothers experience larger achievement gaps than those born to 20-35 year-old mothers. Other household factors had little effect in modifying gaps. Preliminary trajectory analyses showed that academic achievement was stable for most children with and without clefts. Consistent with previously reported differences, children with oral clefts were more likely than classmates to be in steady, "low achievement" trajectories in Language and Mathematics and less likely to be in "high achievement" trajectories in these areas.

CONCLUSIONS: Preliminary analyses indicate that most measured household characteristics have insignificant effects on observed achievement gaps. Trajectory analyses show that longitudinal trends are stable for most children with and without oral clefts, and that children with oral clefts are less likely to be in steady "high-achievement" trajectories in Language and Mathematics than classmates. Further analyses are underway to examine less frequent, but potentially informative trajectories among children with clefts.

109 PATIENT-REPORTED OUTCOMES FOLLOWING CLEFT SURGERY: A SYSTEMATIC REVIEW

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BACKGROUND & PURPOSE: Cleft lip and/or palate (CLCP) profoundly influences self-perception and social functioning. Although surgical outcomes for CLCP are well described, the optimal approach to measuring patient-reported outcomes (PRO) is unclear. Cleft-specific surveys may capture highly detailed information regarding orofacial health, with less focus on global quality of life and health status. In contrast, generic instruments provide data that can be comparable across conditions and centers, but may lack sensitivity to cleft-specific issues. The purpose of this study is to systematically review the literature regarding the use of cleft-specific versus general assessment tools among patients with CLCP.

METHODS: We reviewed articles from MEDLINE, Embase, and PsycInfo that examined the use of PRO instruments for CLCP. Studies on patients with CLCP of all ages that described the use of patient-completed measures were included. Psychometric properties of each instrument (validity, reliability, and responsiveness) were analyzed and each article was reviewed specifically for instrument utilization and barriers to implementation. A research librarian confirmed the search, and two independent, blinded reviewers performed full-text review.

RESULTS: We identified 1,369 papers and selected forty-five for inclusion. Forty studies utilized generic questionnaires (n=60 instruments), most commonly the Strengths and Difficulties questionnaire (n=7), followed by the Satisfaction with Appearance questionnaire (n=6), Childhood Experience questionnaire (n=5), and Child Behavior Checklist (n=5). Five studies used cleft-specific measures (n=4 instruments), most commonly the Cleft Evaluation Profile. Cleft-specific questionnaires assessed the impact of well-defined factors associated with the cleft on general aspects of the patient's life. Generic instruments first examined aspects of the patient's life as a whole to determine overall psychosocial health accounting for variations in demographic variables common to this patient population.

CONCLUSIONS: To date, no accepted measure of health status among CLCP patients has emerged. Generic instruments could provide data comparable across conditions and centers, but have not been examined rigorously for this use. Further research to understand their performance in this population could provide an opportunity to collect patient-reported outcomes more efficiently and effectively in this population.

110 PRENATAL DIAGNOSIS OF ORAL CLEFTS, EARLY LIFE HEALTHCARE EXPERIENCES, AND MATERNAL WELLBEING

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BACKGROUND & PURPOSE: An increasing percentage of cases with orofacial clefting (OFC) are diagnosed during pregnancy due to advances in prenatal diagnostic technology such as 3D ultrasonography. However, little is known about the advantages or disadvantages of prenatal diagnosis for parents and affected children. This study evaluated the effects of prenatal diagnoses on early life utilization of healthcare services, seeking health information and prenatal and long-term maternal psychosocial wellbeing.We also compared maternal perception of the value of prenatal diagnosis between those who had a diagnosis and those who did not.

METHODS: A sample of 117 families with a child born with non-syndromic OFC in Iowa were enrolled in the study between 2008-2013; 30 cases were prenatally diagnosed. Mothers were interviewed 3-17 years after delivery about their experiences and interactions with the healthcare system during pregnancy and after delivery, their information seeking behaviors, and their preferences towards prenatal diagnosis. They also completed four validated instruments aimed at measuring psychosocial wellbeing: Social Avoidance and Distress (SAD), Fear of Negative Evaluation (FNE), Rosenberg Self Esteem (RSE) and Interpersonal Support Evaluation List (ISEL). Regression analysis was used to compare these outcomes between mothers who received a prenatal

diagnosis and those who did not controlling for maternal age, income, and child's birth order.

RESULTS: Preliminary analyses indicates mothers who received a prenatal diagnosis had more hospitalization days after delivery (p=0.043), pediatric visits (p=0.029) contacts with a craniofacial team (p=0.037) and support groups (p=0.0004) compared to mothers without a prenatal diagnosis. They were more satisfied with the information from providers after delivery (p=0.001) and felt the health professionals were more sensitive to them about OFC (p=0.022). Mothers of prenatally diagnosed cases rated learning of the cleft prior to birth as more helpful than mothers without a prenatal diagnosis (p=0.003).Mothers of prenatally diagnosed cases were more likely to report anxiety (p=0.01) and depression (p =0.05) during pregnancy and distress at time of interview based on the SAD instrument.

CONCLUSIONS: Our preliminary analyses indicate that women who received a prenatal diagnosis showed a greater propensity to seek health care services and information after delivery, which could be considered advantageous, but they experienced greater anxiety and depression during pregnancy and long term distress. These findings highlight the need to pay greater attention to effects of prenatal diagnosis on maternal psychosocial wellbeing given its strong effects on children's health, development and family wellbeing.

111 MOTHERS OF CHILDREN WITH AN OROFACIAL CLEFT: SATISFACTION WITH MOTHERHOOD AND EXPERIENCED STRESS

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BACKGROUND & PURPOSE: In 2010, a study in the Netherlands was done to investigate and compare stress and satisfaction with motherhood of mothers of a child with an orofacial cleft and mothers of a child without an orofacial cleft. A sample of 76 mothers whose children, aged 0-4 years, with no other congenital malformation besides the orofacial cleft, were treated in the academic cleft palate center in Amsterdam, participated. Also a group of 52 mothers of children with no orofacial cleft, staying at a child day care, participated.

METHODS: Both groups of mothers completed two questionnaires. The first questionnaire ('Motherhood Satisfaction Questionnaire') contained 18 items about satisfaction with motherhood, and consisted of two subscales ('Behavior of the child' and 'Support from others'). The second questionnaire (NOSI-k) contained 25 items concerning parental stress. This scale included five subscales ('Fastidiousness', 'Behavior child', 'Competence', 'Fatigue' and 'Difficulties'). All items on the questionnaires were answered on a 6-point scale (from 1 (= totally disagree) to 6 (= totally agree)).

RESULTS: No significant differences were found. Both groups of mothers scored high on both questionnaires, meaning that mothers of a child with an orofacial cleft were equally satisfied and experienced equal stress levels about their motherhood compared to the child day care group. Only the item 'If I have problems with my child or if I am concerned about the future, I can talk it through with family or friends' on the subscale 'Support of others' of the Motherhood Satisfaction questionnaire differed significantly. The regression analysis showed that for the patient group the subscale 'Competence' and for the child day care group the subscale 'Behavior Child' were significant predictors of the 'Satisfaction with Motherhood' grade. No difference was seen at subscale level and for the overall 'Motherhood Satisfaction' questionnaire and 'NOSI-k' questionnaire, among the mothers of a child with an orofacial cleft and the child day care group.

CONCLUSIONS: It was concluded that mothers of children with a cleft did not substantively differ in satisfaction with motherhood and experienced stress compared to mothers of children without a cleft.

112 FAMILY SUPPORT NETWORK NEEDS ASSESSMENT

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BACKGROUND & PURPOSE: Families of children born with craniofacial anomalies encounter unique challenges. The prospect of years of treatment, perceived societal stigmas, exposure to "bullying," and financial/emotional costs of treatment are some of these challenges. While psychosocial intervention on a professional level can aid families coping with these challenges, so too can networking and sharing between parents and children in similar situations. The assumption that families would benefit from mutual support offered through a Family Support Network prompted us to start the development of such a network. In preparation for that we attempted to determine: (1) what kind of support do our families want? (2) how do they want that support delivered? (3) what are the issues most important to them? and (4) do these priorities change as the patients reach new phases of treatment and stages of development.

METHODS: We asked our families to complete a Family Support Network Needs Assessment survey with Likert ratings. In addition to basic demographic information, the survey addressed: (1) the extent to which families needed and desired a Family Support Network; (2) the issues or topics they wished to see addressed; (3) the form they wanted the support to take (i.e., group meetings, social media, phone, etc.); and (4) the frequency, length, and time of desired networking or meetings.

RESULTS: Of the 270 surveys mailed (162 to parents; 108 to patients over age 12), we received 154 responses. Preliminary analysis of data revealed: (1) general interest in a support network ranges from moderate to high in 60% of respondents; (2) families with younger patients expressed higher interest in support; (3) large majority (over 85%) have not participated previously in a support network/group; (4) issues most important to families include advocacy, stages of cleft care, and insurance information.

CONCLUSIONS: Previous attempts by our center to establish a Parent Support Network were not sustainable, perhaps due to lack of accurate information from families about their wants and needs. From the data presented, centers can develop Family Support Networks that are responsive to the real needs, interests, and availability of families.

113 CRANIOFACIAL ABNORMALITIES IN ASSOCIATION WITH THE 22Q11.2 DELETION SYNDROME (22Q11.2DS): BEYOND CLEFTING.

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BACKGROUND & PURPOSE: Introduction: 22q11.2DS is a multisystem disorder involving haploinsufficiency of 30-40 genes and is most frequently associated with congenital heart disease, palatal abnormalities and immunodeficiency. Additional common findings include hypocalcemia, feeding/swallowing issues, renal problems, learning differences and psychiatric illness. Craniofacial teams are generally familiar with the presenting palatal phenotype but are unlikely to consider the diagnosis in the presence of less frequently occurring craniofacial anomalies. Here we report additional associated features, beyond clefting, which often result in referral to Plastic Surgery as the initial point of contact. Familiarity with such associations will likely advance detection of the underlying etiology; improve coordinated care and genetic counseling; and ultimately contribute to important genotype-phenotype correlations.

METHODS: Methods: 1175 individuals with 22q11.2DS have been evaluated since 1992. Uncommon craniofacial findings were noted and some have been reported previously. In addition, 836 records had suitable data to assess the presence or absence of asymmetric crying facies.

RESULTS: Important infrequent (<10%) craniofacial findings included craniosynostosis (5); Goldenhar syndrome; ptosis (4); scleracornea (3); and severe micrognathia (3). More prevalent, asymmetric crying facies was identified in 117/836 (14%).

CONCLUSIONS: Conclusion: This study indicates that there are a number of significant craniofacial abnormalities, beyond palatal differences, found in association with 22q11.2DS which brings patients to the Craniofacial Clinic. Thus we suggest that providers remain alert for findings classically associated with 22q11.2DS such as congenital heart disease, palatal anomalies, feeding difficulties, hypocalcemia, and chronic infection when patients present with craniosynostosis, Goldenhar syndrome, ptosis, scleracornea or severe micrognathia. Additionally, based on this evidence, we strongly recommend evaluation for associated features, such as congenital heart disease, as well as 22q11.2 deletion studies, as a first line of investigation in all patients with asymmetric crying facies. Lastly, rare findings in association with 22q11.2DS may well inform our understanding of the etiology of apparently isolated anomalies, via genotype-phenotype correlations, much like the recent report of four children with 22q11.2DS and uncommon features, including one with bilateral cleft lip and palate, and both a 22q11.2 deletion and a mutation in SNAP29 on the remaining 22q11.2 allele hence providing a convincing argument for tracking and reporting atypical patients.

114 PHYSICAL FUNCTION IN INDIVIDUALS WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: 22q11.2 deletion syndrome (aka VCFS) is the most common micro deletion syndrome identified in humans with an estimated incidence of one in 2,000 to 7,000 live births. The syndrome has a multisystem manifestation impacting nearly every organ system and developmental function. The clinical course and presentation are highly variable and vary from patient to patient and may include over 180 clinical findings. Previous research indicates children with 22q11.2 deletion syndrome exhibit developmental delay. However, to date, there is no research that has examined physical function in children with 22q11.2 deletion syndrome. Physical function can be defined as the combination of strength, mobility, balance, walking and endurance for activities of daily living. The purpose of this study was to examine and describe the physical function in children with 22q11.2 deletion syndrome as compared to physical function in individuals who are typically developing.

METHODS: The study sample consisted of 24 subjects who have been diagnosed with 22q11.2 deletion syndrome, and 19 healthy control subjects without the deletion. Within the group with 22q11.2 deletion syndrome, 11 individuals were <9 years of age, 9 individuals were 10-19 years of age, and 4 individuals were > 20 years of age. Following informed consent, demographic information and medical history relating to 22q11.2 deletion syndrome was collected. Physical function was assessed using multiple tasks; Timed Up and Go (TUG) test, Five-Times-Sit-to-Stand Test, Single Leg Stance, handheld dynamometer to measure grip strength, 2-minute walk test and GAITRite. Differences in physical function between groups and within the group with 22q11.2 deletion syndrome were tested using an ANOVA test.

RESULTS: Preliminary data suggests significant differences between the group with 22q11.2 deletion syndrome and the control group were identified in Timed-Up & Go (7.40±1.45 vs 6.33±1.04; p < .01); right single leg stance (12.62±12.81 vs 52.27±34.54; p < .001); left single leg stance (10.09±9.02 vs 52.60±36.19; p < .001); and 2-minute walk test (469.08±74.09 vs 580.58±105.07; p < .001). The group with 22q11.2 deletion syndrome was divided into 3 age groups; <9 years, 10-19 years of age, and > 20 years. Significant differences between the groups were identified in the 2 minute walk (p<.006), right grip strength (p<.000) and left grip strength (p<.000). Results from the GAITRite will also be discussed.

CONCLUSIONS: The results of this study demonstrate that individuals with 22q11.2 deletion syndrome present with decreased physical function as compared to individuals without the syndrome. Within the population with 22q11.2 deletion syndrome, there appears to be a decrease in physical function with age. Continued assessment of physical function across the lifespan is necessary for the population with 22q11.2 deletion syndrome in order to maintain physical abilities.

115 SPEECH CHARACTERISTICS IN VCFS (22Q11.2DS)

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BACKGROUND & PURPOSE: There is increasing evidence in the literature to suggest that VCFS is a neurodevelopmental disorder characterized by cognitive-linguistic deficits, due to co-occurring phonological disorders, in addition to the impact of inadequate velopharyngeal function on resonance. The purpose of the present study was to assess the prevalence of speech disorders in VCFS and its relation to the platybasia phenomenon and other palatopharyngeal anomalies.

METHODS: 132 individuals with VCFS were included in this retrospective case analysis. The subjects were stratified into four groups based on the presence of the following cleft-palatal anomalies: (1) overt cleft palate (CP), (2) submucous cleft palate (SMCP), (3) occult submucous cleft palate (OSMCP) and (4) no cleft palate anomalies (NCP). The relationship between cephalometric measurements and nasopharyngeal space, cleft type, and speech disorders was investigated

RESULTS: The prevalence of OSMCP found to be the highest, 56.10%, followed by SMCP (19.70%), CP (13.60%) and NCP anomalies (10.60%). The cranial-base angle of individuals with VCFS ranged between 124 o to 149o. Of the total sample, 52.20 % had platybasia. Of the 47.80% subjects with no platybasia, 10 subjects were diagnosed with acute angulation of the skull base. No significant difference in the cranial-base angle was found between the five cleft-palatal anomalies. Of the speech sound disorders, the prevalence of omission process and syllable simplification process was found to be relatively high.

CONCLUSIONS: Patients with VCFS demonstrate a unique profile of speech impairment and multiple anatomical differences of the velopharynx influenced by cranial-base flexure. Because the omission process is thought to be more sensitive to cognitive-linguistic deficits, consideration should be given to prioritizing treatment regarding this impairment.

116 SELF-REPORTED SPEECH PROBLEMS IN ADOLESCENTS AND YOUNG ADULTS WITH 22Q11.2 DELETION SYNDROME

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BACKGROUND & PURPOSE: Speech problems are a common clinical feature in 22q11.2 deletion syndrome (22q11DS). Naturally, parents of young, newly diagnosed patients inquire what to expect regarding the clinical course and therapy. It is unclear how many patients undergo speech and language therapy and pharyngoplasty and whether these interventions normalize the speech. The objectives of this study were to 1) inventory the speech history and current self-reported speech of adolescents and young adults, and 2) examine possible variables influencing the current speech ratings including cleft palate, surgery, speech and language therapy, intelligence quotient, and age at assessment.

METHODS: To do this, a cohort of 50 young adults with 22q11DS (ages 12-26 years, mean 18 years, 67% female) filled in questionnaires. A psychologist administered an age-appropriate intelligence quotient test. The demographics, histories and intelligence of patients with normal speech (speech rating =1) were compared to those with different speech (speech rating >1).

RESULTS: Of the 50 patients, a minority (29%) had a cleft palate, nearly half (46%) underwent a pharyngoplasty, and all (100%) had speech and language therapy. Poorer speech ratings were correlated with more years of speech and language therapy (Spearman correlation =0.418, p=0.004). Only 34% had normal speech ratings. The groups with normal and different speech were not significantly different regarding age, gender, a history of cleft palate, surgery or speech and language therapy, and intelligence quotient.

CONCLUSIONS: In conclusion, all adolescents and young adults with 22q11DS had undergone speech and language therapy and nearly half underwent pharyngoplasties. Only 34% attained normal speech ratings. Those with poorer speech ratings continued speech and language therapy for more years.

117 IRF6-RELATED MUTATIONS IN VAN DER WOUDE SYNDROME AND POPLITEAL PTERYGIUM SYNDROME FAMILIES FROM NIGERIA AND ETHIOPIA

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BACKGROUND & PURPOSE: Orofacial clefts (OFC) are complex genetic traits that are often classified as syndromic or non-syndromic clefts. Over 500 types of syndromic clefts are listed in the Online Mendelian Inheritance in Man (OMIM) database and Van der Woude syndrome (VWS) is one of the most common types, accounting for 2% of all OFC. Popliteal pterygium syndrome (PPS) is considered to be a more severe form of VWS. Mutations in the IRF6 gene have been reported to cause VWS and PPS in all the studied populations. In this study, we report findings from families with VWS and PPS in sub Saharan Africa.

METHODS: We screened the DNA of eight families with VWS and one family with PPS from Nigeria and Ethiopia by Sanger sequencing of the most commonly affected exons in IRF6 (exons 3, 4, 7 and 9).

RESULTS: In the families with VWS, we found a novel nonsense variant in exon 4 (p.Lys66X), a novel splice-site variant in exon 4 (p.Pro126Pro), a novel missense variant in exon 4 (p.Phe230Leu), a previously reported splice-site variant in exon 7 that changes the acceptor splice-site and a known missense variant in exon 7 (p.Leu251Pro). A previously known missense variant was found in exon 4 (p.Arg84His) in the PPS family. All the mutations segregate in the families.

CONCLUSIONS: Our data confirms the presence of IRF6-related VWS and PPS in sub-Saharan Africa and highlights the importance of screening known genes for etiological mutations when studying diverse global populations.

118 POSITIVE SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN WITH SYNDROMIC CLEFT LIP AND PALATE.

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BACKGROUND & PURPOSE: The prevalence of obstructive sleep apnea (OSA) in the general pediatric population is 2% to 3%. Craniofacial differences including cleft lip and palate (CLP) place patients at phenotypic risk for OSA. 30% of CLP occurs in the context of an underlying chromosomal abnormality, and this study aims to determine the frequency of positive screening for OSA in syndromic CLP.

METHODS: An IRB approved retrospective chart review was completed on consecutive patients presenting to a large, urban cleft center for treatment from January 2011 to August 2013. Patients and families with syndromic CLP answered 22 "Yes/No" questions for the Pediatric Sleep Questionnaire (PSQ). This validated tool has a sensitivity and specificity of 85% and 87% in predicting moderate to severe OSA in otherwise healthy children. Fisher's exact test was utilized to compare the risk of positive OSA screening in a subgroup—children with 22q— compared to other chromosomal abnormalities. P values less than 0.05 were deemed significant.

RESULTS: A total of 886 patients completed the PSQ during the study period and 115 children with CLP and an underlying chromosomal abnormality met inclusion criteria. The mean age at screening was 8.2 +/- 4.51 years (range = 1.92-18.77) and 58% were male (67/115). The overall incidence of positive OSA screening was 35.6% (41/115). The majority of our study cohort (63/115) had 22q deletion syndrome and nearly half (47.6%) of these patients screened positively for OSA. The most commonly reported symptoms were being easily distracted (53.9%), fidgeting with hands or feet (47.8%), and interrupting or intruding on others (47.0%). Children with 22q were at increased risk for positive OSA screening compared to patients with other underlying chromosomal anomalies (47.6% vs 21.1%, P=0.04).

CONCLUSIONS: Children with syndromic CLP, and especially those with 22q, appear to be at increased risk for the development of OSA by this validated screening tool. By screening this at-risk population, we hope to provide for early diagnosis and treatment to prevent long-term sequelae of OSA.

119 A 35-YEAR EXPERIENCE WITH SYNDROMIC CLEFT PALATE REPAIR: OPERATIVE OUTCOMES AND LONG-TERM SPEECH RESULTS.

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BACKGROUND & PURPOSE: Associated medical comorbidities and developmental delays can put syndromic patients with cleft palate at risk for poor speech outcomes. Reported rates of velopharyngeal insufficiency (VPI) vary from 8-64%, and need for secondary VPI surgery from 23-64%, with few studies providing long-term follow-up. The purpose of this study was to describe one institution's long-term experience with a large series of syndromic patients undergoing cleft palate repair.

METHODS: A retrospective review was performed of all patients with syndromic diagnoses who underwent primary Furlow palatoplasty at a large pediatric center from 1975 –2011. Outcomes included post-operative oronasal fistula (ONF) and need for secondary VPI surgery. Speech scores for verbal patients 5 years or older were collected via the Pittsburgh Weighted Values for Speech Symptoms Associated with VPI. Based upon total score, the velophayngeal mechanism was categorized as competent, borderline, or incompetent. Outcomes were analyzed by syndrome, association with Pierre Robin Sequence (sPRS),Veau cleft type, age at repair, and gender.

RESULTS: 132 patients were included with average age at repair of 20.7 months (6-154). Cleft type distribution was 9% submucosal, 16% Veau Class I, 50% class II, 12% class III, and 13% class IV. The overall ONF rate was 4.5%. A total of 45 syndromes were recorded (most common: Stickler syndrome (32), 22q11.2 deletion syndrome (19); association with PRS (44)). 76 patients (58%) had valid speech records available at a minimum of age 5. The average age at last assessment was 10.4 years (5–21). Overall, 60.5% of all patients had a competent velopharyngeal mechanism, 23.7% borderline, and 15.8% an incompetent mechanism. Patients with 22q had relatively poor speech outcomes with no patients demonstrating a competent velopharyngeal mechanism, compared with 71.4% of patients with sPRS (p=0.02) and 73.3% with Stickler Syndrome (p=0.01). Pittsburgh speech scores for patients with sPRS and Stickler syndrome were not statistically different from the remaining cohort. VPI surgery was performed in 11.4% of all patients at average age of 8.3 years (4.0-15.8). 31.6% of patients with 22q underwent secondary VPI surgery, significantly higher than the remainder of the cohort (p=0.01), compared to only 13.6% of patients with sPRS (p=0.57) and 15.6% with Stickler syndrome (p=0.53). Age, Veau class, gender, and ONF did not correlate with speech outcomes.

CONCLUSIONS: This study demonstrates acceptably low rates of post-operative oronasal fistula after palatoplasty in syndromic patients. While overall incidence of VPI surgery is comparable to non-syndromic patients, those with 22q deletions consistently had borderline or incompetent speech mechanisms and a comparatively three-fold higher need for secondary VPI surgery.

120 DURAL TEARS IN CRANIOSYNOSTOSIS REPAIR ARE MORE COMMON IN PATIENTS WITH UNICORONAL CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: Craniosynostosis surgery has risk of dural tears that can lead to complications such as meningitis, pseudomeningocele, or encephalocele. We reviewed our congenital craniosynostosis repairs looking at factors of diagnosis, intraoperative findings, and postoperative outcomes.

METHODS: Consecutive patients undergoing craniosynostosis surgery from 2002 to 2012 were retrospectively reviewed. Patients with incomplete data were excluded. Continuous variables were compared with t-tests, and categorical variables were compared with Fisher exact tests. When multiple categorical comparisons were performed, familywise error rate was controlled with Bonferroni correction.

RESULTS: 79 patients fulfilled the criteria. Dural tears were reported in 15 patients, of which 14 were small tears that were repaired, and 1 was due to purposeful evacuation of a subdural hematoma. The rate of dural tears among syndromic diagnoses were: syndromic 17% (1/6), nonsyndromic 19% (14/73), P=1.0. The rate of dural tears among different diagnoses of suture synostosis: sagittal 7.1% (3/42), metopic 5.9% (1/17), unicoronal 64.3% (9/14), bicoronal 33.3% (1/3), multiple 33.3% (1/3), *P<0.001. Pairwise comparisons, requiring Bonferonni correction of P<0.005 for a familywise error rate of P<0.05, confirmed that the dural tear rate in unicoronal craniosynostosis was significantly greater than sagittal (*P<0.001), and greater than metopic (*P<0.001). The following factors were not significantly different in patients with dural tears (D), compared to no dural tears (ND): age (D 26.3 months, ND 17.2, P=0.365), procedure time (D 335 minutes, ND 304, P=0.482), estimated blood loss (D 260 mL, ND 250, P=0.888), length of stay in PICU (D 2.8 days, ND 1.4, P=0.410), length of entire hospital stay (D 6.2, ND 4.1, P=0.214). None of the patients with dural tears had sequelae of meningitis, pseudomeningocele, or encephalocele.

CONCLUSIONS: In our series, dural tears were more associated with unicoronal craniosynostosis than sagittal or metopic. Dural tears were not related to preoperative variables such as syndrome or age, and did not appear to affect outcomes such procedure time, blood loss, intensive care unit duration, or hospital length of stay. More significantly, none of the dural tears led to sequelae such as meningitis, pseudomeningocele, or encephalocele.

121 FACIAL ASYMMETRY IN CHILDREN SURGICALLY TREATED FOR UNICORONAL SYNOSTOSIS IN INFANCY

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BACKGROUND & PURPOSE: The purpose was to quantitatively assess spatially detailed facial asymmetry in 3D in children with unicoronal synostosis (UCS) who had undergone surgical reconstruction in infancy.

METHODS: The sample comprised 22 children with UCS (mean age 6.5 yrs; range 1-12.6 yrs), from a mixed ethnic background. All children had undergone surgical reconstruction (mean age 0.8 yrs; range 0.4-1.6 yrs) by bilateral craniotomy with unilateral orbital rim advancement, by the same surgeon. An age and sex matched control group (n=22) was employed. 3D surface scanning was performed using a 3dMDtrio system. Guided by 21 manually placed landmarks, spatially detailed left-right point correspondences were obtained by deforming a symmetric 3D atlas to each individual's surface scan. Point correspondences allowed computation of a detailed map of 3D asymmetry vectors containing information about the amount of asymmetry in the sagittal, vertical and transverse directions, respectively. Mean, SD and maximum values were calculated in the forehead, eye, nose, mouth, chin and cheek regions. Paired Student's t-test was used in order to compare mean values between the UCS and the control group.

RESULTS: The amount of asymmetry in the UCS group was significantly larger than in the control group for all regions studied; largest in the sagittal and vertical planes. The regions with the most pronounced asymmetry were cheeks (mean: 5.5mm; SD: 1.8mm), forehead (mean: 5.0mm; SD: 1.6mm) and eyes (mean: 4.3mm; SD: 1.4mm). The ratio of the mean values (UCS/controls) ranged between 2 and 5, indicating that some of the UCS children showed mean values of asymmetry 5 times larger than their controls. Validation was performed by visual scoring by three experienced observers (correlation coefficient R = 0.81).

CONCLUSIONS: A quantification of spatially detailed 3D facial asymmetry in children treated for UCS showed that remaining asymmetry was present in all face regions, with largest values in the cheek and forehead regions. The method was found to be suitable for clinical follow-up.

122 EVALUATING THE EFFICACY OF AIRWAY EXPANSION USING TRANSCRANIAL VERSUS SUBCRANIAL FACIAL OSTEOTOMIES: A COHORT COMPARISON STUDY BETWEEN MONOBLOC FRONTOFACIAL ADVANCEMENT AND LE FORT III FACIAL ADVANCEMENT

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BACKGROUND & PURPOSE: Differential airway volume expansion comparing transcranial versus subcranial facial advancement procedures remains understudied. Differential airway expansion may occur following frontofacial advancement versus subcranial facial advancement. The aim of this study is to compare differences in airway changes between monobloc/bipartition advancements versus Lefort III advancements.

METHODS: Methods: A 16-month retrospective cohort study comparing airway changes using radiographic data (total airway volume (TAV), nasopharyngeal airway volume (NAV), oropharyngeal airway volume (OAV), and minimal airway areas in the nasopharynx and oropharynx) in patients treated with monobloc/bipartition advancements (Group 1) and Le Fort III advancements (Group 2) was performed. Kawamoto internal distraction devices (KLS Martin, Jacksonville, FL) were used. Computed tomography data was evaluated using Dolphin Imaging Systems (Chatsworth, CA) and OsiriX software (Geneva, Switzerland). Statistical analysis was performed using SPSS 20.0.

RESULTS: In Group 1, four patients (1 female, 3 males, all syndromic) and in Group 2, three patients (3 males, all syndromic) were identified who were treated for airway obstruction and signs of increased cranial pressure (Group 1). Two patients in Group 1 underwent facial bipartition distraction and 2 underwent monobloc distraction. In Group 2, two patients underwent Le Fort III distraction and one patient had a Lefort III/Lefort I combined one-step advancement. Average age was 8.9 years in Group 1 and 15 years in Group 2 (p=0.13). The average radiologic follow-up for Groups 1 and 2 were 4.57 months and 5.28 months, respectively (p=0.78). The average radiographic advancement (body of C2-A) was 12.4mm (10-17) in Group 1 and 12.27 mm (9.9-14.3) in Group 2 (p=0.14). The average unit of volume change (ml) per distance advanced (mm) between Group 1 and 2 was not significant between the NAV (477.2 vs. 491.0, p=0.468), OAV (283.93 vs. 197.3, p=0.443), and TAV (761.1 vs.677.1, p=0.990). The average increase in NAV, OAV, and TAV was 5,374 mm3, 3,463 mm3, and 8,837 mm3 in Group 1 and 5,786 mm3, 2,758mm3, and 8,433 mm3 in Group 2 (p=0.186, 0.734, 0.586). The minimal nasopharyngeal airway area increased in Group 1 (63.7mm2 to 194.6mm2, p=0.068) and in Group 2 (59.6mm2 to 104mm2, p=0.109). The minimal oropharyngeal airway did not significantly change in Group 1 (56.4 mm2 to 74.4 mm2, p=0.144) or Group 2 (89.4 mm2 to 108.4 mm2, p=0.109). All patients in both groups demonstrated resolution of clinical airway obstruction. One major complication occurred in Group 1 (cerebral salt wasting syndrome/seizure) and no major complications occurred in Group 2. There was no mortality in either cohort.

CONCLUSIONS: Airway changes were similarly expanded using either a transcranial or subcranial advancement. Transcranial expansion should be considered for the treatment of concurrent cranial constriction, as both expansions are equally effective treatment for airway expansion.

123 OPTIMIZING TREATMENT OF SAGITTAL SYNOSTOSIS USING DYNAMIC CRANIOPLASTY: A COHORT COMPARISON STUDY BETWEEN REVERSE PI CRANIOPLASTY AND EXTENDED STRIP CRANIOPLASTY

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BACKGROUND & PURPOSE: Background and Purpose: The optimal treatment of early presenting (<1 year old) non-syndromic sagittal synostosis remains controversial. The utility of dynamic shortening of cranial length using a Reverse Pi Cranioplasty (RPC) compared to non-dynamic Extended Strip Cranioplasty (ESC) has not been reported. This study aims to compare radiographic parameters of head shape for patients treated with RPC and ESC in patients less than 12 months of age.

METHODS: A 10-year retrospective cohort study of patients (< 12 months of age) with non-syndromic sagittal synostosis was performed comparing cranial width, length, nasofrontal angles (NFA), and cranial index (CI) changes between RPC (Group 1) and ESC (Group 2) using CT data.

RESULTS: In Group 1, RPC, 13 patients were identified from August 2008-December 2012 (11 male and 2 female, average age 9.4 months, 0 syndromic). In Group 2, ESC, 22 patients were identified from July 2003- May 2012 (18 male and 4 female, average age 3.95 months, 0 syndromic). The average post procedure radiologic follow-up was 1.95 months for RPC and 25.1 months for ESC. In Group 1 (RPC) the average pre- and post-op cranial indices (CI), and length and width measurements were: average CI from 0.71 to 0.82 (p=0.001), average cranial length from 144 mm to 150 mm (p=0.050), and average cranial width from 102 mm to 123 mm (p=0.001). In Group 2 (ESC) the average pre- and post-op CI, and length and width measurements were: average CI from 0.68 to 0.75 (p=0.0001), average cranial length from 138 mm to 157 mm (p=0.000), and average cranial width from 94 mm to 118 mm (p=0.0001). In Group 1 the average pre- and post-op nasofrontal angle increased from 134.3 to 139.6 degrees (p=0.011). In Group 2 the average pre- and post-op nasofrontal angle increased from 127 to 132.2 degrees (p=0.002). Postoperative cranial indices were significantly higher in RPC compared to ESC (0.82 vs. 0.75, p=0.0001). Also, the change in CI between the groups was significantly higher in the RPC group (0.11 vs. 0.07, p=0.009). The change in nasofrontal angles between groups was not significant (p=0.974). All patients in Group 1 (RPC) and Group 2 (ESC) were treated with a single operation. No wound infections, wound dehiscence, or mortality occurred in either group.

CONCLUSIONS: Reverse Pi Cranioplasty more effectively corrected the cranial index abnormality when compared to Extended Strip Cranioplasty. Cranial compression using dynamic Reverse Pi Cranioplasty was not associated with increased morbidity when compared to Extended Strip Cranioplasty. Extended Strip Cranioplasty performed under 9 months of age and Reverse Pi Cranioplasty performed before 12 months equally improved and increased nasofrontal angles without the need for direct frontal bone resection or frontal orbital osteotomy. Both middle third cranial vault procedures significantly improved cranial indices and frontal bossing as measured by the nasofrontal angle.

124 OPEN STRIP CRANIECTOMY, TOTAL CRANIAL VAULT RECONSTRUCTION, AND ENDOSCOPIC STRIP CRANIECTOMY: A RETROSPECTIVE STUDY INCLUDING COST ANALYSIS

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BACKGROUND & PURPOSE: Techniques for repair of sagittal synostosis include total cranial vault reconstruction (TCV), open sagittal strip craniectomy (SS), and endoscopic strip craniectomy followed by helmet therapy (ES). Previous studies looking at outcomes are few and seldom included cost analysis. The purpose of our study was to review and compare the outcomes for the patients with sagittal synostosis who underwent treatment with these techniques.

METHODS: A retrospective chart review was performed to find consecutive patients with sagittal synostosis who underwent surgical correction between January 1, 1993 and June 30, 2013, at our pediatric medical center. Clinical, operative, and process of care variables and their associated specific costs were analyzed and statistical analysis was employed.

RESULTS: 328 patients who underwent surgical correction for sagittal synostosis were identified: 88 underwent TCV, 133 SS, and 107 ES. The operative times were 285 minutes for TCV, 56.6 minutes for SS and 67.9 minutes for ES. The transfusion requirements were 74.4% for TCV, 13.8% for SS, and 21.4% for ES. The average length of stay in the hospital (LOS) was 4.2 days for TCV, 2.2 for SS and 1.2 for ES, with ICU days 1.2 days for TCV, 0.1 day for SS and 0.25 day for ES. The surgical revision rates were 8.9%, for TCV, 17% for SS, and 2% for ES. The hospital cost was $40,808 for TCV, $18,094 for SS, and $21,503 for ES.

CONCLUSIONS: The TCV was the procedure with the highest cost to the hospital, longest LOS, and highest number of ICU days. SS and ES procedures had similar outcome profiles and cost, with statistically significant differences being the much lower operative revision rate and shorter LOS for the endoscopic procedure.

125 IS THE NEED FOR CRANIOPLASTY DEPENDENT UPON PATTERN OF CRANIOSYNOSTOSIS?

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BACKGROUND & PURPOSE: Patients with craniosynostosis may require a cranioplasty after cranial vault reconstruction to repair persistent cranial defects or to improve the contour of the cranium. This study reviews the pattern of craniosynostosis as well as the rate and type of cranioplasty on all cranial vault reconstructions performed in a busy craniofacial practice in the last 10 years.

METHODS: Two hundred and sixty patients with craniosynostosis (279 cranial vault reconstructions) from 2003-2013 were retrospectively reviewed. Patterns of craniosynostosis, type of cranial vault reconstruction, age at cranial vault reconstruction, age at cranioplasty, type of cranioplasty, and associated syndromes were extracted from the patient's medical record. Patients were divided by pattern of craniosynostosis (sagittal, metopic, coronal, lambdoid, multiple) and the rate of cranioplasty for each pattern was determined. Indications for cranioplasty were divided into 3 groups: functional (bony defect), aesthetic (contour irregularities), and both functional and aesthetic. The rate of each indication was determined.

RESULTS: Coronal craniosynostosis had the highest rate of cranioplasty (19.5%). The rate of cranioplasty for the remaining patterns of craniosynostosis included: sagittal (12.4%), metopic (9.6%), lambdoid (7.1%), and multiple suture synostosis (3.1%). The overall rate of cranioplasty was 11.5%. Mean age at the time of cranioplasty was 5.6 years (SD=2.6). The indication for cranioplasty was most commonly both functional and aesthetic (52%), followed by functional only (32%) and aesthetic only (16%).

CONCLUSIONS: The overall rate of cranioplasty after cranial vault reconstruction is low, however it is more common for patients with coronal craniosynostosis. The majority of cranioplasties are performed to repair residual bony defects, with few performed for aesthetic improvement alone. These results will help guide post-reconstruction expectations for both the family and surgeon and will aid in patient-centered counseling and decision-making.

126 AN EVALUATION OF A NOVEL CRANIOFACIAL SKILLS LABORATORY CURRICULUM: AN AID TO PLASTIC SURGERY RESIDENT MILESTONE ACHIEVEMENT

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BACKGROUND & PURPOSE: Plastic Surgery Graduate Medical Education has transitioned to a model of milestones. The objective measurement of surgical skills and technical knowledge remains understudied. Surgical skills curricula have been created for microsurgery, but an educational model for training the unique technical skills for craniofacial surgery has not been defined or validated. The aims of this study are to present and validate a novel educational craniofacial skills laboratory and compare outcomes between traditional on-patient training and simulated laboratory training.

METHODS: A prospective study was designed to evaluate 1) instrument identification, 2) time/accuracy of burr hole placement, 3) time/accuracy of craniotomy resection, and 4) time/accuracy of 4-hole plating before and after the skills laboratory. Minimal classroom training and extensive laboratory training was provided regarding monobloc, bipartition, Lefort III, Lefort I, and mandible osteotomy on fresh cadaver specimens but no direct training with the defined tasks was provided. The R4 group had not yet rotated on the craniofacial service, whilst the R5 group had during the previous year.

RESULTS: The R4 (n=3) group mean time in seconds pre/post-task 1, 2, 3, 4 was 117/28, 6.33/4.33, 77.3/27, 133/98.6 respectively. Percent improvement for task 1, 2, 3, 4 was 76%, 31%, 65%, and 26% respectively. The R5 (n=6) group mean time in seconds pre/post-task 1, 2, 3, 4 was 62/44, 6/4, 32/22, 108/82 respectively. Percent improvement for task 1, 2, 3, 4 was 29%, 33%, 30%, and 23% respectively. R4 group post-training times were not significantly different than R5 pre-training times for each of the tasks recorded (p=0.131,0.597,0.597,0.790) respectively. Accuracy testing with instrument recognition demonstrated the greatest improvement from 82% to 100% (p=0.05) for the entire cohort.

CONCLUSIONS: A single day craniofacial skills laboratory with instruction in standard facial osteotomies measurably improved residents performance on specific tasks by indirect training. Most importantly, R4 residents after the curriculum surpassed the pre-lab R5 residents who had already performed these tasks in the traditional training environment of the operating room. Craniofacial related skills tasks may be used to assess a trainee's readiness for performing them in the operating room and may aid in proper identification of milestone attainment.

127 ADULT QUALITY OF LIFE POST CLEFT PALATE REPAIR: A COMPARISON OF TWO TECHNIQUES

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BACKGROUND & PURPOSE: In 1989, CPCJ published the first randomized prospective cleft surgery study, comparing the Kriens intravelar veloplasty (IVV) with a non-IVV two-flap repair. Results in that and follow up publications yielded no difference between the two groups for need for secondary velopharyngeal management. The subjects have now reached adulthood. This study was designed to ask: Is there any difference between the groups in the outcomes that multidisciplinary team care addresses: speech intelligibility, facial growth, breathing while awake and asleep, attainment of education and long term socioeconomic status?

METHODS: Enrollees from the original published study were invited to participate in a survey. Subjects responded to questions about speech therapy and speech satisfaction, additional surgery, breathing patterns, sleep quality/ sleep disorder, dental occlusion. Demographic information, and information on education level, profession, and socio-economic status were queried. Student's t-test and Fisher's exact test were used to compare results.

RESULTS: Forty-two of the original 312 patients (22 Krien's IVV, 20 non-IVV) chose to participate. Average age at survey was 25 ± 3 years. Analysis yielded no difference between the two respondent groups for need for secondary velopharyngeal management. There were no differences in speech outcome and satisfaction (eight questions, $0.30 < p < 0.97$), sleep concerns (3 questions, $0.16 < p < 0.39$), and dental occlusion ($p = 0.69$). Equivalent proportions of the two groups had been in speech therapy ($p = 0.22$). , There was no difference in education attainment of the two groups ($p = 0.26$).

CONCLUSIONS: The original randomized prospective trial suggested that there was no difference between the two surgery types in need for secondary velopharyngeal management, an important outcome. The more important outcome, however, is the patient as an adult. This long-term survey study suggests that in young adulthood, the two groups have similar outcomes in terms of education, speech satisfaction, dental occlusion, and sleep disorder.

128 10 YEAR EXPERIENCE OF SURGICAL TREATMENT OF VELOPHARYNGEAL INSUFFICIENCY IN THE PATIENT WITHOUT A CLEFT PALATE

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BACKGROUND & PURPOSE: Velopharyngeal Insufficiency (VPI) in the patient with a cleft palate has been well described. Less prevalent, however, are the characteristics and surgical outcomes of patients without a cleft who present with VPI.

METHODS: A 10 year retrospective review was undertaken at a tertiary, interdisciplinary center for craniofacial disorders. Sixty-seven patients who underwent either a pharyngeal flap or sphincterplasty were identified, all without a cleft palate. Fifty-two of these had pre and post-operative speech evaluations. Six qualities of speech, including hypernasality and velopharyngeal function, were quantified on a 6 point scale (1 = within normal limits; 6= severe). Quantitative nasalance scores using standard nasometry were measured. A two-tailed, paired students t-test was used to compare means.

RESULTS: Fifty-two children, mean age 7.3 years, were included in the speech outcomes analysis. 60% were male. Twenty-one distinct conditions were identified with VPI, the most common was 22q deletion (28%). Other conditions not typically described with VPI were Mobius syndrome, Nager and Prader-Willi syndrome, in addition to children with previous pharyngeal surgery. 50/52 (94%) underwent an initial sphincterplasty, 2 (6%) underwent a pharyngeal flap. Pre-operative qualitative speech assessment revealed a mean hypernasality score of 4.2±1.2 (mod-severely hypernasal) with inadequate VP function 2.7±0.5. Quantitative orally loaded-nasalance scores on sustained nasal standard oral loaded sentences was 55.6±15.6 % initially. Post-operative hypernasality score was 1.8±1.3, (normal- mild hypernasality) with adequate VP function 1.3±0.6. The mean oral loaded nasalance score was 27.3 ±15.9% post-operatively . All differences between pre and post- operative speech outcomes were statistically significant ($p<0.05$). 14/52 (27%) underwent a revision of the sphincterplasty an average of 338 days after initial surgery. The most common cited reason revision for revision was upper airway obstruction, 11/14, persistent hypernasalty (2), and one dehiscence.

CONCLUSIONS: VPI in the patient without a cleft palate occurs in a diverse spectrum of medical conditions and syndromes. Sphincterplasty was efficacious in this diverse group of presentations in objectively and subjectively improving speech. Further analysis is underway to identify variables predictive of revision.

129 SPEECH OUTCOME FOLLOWING TONGUE REDUCTION SURGERY IN CHILDREN WITH BECKWITH-WIEDEMANN SYNDROME

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BACKGROUND & PURPOSE: Macroglossia is a frequent finding in Beckwith-Wiedemann Syndrome (BWS) and leads to abnormal appearance, dentoskeletal deformity and at times problems breathing and feeding, all of which usually improve following tongue reduction surgery (TRS). However, speech abnormalities in children with BWS and the effect of tongue reduction surgery (TRS) on speech outcome have not been well characterized. The purpose of this paper is to document the effect of TRS on speech in children with BWS.

METHODS: All patients with BWS and macroglossia who underwent TRS by one surgeon at one center were retrospectively reviewed for speech outcomes, including resonance, articulation, fluency and language. All patients who had both pre- and post-operative speech evaluations by a speech therapist were included in this review.

RESULTS: Forty-two patients met the inclusion criteria (28 male, 14 female). Mean time between speech evaluation and surgery was 24 days. Mean time to 1st post-operative speech evaluation was 19 months. Mean post-operative speech follow-up was 6¾ years. Prior to surgery, speech abnormalities included misarticulations (primarily mid-dorsal tongue productions), difficulty with bilabials and frontal sibilant distortions. Improvements in articulation were observed in 94% of patients. Modest improvements were also observed in language and resonance.

CONCLUSIONS: In this, the largest study to date examining the effect of TRS on speech outcomes in children with BWS, macroglossia associated with BWS is associated primarily with abnormalities in articulation and to a lesser degree with language and resonance. Although some articulation problems may persist following TRS, nearly all patients showed improvement in articulation after surgical tongue reduction. We conclude that TRS may have a significant role in improving speech in children with BWS.

130 PROSTHETIC OBTURATORS FOR MANAGEMENT OF VELOPHARYNGEAL DYSFUNCTION (VPD)

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BACKGROUND & PURPOSE: A prosthetic obturator for velopharyngeal dysfunction (VPD) is a dental appliance extending into the nasopharynx, filling the gap where the velar and pharyngeal muscles do not touch. This paper describes characteristics, clinical course, and outcomes for patients with VPD managed with obturators. The data highlights the role of obturators in multi-disciplinary VPD management.

METHODS: All patients receiving obturators between 2001 - 2012 were included in this institutionally-approved study. Patients were described at referral by demographics, diagnoses, surgical history, perceptual speech assessment, nasopharyngoscopy, and speech videofluoroscopy. The clinical course of obturation was quantified by number of appointments with the orthodontist (ORTHO) and orthodontist + speech-language pathologist (ORTHO+SLP), speech outcomes, and patient acceptance.

RESULTS: Twenty eight patients received obturators during the study period. Mean age at referral was 8.2 ± 4.3 years. Diagnoses most frequently co-occurring with VPD were: obstructive sleep apnea (26%), cleft palate (24%), dysarthria (19%), and cleft lip and palate (14%). VPD at referral was severe (71 %), moderate (14%), and mild (14%). Other VPD interventions included speech therapy (86%), Furlow palatoplasty (38%), and sphincter pharyngoplasty (24%). Mean appointments were 3.8 from delivery through pharyngeal extension (ORTHO), and 4.9 bulb modifications (ORTHO+SLP) to provide adequate VP closure assistance. Obturators improved speech for 93% of patients with full resolution in 50%. Best results were in patients with structural defects without oral-motor problems or intellectual disabilities. Wearing an obturator did not stimulate muscles to decrease or eliminate VPD; all patients required ongoing obturation or VP surgery. Eight patients discontinued obturator due to: family decision (N=3), family move (N=2), VPD surgery (N=2), and uncooperative behavior (N=1).

CONCLUSIONS: Prosthetic obturation is a management option for VPD, and may be a better alternative than surgery for patients with obstructive sleep apnea. Successful speech outcomes with obturators require the involvement of an obturator-trained dentist and SLP, multiple appointments to achieve satisfactory obturation, and periodic patient follow up.

131 THREE-DIMENSIONAL COMPUTER SIMULATIONS DEMONSTRATE THAT INCREASING SURGICAL

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BACKGROUND & PURPOSE: The levator veli palatini (LVP) muscle has long been recognized as the muscle that contributes most to velopharyngeal (VP) closure and is therefore of principal importance for restoring normal speech in patients with a cleft palate. Current approaches to palatoplasty utilize varying degrees of LVP overlap; however, the role of LVP overlap on post-operative VP closure remains unclear. The goal of this study was to create a physics-based computer simulation to elucidate the biomechanical effects of LVP overlap on VP closure.

METHODS: We created a volumetric three-dimensional (3D) finite element computer model that includes representations of the LVP muscle, velum, and posterior pharyngeal wall. Dimensions for the model were taken from adult anatomical parameters published in the literature. Velopharyngeal function was simulated by applying varying levels of activation (up to 100%) to the LVP muscle model. In order to validate the model, predictions of contact force between the velum and pharyngeal wall were compared with published experimental measurements of velopharyngeal closure force during speech. Once validated, varying degrees of overlap and separation of the levator veli palatini were simulated and the corresponding closure force was calculated.

RESULTS: The computational model predictions of closure force compare favorably with the experimental data from the literature. Furthermore, the model predicts that increasing the levator overlap from 10 mm to 20 mm increases closure force by 23%, any overlap is favorable compared with no overlap, and levator separation is the least desirable of the conditions for velopharyngeal closure.

CONCLUSIONS: The results of this study suggest that higher levels of levator overlap may reduce the risk of velopharyngeal insufficiency, producing improved surgical outcomes. This effect is due to the improved force-generating capacity of the levator muscle with greater overlap. Future use of

computational models such as this will provide further insights into optimal cleft palate repair and other craniofacial surgeries.

132 A MATHEMATICAL MODEL PREDICTS THAT ANATOMICAL VARIABILITY INFLUENCES THE EFFICACY OF PALATE REPAIR PROCEDURES

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BACKGROUND & PURPOSE: A long-standing question in cleft palate repair research is how anatomic variability affects, or should affect, the selection or application of a particular surgical procedure. Furthermore, understanding the effects of specific anatomic parameter variations on velopharyngeal (VP) function is vital for the development of subject-specific surgical procedures. This study quantifies the effects of i) anatomic variability (i.e., patient's anatomy) alone on VP closure force and ii) anatomic variability on the efficacy of various surgical procedures, measured by VP closure force.

METHODS: We created a three-dimensional (3D) line segment model that includes representations of the levator veli palatini (LVP) muscle, velum, and posterior pharyngeal wall. Model parameters were aquired from the literature. MRI-derived dimensions for the model were taken from 10 normal adults (ages 19-22 years) and 10 normal children (ages 4-9 years). The dimensions were used to validate the model and estimate anatomic parameter variations. This variability was then used to simulate thousands of random (but anatomically realistic) child anatomies using Monte Carlo simulation techniques. The randomized anatomies underwent the simulated surgical procedures of 50% LVP retrodisplacement with velar lengthening, and 50% midline LVP overlap (i.e., shortening the intravelar length by 50%), separately and in combination. Corresponding VP closure force was calculated.

RESULTS: The computational model predictions of closure force from the normal adult measurements compare favorably with the experimental data from the literature. Anatomic variability in the simulated randomized anatomies produced closure forces ranging from 0.271N to 0.620N for the middle 80% of the data. Independent variations of individual parameters revealed that LVP major axis (long axis of muscle belly), VP port distance, and extravelar LVP muscle length were the most influential variables on closure force within their measured anatomical ranges. Simulated procedures of retrodisplacement, overlap, and the combination produced VP closure force increases of 13-37%, 14-40%, and 26-82%, respectively. Some anatomies benefited more from overlap than retrodisplacement and vice-versa.

CONCLUSIONS: The results of this study reveal that i) some anatomic variations are more influential on VP closure force than others and ii) the efficacy of different surgical techniques is highly dependent on the patient's anatomy. Despite this dependence on anatomy, the procedures of retrodisplacement and overlap alone always increased VP closure force regardless of anatomy and the combination was even more effective. Research using patient-specific MRI data combined with modeling is a powerful means for functional outcome assessments related to the effects of surgical options such as scar tissue patterns, relaxing incisions, suturing methods, and repair of other palate muscles. These research advancements will optimize patient-specific selection of surgical procedures.

133 LONG-TERM HEAD SHAPE AFTER TREATMENT FOR DEFORMATIONAL PLAGIOCEPHALY: A LONGITUDINAL COHORT STUDY

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BACKGROUND & PURPOSE: Deformational plagiocephaly (DP) is a misshapen head in an infant that arises at birth, or shortly thereafter, due to an asymmetry of the skull. There are two treatment methods available for DP: helmeting and repositioning. Little is known about the long term-outcomes of these two treatment options. The purpose of this study was to examine children who received helmeting or repositioning therapy for DP as infants and compare the long-term head shape outcomes of the two groups.

METHODS: A longitudinal cohort study design was used to evaluate change in head shape of children that used both helmet therapy (n=50) and repositioning (n=50). Anthropometric skull measurements taken as infants were compared with measurements taken for this study. Inclusion criteria was initial clinic visit at age 6 months or younger, evaluation by the same practitioner and current age 2-10 years. Head symmetry was assessed using caliper measurements.

RESULTS: Data from 100 children were evaluated for this study. Two measures were used to evaluate head shape, cephalic index and cranial vault asymmetry. The mean change in cephalic index and cranial vault asymmetry were both significant with p-values of 0.003 and 0.001, respectively, demonstrating those children that used helmets had a more symmetric long-term head shape.

CONCLUSIONS: To our Knowledge, this is the largest long-term outcomes study comparing children that used helmets to treat their DP as infants had more symmetric head shapes at age 2-10 years of age.

134 THE EFFECT OF TORTICOLLIS ON HELMET THERAPY FOR DEFORMATIONAL PLAGIOCEPHALY

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BACKGROUND & PURPOSE: Children with deformational plagiocephaly frequently have some degree of relative neck muscle imbalance, or torticollis. It is unclear whether torticollis leads to positional preference in sleeping, or the preferential sleep position limits neck flexibility, but it is commonly thought that concomitant torticollis makes deformational plagiocephaly treatment more refractory. Among patients undergoing helmet therapy for deformational head shape problems, we compared between those diagnosed with torticollis and those who did not have torticollis.

METHODS: Patients with deformational plagiocephaly who underwent helmet orthotic treatment from 2006 to 2013 were retrospectively reviewed. The helmet orthotist recorded standard cranial measurements at each helmet adjustment visit, and only patients who completed their treatment course with final measurements were included. Continuous variables were compared with parametric tests (t-tests), and categorical variables were compared with chi-square tests.

RESULTS: 157 patients met the inclusion and exclusion criteria. Torticollis (T) was seen in 59.9% (94/157), and no torticollis (NT) was found in 40.1% (63/157), p=0.098. Helmet therapy was initiated at age in months adjusted for prematurity. : T 6.14, NT 6.7, p=0.069. Asymmetry was measured by transcranial difference (TCD) between frontozygomatic-to-eurion diagonals in millimeters, with initial TCD: T 11.8, NT 8.3, ***P<0.001; final TCD: T 3.9, NT 3.1, *P=0.013; change in TCD: T 7.9, NT 5.2, ***P<0.001. The duration of therapy in months was: T 3.91, NT 3.85, p=0.819; with rate of TCD change (mm/month) being: T 2.33, NT 1.60, *P<0.001. 47.3% (70/148) of torticollis patients underwent physical therapy (PT) for neck exercises, and their average final TCD (in mm) was 3.8, compared to those who did not get PT at 3.3, P=0.212.

CONCLUSIONS: Our data suggest that torticollis does not significantly affect effectiveness or duration of helmet therapy. Although torticollis patients had greater initial transcranial differences (TCD) as would be expected, they ended with similar final TCD measurements (statistically different, but clinically 3.9 and 3.1 mm are quite similar), and surprisingly, helmet therapy duration was similar despite the worse initial asymmetry. This greater rate of TCD change is not explained by the similar age at initiation of helmet therapy. In addition, infants with torticollis who received physical therapy did not have improved final transcranial differences as compared to those who did not receive physical therapy. These results suggest that although torticollis and deformational plagiocephaly often occur hand in hand, once the decision to proceed with helmet therapy has been made, their outcomes appear to proceed independently. Therefore, treatment can remain independent, with helmeting for the deformational plagiocephaly, and physical therapy for the torticollis.

135 DIAGNOSTIC YIELD OF CERVICAL RADIOGRAPHS IN INFANTS WITH DEFORMATIONAL PLAGIOCEPHALY

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BACKGROUND & PURPOSE: When evaluating infants with a diagnosis of deformational plagiocephaly, some providers routinely obtain infant cervical radiographs in order to rule out concomitant cervical bony anomalies. The purpose of this study was to determine the diagnostic yield of cervical radiographs in demonstrating cervical anomalies in a population of infants referred to a tertiary craniofacial center with deformational plagiocephaly (DP).

METHODS: After obtaining IRB approval, all patients with diagnosis of DP who underwent cervical radiographs between the years of 2011 to 2012 were reviewed. Cervical radiographic findings as determined by radiologist report,

perinatal data, and physical exam findings were recorded, and descriptive statistics were generated.

RESULTS: Electronic medical records of 339 patients with diagnosis of DP were reviewed. Abnormal findings were recorded in 6.48% of cervical radiograph reports (n=22/339). Of those with abnormal findings, 45% (n=10/22) demonstrated osseous abnormalities including: fracture (n=2), bony fusion (n=5), asymmetric clavicle (n=1), hypoplastic posterior elements of C1 (n=1), and rudimentary ribs (n=2). Those with non-osseous abnormalities (n=12/22) included head tilt (n=2), abnormal curvature (n=10), hypertrophic tonsils (n=1). The other 97% of the study population were without osseous abnormalities.

CONCLUSIONS: There is a fairly low diagnostic yield in ordering cervical radiographs in patients with deformational plagiocephaly. Considering the radiation exposure and cost associated with the practice of ordering routine cervical radiographs in all patients presenting with this DP, an inspection of its inclusion as a necessary step in the diagnostic algorithm is warranted.

136 DEFORMATIONAL SCAPHOCEPHALY RESULTS IN INCREASED THERAPY DURATION AND LESS EFFECTIVE CRANIAL INDEX CORRECTION THAN OTHER TYPES OF DEFORMATIONAL PLAGIOCEPHALY

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BACKGROUND & PURPOSE: Scaphocephaly, or long head shape, can be due to deformational or craniosynostotic etiologies. If the etiology is purely deformational, repositioning may be difficult because this requires balancing on the narrow posterior aspect. Therefore, some patients will undergo helmet orthotic therapy. Our aim was to look at our population of infants treated with helmet therapy, and compare those with deformational scaphocephaly versus those without scaphocephaly.

METHODS: Patients with deformational plagiocephaly who completed helmet orthotic treatment from 2006 to 2013 were included. Cranial index (CI) was defined as calvarial width divided by calvarial anterior-posterior length, with mesocephalic (normal) range as 0.76 to 0.81, with scaphocephalic less, and brachycephalic greater. Asymmetry was measured by transcranial difference (TCD) between frontozygomatictoeurion diagonals in millimeters. Patients with incomplete data or did not finish therapy were excluded. Continuous variables were compared with nonparametric tests, and categorical variables were compared with chi-square analysis.

RESULTS: 208 patients with deformational plagiocephaly met our criteria: scaphocephalic 9 (4.3%), mesocephalic 14 (6.7%), brachycephalic 185 (88.9%). The duration (in months) of helmet therapy: scaphocephalic 4.87 (3.27-11.67), non-scaphocephalic 3.43 (1.13-12.40), **P=0.007. Initial CI and TCD: scaphocephalic 70.30/5.0, mesocephalic 79.23/12.5, brachycephalic 90.79/10.0. Difference between final and initial CI: scaphocephalic 0.90 (1.19,4.7), brachycephaly -3.55 (-68.8,9.8), ***P<0.001. Rate of change in CI per month: scaphocephaly 0.185 (-0.20,0.59), mesocephaly -.068 (-2.18,1.34), brachycephaly -1.00 (24.59,2.62) ***P<0.001). Final TCD: scaphocephaly 1.0 (0,4.0), mesocephaly 3.0 (1.0,10.0), brachycephaly 4.0 (0,11.0), **P=0.002. Final CI: scaphocephaly 71.68 (69.0,75.7),, mesocephaly 78.79 (74.58,82.58), brachycephaly 87.10 (30.43,100.0), ***P<0.001.

CONCLUSIONS: Deformational scaphocephaly appears to have a difference response to helmet therapy than non-scaphocephalic deformational plagiocephaly. Treatment lasts almost 1.5 months longer, yet still has significantly less change in CI, and in fact median final CI remains scaphocephalic. This is despite the fact that deformational scaphocephaly patients are more frequently premature and may present younger. Parents and providers need to refer these patients early to improve their chances of response to helmet therapy.

137 LONG-TERM SATISFACTION AND PARENTAL DECISION MAKING ABOUT TREATMENT FOR DEFORMATIONAL PLAGIOCEPHALY

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BACKGROUND & PURPOSE: The incidence of deformational plagiocephaly has increased greatly over the last two decades since the recommendation of supine sleeping. Currently, there are two treatment options for deformational plagiocephaly, helmet therapy and repositioning therapy. This research investigated factors that influenced parental decision making about treatment choice and long-term satisfaction with head shape.

METHODS: A retrospective chart review identified 1660 children, now ages 2 – 10 years old, seen in the deformational plagiocephaly clinic meeting inclusion criteria. Questionnaires were mailed to all eligible families. Four-hundred and fifty-six completed questionnaires were returned. Questionnaires evaluated demographics of the family, factors that influenced treatment choice and satisfaction with current head shape.

RESULTS: Most respondents had Caucasian (93%), male (70%) children. Mother's average age at time of childbirth was 31 years, most mother's had a college degrees or greater (77%) and household incomes over $76,000 (52.6%). Fifteen factors were used to evaluate which ones were significant in influencing parental treatment choice. Severity of the deformational plagiocephaly and time off work for follow-up appointments were the only two factors identified that significantly affected treatment choice.

CONCLUSIONS: More parents that used helmet therapy reported they were satisfied with their child's long-term head shape and would choose the same treatment again (p = 0.002) compared with those that used repositioning therapy.

138 A COMPARISON OF DIRECT AND DIGITAL MEASURES OF CRANIAL VAULT ASYMMETRY FOR ASSESSMENT OF PLAGIOCEPHALY

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BACKGROUND & PURPOSE: Measurement of cranial vault asymmetry (CVA) is a common feature in the treatment of patients with deformational plagiocephaly (DP). In many cases, this measure is the primary marker of improvement. CVA is typically measured with calipers and is subject to inter-rater variability. There is little research comparing results of calipers with those of three dimensional (3D) photogrammetry.

METHODS: 59 caliper only visits were made by 51 children previously diagnosed with DP. 38 were male and 13 were female. 31 of the visits included a 3D photo. Direct measures were obtained by two independent, experienced anthropometrists and included head length, width, circumference, and CVA. Their results were compared to digital measures including measures unobtainable with calipers: asymmetry of head circumference and global asymmetry.

RESULTS: The inter-rater reliability of all caliper measures was excellent (Intraclass correlation coefficients > 0.94). The caliper and digital measures of length, width, cephalic index, and circumference were strongly correlated (Pearson's $R^2 > 0.90$). There was a consistent bias, caliper measures being 1 – 4 mm shorter than their digital analogues. Caliper measured CVA was highly correlated ($R^2 > 0.90$) with the directly corresponding digital measures taken 30 degrees off of the antero-posterior diameter. It was poorly correlated with measures of overall hemispheric asymmetry ($R^2 < 0.10$).

CONCLUSIONS: The cranial measurements of children with DP taken independently by two experienced anthropometrists showed excellent inter-rater reliability. Caliper measures are consistently smaller than the digital measures, presumably due to pressure of the calipers and/or the use of skullcaps during photography. Like circumference and other measures, cranial vault asymmetry measures correlates well with its corresponding digital measure.

139 AGE OF INITIATION OF HELMET THERAPY FOR DEFORMATIONAL PLAGIOCEPHALY DOES NOT SIGNIFICANTLY AFFECT TREATMENT DURATION, CORRECTION RATE, OR FINAL OUTCOME

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BACKGROUND & PURPOSE: It is commonly thought that helmet therapy for deformational plagiocephaly is more effective the earlier the age of initiation, but this did not seem the case for our patients. We therefore sought to compare age of initiation with helmet therapy outcomes.

METHODS: Patients with deformational plagiocephaly who underwent helmet orthotic treatment from 2006 to 2013 were retrospectively reviewed. Asymmetry was measured by transcranial difference (TCD) between frontozygomatictoeurion diagonals in millimeters. Analysis of variance was used to compare groups; results in means (standard deviations).

RESULTS: Patients were stratified into 6 groups (G1,5,6,7,8,9), by age in months: G1, <5 (n=13); G5, 5 (n=40); G6, 6 (n=52); G7, 7 (n=46); G8, 8 (n=23); G9, 9 (n=33). Initial TCDs: G1 11.1 (±4.0), G5 10.3 (±3.6), G6 10.8 (±4.1), G7 11.0 (±3.2), G8 9.30 (±4.5), G9 9.30 (±4.5), P=0.260. Final TCDs: G1 3.10 (±2.7),

G5 4.00 (±2.5), G6 3.80 (±2.0), G7 3.80 (±1.9), G8 3.80 (±2.5), G9 4.80 (±3.0), P=0.253. Change between final and initial TCD: G1 8.0 (±4.4), G5 6.4 (±3.4), G6 7.1 (±3.2), G7 7.2 (±3.3), G8 5.4 (±3.7), G9 4.5 (±4.7), **P=0.007; Tukey posthoc pairwise comparisons showed G9 significantly less than G1,6,7. Duration of treatment in months: G1 3.87 (±.88), G5 4.3 (±2.1), G6 3.90 (±1.93), G7 3.60 (±1.44), G8 3.85 (±1.43), G9 3.94 (±2.46), P=0.692. Rate of change (change in TCD over duration, mm/month): G1 2.10 (±1.1), G5 1.80 (±1.2), G6 2.10 (±1.2), G7 2.40 (±1.6), G8 1.80 (±1.7), G9 1.40 (±1.5), P=0.065.

CONCLUSIONS: When patients were stratified by their initial age of therapy, we found that duration of helmet therapy, final TCD, and rate of change, to be similar without significant differences. There was slightly less TCD change in G9, but no differences in initial or final TCDs. One possibility is that our patients had longer durations of helmet therapy, and perhaps this helped standardize our results. This study cautiously suggests that age at initiation of helmet therapy may not make as much of a clinical difference as previously thought.

140 "BROWNIE-OLOGY": AN INTRODUCTION TO NURSING RESEARCH AND STUDY DESIGN

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BACKGROUND & PURPOSE: Delivering the highest quality care and continuously improving patient outcomes requires nurses to center their care on evidence-based practices (EBP) and research findings. Nurses hold a key position to conduct research, which adds to the knowledge base contributing to best practices. Improved knowledge about and positive attitudes toward research are associated with increased nurses' research engagement and EBP utilization. However, many practicing nurses lack adequate knowledge about and have negative attitudes towards research. The "Great American Cookie Experiment" is an innovative teaching approach used since 1987 with nursing students and staff nurses. This technique successfully provided education and improved attitudes towards research.

METHODS: We developed "Brownie Rounds: An Introduction to Research and Evidence-Based Practice" using the "Great American Cookie Experiment" methodology. To date, "Brownie Rounds" has been presented to 106 healthcare professionals (81 RNs) at a freestanding children's hospital with outpatient clinics. The participant tastes two different brownies and chooses which he/she likes better. Data are collected regarding their brownie choices. Participants are taught about ways in which they participated in research and how the findings could be applied. Participants then identify an area of patient care they think could be improved. The faculty member leads them through designing a study to address a research question. Participant evaluations by RNs revealed favorable responses to the following three statements: "I was actively engaged during the program (99% agreed or strongly agreed)," "I have a more positive view towards research (90% agreed or strongly agreed)," and "I gained new knowledge (93% agreed or strongly agreed)." During this presentation, Brownie Rounds will be conducted. Participants will then be divided into small groups. With coaching by the presenter, each group will identify a research question and formulate a preliminary design for a study. Each small group will present their research design to all participants. At the completion of this presentation, learners will be able to: - Describe increased knowledge about research and EBP. - Express a more positive attitude towards research. - Discuss a preliminary design for a research study aimed at improving patient-centered outcomes for people affected by a cleft or craniofacial condition.

141 USE OF A STANDARDIZED OUTCOME MEASURE OF DENTAL ARCH RELATIONSHIPS (GOLSON) TO ALLOW INTERNATIONAL, INTER-STUDY COMPARISONS

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BACKGROUND & PURPOSE: Valid comparative intercenter audits of treatment outcomes require use of standardized records taken routinely for clinical purposes and reliable standardized outcome reference measures used by calibrated and blinded raters. Two major initiatives in Europe and North America have strictly applied these principles to clinical research. This report applies those principles to compare dental arch relationship outcomes internationally across separate but identical studies.

METHODS: Goslon Yardstick ratings on 465 patients with CUCLP in the mixed dentition from 6 European and 10 North American Centers were carried out in 6 separate studies. All studies used identical protocols including: 1 Standardized preparation of dental casts for blinding; 2 Use of the same Goslon Yardstick reference models established in 1987; 3 Calibration of raters experienced in treatment of patients with clefts; 4 Identical statistical analysis (Weighted Kappa for intra and interrater reliability, ANOVA and/or Kruskal-Wallis for intercenter differences); and 5 Standardized method of reporting outcomes to include total infant management protocols. A wide range of infant management protocols was represented: 7 ctrs w/ primary lip/palate surgery only, 3 ctrs w/ PSIO, 3 ctrs w/PSIO + primary bone graft; 1 ctr w/PSIO + delayed palate closure, 1 ctr with NAM, and 1 ctr w/NAM + GPP. Centers were ranked according to average Goslon scores cross referenced with protocols.

RESULTS: Average Goslon scores ranged from 2.46 (best) to 3.77 (worst). Of the 5 centers averaging better than 3, indicative of the most favorable dental arch relationships, 3 used only primary lip and palate surgery with no ancillary procedures. Of the 5 centers with the worst Goslon averages, 3 carried out primary repair of the infant alveolus. Centers using PSIO without primary bone grafting had Goslon averages across the range of scores.

CONCLUSIONS: This study demonstrates the value of centers agreeing on standardized records, outcome measures and the value of intercenter comparisons to identify best practices. Outcome studies cannot be used to identify cause and effect relationships between protocol features and specific outcomes, but can begin to identify areas of greatest controversy and interest to spur more definitive clinical trials research.

142 SKELETAL AND DENTOALVEOLAR CHANGES FOLLOWING THE USE OF A NOVEL BONDED PROTRACTION HEADGEAR APPLIANCE IN PATIENTS BORN WITH CLCP

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BACKGROUND & PURPOSE: Midface hypoplasia is a common finding in patients with CLCP. Its correction is important for dental function, esthetics and quality of life. The purpose of this study was to evaluate the skeletal and dental changes in patients with CLCP treated by a novel Protraction Headgear (PHG).

METHODS: Records of 267 consecutively treated patients with CLCP (1995-2012) treated with PHG therapy were reviewed. 40 non-syndromic patients with CLCP (27 male, 13 female), mean age 7.70 years (Range 4.03-13.58 years) met the inclusion criteria. All patients underwent PHG therapy with a full occlusal bonded appliance. The mean treatment duration was 7.5 months with a mean force of 405 gms/side. 38 lateral cephalometric landmarks were identified. X and Y axis landmark displacement was recorded at pre-treatment (T_0), following removal of PHG (T_1), and at 1.5 years follow-up (T_2).

RESULTS: Following PHG treatment, Point A advanced by +2.48mm ($p<0.001$), UIE advanced by +4.91mm ($p<0.001$) and Point B moved posteriorly by -2.03mm ($p<0.001$) and inferiorly by -3.86mm ($p<0.001$). During the same time the ANB angle changed from 0.08° to 3.77° ($p<0.001$). At 1.5 year follow-up, Point A moved back by -0.28 ($p=0.48$) mm, Point B moved forward by 3.69 mm ($p<0.001$) and ANB angle decreased to 0.51° ($p<0.001$).

CONCLUSIONS: PHG appliance therapy resulted in, 48% skeletal and 52% dentoalveolar advancement. This was statistically significant. During the study period, the mandible showed clockwise auto-rotation. At 1.5 years T_2, maxillary position was stable with minimal anterior growth, however the mandible showed significant anterior growth contributing to the reduction of ANB angle.

143 PRESURGICAL UNILATERAL CLEFT LIP ANTHROPOMETRICS AND THE PRESENCE OF DENTAL ANOMALIES.

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BACKGROUND & PURPOSE: The occurrence of orofacial clefts and the development of tooth germs have a close relationship. The purpose of the current investigation was to investigate associations between cleft lip anthropometrics and dental anomalies in the permanent dentition in patients with unilateral cleft lip +/- palate.

METHODS: Children with unilateral clefts of the lip +/- palate, with

perioperative anthropometric lip measurements, as well as standard orthodontic diagnostic records including radiographs at the age of 6 or older, were included in this retrospective study. Anthropometric lip measurements were made by a single examiner immediately prior to lip repair. Radiographs and other diagnostic records were used to assess the presence of dental anomalies in the permanent dentition. The presence of associations between anthropometric lip measurements and prevalence rates of different dental anomalies were determined using logistic regression analyses.

RESULTS: In the 122 included patients, the cleft lateral lip element was deficient in height in 80% and in transverse length in 84% of patients. Patients with more deficient cleft side lateral lip height and less deficient cleft side lateral lip transverse length were more likely to present with cleft side maxillary lateral incisor agenesis. On the other hand, patients with a less deficient cleft side lateral lip height and more deficient cleft side lateral lip transverse length were more likely to present with a cleft side supernumerary maxillary lateral incisor. When looking only at incomplete clefts, cleft side lateral lip transverse length deficiency was more predictive of the presence of supernumerary maxillary lateral incisors (p=0.030) while for complete clefts, cleft side lateral lip height deficiency was more predictive of the presence of maxillary lateral incisor agenesis (p=0.035).

CONCLUSIONS: In patients with unilateral clefts, cleft lip anthropometrics have a predictive role in determining the occurrence of dental anomalies.

144 THE STABILITY OF COMBINED MAXILLARY AND TRANSPALATAL DISTRACTION IN PATIENTS WITH CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Maxillary hypoplasia is a common developmental problem in patients with cleft lip and palate and normally occurs with reduction in anteroposterior and transverse dimensions. The authors of this paper have done combined Maxillary and transpalatal distraction to correct severe anteroposterior and transverse deficiencies by using rigid external distractor and hyrax transverse expander. The main purpose of this study is to evaluate the changes in maxillary position in anteroposterior and transverse dimensions after combined Maxillary and transpalatal distraction.

METHODS: Retrospective longitudinal study design. 12 consecutive patients with non syndromic repaired cleft lip and palate aged average 14 years (range 13-17 years) who underwent combined Maxillary and transpalatal distraction by Rigid external distractor and hyrax transverse expander device were included in the study. Cephalograms were used to measure the Maxillary position in anteroposterior and transverse dimensions immediately after distraction, 1 year after distraction.

RESULTS: After combined Maxillary and transpalatal distraction with external frame device and hyrax transverse expander the Maxilla (A point) on average moved forward by 13.5 mm and transversely by 5.85 mm. The maxilla moved backwards by 1.5 mm and transverse relapse was 1 mm at the end of one year.

CONCLUSIONS: The combined Maxillary and transpalatal distraction using an external frame device and hyrax transverse expander is an effective technique to treat patients with severe Maxillary hypoplasia three dimensionally. There is a constant relapse rate at the end of one year in both anteroposterior and transverse dimension. This potential relapse needs to be compensated by overcorrection during distraction phase.

145 COMPARISON OF CEPHALOMETRIC MIDFACE FORM IN UCLP PATIENTS TREATED WITH TRADITIONAL OR NO PSIO (AMERICLEFT AND EUROCLEFT STUDIES) AND PATIENTS TREATED WITH NASOALVEOLAR MOLDING.

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BACKGROUND & PURPOSE: Interest has arisen regarding the effect of NasoAlveolar molding (NAM) on midface growth. The purpose of this study was to determine if NAM imparts a negative, positive or no effect on midface growth in UCLP patients.

METHODS: This retrospective cohort study includes 61 consecutive nonsyndromic Caucasian patients with UCLP, ages 6 - 11 years, treated with NAM. 28 cephalometric landmarks identified and measured by two examiners. The mean value of cephalometric measurements were compared to analogous data sets from Americleft and Eurocleft using T-test.

RESULTS: NAM Group comparison with Americleft: No significant difference in mean values of SNA and ANB between NAM group and Centers B,D,E (P > 0.108). NAM group had significantly larger soft tissue A'N'B' than Center B (P=0.016) and no significant difference compared to centers D and E (P > 0.34). The NAM Group showed significantly larger Ba-N-ANS angle than Centers B, D and E (P= 0.0001) and no significant difference compared to center C. NAM Group comparison with Eurocleft: No significant difference in mean values of SNA between NAM Group and Centers A,B,D,E,F(P > 0.150). There was no significant difference in mean ANB between NAM Group and Centers B,D,E and F (P > 0.161). Center A showed a larger mean ANB than the NAM Group (P=0.023). NAM Group showed significantly larger mean A'N'B' (soft tissue) than Centers D and F (P < 0.0075), and no difference compared to Centers A,B and E (P > 0.600).

CONCLUSIONS: The NAM Group showed no difference or statistically significant positive differences compared to 8 (out of 9) Eurocleft and Americleft Centers. The NAM Group showed greater midface soft tissue convexity than Americleft B,D,E and Eurocleft D,E Centers. No significant difference was shown compared to Americleft Center C and Eurocleft Centers A, B, F. The NAM Group does not appear to have had negatively affected midface growth, compared to a 9 year old population in Americleft and Eurocleft centers.

146 INITIAL SEVERITY OF PATIENTS WITH CUCLP TREATED BY NAM AND SURGERY DOES NOT PREDICT DENTOALVEOLAR AND CRANIOFACIAL MORPHOLOGY

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BACKGROUND & PURPOSE: Previous studies on correlation between the initial cleft severity and long-term outcome parameters showed mixed results. Notably, patients from these studies underwent different treatment protocols. Currently, there are no studies investigating this correlation in patients who received NAM pre-surgically. To address this we analyzed correlation between the severity at birth in patients born with non-syndromic complete unilateral cleft lip and palate (CUCLP) treated by NAM and the dentoalevolar and craniofacial morphology in mixed dentition.

METHODS: The longitudinal records of 38 children born with CUCLP were examined. The initial severity was measured by cleft width on plaster models taken after birth. The width was measured between the widest points of the larger and smaller alveolar segments. Pre-orthodontic dental models and cephalograms taken in mixed dentition (mean= 7.7 years) were analyzed. Measurements of overjet, intercanine and intermolar widths, dental arch relationship rating (GOSLON score), and cephalometric analyses were performed by experienced orthodontists. All study subjects were treated in one center with NAM pre-surgically, followed by lip repair at 3-5 months and one or two-stage palate repair. The one-stage palate repair was performed at 12 months. For the two-stage repair, the soft palate surgery was performed at the same time as the lip repair while the hard palate surgery was performed at 18 months. The data were analyzed using Graphpad statistical software package. Correlation test was performed using Pearson's correlation coefficient.

RESULTS: In this study, we did not find a significant correlation between the initial cleft width and dentoalveolar morphology (overjet r= -0.08; intercanine width r= 0.07; intermolar width r=0.07; GOSLON r= 0.34) or craniofacial morphology (ANB r=-0.33; SNA r=0.01; U1-SN r=0.03; U1-PP r=0.1).

CONCLUSIONS: This study demonstrated that the initial severity as measured by cleft width at birth does not predict dentoalveolar and craniofacial outcomes in patients with CUCLP during mixed dentition. It is possible that treatment protocols used in our study diminished long-term effects of the severity at birth. Our results, however, do not directly address effects of the treatment protocols. Further studies are needed to understand these effects.

147 EFFECTS OF NASOLALVEOLAR MOLDING IN PATIENTS WITH UCLAP - RESULTS OF A PROSPECTIVE INTERDISCIPLINARY TRIAL

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BACKGROUND & PURPOSE: NAM is well known in patients having UCLAP to increase aesthetic and functional results. In contrast the effects of NAM on dentoalveolar relations, breathing, and speech are not well known. Long-term comparisons are necessary to find out additional advantages of NAM.

METHODS: In a prospective study 91 patients (UCLAP) from 3 cleft centres were observed from birth up to 8 years of age. In one third of patients (I) NAM was carried out from birth up to lip surgery using a dynamic appliance combined with a presurgical plate for dentoalveolar development. In the second third (II) a presurgical plate was used only. In this centre patients underwent postoperative NAM using a static appliance for 3 months. In another third of patients (III) nothing was done. In centre I (surgery: Pfeifer) and centre II (surgery: Millard) lip closure was performed within 6 months, in centre III (surgery: Pfeifer) within 3 months of age. In all patients outcome were examined using standardized minimum records from birth up to 5 years of age: Orthodontists have compared bimaxillary dental casts (transversal/sagittal) using a PC guided software, surgeons have compared standardized photographs using a rating score and speech pathologists have compared patients in voice (A-I probe, tonometry) and primary dysfunctions (lip posture, tongue rest position, swallowing). Finally statistical evaluations were done.

RESULTS: Surgical observations revealed significant differences of results when comparing patients from 3 centres: Preoperative NAM has influenced wideness of cupids bow and philtrum as well as position of ala on the cleft side. Orthodontists: In all patients of centres I and II NAM had no negative effects on dentoalveolar relations. Preoperative and postoperative NAM have shown no negative influence on the position of the premaxilla. Speech pathologists have observed significant differences: Cleft patients without NAM (III) had significantly more orofacial dysfunctions like mouth breathing and nonphysiological tongue position than the other.

CONCLUSIONS: Preoperative NAM has significant effects on aesthetic results of white lip and nose. This may be influenced by surgical techniques. NAM has no negative influence on dentoalveolar development. NAM has positive effects on primary and secondary functions of the orofacial system.

148 THE TWO-ALTERNATIVE FORCED-CHOICE PARADIGM: THE MODERN Q-SORT

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BACKGROUND & PURPOSE: Aesthetic outcome analysis of cleft lip repair has become a targeted focus of cleft researchers in evaluating various surgical techniques. Current strategies (including the Q-sort method) require manual sorting and are time consuming. Further, evaluators require training on evaluation systems to consistently provide reliable assessments. This study investigated an automated sort technique using untrained evaluators to determine whether the two alternative forced-choice paradigm (2AFC) can be applied to aesthetic surgical outcomes generally and to cleft lip repair analysis specifically. The goal of our study was to determine the reliability of 2AFC in the general population as a mechanism for quantifying the public's perception of a cleft repair.

METHODS: Fourteen untrained evaluators were presented with a series of 6-month postoperative cleft lip repair photographs. Series of de-identified images (frontal/basal views) were shown two at a time on a computer screen. To advance to the next set of images, the evaluator selected the repair perceived as having the holistically superior outcome. Each evaluator was shown a total of 234 comparisons from 39 sets of images. An interrater reliability analysis using the intrarater reliability coefficient (ICC) was performed to determine consistency among raters.

RESULTS: The interrater reliability for the evaluators was found to be ICC = 0.760, 95% CI (0.544, 0.873). The reliability between the average 2AFC evaluation and the method currently used at our institution was found to be 0.622, 95% CI (0.513, 0.736).

CONCLUSIONS: We present a promising new development in evaluating the quality of cleft lip repair aesthetic outcomes. Our results show that public perception of a cleft lip repair is consistent and that the 2AFC generates a significantly reliable rating without the need for trained surgical evaluators.

149 THE AMERICLEFT PROJECT: COMPARISON OF RATINGS USING 2D VS 3D IMAGES FOR EVALUATION OF NASOLABIAL APPEARANCE IN PATIENTS WITH CUCLP

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BACKGROUND & PURPOSE: Comparing nasolabial appearance outcomes following repair of CUCLP between centers allows the clinical differences between treatment methods to be quantified. The best measurement would achieve a balance between practicality of use and similarity to a live patient evaluation. 2D photographs are widely available, inexpensive, and easily shared; however, the detail of evaluation is limited by the number of projections. 3D imaging more closely mimics a patient encounter but may be more cumbersome and limited by cost. This study measured the relationship between photographic and 3D surface imaging ratings.

METHODS: Twenty-seven consecutively treated patients with CUCLP who had complete 2D and 3D photographic documentation were included (mean age 6yr 10mos). Frontal, profile, and 3D digital images were cropped similarly to show the nose and upper lip and coded. Nasolabial profile, nasolabial form, and vermillion border aesthetics were rated by 6 trained and calibrated raters (3 orthodontists, 2 surgeons, 1 prosthodontist) using the 5-point scale described by Asher-McDade and the modified Q-sort method. Cropped 3D images were available for viewing by each rater allowing for complete rotational control for viewing the images from all aspects. 2D and 3D ratings were done separately and repeated the next day with the order reversed. Intrarater and interrater reliabilities were calculated using weighted kappa statistics. Correlation of 2D and 3D ratings was determined using Bland-Altman plots.

RESULTS: Interrater reliability scores were good for 2D and fair to good for 3D imaging. Intrarater reliability was good to very good for 2D and moderate to good for 3D imaging. Bland-Altman analysis showed good agreement of 2D and 3D scores for nasolabial profile and nasolabial form, but there was more systematic error in the assessment of vermillion border.

CONCLUSIONS: Although 3D images may be perceived as more representative of a direct clinical facial evaluation, their use for subjective rating of nasolabial esthetics was not more reliable than 2D images in this study. Conventional 2D images provide acceptable reliability while being readily accessible for most cleft palate centers.

150 A MODIFICATION OF ASHER-MCDADE METHOD FOR RATING NASOLABIAL ESTHETICS IN PATIENTS WITH CUCLP

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BACKGROUND & PURPOSE: Nasolabial esthetic ratings of patients with clefts are one of the most important yet least reliable outcome measures. The Asher-McDade method represents a commonly cited method due to its simplicity and use of standard photographs taken routinely. However the method has shown only fair reliability. This study was an attempt to refine that method to improve reliability and rater satisfaction so as to allow for continued cross comparison with the original Eurocleft studies.

METHODS: A modified Q-Sort method in conjunction with a new yardstick was developed and used to rate the nasolabial esthetics of 149 5-year-old patients with CUCLP. The sample from 3 different centers was used in a comparison of outcomes of treatment with presurgical infant orthopedics, and nasoalveolar molding. Seven experienced judges were given cards with frontal and profile photographs of each patient and asked to rate them on a scale of 1-5 for nasolabial profile, nasolabial frontal, and vermillion border utilizing the yardstick and Q-Sort method. Q-sort utilizes placement of the cards into categories sequentially up to the 5 categories of the scale. The inter-and intrarater reliabilities were calculated using the Weighted Kappa. The reliabilities were compared with previous studies which had utilized the original Asher-McDade rating method.

RESULTS: There was no significant improvement in inter or intrarater reliabilities using the new method and expanded yardstick. Four judges in the current study also participated in two previous studies that utilized the original Asher-McDade method. Only one rater showed a consistent improvement as compared to their previous scores. There was consensus

among the raters that the method simplified the method and gave them more confidence in their ratings.

CONCLUSIONS: The use of the Q-Sort methodology with rating cards rather than a powerpoint of photos matched but did not improve reliability in this study compared to previous studies using the original Asher-McDade method, but all raters preferred this method due to the ability to continuously compare photos and adjust relative ratings between patients. We believe that development of an age-appropriate yardstick, standardized records, and formal calibration session used with this method will result in an improvement in inter and intra rater reliability.

151 USING EXCEPTIONAL CHILDREN'S SERVICES: THE EXPERIENCE OF CHILDREN IN NORTH CAROLINA BORN WITH ISOLATED OROFACIAL CLEFTS

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BACKGROUND & PURPOSE: Children with orofacial clefts (OFCs) may experience academic and communicative difficulty requiring the support of exceptional children's (EC) services, yet utilization of these services on a population level is unknown. The purpose of this study was to examine patterns in EC service use between children with and without OFC in North Carolina.

METHODS: We used a retrospective cohort design consisting of 712 children with OFC born between 1997 and 2003 identified from the NC Birth Defects Monitoring Program, and a random sample of 6,822 children without a structural birth defect identified from birth certificates and born during the same time. Children with OFC were classified according to cleft type (cleft lip alone (CL), cleft lip with cleft palate (CLP), cleft palate only (CPO), and according to whether the cleft was isolated or associated with other congenital anomalies. We matched study subjects to NC Department of Public Instruction records to obtain information on EC status and eligibility classification. Children had to be enrolled in NC public schools for at least one time point between 2006 and 2010 (3rd-9th grade) to be included in the study. We calculated prevalence estimates, prevalence ratios and 95% confidence intervals, and used generalized estimating equations to calculate the odds of EC enrollment over time.

RESULTS: In grades 3-5, 36% of children with an isolated OFC received EC services compared to18% of the comparison children. Children with isolated CLP or CPO were twice as likely to receive EC services relative to the comparison children (PR: 2.74, 95% CI: 2.34, 3.22) and (PR: 2.03, 95% CI: 1.61, 2.57), respectively. EC service use among children with isolated CL was no different than that of children in the comparison group (PR: 1.01, 95%CI: 0.70, 1.47). The difference in the odds of use of EC services between children with an isolated OFC and the comparison children declined over elementary and middle school.

CONCLUSIONS: The prevalence of EC service use among children with an isolated OFC depends on the cleft phenotype. Receipt of EC services declined with time, possibly indicating a decreased need for services as the children aged.

152 TOWARD REALTIME PATIENT-CENTERED OUTCOMES ASSESSMENT AND CONTINUOUS QUALITY IMPROVEMENT: A CLEFTKIT PROGRESS REPORT

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BACKGROUND & PURPOSE: The CLP360° Working Group was formed in late 2011 with the purpose of developing a "next generation" method of assessing outcomes in cleft care. At the 70th Annual Meeting of the ACPA in 2012 (appropriately themed "Excellence: Is There an App for That?"), the Working Group lead the general closing session in a discussion on the challenges inherent in the comprehensive appraisal of cleft care, including clinical, psychosocial, economic, and systems-based outcomes. At the 12th International Congress in 2013, the Working Group described its use of the Effectiveness, Quality, Innovation, and Policy (EQUIP) system for developing a strategic approach toward overcoming these obstacles. Specifically, this approach involved the systematic consideration of the perspectives of caregivers, payers, and patients/families ("360° review"); evidence collection and appraisal; taxonomy building; and development of methods for standardized data collection, reporting, and analysis. This presentation describes the next step in the translation of these foundational principles into a concrete and practical framework for comprehensive outcomes assessment.

METHODS: In this presentation, the complex concept of "cleft care" is carefully reinterpreted as an interconnected network consisting of clinical, psychosocial, and systems-based processes. Each domain is explored in detail, identifying challenges and strategies for outcomes assessment in each. A "mixed-methods" approach for outcomes assessment is advocated, respecting the complexity associated with outcomes assessment for a pediatric population requiring long-term, coordinated care by multiple specialties and services.

RESULTS: Specifically, the conceptual framework presented in previous years has been translated to a practical tool designed to fit into the clinical workflow. CleftKit is a modular, mixed-methods, and multidisciplinary ("M3") tool designed to measure holistic, patient-centered outcomes. Continuous data aggregation and near-realtime statistical dashboards permit rapid, responsive, and relevant ("R3") research. A key component of CleftKit is incorporation of the patient's voice in the dataset. The importance of health information technology and data standardization to comparative effectiveness research, learning health care, and continuous quality improvement are underscored.

CONCLUSIONS: This progress report on CleftKit seeks to provide a vision for the future of outcomes assessment, in which "M3+R3" technologies may help support evidence-based, patient-centered clinical practice decisions and thereby improve the effectiveness, efficiency, quality, and value of care for patients with cleft lip and/or palate.

153 HOSPITAL RESOURCE USE AND PAYER TYPE IN A 10-YEAR POPULATION-BASED STUDY OF CHILDREN WITH OROFACIAL CLEFTS

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BACKGROUND & PURPOSE: Information on hospitalizations and costs beyond the first few years of life by cleft type, presence of other anomalies, and payer type is lacking for children with orofacial clefts. Our objective was to examine differences in hospital resource use for children with orofacial clefts by the presence of other birth defects, cleft type, and payer type.

METHODS: This was a retrospective, population-based, state-wide study of children with orofacial clefts born 1998-2007, using the Florida Birth Defects Registry and hospital discharge records. Descriptive statistics on number of hospitalizations, hospitalized days, inpatient costs, and payer type were calculated. Results were stratified by isolated orofacial clefts (no other birth defect present); cleft type (cleft lip only, cleft palate only, and cleft lip and palate); and health insurance payer type.

RESULTS: Of 2,584 children with orofacial clefts, 17.0% (n=439) had cleft lip only, 34.0% (n=878) had cleft palate only, 49.0% (n=1,267) had cleft lip and palate; and 52.6% (n=1,360) isolated orofacial clefts. These children had 6,835 inpatient admissions for 1998-2008, of which 69.9% occurred during infancy. Children with orofacial clefts and other defects had almost twice the number of hospitalizations, four times more hospitalized days, and almost six times higher total costs than children with isolated orofacial clefts. Among children with isolated orofacial clefts, children with cleft lip and palate and cleft palate only had a significantly greater number of hospitalizations, more hospitalized days, and higher total costs than children with cleft lip only. Of all hospitalizations, 59.7% (n=4,081) were paid by public payer sources. Among children with multiple hospitalizations, 16.5% (n=260) had a mix of public and private payers.

CONCLUSIONS: Costs and hospital use vary greatly by the complexity of the cleft condition, including the presence of additional birth defects and the type of orofacial cleft. Birth defects registry and hospital discharge data provide useful tools for evaluating patterns of hospital resource use over time.

154 INITIAL NUTRITIONAL ASSESSMENT OF INFANTS WITH CLEFT LIP AND/OR PALATE: INTERVENTIONS AND RETURN TO BIRTH WEIGHT

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BACKGROUND & PURPOSE: Lower than average birth weight and weight gain have been reported for infants with cleft lip and/or cleft palate. Difficulty with breast and bottle feeding is common. Ensuring appropriate feeding should be a primary concern for initial team-centered assessment after a cleft has been identified. The presence of a nutritionist or feeding specialist has not been specifically identified as necessary for comprehensive cleft team care. In our experience, the presence of a registered dietitian and occupational feeding therapist are invaluable for successful management of these patients. This preliminary study aims to quantify and assess our team practices with regard to nutritional support.

METHODS: A retrospective study of 100 consecutive newborn patients with a diagnosis of cleft lip and/or cleft palate. Data was collected from the first team visit regarding birth weight, gestational age, cleft type, initial team weight measurements, feeding practices, and recommended nutritional interventions.

RESULTS: Of 100 patients, 3 were excluded for incomplete records. 36 had isolated cleft lip (CL), 33 had cleft lip with cleft palate (CLP), and 28 had isolated cleft palate (CP). 100% were assessed by a registered dietitian and occupational therapist. Average age (in days) at the first visit was similar for each cleft type: CL=27.9, CLP=26.9, CP=27.4. Average birth weight was CL=3.29kg, CLP=3.08kg, CP=3.44kg. Average % birth weight was CL=123.3%, CLP=112.5%, CP=108.3%. The calculated age (in days) for return to birth weight was CL=14.7, CLP=15.21, CP=23.4. Exclusive use of breast milk was CL=50%, CLP=30.3%, CP=21.4%. Exclusive formula use was CL=30.6%, CLP=39.4%, CP=67.9%. 31 detailed nutritional interventions were made at the first visit: CL=2, CLP=14, CP=15. These interventions included specific increase in goal intake volume (12), concentration of caloric density of milk (15), or specific change in feeding method (3). 1 patient required inpatient admission for feeding assistance.

CONCLUSIONS: Distinct differences exist in neonatal weight gain between cleft types. There is a slower return to birth weight for isolated cleft palate patients and significantly greater total weight gain of CL patients at their first visit. CL patients required far fewer interventions at the initial assessment and were more likely to be provided breast milk exclusively or in combination with formula (69.4%). CP infants were far less likely to receive any breast milk (32.1%). Both CLP and CP patients required frequent nutritional interventions (42.4% and 53.6%, respectively).

155 FACTORS AFFECTING PARENTAL ANXIETY AND POSTOPERATIVE PAIN IN INFANTS UNDERGOING CLEFT LIP OR PALATE REPAIR

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BACKGROUND & PURPOSE: Pediatric cleft lip and palate surgery can be stressful for both the child and the parents. Limited pain knowledge and certain parent psychological traits are associated with increased parental anxiety around surgery in older children. Increased parental anxiety has been associated with increased child pain, decreased ability of the child to cope with pain and worse outcomes in other surgical settings. Little is known about parental anxiety and child pain in preverbal children undergoing cleft lip and palate repair. The objectives of this study were to explore possible sociodemographic factors contributing to parental anxiety in the immediate postoperative period and to determine if there is a relationship between parental postoperative anxiety and infant postoperative pain.

METHODS: Cross-sectional pilot study, semi-structured interview. Eight mothers of children under 18 months of age undergoing cleft lip/palate (CL/P) repair at an urban craniofacial center were recruited. Semi-structured interviews about their experience with their infant's surgery were conducted. Demographics were collected at a preoperative visit, while maternal anxiety scores, measured using the Hospital Anxiety and Depression Scale (HADS), and nurse-recorded child pain scores (Face, Legs, Activity, Cry, Consolability scale), were collected on postoperative day (POD) 1. Fisher's exact tests were used to compare demographics and student T-tests were used to analyze pain medication and doses given.

RESULTS: Mothers who were healthcare workers were more likely to have borderline/abnormal anxiety scores (HADS>7) than mothers who were non-healthcare workers (p=.035) on POD1. Mothers of infants undergoing a bilateral CL/P repair tended to be more anxious than mothers of infants undergoing a unilateral CL/P repair (p=.090). Infants of anxious mothers tended to have more variation in pain scores, more pain scores recorded (95% CI -1.74, 4.0)(p=.19) and more pain medication given (95% CI 2.59, 5.82) (p=.37), compared to infants of non-anxious mothers.

CONCLUSIONS: Many factors contribute to parental anxiety, which may affect infant pain level and surgical outcomes. This pilot study elucidated possible factors contributing to parental anxiety, validated the prevalence of postoperative parent anxiety and informed the groundwork for a current, larger prospective study examining parent and child factors correlated with parent anxiety and child pain around CL/P repair.

156 MANAGEMENT OF PRENATAL CONSULTATIONS IN THE CLEFT LIP AND PALATE PROGRAM

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BACKGROUND & PURPOSE: Steady advancement in diagnostic technologies has resulted in an increase in prenatal cleft lip and/or cleft palate (CL/P) diagnosis. Given such diagnosis, parents may choose to terminate or continue the pregnancy. Prenatal consultations with a specialized CL/P program plays a role in this decision making process. Currently, no consensus exists on how prenatal consultations should be conducted. The purpose of this study was to evaluate the prenatal CL/P program in a large urban pediatric hospital to establish best practice guidelines.

METHODS: Part I was a retrospective review of parents (n=41) who received a prenatal consultation by the CL/P team during 2011 and 2012, and the children of those parents born prior to July 2013 (n=34). Demographic and diagnostic information was collected and analyzed with descriptive statistics. Part II involved in-depth interviews of: 1) Parents (n=7), 2) Interprofessional CL/P team members at the author's institution (n=9), 3) Referring geneticists (n=3), 4) International CL/P teams (n=3). Interviews were analyzed using thematic content analysis. Major and minor themes were determined after 3 iterations, expert and member checking.

RESULTS: Part I: 24.3% of babies born with CL/P and referred to the team were diagnosed prenatally. The main purpose of prenatal consultations for both parents and professionals was identified as providing education and support. Accuracy of prenatal diagnosis was 70.6%. Families waited an average 25 days from referral to consultation. The majority (68.3%) of consultations were conducted by the CL/P nurse coordinator and plastic surgeon. Part II: Major themes derived from interviews were: (1) emotional support: timing and needs, (2) CL/P resources: type, accuracy and timing of distribution and, (3) satisfaction with the CL/P team. A best practice pathway that prioritizes timing and centralization of resources was developed. Web-based programs and multimedia will be key in addressing these needs.

CONCLUSIONS: Best practice guidelines for prenatal consultation must prioritize centralization of resources from the CL/P team to community partners to optimize the timing, accuracy and comprehensiveness of the education and emotional support that family's desire when seeking prenatal CL/P consultation.

157 EARLY EXPERIENCE WITH 30 CASES OF ENDOSCOPIC SPRING ASSISTED SURGERY FOR SAGITTAL CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: The purpose of this study is to review our experience with the addition of the endoscopic approach to spring assisted surgery.

METHODS: We began placing springs endoscopically 2 years ago. Surgical procedures are done as a team approach with our pediatric neurosurgical colleagues. An endoscopic strip craniectomy is performed and 1 to 3 springs placed. Spring design is dependent on age at surgery, type of craniosynostosis, and bone thickness. Postoperative analysis includes cephalometric analysis, cephalic index, cranial volume calculations utilizing a scanning laser analysis.

RESULTS: We have treated 30 children (20 males, 10 females) at a mean age of 4.4 months at the initial surgery and mean age at removal of 8.6 months (mean duration 4.2 months) for scaphocephaly. The cephalic index improved significantly from a mean pretreatment value of 70 to 76 and this has

continued to improve and be maintained over a follow up time of 6-30 months. Mean OR time, blood utilization, hospital stay, and cost are all comparable to children treated for scaphocephaly with open spring placement. There has been on child who required early spring removal for asymmetry and one child who required CVR for under correction and asymmetry and no mortalities associated with this treatment protocol.

CONCLUSIONS: Since beginning our clinical study in 2001, SAS has become our treatment of choice for children 7 months or younger with scaphocephaly. In 2011 we added the endoscopic approach to our treatment protocol and have found the OR times, blood loss, and complication rate not significantly different from the open approach for spring placement. Spring-assisted surgery offers a safe, effective, and less invasive option for the treatment of craniosynostosis. The addition of the endoscopic approach does have a learning curve associated with it but has comparable clinical results as well as no significant difference in perioperative morbidity and mortality.

158 THE ROLE OF DISTRACTION OSTEOGENESIS IN THE MANAGEMENT OF CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW

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BACKGROUND & PURPOSE: Distraction osteogenesis (DO) has been proposed as an alternative to cranial remodeling surgery (CRS) for craniosynostosis, but technique descriptions and outcome analyses are limited to small case series. This systematic review summarizes operative characteristics and outcomes of DO for craniosynostosis. A secondary aim is to identify advantages and disadvantages of this approach and formulate guidelines for recommending its use over CRS.

METHODS: Two independent assessors undertook a systematic review of the literature using Cochrane, PubMed, Scopus, Google Scholar, and Web of Science databases. Studies that reported descriptive analysis, operative technical data, outcomes, or post-operative complications of DO for craniosynostosis were included. Studies that reported concomittant midface or mandibular distraction were excluded.

RESULTS: Twenty-two eligible manuscripts, totaling 292 cases, were identified. In 267 cases DO was the primary procedure while 25 had previous operations. There were 93 cases of syndromic craniosynostosis, most frequently Apert (38) and Crouzon (21) syndromes. The remaining 199 were nonsyndromic, the most common deformities being plagiocephaly (56), scaphocephaly (40), and brachycephaly (23). All comparison studies found mean operative time, blood loss, and intensive care unit (ICU) length of stay to be less than CRS, some with statistical significance. Only 19 patients (6.5%) required any blood transfusion whereas in CRS transfusion is almost universal. Treatment protocols included: latency period of 4.7 ± 1.6 d, distraction rate of 1 millimeter/d, distraction period of 20.4 ± 6.1 d, and consolidation period of 59.6 ± 22.8 d. There were complications in 46 (16%) cases, but most of these were minor, such as superficial infections, cerebrospinal fluid leaks requiring no intervention, or hardware issues. Footplate loosening or hardware malposition was highly variable and dependent on surgical technique. There were no post-operative deaths. Serious complications associated with CRS such as meningitis, epidural abscess, or significant resorption were not observed after DO. With reasonable follow-up (23.6 ± 21.6 months, range 6 to 130), there have been zero reports of bony relapse, including when DO was used to treat relapse after CRS.In 291 cases, post-operative improvement was observed in the form of decreased intracranial pressure, resolved headache or papilledema, improved aesthetic appearance, increased cranial volume, or other measurements of endocranial angulation or proportion.

CONCLUSIONS: DO is a useful adjunct to treat craniosynostosis with low morbidity and durable results. While DO can be labor-intensive and requires at least two procedures, its efficacy and safety profile suggest it can be considered an efficacious alternative method for the treatment of craniosynostosis. DO may be particularly advantageous in posterior vault expansion or to salvage cases of previous failure/relapse following CRS.

159 A NOVEL METHOD OF PHOTOGRAMMETRY AND ANALYSIS OF FACIAL AND NASAL LANDMARKS FOLLOWING CLEFT LIP/PALATE REPAIR

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BACKGROUND & PURPOSE: Cleft lip and/or palate defects occur in 16 of every 10,000 neonates born in the U.S. Precise measurements are often used by plastic surgeons and orthodontists in the repair of these congenital abnormalities. Photographs taken pre- and intra-operatively enable the surgeon to calculate anthropometric measurements related to the reconstruction. Two- and three-dimensional photogrammetry methods are currently available for this purpose. While three-dimensional photogrammetry provides the best facial analysis, this method is costly and involves extensive user training. On the contrary, the contemporary two-dimensional technology is not as effective in encompassing facial structures and contours, in addition to having high rates of user error.

METHODS: In this study, we propose and assess the accuracy of a novel two-dimensional photogrammetric method for analyzing facial and nasal landmarks. Our technique involves the use of two widely available computer programs, Adobe Photoshop and Microsoft Excel, to analyze pre- and intra-operative photographs. We tested the technique's precision by utilizing the method to calculate ten different facial measurements on 35 pre-operative and intra-operative photographs of 13 unilateral and bilateral cleft lip and palate patients. Each of the ten measurements on each photograph was performed in a random manner and was repeated five times. Statistical analysis using ANOVA, Cronbach's Alpha, and Intraclass Correlation Coefficient was then performed on the data.

RESULTS: All ten facial measurements demonstrated precision at a significant level ($p<0.001$), indicating that the technique repeatedly gave similar measurements for the different landmarks.

CONCLUSIONS: Our proposed two-dimensional photogrammetric method for analyzing craniofacial landmarks is cost-effective, user-friendly, and capable of significant precision in its calculations. We feel that it provides an excellent alternative to existing photogrammetry methods.

160 WHAT TO DO WHEN PEOPLE STARE WORKSHOP TEACHES INDIVIDUALS WITH DISFIGURING CONDITIONS TO CONTEND WITH STARING AND TAKE MORE CONTROL OF SOCIAL INTERACTIONS

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BACKGROUND & PURPOSE: Facial disfigurement caused by any reason can be a barrier to communication, complicate social integration, and cause isolation and rejection. Contending with staring is one of the most frequently reported concerns of patients and families. There are no programs in the U. S. to help disfigured individuals adjust to an altered appearance, understand the science of staring, and learn communication skills. The What to Do When People Stare workshop educates attendees about the science of staring based on the research of (Ectoff,1999),and incorporates specific interactive exercises to demonstrate communication skills. Since the workshop's inception in 2000, more than 796 burn survivors and family members have participated in the worshop, as well individuals with disfiguring dermatological conditions, and craniofacial anomalies. In 2011, we created an Interval Scale Survey with 10 questions to measure the effectiveness of the program. This study focuses on the 46 individuals with disfiguring conditions including, burns, dermatological, and craniofacial conditions who anonymously completed the survey.

METHODS: Of the 46 individuals,12 had burn injuries; 15 had disfiguring dermatological conditions, and 19 had craniofacial anamolies, or were the parents of children with craniofacial conditions. The instructor, who has a facial difference, discussed her injury and experience and reviewed the science of staring, influence of media, history of beauty, and asked open ended questions to elicit feelings and beliefs about why people stare, and how it feels to be the object of a stare. Participants practiced eye contact, and communication skills, and developed one sentence statements to describe their difference to a stranger as shown to be effective by Partridge,1990. After the workshop, participants rated their experience by answering questions like,"Having completed the seminar, to what extent do you feel better prepared to contend with staring?" They rated their responses on an Interval Scale from 1 being (Same) to 7 being (Much Better). Attendees received a companion brochure that we created, What to Do When People Stare to summarize the workshop and 12 actions to use in social situations.

RESULTS: Of the burn survivors, all 12 reported that they felt better prepared to manage staring, and had a better understanding about the motives of staring. Of dermatological patients,12 reported that they felt better prepared to manage staring, and 11 reported better understanding of the motives of staring. Of the individuals with craniofacial conditions and parents of children with these conditions,13 felt better prepared to cope with staring,and 15 reported a better understanding of the motives of staring.

CONCLUSIONS: The self reported outcome shows that individuals with disfiguring conditions feel better prepared and empowered to contend with staring and communicate with confidence after participating in this workshop.

161 PUBLIC AWARENESS OF CLEFT PALATE IN DULUTH AND SURROUNDING AREAS

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BACKGROUND & PURPOSE: The purpose of this project was to survey the public to determine what is known about the care of the individual with a cleft palate.

METHODS: Five hundred randomly selected individuals from Duluth, MN and surrounding areas were mailed a letter explaining the study and inviting them to participate. Along with the invitation letter, individuals received a consent form, the survey, and an addressed postage-paid envelope to return the survey. The survey questions were adapted from Middleton et al. (1986) and focused on the following areas: definition, cause, treatment, prevention, occurrence, ethnic group, the source of participants' knowledge about cleft palate and whether participants had any knowledge of professional organizations associated with the care of the individual with cleft palate. The survey questions consisted of multiple choice, yes/ no, and open-ended responses. Item-by-item analysis was conducted to calculate the frequency of each possible response for each question.

RESULTS: Eighty three participants responded to the survey. The majority of participants were age 45 and over (n= 70) and had completed at least an Associates degree (n=46). Sixty seven percent of the participants chose the correct response for the definition of cleft palate while only 14% were aware of variation in cleft type. "I don't know," was the most frequent response for the questions regarding cause (54%), occurrence (79%), ethnic group (72%), and prevention (63%). The American Dental Association (86%), the American Medical Association (87%) and Operation Smile (59%) were the most frequent choices for professional organizations by the participants.

CONCLUSIONS: Results suggest that participants were not aware of the cause, types, occurrence, and prevention of cleft palate nor were they aware of the most affected ethnic group. With regard to treatment, participants had an idea of what kinds of problems an individual with cleft palate may experience (with the exception of hearing) and where in general to go for help. Many of the participants indicated that their sources of information about cleft palate came from television, school, or family/friends. Few participants were aware of some of the major organizations devoted to the care of the individual with cleft palate.

162 PAIN MANAGEMENT IN ALVEOLAR BONE GRAFTING SURGERY

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BACKGROUND & PURPOSE: Post-operative hip pain is commonly reported after iliac crest harvest for alveolar bone grafting, and can adversely affect a child's overall surgical experience. The goal of this study was to describe our institution's iliac crest bone graft harvest experience, and to examine the efficacy of our graft harvest site pain management protocols.

METHODS: This study included patients undergoing alveolar bone grafting from the anterior iliac crest between January 1, 2011 and April 17, 2013. Retrospectively, demographic information, operative technique, intraoperative pain catheter placement, and post-operative pain medication use was collected. Using SPSS, standard descriptive statistics were conducted. The Mann Whitney U Test and the Fishers Exact Test were used to examine differences.

RESULTS: Eighty-five patients, 53 males and 32 females, averaging 8.8-years-old (+2.9) were included. The trap door technique was utilized in 47 patients (55%) and the crest was split in 38 patients (45%). Twenty-four (28.2%) patients had an intraoperative pain catheter placed in the graft donor site, and the remainder received an intraoperative injection of a long-acting local anesthetic. Post-operatively, 18 (75%) patients in the pain catheter group received IV narcotics compared to 27 (44%) without a pain catheter ($p = .015$), although for a significantly shorter duration (1.8 hours vs. 1.9 hours; $p < .05$). Pain catheter patients received more IV morphine (.042 mg/kg vs .035 mg/kg; p=.117), but less total oxycodone during their hospital stay (.317 mg/kg vs .397 mg/kg, p=.136). Patients undergoing the trap door technique utilized IV narcotics significantly more than the split crest group (p=.031), however no difference was found between oxycodone use and operative technique (p=.608). Regardless of intraoperative technique or pain catheter usage, the average time to post-procedure oral intake was 6 hours (+ 6.5 hours) and 78 (91.7%) patients were discharged within 24 hours.

CONCLUSIONS: Operative harvest technique was not related to oral pain medication usage, nor did an indwelling pain catheter reduce the amount of required oral pain medication post-operatively. Further studies assessing patient-reported pain ratings and time to ambulation, as well as long-term donor site complications are needed to optimally standardize care in this patient group.

163 READING ACHIEVEMENT, NEUROPSYCHOLOGICAL SKILLS, AND NEUROCIRCUITRY IN BOYS WITH NON-SYNDROMIC CLEFT PALATE ONLY

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BACKGROUND & PURPOSE: Decades of research has documented significantly elevated rates (up to 46%) of learning disorders (predominately reading or dyslexia) among children with isolated oral clefts. Findings on potential related have been mixed and neuroimaging studies have been limited. This study advances previous research through administration of measures of achievement, neuropsychological skill, and functional neuroimaging.

METHODS: Male subjects, ages 8 – 16, with non-syndromic cleft palate only (NSCPO) and controls without cleft were recruited through clinic lists and local advertisements. Each subject was administered tests of intelligence; reading accuracy, fluency, and comprehension; phonemic awareness; memory; and rapid naming. An functional MRI (fMRI) sequence evaluated brain activation during pseudoword reading tasks. Finally, audiology records for subjects with NSCPO were collected. Analysis of Variance (ANOVA) evaluated differences between groups and Hierarchical Linear Regressions evaluated differential relationships between group, age, reading achievement, and neuropsychological skill.

RESULTS: Ten subjects with NSCPO and 10 controls were enrolled and tested. fMRI data acquisition was successful for all controls and 7 subjects with NSCPO. There were no between group differences in intelligence, reading achievement, or neuropsychological skills. However, boys with NSCPO demonstrated slower reading fluency and rapid labeling of letters, this performance gap increased with age. Measures of early hearing had no relation to reading outcome. Finally, for neural activity, subjects with NSCPO had significantly increased activation bilaterally in their occipital lobe and decreased activation in the frontal lobe.

CONCLUSIONS**:** For male subjects with NSCPO reading fluency and rapid automatized naming skill do not develop at the same trajectory as healthy controls and early hearing is not related to reading outcome. Neurociruitry associated with reading is discrepant from healthy controls; following a pattern more commonly seen among children with dyslexia. It is important to evaluate all potential etiologies to better understand the causes of these reading difficulties and to determine means of early identification and the best modes of intervention.

164 DIFFERENTIAL GENE EXPRESSION OF CALVARIAL COMPARTMENTS WITH DIFFERENT EMBRYONIC ORIGINS

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BACKGROUND & PURPOSE: The human calvaria has four major sutures (the metopic, coronal, sagittal and lambdoid). These sutures consist of intrasutural mesenchyme (ISM) each flanked by two bones. The presence of unossified sutures facilitates fetal movement through the birth canal, and afterwards, as a growth center, allowing for brain growth. During growth of the calvaria, osteogenesis takes place at the osteogenic front; the leading edge or each bone. The premature fusion of the sutures is called craniosynostosis. There are hundreds of studies investigating the molecular causes of craniosynostosis. Yet most of the molecular mechanisms involved in the physiological development of each suture are not understood. The calvaria and intrasutural mesenchyme are derived from different embryonic origins. The frontal bones and the intrasutural mesenchyme of the metopic suture are of neural crest origin, while the parietal bones and coronal sutures are derived from paraxial mesoderm. There is controversy on the origin of the sagittal suture. In this study we investigated the gene expression in frontal and parietal bones and the metopic and sagittal intrasutural mesenchyme to determine their expression signature as related to their embryonic origins.

METHODS: Samples were obtained from human fetal cranium (gestation day 94-103). After isolating RNA from cell cultures gene expression was assessed using microarray technology. Paired comparison and transcript correlation analyses were performed on the expressome of each tissue type.

RESULTS: The analyses revealed that the frontal and parietal bones had the most distinct expression profiles. Among all the possible comparisons between these four compartments, two comparisons, frontal bone versus metopic ISM and parietal bone versus sagittal ISM, showed the least difference. This result was unexpected; due to the similarity of tissue type we expected the bones (frontal and parietal) and intrasutural mesenchyme (metopic and sagittal) to have a high degree of similarity in expression patterns. Instead, we found more similarities in gene expression in tissues of like origin (e.g. frontal bone most similar to metopic ISM). Our analysis also found that the most consistently upregulated transcripts in the frontal and metopic cell lines were TFAP2A and TFAP2B, known transcription factors involved with neural crest development.

CONCLUSIONS: Cranial compartments maintain distinct gene expression patterns related to their embryonic origin with tissues of like origin having more similar expression profiles than like tissues (e.g. bone vs. unmineralized ISM). We will discuss potential implications of these results as they relate to the pathogenesis of craniosynostosis.

165 DESIGN AND FABRICATION OF A NOVEL CAD/CAM SURGICAL GUIDES COMBINED WITH SINGLE-SPLINT TECHNIQUE FOR CLEFT-ORTHOGNATHIC SURGERY

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BACKGROUND & PURPOSE: This study proposed a novel design of computer-aided design and manufacture (CAD/CAM) surgical guides combined with single-splint technique in cleft-orthognathic surgery and demonstrate the feasibility and validity of our method.

METHODS: Two types of custom-made surgical guides were designed and fabricated by using CAD/CAM technology to guide Le Fort I osteotomy and position the maxilla for translation of the 3D virtual surgical planning to actual orthognathic surgery. All operations were performed by the same surgeon. A cone-beam computed tomography (CBCT) was taken preoperatively and postoperatively, and used in surgical planning and evaluating the accuracy of the presented method. The measurements between maxillary hard landmarks and reference planes were used to compare the differences between the virtual plan and postoperative surgical result.

RESULTS: Eight patients who underwent orthodontic treatment combined with two-jaw orthognathic surgery were performed in this study. One patient did not use the osteotomy guide in surgery, and was thus excluded from analysis. The Wilcoxon rank-sum test showed no significant difference between the virtual plan and postoperative surgical result in maxilla and condyle measurements. ($P < .05$) The experimental results showed that the proposed study exhibited clinically acceptable precision for position of the maxilla ranged from 0.04 to 1.46 mm and condyle ranged from 0.06 to 1.61 mm.

CONCLUSIONS: Our CAD/CAM surgical guides combined with single-splint provide a clinical feasible and reliable method for translation of the virtual planning to actual surgery. This study showed that the proposed approach is less complicated design, low-cost fabrication and easy-to-use for surgeon.

166 CRANIOFACIAL TRAINING FOR CLEFT TEAM SLPS: A MODEL FOR SLP EDUCATION AND EXPANDING ACCESS TO SPEECH THERAPY SERVICES

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BACKGROUND & PURPOSE: The volume of patients with cleft palate requiring speech therapy supersedes the number of SLPs with training in resonance and compensatory articulation disorders. Results from past US surveys of SLPs indicate a need for further education regarding treatment of children with clefts (Bedwinek, 2010), since SLPs have an obligation to provide services in which they are competent (ASHA, 2003). Currently, most cleft team rosters include only 1-2 specially trained SLPs, who typically function in a diagnostic role in the team setting. The low number of cleft-trained SLP's has resulted in limited accessibility to specialized therapy services, which are critical to ensuring optimal speech outcome. While cleft teams may provide adequate speech evaluation services with a single SLP, obtaining speech therapy from the cleft team SLP is often unattainable. By implementing a systematic approach to comprehensive education, training, and mentorship for cleft palate speech therapy, our cleft palate program has been able to train multiple SLPs within a single major pediatric academic health system to provide cleft palate speech therapy services throughout a large metropolitan area and satellite clinics in the surrounding suburbs. This has resulted in the ability to meet the demands of the cleft palate speech therapy caseload, improve patient accessibility to quality therapy services, and also provide depth to cleft team speech services.

METHODS: This poster will discuss the specific components of our training protocol including (1) directed readings and a conference call with the lead team SLP to review reading content and questions, (2) an annual cleft palate speech educational retreat, (3) observation of therapy sessions, (4) mentored treatment planning and therapy sessions with direct instruction provided by team SLPs, and (5) advanced training opportunities for transition into the full cleft team SLP evaluation role. Since 2012, this cleft palate speech training program has resulted in training 6 SLPs who have now met core cleft palate speech therapy competencies. In addition, this training approach has allowed our team to now have a minimum of four SLPs, at any given time, trained in evaluation of resonance and compensatory articulation disorders to serve on the Cleft Palate Team.

167 THE EFFECTS OF ANCHORS ON THE RELATIONSHIP BETWEEN NASALITY RATINGS AND NASALANCE SCORES

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BACKGROUND & PURPOSE: This investigation explored the relationship between nasalance scores and nasality ratings when perceptual anchors were placed at different points along a 7-point scale used to rate nasality.

METHODS: One hundred speech samples and nasalance scores were obtained simultaneously from 95 children followed by a cleft palate team and 5 non-patient speakers. The speech samples were randomized and duplicated to make six different sets of 100 samples each. Listeners (N=129) were randomly assigned to one of six listening groups and each group rated nasality on a seven-point scale that ranged from "1" normal nasality to "7" severe nasality. Five groups heard single or multiple anchors; but the anchors were located at different points along the perceptual continuum for each group. One group did not hear anchors.

RESULTS**:** Correspondence between median nasality ratings and mean nasalance scores differed for the different listening conditions. Group 4 heard anchor stimuli representing "3", and "5" on the rating scale and this resulted in the best correspondence between nasality ratings and nasalance scores (r=0.48). The poorest correspondence was for Group 1 which did not hear any anchor stimuli (r=0.41). A median rating was computed across listeners for each of the 100 samples in order to assign a single rating to each sample and these were compared to the mean nasalance scores. Mean nasalance scores were essentially the same for all stimuli rated "1" (26.4%), "2" (26.9%), or "3" (26.7%). In other words, it appeared that listeners made distinctions on the mild-moderate end of the perceptual scale that the Nasometer did not. Mean nasalance scores increased only about 3% from scale value "3" (26.76%) to scale value "4" (29.72%) and increased again about 6% from "4" to "5" (36.41%). Nasalance increased substantially for scale values "6" (44.05%) and "7" (41.28%) but there was little difference in nasalance for speech samples at the high end of the scale.

CONCLUSIONS: Correspondence between nasality ratings and nasalance scores is influenced by different placement of perceptual anchors. Nasalance scores increased in a step-wise fashion relative to listener ratings rather than linear.

168 RENAL AND SPINE SCREENING IN SUB-PHENOTYPIC POPULATIONS OF PATIENTS WITH CRANIOFACIAL MICROSOMIA

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BACKGROUND & PURPOSE: Craniofacial microsomia (CFM) is among the most common craniofacial conditions; however, there has been no standardization of clinical care nor consensus on surveillance for extra-craniofacial anomalies. The reported prevalence of spine and genitourinary anomalies ranges widely; 24%-42% and 4-15%, respectively. Timely diagnosis of these anomalies is

essential for safe and comprehensive care, given that many children undergo multiple surgeries and procedures. The goal of this study is to understand the prevalence and type of renal and spine anomalies in CFM and identify phenotypic subpopulations at risk.

METHODS: One hundred children with CFM were enrolled from four US craniofacial centers between 2011-2012. Participants were identified using clinical, billing and scheduling databases. Demographic, phenotypic, and clinical data, including birth, medical and surgical histories were ascertained from study visits, parental interview, photographs and medical records review.

RESULTS: One hundred case participants, 56% males, mean age: 8.2 years, were enrolled and grouped by facial phenotype: a) isolated microtia (18%); b) facial asymmetry and preauricular/facial tags (tags) without microtia (2%); c) facial asymmetry and tags or microtia plus other features (epibulbar dermoids, macrostomia, tags) (76%); d) other features excluding facial asymmetry or microtia (4%). Renal ultrasounds had been performed in 62 participants, and spine radiographs in 39. Of the total group, 8% had a renal anomaly (all unilateral, 66% in right side), and 21% had vertebral anomalies (all from phenotypic groups c and d). Renal ultrasounds and spine radiographs frequency varied between groups a to d: 71%, 50%, 72%, 33% and 12%, 0%, 47%, 50%; respectively.

CONCLUSIONS: We report a ten-fold higher frequency of renal anomalies and three-fold higher frequency of spine anomalies in CFM patients compared to the general population. These prevalences are likely underestimates given incomplete screening. Our data support renal and spine imaging in the standard clinical care patients with CFM.

169 HOW AN AUDIT INTO THE AGE AT WHICH CHILDREN WITH CLEFTS STOP USING A BOTTLE TO DRINK HAS LED US TO A NEW STRATEGY FOR ENCOURAGING THEM TO STOP BY THE RECOMMENDED 12 MONTHS

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BACKGROUND & PURPOSE: Background Caries experience in patients with clefts is reported to be twice that of the general population. (Britton and Welbury 2010) Extended use of a feeding bottle can have a detrimental effect on the dentition and as a result the quality of life of a child. This audit reports on whether the introduction of Nursing Dental Health Standards (NDHS) has had an impact on the bottle habits of patients in a regional Cleft Unit. We wanted an outcome of all patients to have stopped having a bedtime drink other than water and to have stopped using a bottle by the age of 12 months as per the UK Department of Health guidance and National Paediatric Dental Cleft Standards. Our aim was to establish whether the current strategy in place was effective, and if not to determine ways in which it could be improved.

METHODS: The first cycle of this audit resulted in the introduction of the Nursing Dental Health Standards checklist across all cleft units which had a pediatric dentist. Following this, patient's families were given preventative advice by the cleft nurse using the checklist during home and clinic visits between 4 and 6 months of age. Their bottle feeding habits were then assessed during a clinic visit at 18 months of age by the pediatric dentist. Data was collected nationally over an 18 month period, following which the results were analyzed.

RESULTS: Results Although 70% of parents remembered the advice to stop the use of the bottle by the child's 1st birthday, only 46% had stopped by their 18 month review. This is a 15% improvement on results pre-introduction of NDHS (31%), however further improvement is still needed. All patients were brushing at least once daily, with 93% of patients brushing twice daily compared to 80% prior to the introduction of NDHS. 70% of patients were registered with a general dental practitioner.

CONCLUSIONS: Based on findings we have modified our current strategy in an effort to further improve outcomes for patients with clefts. Firstly, a letter is sent out to families at 5 months to explain the importance of dental prevention. Secondly, a leaflet reminder is sent out just prior to their first birthday to reiterate the "Stop the Bottle" advice. A leaflet documenting for parents the importance of stopping bottle feeding at 12 months has also been created for distribution.

170 THE EFFECTIVENESS OF PARENT-IMPLEMENTED INTERVENTION FOR YOUNG CHILDREN WITH CLEFT PALATE

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BACKGROUND & PURPOSE: The purpose of the study was to examine the effectiveness of a parent-implemented intervention program for children with cleft palate younger than 3 years on the speech and language development.

METHODS: A parent-implemented intervention program had been developed based on literature review and opinions of parents and clinical service providers in cleft palate clinics. The intervention program included four phases; pre-intervention test, small group parent training, administration of parent-implemented intervention in children's home for 3 months and monitoring, and post-intervention test. Seventeen children with cleft palate aged 12 to 30 months and their mothers participated in the entire sessions of the intervention program. To investigate the effectiveness of the intervention more validly, 7 children with cleft palate and their mothers involved in the study as a control group and they participated in only test sessions and did not voluntarily receive parent training. Testing procedures involved administration of standardized language tests and collection of 20-minute language samples while mothers interacted with their children in their homes. Researchers who were blinded the purpose of the study, group type, and testing phase transcribed and analyzed the language samples and provided mothers' and children's measures. The maternal measures involved the length and complexity of language and communication style. The children's measures included the percentage of communication modes (gesture, vocalization, and intelligible speech), vocabulary size, the mean length of utterance (MLU), the number of true consonants in the phonetic inventory excluding glottal consonants, and the number of different syllable structures. Children's speech-language characteristics and mothers' interaction style from pre- and post-intervention tests and between the two groups were compared.

RESULTS: All the measures of pre-intervention test did not show significant differences between the experimental and the control groups. The post-intervention test exhibited the differences in the number of expressive vocabulary and the use of gestures between the two groups. The experimental group showed that 6 speech-language measures of children significantly changed after the intervention. They were (1) language score age, (2) number of expressive vocabulary, (3) number of true consonants, (4) number of different syllable structures, (4) number of different words, (5) MLU, and (6) percentage of gestures. Responsiveness of mothers on children's communication acts in the experimental group significantly increased after the intervention.

CONCLUSIONS: The findings of the study suggest that the parent-implemented intervention is effective in improving speech-language performances of children with cleft palate and language stimulation and interaction skills of mothers. The study has implications for establishing models for the delivery of early intervention program in the population.

171 FEEDING OUTCOMES FOLLOWING MANDIBULAR DISTRACTION OSTEOGENESIS IN PIERRE ROBIN SYNDROME

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BACKGROUND & PURPOSE: Pierre Robin Syndrome (PRS) is classically described as microretrognathia, glossoptosis, and airway obstruction. Infants with PRS frequently suffer from feeding difficulties due to airway obstruction and severe reflux, leading to poor weight gain and slow growth. Mandibular distraction osteogenesis (MDO) is the only surgical modality that definitively corrects the pathology of PRS. While the literature supports improvement in airway obstruction with MDO, feeding behaviors following mandibular distraction in PRS have not been described. The aim of this study is to explore whether MDO affects oral intake and growth in infants with PRS.

METHODS: A retrospective study was performed at our institution to analyze MDO performed between 2003 and 2013. Patient charts were identified using CPT codes for segmental osteotomy and external fixators. Patients without PRS were excluded from the study. Hospital charts were reviewed for associated genetic syndromes, co-existing cleft palate/lip, airway assessment via direct laryngoscopy, presence of gastroesophogeal reflux symptoms, use of anti-reflux medications, feeding method(s) and amount, and weight percentiles. These variables were compared before and after MDO to detect any differences.

RESULTS: 21 infants with PRS were included in the study. 18 patients (86%) had an associated cleft palate and 1 patient (5%) had tracheomalacia on laryngoscopy. 12 patients had isolated PRS and 9 patients had syndromic PRS. The average age at surgery was 3.0 months. Average follow-up time was 14.0 months (range 1.5 - 42 months). Gastroesophogeal reflux symptoms and the use of anti-reflux medications were similar before and after surgery. Significantly more infants tolerated oral feedings after MDO as compared to before surgery (p=0.02). Volume of oral intake, weight, and weight percentile were significantly greater post-operatively as compared to pre-operatively

(p<0.001, p<0.001, p=0.04 respectively).

CONCLUSIONS: Mandibular distraction osteogenesis is an effective treatment for feeding difficulties in infants with PRS. Surgical treatment of PRS can improve oral feeding behaviors, increasing the amount of nutrition consumed orally and enhancing weight gain.

172 RACIAL/ETHNIC DIFFERENCES IN BULLYING, AGGRESSION, AND SOCIAL SUPPORT AMONG SCHOOL-AGE CHILDREN IN A PEDIATRIC CRANIOFACIAL CLINIC

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BACKGROUND & PURPOSE: Despite growing literature on the psychosocial impact of craniofacial anomalies in pediatric populations, research addressing the relationship between racial/ethnic differences and psychosocial concerns in this population is limited. The current study examined psychosocial factors in a pediatric craniofacial population, particularly as they related to race and ethnicity.

METHODS: Data were collected during in-person clinic visits and via medical chart reviews. Chi-square analyses were conducted to examine the relationships between ethnicity and other demographic and psychosocial variables. The total sample included 278 children and adolescents, ages 5-17 years (mean age=9.78 years; Hispanic= 52.6%).

RESULTS: Chi-square analyses revealed that racial/ethnic differences were significantly related to reported rates of bullying/teasing, with 61.5% of Black/Non-Hispanic respondents endorsing bullying/teasing compared to 34.8 of Hispanic patients and 39.5% of White/Non-Hispanic patients. Racial/ethnic differences were significantly related to reported rates of aggression, with 40.7% of Black/Non-Hispanic respondents endorsing aggression compared to 18.6% of Hispanic respondents and 22% of White/Non-Hispanic respondents. Finally, racial/ethnic differences were significantly related to reported rates of social support, with 22.2% of Black/Non-Hispanic respondents endorsing lack of social support, compared to 6.5% of Hispanic respondents and 5.1% of White/Non-Hispanic respondents.

CONCLUSIONS: These findings indicate significant racial/ethnic differences in reports of bullying, aggression, and social support by children and families in this particular sample. Future research should focus on the extent and effects of these disparities on the psychosocial wellbeing of children and adolescents with craniofacial anomalies.

173 FACIAL SOFT-TISSUE ASYMMETRY IN 3D CONE BEAM COMPUTED TOMOGRAPHY IMAGES OF CHILDREN WITH SURGICALLY CORRECTED UNILATERAL CLEFTS

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BACKGROUND & PURPOSE: Cleft lip with or without cleft palate (CL/P) is a relatively common craniofacial malformation that disrupts bony and soft-tissue development of the labionasal facial regions. Individuals with CL/P typically undergo multiple surgeries to close the cleft and improve appearance of the cutaneous upper lip and nose. The combination of CL/P and subsequent craniofacial surgeries can cause scarring and muscle pull and can result in soft-tissue depth asymmetries across the face.

METHODS: We tested the hypothesis that bilateral facial tissue depths of children with surgically repaired unilateral CL/P exhibit differences in symmetry. Following IRB approval (study # 1210009813), reliability studies were carried out to assess intra-class correlation (ICC) and technical error of measurement (TEM). A total of 28 bilateral tissue depths were measured by one investigator on cone beam computed tomography (CBCT) images from orthodontic records of children with unilateral CL/P (n = 55) who have been surgically repaired, aged 7-17 yrs., using Dolphin software (v 11.5). Paired t-tests were used to determine whether the tissue depths on each side of the face were significantly different, and a p-value of ≤ 0.05 was considered significant.

RESULTS: ICC was high (0.99) and indicates that tissue depth measurements are reliable. TEM was low (0.20 mm) and indicates that measurement error is adequately low. Significant differences in tissue depth symmetry were found around the cutaneous upper lip and nose, with tissue depths on the clefted side being significantly increased by (0.6 - 1.6mm).

CONCLUSIONS: Despite the best efforts of plastic surgeons there is usually residual facial asymmetry from CL/P, although these asymmetries are small. Surgeons can quantify asymmetry using 3D CBCT images and 3D imaging software to develop individualized treatment plans for patients after evaluating the anatomical relationship between the hard- and soft-tissues of the craniofacial complex.

175 DELETIONS OF EFTUD2 IN PATIENTS WITH FACIAL DYSOSTOSIS: A USEFUL CONSIDERATION IN A DIFFERENTIAL DIAGNOSIS

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BACKGROUND & PURPOSE: Mandibulofacial dysostosis is a clinically and etiologically heterogeneous group of disorders characterized by significant malar and mandibular hypoplasia. Recently, heterozygous loss-of-function mutations of the EFTUD2 gene on 17q21.31 were identified in a rare syndromic craniofacial condition termed mandibulofacial dysostosis with microcephaly (Mandibulofacial dysostosis, Guion-Almeida type; MFDM). We present two patients with deletions at 17q21.31 encompassing the EFTUD2 gene illustrate the importance of including this condition in the differential diagnosis of other human facial dysostosis syndromes.

METHODS: Chromosome microarray analysis was done using Agilent technologies © 400K CGH+SNP array and Affymetrix © Cytoscan HD. ®

RESULTS: Patient 1 was diagnosed prenatally with a cleft palate and ventriculomegaly. Postnatally, she was noted to have low weight, microcephaly, microretrognathia, and midface hypoplasia. Musculoskeletal findings included proximally placed thumbs, overlapping toes and limited forearm supination. X-rays documented bilateral radioulnar synostosis and 11 ribs. Brain imaging revealed thinning white matter with heterotopias. By 5 months of age, the patient continues to have significant microcephaly and displays developmental delay. Patient 2 is a 4 year old female with a history of a submucousal cleft palate, epilepsy, and speech apraxia. On physical exam, she was noted to have a small mouth, hypotelorism and micrognathia. Examination of her extremities did not reveal abnormalities and her anthropometric measurements were normal, including head circumference. Testing for both patients revealed deletions at 17q21.31 involving EFTUD2.

CONCLUSIONS: Three previously reported patients with deletions involving EFTUD2 were microcephalic, like Patient 1. Patient 2 was notably not microcephalic, which is consistent with the assertion that microcephaly is not a unifying feature. In fact, the relative milder developmental impairment of Patient 2 provides evidence for the relationship between a lack of absolute microcephaly and favorable neurodevelopmental outcomes. On the other hand, Patient 1 is the first documented case of radioulnar synostosis in this condition. This provides further evidence of the clinical overlap among human facial dysostoses. The variable phenotype among patients with alterations of the EFTUD2 gene indicates that MFDM should be considered among the differential diagnosis for facial dysostosis.

176 EXPLORING COMMUNICATION ATTITUDE AND ITS RELATIONSHIP TO COMMUNICATION APPREHENSION, AND SPEECH SEVERITY IN CHILDREN WITH VELOPHARYNGEAL INSUFFICIENCY (VPI)

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BACKGROUND & PURPOSE: Speech-associated attitudes may influence the communicative functioning of children with velopharyngeal insufficiency (VPI). Specific to children with speech disorders, attitude may be defined as children's perceptions and feelings as they pertain to speech. Negative speech-associated attitudes have been shown to develop at an early age in children with a variety of speech disorders. These negative communication attitudes (CA) are likely to interact with one's cognitive processes, affective states, and behavior during communication situations. The purpose of the present study is to evaluate CA and its association with speech severity, satisfaction with speech, and communication apprehension, in children with VPI.

METHODS: 20 children with VPI (7-14 years), and 20 typically developing children matched on age and gender participated in this study. Study participants completed: the Communication Attitude Test (CAT), a 35-item measure of CA, the Measure of Elementary Communication Apprehension-Revised (MECA-R), a 16-item measure of communication apprehension, and, a one-item measure evaluating speech satisfaction. In addition, perceptual evaluations of the speech of children in the experimental group were performed by a Speech Language Pathologist using the American Cleft Palate Association Data Entry Form (ACPA). The experimental questions posed were: 1) Do children with VPI experience more negative attitudes towards speech than controls?, and 2) Does a relationship exist between CAT scores and

MECA-R scores, speech severity scores (ACPA scores), and speech satisfaction?

RESULTS: On average, children with VPI experienced more negative attitudes towards their speech than controls. Furthermore, moderate to strong correlations were observed between CA and communication apprehension, speech satisfaction, and speech severity variables (nasal air emission, and overall intelligibility).

CONCLUSIONS: Children with VPI experience negative internalized appraisals of their speech abilities. These attitudes towards communication may be associated with their speech functions and overall communicative functioning. As such, the present data allows for further understanding of limitations in communicative participation in children with VPI.

177 QUANTIFICATION OF MAXILLARY SINUSITIS IN UNILATERAL CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Cleft lip and palate (CLP) perturbs osseous and soft-tissue development of the nasolabial regions, often resulting in chronic maxillary sinusitis. The purpose of this preliminary study is to quantify maxillary sinusitis in children with surgically repaired unilateral CLP.

METHODS: We hypothesize that maxillary sinusitis is increased in children with surgically repaired CLP relative to controls. We define “sinusitis” as the difference between the entire maxillary sinus volume (including non-bony obstruction, e.g. fluid, mucous, inflammation) and airspace volume. Cone beam computed tomography (CBCT) images of 8-14 yr. old age- and sex-matched unilateral CL/P patients (n = 10) and controls (n = 10) were obtained from orthodontic records with IRB approval (# 1210009813). Reliability was assessed using intra-class correlation (ICC). Left and right maxillary sinus and airspace surface area (SA) was measured on each individual CBCT slice in coronal view by one investigator (15,578 measurements). SA measurements were summed and multiplied by voxel size (0.4mm) to obtain a volumetric value for each measurement per individual. Paired t-tests determined whether maxillary size, airspace, sinusitis (i.e. maxillary size - airspace), and percentage of sinusitis (i.e. 1 - airspace/maxillary size) differed between the two samples. A p-value of ≤ 0.05 was considered significant.

RESULTS: ICC was high (0.99) and SA measurements reliable. Significant differences were found for several measurements: Maxillary airspace (non-cleft p-value 0.002; cleft-side p-value 0.004), sinusitis (cleft-side p-value 0.009), and percentage of sinusitis (non-cleft p-value 0.002, cleft-side p-value 0.002). Maxillary airspace was decreased by 30% on the non-cleft side and by 35% on the cleft side. Percentage of average sinusitis was 37% on the non-cleft side and 46% on the cleft side of CLP patients, but only 10% on each side in controls.

CONCLUSIONS: Surgically repaired CLP patients exhibit decreased maxillary airspace and increased sinusitis relative to controls. CLP deformities appear to encourage the presence of sinusitis, which may perturb maxillary pneumatization during morphogenesis and growth to disrupt physical respiration, or vice versa.

178 CRANIAL BASE IN HEMIFACIAL MICROSOMIA: AN OBJECTIVE CRANIOMETRIC ANALYSIS

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BACKGROUND & PURPOSE: The abnormal growth pattern in patients with Hemifacial Microsomia (HFM) results in noticeable craniofacial asymmetry. The focus of most reports has been abnormal mandibular morphology with less attention paid to the midface. Thus far, no studies have evaluated the degree of asymmetry of the cranial base in HFM. The aim of this study is to evaluate the endocranial morphology of the anterior and middle cranial base in HFM.

METHODS: Consecutive patients with HFM treated at a major craniofacial center from 2000 to 2012 were included and classified according to the degree of severity using the Kaban-Pruzansky classification. Patients were excluded if they were diagnosed with bilateral HFM, were less than 1 year of age, underwent a surgical intervention, had an incomplete medical record or lacked a 3D-CT scan of the head. Transverse craniometric measures and lateral facial measurements were reported and used to calculate mean ratios between affected and unaffected sides. Statistical analysis was performed on craniometric measurements using Kruskal-Wallis and Wilcoxon signed-rank tests.

RESULTS: 30 patients(14 males and 16 females) were included. Patients were on average 7.47 years of age(range: 1.09 - 15 years). 4 patients were classified as mild, 12 patients as moderate, and 14 patients were considered severe. The mean cranial base angle was found to between 179 and 180 degrees in all severity groups without a significant difference between the cohorts. There were no significant differences in transverse measurements between the severity classes including bi-hypoglossal canal, bi-IAM, bi-lateral carotid canal and bi-medial carotid canal distances. The average ratios of the lateral measurements did not vary significantly, except for one measure; the infraorbital foramen to mental foramen distance which varied significantly between the classes(0.98 ± 0.036, 0.86 ± 0.10, 0.89 ± 0.06; p = 0.026).

CONCLUSIONS: Although HFM patients display facial asymmetry, the cranial base axis is not deviated and there exists little difference in endocranial morphological measurements. Moreover, there was no difference with regards to the endocranial morphology among HFM patients with different degrees of severity. This data is surprising given the cranial base’s role in facial growth and interesting given the varying hypotheses regarding mechanism of the pathology.

179 IMPACT OF VISIBILITY ON PSYCHOSOCIAL FUNCTIONING AMONG YOUTH WITH CRANIOFACIAL DIFFERENCES

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BACKGROUND & PURPOSE: Facial appearance plays a crucial role in social interactions (Cole, 1998). Facial differences frequently result in negative life experiences for children and adolescents. Thus, visible facial differences can negatively affect early parent-child interaction and attachment (Speltz, Endriga, Fisher, Mason, 1997) or make children more prone to being teased (Hunt, Burden, Hepper, Stevenson, Johnston, 2006). In the present study we examined the impact of visibility of facial differences on socio-emotional functioning in a sample of children with various craniofacial anomalies.

METHODS: The present study involved 163 children and adolescents and their parents receiving treatment at the multidisciplinary craniofacial clinic. The range of diagnoses included cleft lip, cleft palate, cleft lip and palate, craniosynostosis, and vascular birthmarks. The mean age of participants was 8 years (SD=4.42). The parents reported the children’s level of psychosocial adjustment on the Strengths and Difficulties Questionnaire (Goodman 1997). Participants that were 11 years and older (N=34) were additionally administered a self-report version of Strengths and Difficulties Questionnaire. All participants gave consent/assent to be in the study, and all procedures were approved by the Institutional Review Board at our institution.

RESULTS: Findings based on hierarchical regression analyses indicated no significant relationship between visibility of facial differences and total difficulties in parent reported or self-reported data. Likewise, parent and self-reported versions of four subtests measuring emotional symptoms, conduct problems, hyperactivity/inattention, and peer problems respectively were not related to visibility of facial differences. Interestingly, visibility was found to be positively related to prosocial behaviors based on parent reports. A similar but non-significant trend was also seen for self-report data.

CONCLUSIONS: Findings of this study indicate that youth with visible facial differences were more likely to show prosocial behaviors such as caring, sharing, being considerate, kind and helpful as observed by parents. This finding has important implications for identifying psychosocial interventions for this population.

180 POSTERIOR CRANIAL VAULT ASYMMETRY IN LAMBDOID CRANIOSYNOSTOSIS AFTER OPEN AND ENDOSCOPIC REPAIR

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BACKGROUND & PURPOSE: Lambdoid craniosynostosis causes an asymmetric deformation of the posterior cranial vault, resulting in ipsilateral occipital flattening and contralateral parietal bossing. Traditional open posterior cranial vault reconstruction seeks to restore normocephaly. Endoscopic-assisted suturectomy followed by molding helmet therapy is a minimally invasive alternative offered to patients younger than 6 months of age. Given lack of published data comparing open and endoscopic repairs of lambdoid craniosynostosis, the purpose of this study is to quantitatively analyze the effectiveness of two procedures in correcting asymmetry of the posterior cranial vault.

METHODS: Patients with isolated unilateral lambdoid synostosis with

preoperative and 1-year postoperative three-dimensional computed tomography scans were included in this study. Using Analyze image analysis software, three-dimensional reconstructions of the skull were segmented to determine the volumes of the parietal regions. Synostotic and nonsynostotic sides were compared and postoperative change was recorded. Patients treated with open reconstruction (n=6) were compared to those treated endoscopically (n=4).

RESULTS: Statistically significant postoperative improvements in posterior cranial vault asymmetry were found in both the open (p=0.016) and endoscopic (p=0.021) groups. Mean preoperative asymmetries for the open (27 percent) and endoscopic (31 percent) groups were statistically equivalent (p=0.548); mean postoperative asymmetries were 16.7 and 17.1 percent (p=0.934), respectively. Preoperatively, all patients had a larger parietal cranial vault on the nonsynostotic side and all had postoperative improvement in parietal asymmetry.

CONCLUSIONS: Open cranial vault remodeling and endoscopic-assisted suturectomy equally improved posterior cranial vault asymmetry for children with unilateral lambdoid synostosis, suggesting that endoscopic surgery can be an effective option for eligible patients. Neither procedure achieves complete symmetry of the cranial vault.

181 VOLUMETRIC COMPARISON OF MAXILLARY SINUSES IN PATIENTS WITH UNILATERAL CLEFT

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BACKGROUND & PURPOSE: Authors have debated the incidence, prevalence and underlying causes of sinusitis in pediatric cleft patients. Sinus anatomy has relevance to multiple areas in craniofacial care, including orthodontics, oral surgery, plastic surgery, dental, as well as otolaryngology. Studies have proposed that both maxillary sinus development and nasal septal deformities play a part in the health or disease of the sinuses. Findings vary in the literature, with regard to the diagnosis of sinusitis in the cleft patient. Prior studies have been mostly descriptive in nature, though the cross-sectional area of the sinuses was determined in a previous study, with findings of no significant difference in size from side to side.

METHODS: This study examines the 3-D volumes of maxillary sinuses in a group of 8-12 year old patients with unilateral cleft lip and palate who received cone-beam CT scans as part of their work-up for alveolar bone graft. Mimics 16.0 software was used to render the full volume of the left and right maxillary sinuses and these volumes were compared. A total of 15 scans were reviewed, with a comparison made between the cleft and the non-cleft side. A control group of 10 scans of 10-12 year old non-cleft patients, presenting for routine orthodontic care, was used.

RESULTS: Findings in our study were that significant variability (p= 0.02) existed between maxillary sinus volumes in patients with unilateral cleft lip and palate. This variability was greater in the study group than in the control group of unaffected patients. The variability, though present, was not predictable. The maxillary sinus volume on the cleft side was sometimes smaller and sometimes larger than the non-cleft side.

CONCLUSIONS: This study finds a significant difference between cleft and non-cleft patients in terms of maxillary sinus volume. More variability exists between the right and left maxillary sinus volume in patients with unilateral cleft lip and palate than in unaffected control patients. Maxillary sinus abnormalities have relevance to the multi-disciplinary care of patients and have specific importance in orthognathic surgery, where entry to the sinuses is common and complications of infection can be problematic. Further studies are anticipated in examining the sinuses of patients with craniofacial conditions.

182 EXPERIENCE WITH THE ORTICOCHOEA SPHINCTERIC PHARYNGOPLASTY IN OVER [illegible]S

Withdrawn

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BACKGROUND & PURPOSE: Orticochoea described the sphincteric pharyngoplasty using the palatopharyngeus muscles in 1968. Since then variations of operative technique have been presented but few papers dealing with outcomes in a large series. This paper demonstrates the efficacy of the method in controlling velopharyngeal incompetence(VPI) but also its failure rate and incidence of complications.

METHODS: This is a retrospective study of 202 patients who underwent an Orticochoea pharyngoplasty over a 15 year period. 181 charts were available for review. 81% of patients had a previous cleft palate repair. 19% of patients had VPI of non cleft origin 6% of patients had 22q11deletion. A survey of results was achieved by speech analysis by a speech pathologist and a telephone enquiry relating to airway symptoms by a clinical nurse manager.

RESULTS: 55% of all patients achieved normal or acceptable speech resonance. A further 30% had improved VPI but were mildly to moderately hyponasal or had mixed nasality. 15% remained sufficiently hypernasal to require further surgery for VPI usually a tightening of one or other palatopharyngeus flap which had dehisced post operatively. Several patients demonstrated obstructive symptoms with difficulty blowing their nose and 30% snored at night.

CONCLUSIONS: The Orticochoea pharyngoplasty is an effective method of treating VPI But it was apparent to the team that their was a significant failure rate (15%) requiring further surgery and a high incidence of moderate hypo nasality which usually resolved after 3 to 6 months but often persisted as a mild hypo nasal tone audible to the speech pathologist. However snoring and difficulties clearing the nasal passages when suffering from head colds were common persistent symptoms.

183 THE PATH OF THE SUPERIOR SAGITTAL SINUS IN UNICORONAL SYNOSTOSIS

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BACKGROUND & PURPOSE: The sagittal suture of the skull is frequently utilized as a landmark designating the location of the superior sagittal sinus (SSS). However, when significant asymmetry exists, as in the case of unicoronal synostosis, the relationship between the sagittal suture and the SSS cannot be presumed. This study investigates the anatomical relationship between the SSS and the sagittal suture in infants with uncorrected unicoronal synostosis. The morphology of the SSS is also evaluated postoperatively to assess whether normalization of intracranial structures occurs following reconstruction.

METHODS: The study sample consisted of 20 computed tomography scans (10 preoperative, 6 postoperative, and 4 unaffected controls) obtained at St. Louis Children's Hospital between 2001 and 2013. The SSS and the sagittal suture were outlined using Analyze imaging software. These data were used to measure the maximum discrepancy between the SSS and sagittal suture and to assess for any change in the morphology of the SSS pre- and post-operatively.

RESULTS: In children with uncorrected unicoronal synostosis, the SSS deviates to the side of the patent coronal suture posteriorly and tends to follow the path of the sagittal and metopic sutures. The discrepancy between the SSS and the sagittal suture ranged from 5.0 mm to 11.8 mm, with a 99.9% upper prediction bound of 14.4 mm. The curvature of the SSS was statistically decreased following surgical intervention though it remained significantly greater than in unaffected controls.

CONCLUSIONS: The SSS follows a predictable course relative to surface landmarks in children with unicoronal synostosis. When creating burr-holes for craniotomies, the SSS can be avoided in 99.9% of cases by remaining at least 14.4 mm from the outer edge of the sagittal suture. Postoperative changes in the path of the SSS provide indirect evidence for normalization of regional brain morphology following fronto-orbital advancement.

184 COMPARATIVE EVALUATION OF NASOPHARYNGEAL AIRWAYS OF UNILATERAL CLEFT LIP AND PALATE PATIENTS USING THREE-DIMENSIONAL METHOD

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BACKGROUND & PURPOSE: Nasal deformities due to congenital defects or resulting from various prior operations are frequently encountered. Atresia and folds in nostrils and mucosal hypertrophies usually decrease the nasal

cavity dimensions and hinder nasal airflow in patients with orofacial cleft. The production of speech with a balanced oronasal resonance is known to require adequate nasal and pharyngeal patency and closure. Although the volumetric nasopharyngeal investigation of different skeletal patterns and various facial heights has been carried out using 3D reconstruction of CBCT images, there has been no investigation assessing the volumetric capacity of nasopharyngeal airways of patients with orofacial clefts. The aim of this study was to compare nasopharyngeal airways of patients with UCLP with a control group of orthodontic seeking patients.

METHODS: This study examines the 3-D volumes of nasal (NV) and oropharyngeal (PV) airways in a group of 8-12 year old subjects with UCLP who received cone-beam CT scans as part of their work-up for alveolar bone graft. Additional 15 scans of orthodontic seeking treatment subjects with ages 8-12 year old were also reviewed as a non-cleft control group. The airway images were rendered and volume was measured in mm3.

RESULTS: The mean PV of the UCLP subjects was 6.0 mm3 and the mean NV was 10.9 mm3. Control group presented mean PV = 8.1 mm3 and the mean NV = 11.6 mm3. Student T test showed statistically significant difference when PV was compared (p=0.03).No significant differences were observed in NV.

CONCLUSIONS: Evaluation of the nasopharyngeal airways of cleft and noncleft patients showed that the NV airway showed no difference between the cleft and non-cleft adolescent child. It is interesting to postulate that the reported septal and nasal abnormalities do not have a significant effect on the overall volume, at least as shown in our study sample. As for PV, it was statistically significant different when the two groups were compared. This inadequacy can be interpreted as either due to the underlying palatal defect in the cleft patient or to an effect of the surgery on the soft palate. We hope to address these issues with further study.

185 USING SYNCHRONIZED AUDIO MAPPING TO PREDICT VELAR AND PHARYNGEAL WALL LOCATIONS DURING DYNAMIC MRI SEQUENCES

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BACKGROUND & PURPOSE: Studies have used machine learning techniques (Nattkemper et al., 2005) which utilizes visual features to feed a supervised or unsupervised training model to predict structural location. Traditionally, movements of the velopharyngeal structures require manual tracings for image segmentation (Bae et al., 2011). Velar and pharyngeal movement tracking systems provide a significant benefit for the analysis of speech movements obtained from dynamic magnetic resonance imaging (MRI). The purpose of this study is to illustrate a methodology to track the velum and pharynx from a sequence of magnetic resonance images using the Hidden Markov Model (HMM) and Mel-Frequency Cepstral Coefficients (MFCC) by analyzing the corresponding produced audio signals. The trained model was then used to predict the location of the velar and pharyngeal structures based upon the audio signals.

METHODS: One adult male subject was imaged using a fast-gradient echo Fast Low Angle Shot (FLASH) multi-shot spiral technique to acquire 15.8 frames per second (fps) of the midsagittal image plane during the production of “ansa.” The nasal surface of the velum and the posterior pharyngeal wall was tagged (selected pixel) using a novel circular tagging system in Matlab. Audio signal extraction was accomplished using MFCC and feature discretization was used to convert the continuous audio signals into features. After the audio and visual features were extracted and the computerized model was trained by the researcher, a HMM (Rabiner, 1989) was used to predict velar and pharyngeal wall boundaries relative to the audio signal. The error rate was measured by calculating the accumulation error and through visual inspection.

RESULTS: The proposed model traced and animated dynamic articulators during the speech process in real-time with an overall accuracy of 81% considering one pixel threshold. The predicted markers (pixels) successfully segmented the structures of interest in the velopharyngeal area and were able to predict the velar and pharyngeal configurations when provided with the audio signal.

CONCLUSIONS: This study demonstrated a potential method for using audio signals to determine velopharyngeal positioning during speech production. Although this study demonstrates a single case study, the findings illustrate a novel model which includes training and evaluation protocols that can be applied to any speech task for normal or cleft palate anatomy. The potential clinical applications will be discussed.

186 INTEGRATING THREE-DIMENSIONAL DIGITAL DENTAL MODEL INTO CRANIOFACIAL SKULL COMPUTED TOMOGRAPHY BY AUTOMATIC SUPERIMPOSITION OF INTRA-ORAL FIDUCIAL MARKERS

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BACKGROUND & PURPOSE: Obtaining a detailed dentition image was the most important step during 3-dimensional (3D) virtual simulation of orthognathic surgery. The purpose of this study was to introduce a method by automatic superimposition of intra-oral fiducial markers for integrating 3D dental model images to cone beam computer tomography (CBCT) maxillofacial image and evaluate the accuracy of tooth image replacement.

METHODS: A dry plastic skull model was used in a preliminary test, and six patients with complete dentition were enrolled in this study. A palatal plate was created with 4 attached fiducial markers. CBCT scan was performed on patients bonded with metal brackets and wearing the intraoral appliance. 3D digital data of dental models were obtained by CBCT or laser scanner, including upper dental model with the intraoral appliance, model in occlusion and lower dental model. The digital dental models were integrated to maxillofacial CBCT by fusion method of the fiducial markers. 3D Euclidean distances on the occlusal surfaces at both superimposed images were measured to evaluate the registration errors.

RESULTS: Automatic fusion of palatal fiducial markers was achieved. The preliminary skull model test revealed high accuracy. In the 6 patients, mean distance of surface difference were 0.03 ± 0.02 mm in maxillary dentition, 0.16 ± 0.02 mm in mandible dentition on CBCT dental model images, and 0.08 ± 0.03 mm in maxillary dentition, 0.22 ± 0.03 mm in mandible dentition on laser-scanned dental model images. The results showed high accuracy.

CONCLUSIONS: The results of this study confirmed high accuracy of the proposed intra-oral appliance superimposition method, and indicated that it could be routinely used in clinical practice.

187 CHANGES IN MANDIBULAR PROXIMAL SEGMENT AFTER SURGICAL CORRECTION OF MANDIBLE DEVIATION AND THE RELATION WITH MANDIBULAR FUNCTIONAL ALTERATION

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BACKGROUND & PURPOSE: The aims of the present study were to access the alteration of mandibular proximal segments in patients with skeletal Class III mandible deviation after orthognathic surgery (OGS), and to investigate the 6 month post-surgical outcome of jaw motion analysis in relation with the changes of mandibular proximal segments.

METHODS: Twenty-one adult patients with skeletal Class III malocclusion were accessed; the mandible deviation was greater than 4 mm at Menton. All the patients underwent two-jaw OGS. The records included cone-bean computerized tomography (CBCT) before (T1) and within one month after OGS (T2), jaw motion analysis (JMA) data obtained 6 months after OGS, and TMJ examination. 3D CBCT skull images were constructed and further measured with software Simplant®. The differences in morphology between the deviated and non-deviated sides were tested with paired-t test. The Pearson correlation test was performed to assess the relationship between the surgical changes and outcome of JMA.

RESULTS: The skeletal changes demonstrated decrease in the mandibular body at both sides after OGS. The ramus axis to the coronal plane became more upright bilaterally, while the gonial angle on the deviated side showed remarkable increase after the OGS by moving into a normal position. The ramus height also became more balance as it decreased on the non-deviated side, and increased at the deviated side. For the JMA, the condylar range of motion at the deviated side demonstrated significant improvement in transverse and vertical direction, while the range of movement became limited in anteroposterior direction. The non-deviated side showed improvement in the anteroposterior dimension after the OGS.

CONCLUSIONS: The visualization of 3D model clearly detected the amount of changes in the proximal segment after the OGS. The condylar range of motion did show relationship with the skeletal changes of the proximal segments in Class III patients; the improvement appeared mainly at the deviated side.

188 VELOPHARYNGEAL INSUFFICIENCY IN CHILDREN WITH PRADER-WILLI SYNDROME AFTER ADENOTONSILLECTOMY

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BACKGROUND & PURPOSE: Prader-Willi syndrome (PWS) is a rare genetic disorder with an incidence rate of 1 in 10,000-30,000. PWS patients have a high rate of obstructive sleep apnea (OSA) and adenotonsillectomy has been advocated as a first line approach for treatment. Velopharyngeal insufficiency (VPI) is a known complication of adenotonsillectomy. The objective of this study is to review the occurrence of VPI in patients with PWS after adenotonsillectomy for OSA.

METHODS: A retrospective review of all patients with PWS and OSA from a tertiary pediatric hospital was performed between the years of 2002-2012. Pre- and post-operative sleep studies and sleep disordered breathing symptoms, post-operative VPI assessment, and VPI treatments were evaluated.

RESULTS: Nine patients (five males and four females), fitting the inclusion criteria, were identified. The age of the patient at the initial otolaryngologic evaluation ranged from 2 to 9 years. All patients underwent adenotonsillectomy for sleep disordered breathing. Of these, four patients were diagnosed with post-operative hypernasality after assessment by a speech pathologist. The hypernasality ranged from mild to moderately severe. Of the four patients with hypernasality, two were found to have structural issues requiring surgery (pharyngeal flap). Both of the surgical patients experienced significant improvement in their VPI after surgery. The remaining two patients were found to have articulation error patterns that were considered more developmental in nature and both responded to speech therapy. All patients had improvement in their polysomnogram or sleep symptoms after adenotonsillectomy. However, three patients continue to require continuous positive airway pressure at night, including one of the patients who underwent a pharyngeal flap.

CONCLUSIONS: Adenotonsillectomy is frequently used to treat OSA in patients with Prader-Willi Syndrome, however monitoring for OSA should be continued after surgery due to persistence of OSA in this patient population. Furthermore, the families should be counseled of the risk of VPI after surgery, and the potential need for operative intervention to correct this.

189 SENSORY RETRAINING FACILITATE SENSORY RECOVERY AFTER BILATERAL SAGITTAL SPLIT OSTEOTOMY – PRELIMINARY STUDY

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BACKGROUND & PURPOSE: The bilateral sagittal split osteotomy (BSSO) is one of the most common surgical procedures to correct mandibular skeletal problems. The incidence of inferior alveolar nerve injury in this procedure is 9% ~85%. Most of the patients will be spontaneous sensory recovery at the postoperative sixth month and some of them will wait for one year or permanent with altered sensation. The purpose of this study was to evaluate whether the sensory retraining facilitate sensory recovery after BSSO.

METHODS: After BSSO, forty one patients identified as sensory disturbance at 1 week postoperatively were randomized into two groups. One group was instructed with sensory retraining and the other one was without sensory retaining. The sensory retraining was included three stages: light touching, direction and differentiation of the texture courses at postoperative 1 week, 1 month and 3 months. All patients had the subjective and objective sensory tests at postoperative 1 week (T1), 1 month (T2), 2 months (T3), 3 months (T4), 4 months (T5), 5 months (T6) and 6 months (T7).

RESULTS: For both groups, neurosensory function identified by objective sensory test was recovered equally well in 90% at postoperative 3 months, no matter sensory retraining was applied or not. Sensory retraining could accelerate sensory recovery could be found using subjective sensory test from 1-3 months postoperatively.

CONCLUSIONS: Sensory retraining of perioral region could improve subjective feeling, but not objective assessment, of sensory recovery of mandibular nerve after BSSO.

190 CRANIOFACIAL AND DENTAL DEVELOPMENT IN CARDIO-FACIO-CUTANEOUS (CFC) AND COSTELLO SYNDROME (CS)

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BACKGROUND & PURPOSE: Cardio-facio-cutaneous (CFC; OMIM #115150) and Costello syndrome (CS; #218040) are two of the RASopathies, a group of syndromes that have in common activated RAS/mitogen-activated protein kinase (MAPK) signaling, with both overlapping and distinct phenotypic features. Both CS and CFC are characterized by craniofacial dysmorphia, ectodermal abnormalities, congenital heart defects, growth delay, and neurocognitive deficits while CS individuals present with musculoskeletal anomalies. CS is nearly always caused by a heterozygous, de novo germline mutation in HRAS that results in a constitutively active RAS protein while CFC is caused by activating mutations in genes encoding proteins in the MAPK pathway downstream of RAS: BRAF, MAP2K1, MAP2K2, and KRAS. Although receptor tyrosine kinase (RTK) signaling, which is upstream of RAS/MAPK, is known to play a critical role in craniofacial and dental development, the key craniofacial and dental features of neither CS nor CFC had been systematically defined, and thus, we analyzed and compared the craniofacial and dental characteristics in large CS and CFC cohorts.

METHODS: A total of 41 individuals with a clinical diagnosis of CS and 32 clinically diagnosed with CFC were examined during the 6th International Costello Syndrome Conference in Berkeley, California in 2009 and the 7th International Costello Syndrome Family Forum in Chicago, Illinois in 2011. Complete intra- and extra-oral exams were performed by a licensed dentist which included extra-oral frontal and profile view facial photographs and when possible, intra-oral photographs, radiographs (including panoramic, periapical, and bitewing radiographs) and dental records provided by the participant, and alginate dental impressions.

RESULTS: CS and CFC share craniofacial features, including macrocephaly, bitemporal narrowing, and convex facial profile, and CS individuals also possess additional, unique characteristics including full cheeks, large appearing mouth, and thick appearing lips. Dental malocclusion, including anterior open bite and posterior crossbite, was a common dental finding in both CS and CFC. Overall, CS had a more dysmorphic dental phenotype than CFC with increased incidence of class III malocclusion, delayed tooth development and eruption, gingival hyperplasia, and thickening of the alveolar ridge. CS individuals also had a hypo-mineralized enamel defect observed clinically and confirmed with scanning electron microscopy (SEM) of exfoliated teeth.

CONCLUSIONS: Comparison of the craniofacial and dental phenotypes of CS and CFC, and further analysis of other RASopathies, will provide insight into the complexities of Ras/MAPK signaling in human craniofacial and dental development.

191 EFFECTS OF NASOALVEOLAR MOLDING (NAM) ON INFANT GROWTH VELOCITY AND TIMING OF PRIMARY BILATERAL CLEFT LIP REPAIR.

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BACKGROUND & PURPOSE: NAM proponents report the following benefits in patients with bilateral cleft lip and palate (BCLP): alignment of maxillary lip and alveolar segments, columellar lengthening and improved nasolabial esthetics.. Randomized controlled studies in patients with UCLP demonstrate no positive or negative effect in feeding with a molding plate. We report the effects of NAM on feeding and timing of primary lip repair in patients with BLCP.

METHODS: We performed a retrospective chart review (n=77) based on hospital administrative data (CPT code 40701) from 2005-2012 at a single institution. Inclusion criteria included patients with BLCP and repair prior to 1-year of age. Exclusion criteria included use of TPN or feeding tubes. Data included gestational age, age at time of primary lip repair, weight and Body Mass Index (BMI). Corrections for age were made based on gestational age. Age and weight at time of surgery are reported as a mean ± standard deviation; statistical comparisons were made with a Mann-Whitney two sided t-test. A Linear regression model was used to compare the growth velocities (kg/day) and (BMI/day) of the NAM and non-NAM groups.

RESULTS: Fifty-five patients met the inclusion criteria, of which 6 underwent NAM. The age (days) at time of primary cleft lip repair in NAM patients was 124.2 ± 31.5; the non-NAM group was 120.1 ± 50.45 ($p = 0.500$). The weight (kg) of patients at time of surgery in the NAM group was 6.19 ± 0.87 and in the non-NAM group was 5.58 ± 1.24 ($p = 0.094$). The weight growth velocity (kg/day) of the NAM group was 0.02418 ± 0.0030, while the non-NAM group was 0.01738 ± 0.00112 ($p = 0.096$). The BMI growth velocity (BMI/day) of the

NAM group was 0.04066 ± 0.00713 and the non-NAM group was 0.01554 ± 0.00263 (p = 0.007).

CONCLUSIONS: This study attempts to explore the relationship between the selective use of NAM, pre-operative weight gain, and timing of primary lip repair. We did not detect a statistically significant difference between the NAM and non-NAM group in terms of age and weight at time of repair, or in weight growth velocity. BMI growth velocity was different between the two groups, with the NAM group having a greater increase in BMI with increased age.

192 EFFECTS OF NASAL ALVEOLAR MOLDING (NAM) ON INFANT WEIGHT GAIN AND TIMING OF PRIMARY UNILATERAL CLEFT LIP REPAIR

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BACKGROUND & PURPOSE: Proponents of nasal alveolar molding (NAM) report that the technique facilitates surgical repair of the severe unilateral cleft lip by narrowing the cleft width, aligning the alveolar segments, lengthening the columella, and improving nasal tip projection. They also suggest improvement in feeding. The impact of selective use of NAM on infant weight gain and timing for primary lip repair was evaluated in a cohort of patients with unilateral cleft lip and palate (UCLP).

METHODS: We performed a retrospective review of consecutive patients presenting to our institution with UCLP between 2007 and 2013. Inclusion criteria included patients with UCLP with lip repair performed at a single institution. Exclusion criteria included lip repair after 1 year-of-age and use of parenteral or non-oral feeding. Data included gestational age, age at time of primary lip repair, weight, and body mass index (BMI). Corrections for age were made based on gestational age. All data are reported as a mean ± standard deviation. Statistical comparisons were generated using a Mann-Whitney test with significance set at a p value < 0.05.

RESULTS: Of the 177 patients presenting to our institution during the study period, 116 patients met the inclusion criteria, of which 11 underwent NAM. The age in days for primary cleft lip repair in NAM patients was 117.5 ± 15.65 and in the non-NAM group was 127 ± 45.24 (p = 0.8174). The weight in kilograms of patients at time of lip repair in the NAM group was 6.08 ± 0.65 and in the non-NAM group was 6.37 ± 1.24 (p = 0.5155). The BMI at time of lip repair in the NAM group was 16.10 ± 1.41 and in the non-NAM group was 16.59 ± 1.79 (p = 0.3625).

CONCLUSIONS: This study attempts to explore the relationship between the selective use of NAM, preoperative weight gain, and timing of primary lip repair in patients with UCLP. NAM did not significantly affect weight gain, BMI or age of the patient at time of repair. This data suggests that infants with NAM and non-NAM were similar in weight gain and timing to lip repair.

193 STOP-GAP DURATION OF PERSIAN PLOSIVES IN MID AND FINAL WORD POSITIONS IN THE SPEECH OF CHILDREN WITH CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: In early studies on the temporal integration of speech in children with cleft lip and palate (CLP), Brooks, Shelton, and Youngstrom (1965; 1966) hypothesized that compensatory articulation might change the temporal characteristics of speech. The purpose of this study was to examine stop-gap duration (SGD) of Persian plosives in mid and final word positions produced by children with CLP.

METHODS: 11children with repaired BCLP (5 M, 6 F; mean age= 9.0 years, SD=2.8) and 20 non-cleft healthy children (11 M, 9 F; mean age= 9.2 years, SD=2.1) participated in the study. None of the children with CLP had known hearing loss or any syndrome. None had oronasal fistula and only one had alveolar bone grafting. Moreover, all of the children with CLP were undergoing maxillary expansion with removable orthodontic appliances. All participants were native speakers of Persian. All recordings were made using a microphone and CSL in a sound-attenuated room. Children with CLP removed appliances during recordings. The speech stimuli consisted of 14 monosyllabic (7 CVC and 7 VCV) real and nonsense words spoken in isolation. SGD of Persian plosives including /p, b, t, d, k, g, G/ in both mid and final positions were measured manually using PRAAT software.

RESULTS: Results showed that children with CLP had prolonged stop-gap durations. t-tests revealed significant differences between the two groups in the duration of stop gaps for all plosives in mid-word position ($p<0.001$) and all plosives in final-word position except for /b/ ($p<0.05$).

CONCLUSIONS: This study provides acoustic evidence to support the idea that children with CLP tend to prolong stop-gap duration. The cause of prolonged SGD may be due to a) a compensatory response to increase perceptual distinction of phonetic segments, and/or b) reduced tactile feedback due to scarring in children with CLP.

194 COMPARISON OF SPEECH OUTCOME[illegible]GLISH AND FILIPINO LANGUAGES AFTER PALAT[illegible]RIMARY PHARYNGEAL FLAP VERSUS PA[illegible]NG TEENAGE TO YOUNG ADULT PATIENTS

Withdrawn

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BACKGROUND & PURPOSE: Filipino children with cleft lip and palate have grown to their teenage and even into adulthood left un-operated due to poverty and failure to access even charity surgical service. They still harbour the burden of this defect with ill-developed speech due to velo-pharyngeal insufficiency (VPI). The dilemma of speech improvement for VPI cases primarily due to cleft palate is well managed by a team of multi-specialties providing multiple modalities of synergistic effectiveness. However, it is not feasible in our condition. Speech improvement is possible with repair of VPI using primary palatoplasty with primary pharyngeal flap therapy to this age group. Pharyngeal flap surgery can be just as effective in eliminating VPI in adults as it is in children (Hall, et al. 1991). Lowest possible cost for a successful treatment approach includes surgery utilizing palatoplasty with primary pharyngeal flap followed by speech therapy.

METHODS: This is a 2 year multi- center single blind randomized controlled trial done to compare the effectiveness of two-flap palatoplasty with primary superior-based pharyngeal flap versus two-flap palatoplasty alone in terms of speech outcome for both English and Filipino languages in terms of resonance ratings, voice disorders, nasal emission or turbulence, articulation errors, speech understandability and speech acceptability. Speech evaluation was done for each sample during the following post-op periods: 1 month, 6 months, and 1 year post-operative period.

RESULTS: A total of 44 sample patients were included in the study (n=22 for Group A – palatoplasty, n=22 for Group B - palatoplasty with primary pharyngeal flap). No hyponasality and voice disorder were recorded for all patients both for pre-op and post-operative evaluations. Comparison of hypernasality ratings of both groups presented with no significant statistical difference for pre-op evaluation and all follow-up periods. Further statistical analysis of the hypernasality ratings within the group comparing each post-operative follow-up period to baseline data showed significant statistical differences. This was observed for both groups, with increasing improvement during post-operative course. Speech understandability and speech acceptability for English and Filipino languages were evaluated for both groups and showed no significant statistical difference. Further statistical analysis within each group comparing each follow-up evaluation period to baseline pre-operative evaluation showed significant statistical difference. Data analyses also showed increasing ratings and percentages during the post-operative follow-up course alluding to these significant positive results.

CONCLUSIONS: Surgical management of teenage to young adult patients with cleft using either palatoplasty or palatoplasty with a primary pharyngeal flap can be accomplished with improvement of speech outcome parameters in terms of hypernasality, speech acceptability and understandability for English and Filipino languages.

195 NASAL CHANGE WITH MAXILLARY REPOSITIONING: A NOVEL THREE-DIMENSIONAL CT-BASED METHOD FOR ASSESSMENT

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BACKGROUND & PURPOSE: The LeFort 1 maxillary osteotomy is the standard surgical procedure for cutting and then repositioning the maxilla in patients with skeletal discrepancy of the jawbones due to congenital, developmental, and posttraumatic dentofacial skeletal deformities. This procedure is conducted to improve occlusion, symmetry, and harmony between the midface and surrounding face. Repositioning of the maxilla is often accompanied however by morphologic change of the nose, as the maxilla is the skeletal foundation for the lower portion of the nose. As such, subsequent

rhinoplasty is sometimes required to restore the original nasal appearance. Previous studies have attempted to quantify this change in nasal morphology through the use of cephalometric landmarks and linear measurements using two-dimensional images. The goal of this study is to develop a method for quantitatively describing the nasal morphologic changes using three-dimensional cone beam CT scan via exploring the full potential of 3D medical image analysis, including feature analysis and volumetric analysis.

METHODS: A series of patients in whom the maxilla was repositioned with LeFort 1 osteotomy was selected and their archived CBCT scans were collected with IRB approval. For each, preoperative hard and soft tissue 3D forms were superimposed with 1-year postoperative 3D forms. SimPlant Pro 2011 (Materialise Dental NV, Leuven, Belgium) and MIMICS v 15 software (Materialise NV, Leuven, Belgium) was used to analyze the images. Three-dimensional skeletal maxillary movement was quantified by direction and by degrees of rotation. Change in nasal morphology was quantified based on a set of landmarks, linear measurements, and angular measurements that we developed. Local curvature of the nose was fitted using a spline technique, and volumetric analysis was performed on the soft tissue of the nose and corresponding airways.

RESULTS: Changes in nasal morphology was quantified three-dimensionally, corresponding to the movement of the maxilla in typical maxillary repositioning procedures. The linear measurements recorded in this study agreed with those previously reported in the literature. Quantitative results of our newly developed 3D quantification parameters (features and soft tissue volumes) are in agreement with qualitative clinical observations.

CONCLUSIONS: A three-dimensional CT based method has been developed to describe the nasal morphologic change as a results of maxillary repositioning. Data obtained through this methodology supplements the existing literature and provides a broad 3D-based data set. This approach is feasible for future outcome studies.

*197 CURVILINEAR BONE TRANSPORT OSTEOGENESIS DEVICES FOR TREATMENT OF LARGE CALVARIAL DEFECTS: AN ALTERNATIVE TO CONVENTIONAL CALVARIAL RECONSTRUCTION AND LINEAR BONE TRANSPORT IN A PRE-CLINICAL SHEEP MODEL

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BACKGROUND & PURPOSE: Bone transport osteogenesis (BTO), distraction of a portion of bone across a defect, offers a vascularized, autologous solution to large cranial defects that may allow treatment without use of permanent bone substitutes or hardware implants. Previous studies of calvarial BTO have not investigated the use of complex, curvilinear distraction vectors that mimic native calvarial contours. This study establishes a sheep model to evaluate the feasibility and efficacy of a curvilinear transport vector to mimic the complex geometry of the calvarium.

METHODS: Sub-total cranial defects (3.5 x 3.5cm) were created in 7 adult male Dorset sheep. Control animals underwent no distraction (N=2). A transport segment (3.5 x 2cm) traversed the defect at 1 mm/day using semi-buried curvilinear (N=3) or linear (N=2) cranial distractors. Periodic x-ray monitored progress of the transport segment across the defect. After a 6-8 week consolidation period, sheep were euthanized and resultant bone was analyzed by histology, mechanical testing and CT to quantify bone formed per distraction distance.

RESULTS: Gross examination, histology, and 3D-CT revealed that control animals had fibrous nonunion while distraction animals had ossified defects with variable union at the docking site. During linear distraction, the transport segment exited the plane of the native calvarium, docking 2-3mm cephalad to native bone. In contrast, curvilinear distraction resulted in improved contour, and appropriate docking geometry. The volume of bony regenerate/distraction distance for the control, linear and curvilinear group was 17.5 +/- 11.2 mm2, 95.4 +/-20.5 mm2, 312.9 +/- 213.4 mm2 respectively (p=0.07). Histologic analysis of the distraction group showed significant quantities of new bone formation, membranous ossification, formed in a thin trabecular pattern with a woven appearance. Complications included one premature consolidation after device failure, one wound infection treated with antibiotics and wound washout, and 6 broken distractors treated with replacement of either the distraction arm or the entire device.

CONCLUSIONS: This experiment provides proof of concept for bone transport osteogenesis for large calvarial defects in a sheep model using a complex curvilinear distraction device for improved three-dimensional contouring of regenerate bone. There was a high complication rate with semi-buried devices in the cranial location in sheep; such device complications have not translated to humans.

Gift (e.g.materials and/or equipment): This study was funded in part by a grant from Synthes CMF Inc.

198 MINIMAL ACCESS CRANIAL VAULT REMODELING FOR SAGITTAL CRANIOSYNOSTOSIS: ANALYSIS OF SURGICAL RESULTS AND ESTHETIC OUTCOMES

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BACKGROUND & PURPOSE: Cranial vault remodeling (CVR) for sagittal synostosis has lower recurrence rates and improved esthetic outcomes compared to strip craniectomy. However, total CVR techniques utilize complex approaches accompanied by increased operative time, blood loss and hospital stay. Purpose: The aim of this study was to examine inter-relationships among outcomes and safety measures of minimal access CVR for the management of sagittal synostosis.

METHODS: 31 Patients (25 boys and 6 girls) ages 3.1-18.9 mo (mean 6.6 mo) with isolated sagittal synostosis were treated with minimal access cranioplasty followed by helmet therapy. Surgical access was via a single 3-4 cm zigzag vertex incision. Following subgaleal dissection, a malleable lightsource allowed direct visualization of strip craniectomy. In 26 patients, barrel stave cuts and wedge excisions were made with bone scissors to address associated scaphocephaly, frontal bossing and occipital bathrocephaly. In 5 patients (ages 4.5-18.9 mo), the completion of the calvarial cuts required B5 Midas and rongeurs. Helmet therapy was started 1-3 weeks after surgery and continued for 9.9 ± 4.5 weeks. Omega tracer scans were obtained postoperatively and at completion of helmet treatment. Cranial width, length and cephalic- and symmetry ratios were used as objective measures of headshape. Parents were sent a questionnaire to obtain a subjective assessment of esthetic outcome and level of satisfaction.

RESULTS: Blood loss (mean ± SD = 192 ± 198 ml), transfusion volume (179 ± 167 ml), procedure duration (2.4 ± 1.3 hrs) and postoperative hospital stay (2.5 ± 0.7 days) compared favorably to national practices. Significant positive correlations were found between age and blood loss ($r=0.56$, $p<0.01$), duration of operation and blood loss ($r=0.70$, $p<0.001$), blood loss and hospital stay ($r=0.57$, $p<0.001$) and operation duration and hospital stay ($r=0.70$, $p<0.001$) . One patient required re-operation for restenosis. Both the objective cranial index measures and the parental evaluation of postoperative calvarial shape were excellent.

CONCLUSIONS: Minimal access CVR followed by helmet therapy is safe and efficacious for the surgical correction sagittal synostosis. This procedure is best performed < 5 months of age. Compared to traditional CVR, transfusion requirements are lower and hospital stay is shorter. Compared to endoscopic procedures, the approach is simpler, leaves a smaller scar and yet allows for superior visualization and surgical control.

199 OPERATIVE AND POST-OPERATIVE OUTCOMES FOLLOWING USE OF DENTO MAXILLARY APPLIANCE FOR INFANT ORTHODOPEDIC TREATMENT IN PATIENTS WITH UNILATERAL COMPLETE CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: The objective of the current study is to examine outcomes following infant orthopedic treatment with a Latham type Dento Maxillary Appliance (DMA) which is placed under general anesthesia in patients with unilateral complete cleft lip and palate.

METHODS: The current study is a retrospective analysis of 40 consecutively treated unilateral complete cleft lip and palate (UCCLP) patients who had a comprehensive set of pre and post-operative records. IRB approval was obtained prior to conducting the study. The primary outcome variables of interest included width of the alveolar cleft following treatment with DMA, performance of gingivoperioplasty (GPP), and intra-operative complications. Multivariable logistic regression models were used to examine the effects of several patient and surgeon related factors on outcomes.

RESULTS: The study included 40 patients including 17 with right UCCLP and 23 with left UCCLP. Nine patients were females. The average age at the time of DMA insertion was 11 weeks. The average cleft width prior to DMA insertion was 10.8 mm. The mean time of placement of DMA was 6 weeks. The mean cleft size following treatment with DMA was 2.1 mm (average reduction in cleft width was 8.6 mm). Two surgeons performed the cleft lip adhesion/repair and gingivoperioplasty (GPP) procedures. A total of 33 patients had GPP. In the multivariable analysis, the significant factor associated with post-DMA cleft width reduction was the pre-operative cleft width (p <0.0001). Wider clefts were associated with significantly higher reduction in widths following DMA. Post-DMA width size was the significant factor associated with performance of GPP (p=0.01). Close to 69% of patients did not have any blood loss, 23% had1 cc of blood loss, while 8% had a blood loss of more than 1 cc (maximum loss was 5cc). The mean oxygen saturation levels immediately following DMA were 98.8%.

CONCLUSIONS: Use of DMA is associated with a significant reduction in the width of the cleft and outcomes are predictable without any major adverse events or complications. Those whose post-treatment clefts were 1 to 2 mm in size were associated with a higher odds of having a GPP.

200 CONNECTING FAMILIES PEER TO PEER MENTOR PROGRAM

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BACKGROUND & PURPOSE: Connecting Families mission is to help create family-to-family partnerships that promote healthy lifestyles and enhance the quality of life for the child and their family. A family with a child diagnosed with a cleft lip or palate will benefit from the connection to a peer experiencing the same diagnosis. Mentees often feel overwhelmed trying to make sense of their child's diagnosis. Healthcare teams diagnose, educate, support, treat and often cure, but they cannot normalize the every day experience of living with a diagnosis. Connecting Families Mentors will be trained volunteers who can help families navigate increasingly complex medical healthcare systems. Our social work coordinator provides mentor orientation, ongoing training and psychosocial support.

METHODS: A peer mentor program for families facing a new diagnosis of cleft lip and/or palate will be offered a connection with a peer mentor at diagnosis. Ideally mentees will be matched based on similarities in diagnosis, demographics and culture. We began in May 2013 and we currently have eight trained mentors and have matched nine mentees successfully. We recently trained a young adult with cleft lip/palate to provide support to adolescents dealing with ongoing surgical needs and to help teens "normalize" their diagnosis during one of the most challenging life stages. Our future goal is to train adolescent peer mentors. This program will enhance our interdisciplinary approach to care bringing the family perspective /support to the team and to the mentee family by providing support "between team visits that is in real-time.

RESULTS: We have matched eight mentors with nine mentees. We have four additional mentees getting trained this month including a hispanic couple and a young adult mentor (Age 22).

CONCLUSIONS: Having a active parent volunteer mentor program increases family satisfaction and overall quality of life and enhances the interdisciplinary team's reach of care.

201 THE ROLE OF DISTRACTION OSTEOGENESIS IN THE SURGICALMANAGEMENT OF CRANIOSYNOSTOSIS: A SYSTEMATIC REVIEW

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BACKGROUND & PURPOSE: Distraction osteogenesis (DO) has been proposed as an alternative to cranial remodeling surgery (CRS) for craniosynostosis, but technique descriptions and outcome analyses are limited to small case series. This systematic review summarizes operative characteristics and outcomes of DO for craniosynostosis. A secondary aim is to identify advantages and disadvantages of this approach and formulate guidelines for recommending its use over CRS.

METHODS: Two independent assessors undertook a systematic review of the literature using Cochrane, PubMed, Scopus, Google Scholar, and Web of Science databases. Studies that reported descriptive analysis, operative technical data, outcomes, or post-operative complications of DO for craniosynostosis were included. Studies that reported concomitant midface or mandibular distraction were excluded.

RESULTS: Twenty-two manuscripts, totaling 292 cases, were included. In 267 cases DO was the primary procedure; 25 had previous operations. There were 93 cases of syndromic craniosynostosis; the most common nonsyndromic deformities were plagiocephaly (56), scaphocephaly (40), and brachycephaly (23). All comparison studies found mean operative time, blood loss, and intensive care unit length of stay to be less than CRS. Only 19 patients (6.5%) required any blood transfusion whereas in CRS transfusion is almost universal. Treatment protocols included: latency period, 4.7 ± 1.6 d, distraction rate, 1 mm/d, distraction period, 20.4 ± 6.1 d, and consolidation period, 59.6 ± 22.8 d. Final distraction length was 22.9 ± 9.7 mm. There were complications in 46 (16%) cases, but most were minor. There were no post-operative deaths. Serious complications associated with CRS such as meningitis, epidural abscess, or significant resorption were not observed after DO. With reasonable follow-up (23.6 ± 21.6 months), there were no reports of bony relapse, including when DO was used to treat relapse after CRS. In all but one case, post-operative improvement was observed in the form of decreased intracranial pressure, resolved headache or papilledema, improved aesthetic appearance, increased cranial volume, or other measurements of endocranial angulation or proportion.

CONCLUSIONS: DO is a useful adjunct to treat craniosynostosis with low morbidity and durable results. Compared to CRS, DO is performed with decreased operative time, blood loss, need for transfusion, and need for intensive care. While DO can be labor-intensive and requires at least two procedures, its efficacy and safety profile suggest it can be considered an effective alternative method for the treatment of craniosynostosis. DO may be particularly advantageous in posterior vault expansion or to salvage cases of relapse following CRS.

202 AN INVESTIGATION OF RELATIONSHIP BETWEEN ARTICULATION AND MOTOR COORDINATION IN INDIVIDUALS WITH UCLP

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BACKGROUND & PURPOSE: The velopharyngeal physiology and oral morphology primarily affect the acquisition of speech in individuals with cleft palate. However, employing The Developmental Coordination Disorder Questionnaire (DCDQ) as a screening tool for motor coordination, our previous study indicated that motor coordination can also play a certain role in the onset of cleft speech characteristics (CSCs) in individuals with cleft palate with/without cleft lip. This study was aimed to clarify whether the onset of CSCs could be predicted by 15 items of DCDQ, and how the ratings of DCDQ are related to the onset of CSCs in individuals with UCLP.

METHODS: Subjects were 62 individuals with UCLP (4y0m~8y8m, 40 boys and 22 girls) without known syndromes and/or severe complications, including clear velopharyngeal dysfunction and residual fistulae that would inhibit speech acquisition. Speech assessments were carried out by speech-language therapists. To screen for motor coordination, parents were asked to complete DCDQ. DCDQ consists of 15 items and each item should be rated on a 5-point scale. All 15 items of DCDQ were employed as variables to perform principal component analysis.

RESULTS: Thirty-three subjects demonstrated CSCs. The first component (contribution rate=43.424%) showed a strong correlation (approx. +0.7) with all items of DCDQ except #14 and 15. This is interpreted as the first component reflecting "comprehensive strength of motor coordination". The high value of the first component The second component (contribution rate=10.632%) was positively correlated with items #7, 8, 9, and 14 and negatively correlated with #4, 11, and 12. It was interpreted that the second component reflected "strong and weak areas within motor coordination", because items #7, 8, 9, and 14 concern fine motor skills and #4, 11, and 12 concern fullbody motion. In a scatter diagram, subjects with CSCs were observed more frequently where the value of the first component was low, especially where the value of the second component was high.

CONCLUSIONS: The results of this study suggest that: 1) 15 items of DCDQ could predict the onset of CSCs, 2) the prevalence of CSCs increases when the comprehensive strength of motor coordination is low, 3) with regard to the strong and weak areas of motor coordination, it would affect the onset of CSCs only when the comprehensive strength of motor coordination is low. In order to investigate which specific items of DCDQ are most relevant to the

onset of CSCs, we are planing to conduct a further gender-segregated study with an increased number of subjects.

204 SPECTRAL ANALYSIS OF WORD-INITIAL /S/ AND /SH/ IN PERSIAN SPEAKING CHILDREN WITH BILATERAL CLEFT LIP AND PALATE AND MAXILLARY COLLAPSE

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BACKGROUND & PURPOSE: Children with clefts of lip and palate (CLP) are known to have misarticulation problems, especially for the alveolar and palatal sounds. The current study examined articulation of /s/ and /sh/ sounds in Persian-speaking children with CLP using spectral moment analysis (SMA).

METHODS: Participants were 10 children with repaired CLP (6 M, 4 F; mean age= 8.60 years, SD=2.95) and 25 normally developing children (11 M, 14 F; mean age= 8.96 years, SD=2.28). None of the children with CLP had known hearing loss or any syndrome. None had oronasal fistula and one had alveolar bone grafting. Moreover, all of the children with CLP were undergoing maxillary expansion with removable orthodontic appliances. All participants were native speakers of Persian. The speech stimuli consisted of the nonsense words /sis/ and /shish/. All recordings were made using a microphone and CSL in a sound-attenuated room. Children with CLP removed appliances during recordings. Spectral moments of initial /s/ and /sh/ sounds were determined using TF32 software. Mean first spectral moment differences between /s/ and /sh/ were also calculated.

RESULTS: SMA revealed that children with CLP had significantly reduced first spectral moment of /s/ and /s/-/sh/ difference. Mean spectral moment differences between /s/ and /sh/ were 0.33 kHz (SD= 0.42) for the children with CLP and 4.38 KHz (SD= 0.89) for the controls. T-test results showed statistically significant differences between the groups for the first (mean), third (skewness) and forth (kurtosis) spectral moments of /s/ ($p<0.001$). For the /sh/ sound, however, there was only a significant difference between the groups in skewness ($p<0.05$).

CONCLUSIONS: Reduced first spectral moment for /s/ by children with CLP and maxillary collapse is consistent with retracted tongue positioning. Reduced maxillary arch dimensions and/or structural anomalies of the oral cavity may be contributing factors in the misarticulation of alveolar sounds.

205 CHILDREN BORN WITH CLEFT LIP AND PALATE DEFORMITIES EXPERIENCE FELT, INTERNALIZED, ENACTED, FELT NORMATIVE, AND SYMBOLIC STIGMA

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BACKGROUND & PURPOSE: Cleft lip and palate are the most common craniofacial birth defects and one of the most common congenital abnormalities in humans. Anecdotal evidence suggests that stigmatization is a common “phenomenon” experienced by families of children afflicted with cleft lip and palate deformities. This study aimed to explore the stigmatization experienced by families with children born with cleft lip and palate deformities from family members, friends, and the community, as well as health-care givers.

METHODS: The study was carried out at the surgical outpatient cleft clinic of the Lagos University Teaching Hospital, Lagos, Nigeria. This was a cross-sectional descriptive study among mothers of children born with cleft lip and palate deformities, using both interviewer-administered questionnaire and a semi-structured interview.

RESULTS: A total of 27 mothers of subjects with cleft lip and/or palate deformities participated in the study. Most respondents (33%) believed cleft deformity was an “act of God”, whereas others believed it was either due to “evil spirit” (3.7%), “wicked people” (18.5%). About 82% of the mothers were ashamed of having a child with cleft deformities. Two of the respondents wanted to abandon the baby in the hospital. About a quarter of the respondent wished the child was never born and 70% of the fathers were ashamed of having a child with cleft deformity. Fifty-six percent admitted that their relatives were ashamed of their affected children, and 37% admitted that their friends were ashamed of their children. Also, 37% of the respondents admitted that they have been treated like an outcast by neighbours, relatives and friends because of the defect of their children. When asked about refusal to carry the affected children by friends, relatives and neighbours, 33% of respondents said “Yes”.

CONCLUSIONS: Myths surrounding the aetiology of cleft deformities are prevalent in the studied environment. Types of stigma associated with cleft deformity included felt, internalized, enacted, felt normative, and symbolic stigma. Better informed public and sensitized professionals are barriers against stigmatization, therefore the public and healthcare professionals must be equipped with necessary knowledge to combat the stigma associated with cleft deformities.

206 SECONDARY CRANIAL VAULT REMODELING WITH DISTRACTION

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BACKGROUND & PURPOSE: Cranial Expansion by Distraction (CED) is investigated as an alternative to Secondary Vault Expansion with Exchange Cranioplasty (SVEEC). Long term results are presented as well as technical modifications for differential multisegmental and multivectorial remodeling

METHODS: Retrospective query of prospectively collected data at a tertiary center Craniofacial Clinic. These results were compared to historical controls and similar reports in the literature

RESULTS: 324 patient-charts followed at the Craniofacial Clinic were queried. 21 patients that underwent CED were identified. Three were excluded do to short follow up (<1 year).Eighteen patients were identified, with a mean follow up of 3.4 years (Range 1-8). Eight patients underwent cranial expansion with Pi Craniotomies and two parietal distractors, 5 with clamshell biparietal expansion, and 5 underwent Multiple Segment Differential (MSD) cranial vault and frontal remodeling with hinge plates and counter-lever arms activated by a single driving distractor. A second procedure was performed 4-6 months later for device and hardware removal and closure of residual defects with autogenous Calvarial Lamellar Grafting (CLG). Intraoperative blood loss was 15.6cc/kg (range 0-35) and an additional 6.4cc/kg (Range 0-10) was transfused in the first 24 hours. Ossification of the defects was found to be 85% at the time of distractor removal and 99% after CLG. 2 patients had mechanical distractor failure while the most common complication was minor wound contamination (44%). Operative times averaged 122 minutes (range 90-150 minutes). Neurodevelopmental indicators showed marked improvement in headaches: 17 patients had severe to debilitating headaches pre-operatively and all showed resolution of headaches in the immediate aftermath. One patient showed partial relapse two years post-operatively. Only two patients had papilledema preoperatively. Neurodevelopmental scores and z-scores did not show significant changes 6 months post-operatively. All patients were encouraged to participate in sports activities. No significant cranial trauma was reported during the observation period.

CONCLUSIONS: Multisegmental Cranial Expansion by Distraction may shorten operative times and result in more favorable anatomical/biophysical properties of the Cranial Vault at the expense of a second procedure. Papilledema is an unreliable finding in the younger patient while clinically suggestive headaches should raise a high index of suspicion. Favorable Calvarial Regenerate does not preclude future participation in sports

207 LEVATOR VELI PALATINI MUSCLE MORPHOLOGY IN ADULTS WITH REPAIRED CLEFT PALATE

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BACKGROUND & PURPOSE: MRI is the only imaging modality that can visualize the underlying musculature of the velopharynx, including the levator veli palatini (LVP). Research of the velopharyngeal (VP) mechanism using MRI is primarily based on images obtained at rest or during sustained phonation of speech sounds (Ettema et al., 2002; Ha et al., 2007). Dynamic MRI in real-time enables visualization of rapid VP closure as it occurs in 100-150 milliseconds during connected speech (Kuehn, 1976). The purpose of this study was to examine differences in LVP muscle morphology in adults with repaired cleft palate and adults with normal anatomy at rest and during speech.

METHODS: Five adults with repaired cleft palate and five adults with normal anatomy were included. Participants were scanned in the supine position with a Siemens 3 Tesla Trio MRI scanner at rest and during production of “ampa.” Images during speech were obtained using a fast-gradient echo fast low angle shot (FLASH) multi-shot spiral technique enabling acquisition of images at 15.8 frames per second. A time-efficient acquisition of a six-shot spiral pulse sequence with alternating echo time (TE) and multiple saturation bands provided better quality images and improved signal-to-noise ratio as cited in previous literature (Bae et al., 2011; Perry, Kuehn, & Sutton, 2013; Sutton et al., 2010). Data enabled visualization of midsagittal and oblique coronal

images for each subject at rest and during production of each phoneme in the sample. Measurements included LVP origin, length, and thickness.

RESULTS: Preliminary findings are based on quantitative measurements of ten participants at rest. Average LVP length was longer in adults with normal anatomy than those with repaired cleft palate with mean values of 46.52 mm (SD = 3.05 mm) and 43.54 mm (SD = 4.72 mm), respectively. The normal anatomy group demonstrated less variability between participants in LVP length and distance between origin points. Distance between origin points was shorter in adults with repaired cleft palate than those with normal anatomy with mean values of 55.08 mm (SD = 4.02 mm) and 60.65 mm (SD = 2.79 mm). Preliminary results suggest similar average angle of origin and LVP thickness measurements between adults with repaired cleft palate with mean values of 54.19° (SD = 3.74°) and 3.93° (SD = .47°) and adults with normal anatomy with mean values of 53.95° (SD = 3.41°) and 4.09° (SD = .51°). Data collection is currently ongoing to increase the sample size to 16. Statistical analyses will enable between and within group comparisons at the conclusion of data preparation.

CONCLUSIONS: Findings suggest variations between individuals with repaired cleft palate and adults with normal anatomy. These findings are in agreement with prior studies related to normal and abnormal anatomy in adults (Ettema et al., 2002; Ha et al., 2007). Further data collection will provide improved statistical model.

209 APPLICATION OF GAME-BASED 3D SCANNING IN CRANIOFACIAL ANALYSIS

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BACKGROUND & PURPOSE: Motion tracking interfaces commonly available in gaming (Kinect®) can be modified to generate rough 3D surface scans with sufficient resolution for shape analysis methods. We compared the precision of Kinect® generated surfaces to standard CT scanning and applied shape analysis methods on cranial shapes associated with common craniofacial conditions

METHODS: After IRB approval, 42 patients with craniofacial conditions that underwent CT scans of the craniofacial area were selected for external scanning using commercial kinect® setup. The dense point cloud generated was used to generate a smoothed surface model and compared to the CT scan generated Surface model and compared for accuracy. Two shape analysis algorithms were then applied to the Kinect® generated surfaces to find discriminant descriptors of different craniofacial conditions-

RESULTS: 12 patients with deformational plagiocephaly, 14 with scaphocephaly, 6 with metopic and 10 with unicoronal synostosis were recruited. Kinect® generated surfaces of the cranial vault were within 4mm of the CT scan generated skin surfaces, and most of the errors were related to distortion related to the gantry. The Kinect generated surfaces also related well to the underlying bony anatomy. Ellipsoid Analysis (Kane et al) and Fourrier descriptors applied to the Kinect®-generated surfaces of the cranial vault were found to discriminate reliably between the 4 conditions

CONCLUSIONS: Widely available motion tracking game controllers can generate reliable surface models of the cranial vault. Automated, landmark-independent discrimination between deformational plagiocephaly and synostosis conditions may be possible

210 EVALUATION OF VENTILATION TUBE PLACEMENT AND AUDIOLOGIC OUTCOME IN CHILDREN WITH CLEFT PALATE

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BACKGROUND & PURPOSE: There is currently no standard protocol on the placement of ventilation tubes in children with cleft palate. Current studies are either underpowered or limited to short-term outcomes. Furthermore, these studies have failed to reach a consensus on the impact of early tube placement and the use of multiple tubes. The purpose of this study is to assess the effect of ventilation tube placement on the occurrence of otological complications and long-term hearing outcomes in children with cleft palate.

METHODS: Retrospective chart review was performed using the genetic and dysmorphology database at Rady Children's Hospital-San Diego. Patients with cleft palate diagnosis who underwent surgery at Rady between 1995-2011 were included. Cross sectional analysis was performed with primary outcomes of complications (perforation, tympanosclerosis, retraction, atrophy) and hearing loss (measured by pure tone audiometry and tympanometry) at 10 years of age. The independent variables were age at first tube placement and number of total tubes placed. Multivariate analysis was performed adjusting for patient demographics, diagnosis, age at palate repair, and year of first tube placement.

RESULTS: The study included 196 patients. Multivariate analysis showed that patients with a cleft lip and palate had a lower risk of long-term hearing loss than patients with an isolated cleft palate (OR=0.10, 95% CI:0.03-0.30). Increased number of tube placements lead to a higher risk of complications (OR=3.81, 95% CI:1.03-14.11) by age 10. Increased number of tubes also showed a higher risk of hearing loss at age 10 even after adjusting for total number of complications (OR=7.49, 95% CI:1.71-32.87). The timing of tube placement did not have a perceived effect on complication or hearing outcome in this study.

CONCLUSIONS: More tube placement resulted in an increased risk of hearing loss at ten years. Furthermore, results indicate that complications increase with greater number of tube placement. These results demonstrate the potential negative outcomes of multiple tube placements and suggest the need for more long-term outcome consideration in guiding patient-centered decision making for ventilation tube placement.

211 INTERNAL CAROTID ARTERY VARIATIONS IN VELOCARDIOFACIAL SYNDROME PATIENTS AND IT'S IMPLICATIONS FOR SURGERY

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BACKGROUND & PURPOSE: Velocardiofacial syndrome (VCFS) is the most common genetic syndrome causing cleft palate and velopharyngeal insufficiency. A pharyngeal flap is considered to be effective procedure, with success rates of 78 to 98 percent. Medially displaced internal carotid arteries in VCFS are well-known and carry a risk during pharyngeal flap surgery. Preoperative imaging evaluation is routinely recommended. This study was designed to evaluate the frequency of medially deviated internal carotid arteries in both VCFS patients and general pediatric population, and assess their minimum distance to the pharyngeal walls in order to define the potential risk of ICA injury during pharyngeal surgery

METHODS: From July 2003 to July 2012, 23 consecutive patients, who were diagnosed as VCFS and underwent posterior pharyngeal flap operation, were reviewed retrospectively 21 control subjects who did not have VCFS but underwent oropharynx MRI were reviewed. We assessed the medial deviation of internal carotid artery and the minimum distance to the posterior wall at the level of oropharynx.

RESULTS: Medial deviation of at least one internal carotid artery (ICA) was documented 10 patients (43.5%) in VCFS patients as compared with 3 patients (14.3%) in control group.(P=0.034) The mean of the minimum distance to the posterior pharyngeal wall was 3.78 ± 1.86 in VCFS patients as compared with 9.17 ± 2.94 in control group.(P= 0.014) Only one patient had significant medial dislocation of ICA and the closest distance from the pharyngeal wall was 0.86mm. The deviated internal carotid artery was located in the submucosal plane and near the level where the distal end of pharyngeal flap was expected. But injury to the internal carotid artery did not occur and there was no excessive intraoperative or postoperative bleeding.

CONCLUSIONS: In VCFS patients, medial dislocation of internal carotid artery was common and the length of the minimum distance to the pharyngeal wall was short comparing with control group. However, In most of our patients variations, the course of the cervical portion of the ICA is irrelevant to the pharyngeal flap operations. We concluded that preoperative vascular imaging study is not cost-effective in VCFS patients, but intraoperative use of ultrasound imaging is still valuable for the purpose of planning pharyngeal flap.

212 MIDFACE GROWTH FOLLOWING SEVERE PEDIATRIC FACIAL TRAUMA: A CEPHALOMETRIC STUDY

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BACKGROUND & PURPOSE: Severe pediatric facial trauma is characterized by

multiple, comminuted and impacted unstable fractures, necessitating operative intervention. To date, rigid internal fixation is the mainstay of surgical treatment of pediatric facial fractures. Disruption of facial growth is a primary concern in the long term sequelae of pediatric facial fracture management. We catalogue our experience with severe midface pediatric fractures at a major pediatric teaching hospital with cephalometric analysis of midface skeletal growth following injury.

METHODS: A retrospective chart review was performed on all patients with facial fractures. Patients with multiple orbit and midface fractures were included. Lateral cephalograms at longest-term follow up were traced, digitized, and averaged. Seven cephalometric landmarks of the midface (A point, ANS, orbitale, bridge of nose, distal U6, upper lip, stomion superius) were identified for comparative measurements with age and gender-matched superimposed Bolton norms as controls. Differences in x and y axes between test and control metrics were measured. Clinical significance was defined as a 2mm discrepancy from the norm. Statistical significance for each patient was determined using T-tests of the x and y arrays of patient values versus normal controls.

RESULTS: Seven patients met the inclusion criteria for severe midfacial trauma with mean age of 8.9 years (range 3-14 years) at time of injury. All patients underwent initial open reduction and internal fixation and subsequent revision surgeries. Mean cephalometric follow up was 4.6 years (range 2-10 years). Considering all landmarks for all patients, mean deficiency in growth was 3.7mm (range -4.0mm to 13.7mm) in the x axis ($p<0.001$) and 2.9mm (range -1.1mm to 8.8mm) in the y axis ($p<0.001$). Six out of 7 patients (86%) showed clinically significant impairment in growth in either horizontal (29%), vertical (29%) or both planes (29%). T-tests confimed statistical significance ($p\leq0.05$) for all clinically significant differences. Mean deficiency in growth for all landmarks was 3.7mm (range -4.0mm to 13.7mm) in the x axis and 2.9mm (range -1.1mm to 8.8mm) in the y axis.

CONCLUSIONS: Current treatment of severe pediatric facial trauma often results in compromised bone growth and permanent facial deformity. New methodologies of pediatric facial fracture management that better allow for growth are needed.

*213 EFFECTIVENESS OF DYNACLEFT FOR PRESURGICAL ORTHOPEDICS FOR PATIENTS WITH UNILATERAL CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Cleft lip and palate care typically involves the use of presurgical orthopedics (PSIO) as an adjunct to the overall management of the defect and to approximate the alveolar segments prior to surgical repair. The specific aim of this project was to assess the efficacy of Dynacleft as a presurgical orthopedic device on infants with a unilateral cleft lip and cleft palate who used an oral obturator.

METHODS: Data was collected from 25 infants diagnosed with a unilateral complete cleft lip and palate. The infants were all of comparable age. Eight patients underwent Dynacleft therapy (Group Alpha) 17 patients had no presurgical orthopedics. Two maxillary impression casts were obtained from each patient: the first at the time of initial evaluation and the second at the time of cleft lip repair. Cleft width as well as the intersegment, intercleft, and maxillary retraction distances were measured and recorded from the maxillary casts. Measurements were based on a coordinate system involving the tuberosity, canine, alveolar crest, premaxillary segment, and incisal points. Casts were measured twice by one observer using a Carrera Precision digital caliper. Differences in alveolar cleft width was compared within and between the two treatment groups.

RESULTS: Group Alpha began treatment on an average age of 24.25 days and Group Beta an average of 15.35 days of age. The average cleft width of Group Alpha was 8.13 mm and after treatment it was 4.59 mm. The average cleft width of Group Beta was 8.09 mm and 6.92 mm after treatment. Results of paired t-tests and two-sample t-test showed that cleft width changes between the two groups were significant ($P = .03$).

CONCLUSIONS: Dynacleft significantly decreases the size of the alveolar cleft width compared to infants who do not undergo Dynacleft therapy.

Gift (e.g.materials and/or equipment): Canica, the company that produces dynacleft donated the medical device to treat 5 patients.

214 FACTORS INFLUENCING TIMING OF ALVEOLAR CLEFT REPAIR

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BACKGROUND & PURPOSE: The objectives of this retrospective study were 1) to assess dental factors influencing timing of bone grafting for alveolar clefts and 2) to determine the viability over time of retained teeth in the cleft region after grafting.

METHODS: This study was a retrospective review of records of 76 patients treated with alveolar bone grafting (ABG) by our cleft palate team. We assessed whether 1) the dentition in the cleft region or 2) the use of rapid maxillary expansion (RME) prior to ABG were associated with the timing of ABG. In addition, the viability of teeth remaining in the cleft region was evaluated at 1 and 5 years post ABG. Differences were assessed using t-test comparisons.

RESULTS: There was a statistically significant difference ($p <0.05$) in the ages of patients at time of ABG between those with (n=26) and without teeth in the cleft (n=50), mean age 8.0 year and 9.5 years respectively. Mean age at ABG was unaffected by RME (p-value = 0.1568); RME (n=45) 8.4 years of age and no RME (n=30) 9.8 years of age. Patients with teeth present in the cleft site prior to the alveolar bone graft, had 1 year and 5 year post ABG retention rates of 85% and 71% respectively.

CONCLUSIONS: The presence of teeth in the cleft site influenced timing of ABG, but this was not affected by the use of RME. Teeth retained in the cleft site after ABG had quite high retention rates at 1 and 6 years post ABG. Future multi-facotrial analyses looking at these and other potential influences will be useful in the planning for ABG repair of clefts.

215 RELATIONSHIPS AMONG BULLYING AND OTHER PSYCHOSOCIAL FACTORS IN CHILDREN WITH CRANIOFACIAL CONDITIONS

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BACKGROUND & PURPOSE: Evidence suggests that children with craniofacial conditions may be at greater risk for impairment in areas such as emotional and academic functioning, cognitive and language development, and interpersonal relations in comparison to their peers (Hunt et al., 2005). The current study examined psychosocial variables in a pediatric craniofacial population, particularly with regard to bullying.

METHODS: Data were collected during clinic visits and via medical chart reviews. Chi-square analyses were conducted to examine the relationships between bullying and other demographic and psychosocial variables. The sample included 292 children and adolescents, ages 5-20 years (mean age=10.09 years; 55.5% Hispanic or Latino; 43.8% female).

RESULTS: Chi-square analyses revealed significant relationships ($p < .05$) between bullying and multiple areas of development and functioning, including language and cognition, mood and emotional functioning, social relations, and psychosocial quality of life as measured by the PedsQL.

CONCLUSIONS: These findings suggest that children and adolescents with craniofacial abnormalities who report being bullied may be at increased risk for difficulties in other areas of developmental and psychosocial functioning. Future research should focus on exploration of protective factors in this population in order to inform interventions.

216 PRIMARY NOSE REPAIR IN UNILATERAL CLEFT LIP PATIENTS: "CLOSED TRIPLE SUTURE" TECHNIQUE

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BACKGROUND & PURPOSE: The correction of the nasal tip together with the lip repair is the treatment of choice in the primary management of unilateral cleft lip patients. The repositioning of the deviated columella and the correction of the laterally and inferiorly displaced ipsilateral alar cartilage are the main elements of the nasal surgery. In this study a new technique is presented for the correction of the nasal deformity accompanying unilateral cleft lip.

METHODS: Thirty-four out of 119 unilateral cleft lip patients treated in our institution between 2009 and 2012 were operated by the same senior surgeon using the “Triple Suture Technique”. The absorbable sutures were removed during the palate repair or left to be absorbed. 9 patients with an average age of 6.5 months completed a thorough postoperative follow-up period. Surgical Technique: During the preparation of the local flaps for the lip repair the caudal two third of the nose is dissected and the alar cartilages are exposed in the subpericondrial plane. Following the completion of the lip repair the curved needle of a 3/0 PDS suture is straightened with a needle holder and the needle is passed on the ipsilateral cleft side through the nasal mucosa, the posterior edge of the alar cartilage, dorsal septum, contralateral upper lateral cartilage and the skin, respectively. The exit point of the needle on the skin is slightly enlarged with the tip of a 30 G needle. Thereafter the needle of the PDS suture is put back through this orifice passing through all the above-mentioned structures in a reverse fashion and tied. For the second suture the flattened nostril roof of the cleft side i s elevated with a skin hook and the suture is placed transmucosally starting from the contralateral nostril at the level of the nasal dome to level the peak points of both medial crura. The third suture is placed for the correction of the free edge of the inferiorly displaced lateral crus at the cleft side. The needle firstly pass through the nasal mucosa on the cleft side, exits from the skin, reintroduced in a reverse fashion and tied above the nasal mucosa.

RESULTS: The mean follow-up period was 11.7 months and the postoperative healing period was uneventful. Postoperative photographs were analyzed to evaluate the position of alar cartilages, the symmetry of the nasal domes as well as the diameter and shape of the nostrils, all of which were recorded to be as pleasant and satisfactory results.

CONCLUSIONS: Various studies in the literature as well as our study results clearly demonstrate that unilateral cleft lip patients treated with simultaneous primary nose repair during the cleft lip surgery have superior results for nasal appearance. The “Triple Suture Technique” promises to be a useful technique yielding a pleasant appearance of the nasal tip with symmetrical nostrils and a well-established curvature of the alar cartilage.

*217 DEVELOPMENT OF A SMARTPHONE APPLICATION FOR PATIENTS WITH CLEFT LIP & PALATE AND THEIR PARENTS

Withdrawn

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BACKGROUND & PURPOSE: The growth, prognosis and course of treatment of patients with cleft lip and palate(CLP) vary depending on the different types. Therefore, it is difficult for parents and patients to get appropriate information, although there is a vast amount of information on the internet. A smartphone application (app) has been developed to provide individualized, timely information about CLP and to manage the treatment schedule.

METHODS: To integrate the opinions of parents and patients into this new app, we conducted interviews and surveys. Questions on message boards of web communities for CLP were collected and assorted into categories. The app was designed and the contents approved by a plastic surgeon to improve the accuracy and reliability of the program.

RESULTS: A prototype has been developed. On launching, the user is prompted to enter the patient’s birthday and gender (or ‘in pregnancy’). The type of CLP is determined by answering several steps of questions with illustrations. All CLP types are categorized by 4 digit codes- laterality of cleft lip, severity of cleft lip, presence of alveolar cleft, and severity of cleft palate. “FAQ”, “Treatment Protocol” and “Treatment Diary” are included in the main menu. In the “‘Frequently Asked Questions (FAQ)” section, appropriate information is provided according to the individual type of CLP and age of patient. Over 150 answers are listed by categories (prenatal care, genetics, surgery, speech, orthodontics, hearing, and psychology) and also retrieved quickly by searching a keyword. In the “Treatment Protocol” section, the expected course of treatment and the detailed description of each treatment step for individual types are displayed. The users can also get answers to their treatment -related questions from the “FAQ” section that is linked to the “Treatment protocol” section. In the “treatment diary” section, the doctor’s comments in the outpatient clinic can be recorded and stored by users. When a surgery or treatment option is planned for the patient, information and instructions are displayed to help the patient and parents to fully understand the admission and treatment procedure.

CONCLUSIONS: This application is going through usability testing by getting feedback from qualitative semi-structured interviews and currently being refined.

Contracted Research: This study was supported by a grant of the Korea Health Technology R&D Project, Ministry of Health & Welfare, Republic of Korea. (A112062)

218 TREATMENT OF CLINICAL CONGENITAL ANOPHTHALMIA WITH AN INTRA-ORBITAL EXPANDER

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BACKGROUND & PURPOSE: Treatment of congenital anophthalmia consists of serial acrylic conformers which provide minimal stimulation of orbital growth. We report our experience with orbital expansion for congenital anophthalmia with a minimum follow-up of seventeen months.

METHODS: Orbital expansion was performed in conjunction with enucleation of residual orbital contents. The silicone expander was placed intra-orbitally with the collar positioned through a lateral wall orbitotomy. Tubing was subcutaneously connected to a micro-port near the cranial vertex. Expansion occurred bi-monthly and terminated at physical signs of intolerance. One-year postoperative CT scans were obtained. Measurements were taken in the x and y-axis of the coronal plane at the midline of the expander. The z-axis was measured in the sagittal plane from the infraorbital rim to the optic chiasm.

RESULTS: Two patients with left unilateral congenital anophthalmia were prospectively followed. A 4 month-old female had a 1.2x1.2cm expander implanted with a cumulative fill volume of 6.95mL. A 4 year-old male had a 2x2cm expander implanted with a cumulative fill volume of 6.75mL. In the 4 month-old, the unaffected orbit grew 8.6%, 13.9% and 18% in the x, y and z-axis. The affected orbit expanded 20.5%, 26% and 16.4% respectively. In the 4 year-old, the unaffected orbit grew 0.36%, 2.2% and 4.3% in the x, y and z-axis. The affected orbit expanded 0.49%, -3.4% and 5.8% respectively. No complications have been observed at 17 months minimum follow-up.

CONCLUSIONS: The 4 month-old had a greater than 2-fold increase in the x and y-axis of the expanded orbit compared to the unaffected orbit. This suggests that the affected orbit can be expanded at a rate greater than the growth of the unaffected orbit. Minimal change in the z-axis was an expected finding as the expander was not designed to deepen the orbit. The 4 year-old had minimal growth in the unaffected orbit and a negligible difference in comparison to the expanded orbit. This suggests that skeletal maturity or the loss of osseous plasticity may be reached by this early age and the patient will require operative orbital repositioning. Intra-orbital expansion is a promising technique in infancy that may be lost by early childhood.

219 CLEFT LIP STANDARDIZED PATIENT EXAMINATIONS: THE ROLE IN PLASTIC SURGERY RESIDENT EDUCATION

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BACKGROUND & PURPOSE: Our institution has incorporated the use of objective structured clinical examinations (OSCE) in our plastic surgery residency curriculum. The OSCE provides trainee education and evaluation while addressing the six ACGME core competencies required within surgical training programs. We report our plastic surgery resident program’s experience with the first ever conducted cleft OSCE.

METHODS: A validated method for administration of OSCEs currently used at our medical school was utilized. Residents PGY 3-6 participated. The simulated patient encounter involved a 1 month-old newborn with a unilateral cleft lip and palate with standardized patient actors as parents. Video recordings of the clinic encounter were performed. Standardized photographs were used to test trainees on the markings for lip repair. A post-encounter written exam assessed medical knowledge. The written and video recorded exams were graded. A resident post-OSCE questionnaire regarding the utility of the exercise was administered. Results were evaluated using analysis of variance, ANOVA (statistical significance $p < 0.05$).

RESULTS: There was a positive correlation with increasing level of training in terms of medical knowledge ($p < 0.04$). PGY 3-4 residents demonstrated lower understanding of the surgical markings and the details of the lip repair compared to PGY 5 and 6 ($p < 0.03$). All residents performed similarly on evaluation of the remaining ACGME core competencies. All residents agreed that this was a realistic and useful encounter.

CONCLUSIONS: Results of our cleft OSCE demonstrate that medical knowledge regarding the evaluation, management, and surgical repair of patients with a cleft is less in mid-level residents relative to more experienced senior residents. All residents expressed an interest in earlier exposure to pediatric patients in training. Although a cleft OSCE does not replace clinical rotations, it is a valuable adjunct to training and evaluation of trainees, particularly for junior residents.

220 THE OCCURRENCE OF PREMAXILLARY REPOSITIONING SURGERY IS DECREASED IN PATIENTS WITH COMPLETE BCLP TREATED WITH NAM AND PRIMARY GINGIVOPERIOSTEOPLASTY

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BACKGROUND & PURPOSE: Premaxillary repositioning (PMR) with alveolar bone grafting (ABG) is a controversial yet frequently performed procedure in individuals born with BCLP. It has been demonstrated in the literature that PMR negatively affects long-term midface growth. The purpose of this study was to determine if NAM in combination with primary gingivoperiosteoplasty (GPP) reduces the need for PMR later in life.

METHODS: Consecutively enrolled (1996-2006) nonsyndromic patients (n=53) with BCLP, who underwent NAM and primary GPP (unilateral or bilateral), were studied. Patients were assessed clinically and radiographically for the need of PMR and secondary ABG. The comparison group included consecutively enrolled nonsyndromic patients (n=27) with BCLP who had no history of NAM and primary GPP. Detailed review of medical records was performed to determine the incidence of PMR in these two groups.

RESULTS: Of the 53 patients who underwent NAM and primary GPP, 52 (98.1%) did not require PMR and 1 (1.9%) did. Moreover, 20 (37.7%) did not even require secondary ABG surgery. Of the 27 patients that were not treated with NAM and primary GPP, 17 (63%) did not require PMR and 10 (37%) did. However, 100% of these patients did require secondary ABG surgery.

CONCLUSIONS: Patients with BCLP treated with NAM and primary GPP were significantly less likely to need PMR than those that did not have this treatment ($p<0.01$). The importance of this may go beyond the technical aspects of the procedure and its inherent risks. The descended and mobile premaxilla, with its impact on function and facial esthetics, may have an effect on the patient's quality of life (QOL), which requires further study.

221 POSTOPERATIVE STEROIDS IMPROVE HOSPITAL STAY IN CLEFT PALATE AND SPEECH SURGERY WITHOUT AFFECTING WOUND HEALING AND SPEECH OUTCOMES

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BACKGROUND & PURPOSE: Cleft palate and speech surgery attempt to restore velopharyngeal competence, but risk postoperative retropharyngeal swelling. Although steroids may decrease swelling, they are not routinely used due to concern for wound healing problems. We retrospectively reviewed primary palate and secondary speech operations for postoperative steroid use and outcomes.

METHODS: Cleft palate and secondary speech operations at our pediatric hospital from 2010 to 2012 were included. Patients with concurrent operative sites that could influence pain scores were excluded. Length of stay (LOS) was discharge time minus procedure end-time. Postoperative speech was assessed by Pittsburgh Weighted Speech Score. Steroids were recorded as dexamethasone equivalents per kilogram. Cases were classified as steroids (S) versus no steroids (NS). Categorical outcomes were compared with chi-square tests, and continuous outcomes by t-tests and linear regression.

RESULTS: 81 cleft palate-speech speech operations were found. Average age at surgery was 6.7 years, with average follow-up of 1.1 years. 16 receive postoperative steroids (S), and 65 did not (NS). The average LOS was: S, 23 hours; NS, 35 hours, *P=0.02. Percentage of patients discharged on postoperative day 1 were: S 88% (14/16), NS 59% (38/65), *P=0.04. According to linear regression, the dosage of steroids accounted for 5.8% of the variance of time-to-discharge (*P=0.031). During the hospital stay, percentage of patients who displayed evidence of poor oral intake were: S 0% (0/15), NS 49% (32/65), ***P<0.001. There was no significant difference in the maximum pain score, time from end-of-surgery to maximum pain score, or total narcotics received between the two groups. Clinic outpatient follow-up variables included: delayed wound healing, S 36% (5/14), NS 23% (15/65), P=0.33; operative site fistulas, S 14% (2/14), NS 12% (8/65), P=1.0; snoring, S 29% (4/14), NS 55% (35/64), P = 0.138; and sleep apnea, S 29% (4/14), NS 13% (8/64), P=0.131. Average speech scores were: S 7.31, NS 6.45, P=0.688.

CONCLUSIONS: In patients undergoing cleft palate or secondary speech surgery, postoperative steroids lead to shorter hospital stays and improved oral intake. There was no evidence for increased negative outcomes. This increase in length-of-stay usually translated to another night in the hospital not pre-approved by insurance.

*222 EVALUATION AND TREATMENT OF SPEECH DISORDERS ASSOCIATED WITH CLEFT PALATE

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BACKGROUND & PURPOSE: ASHA SIG 5 Continuing Education Committee offers this poster as a practical review of assessment and management approaches for speech disorders associated with cleft palate and/or velopharyngeal dysfunction (VPD). The poster's simple, concise, yet informative style allows for easily accessible education for students, residents, and professionals from speech and non-speech disciplines.

METHODS: The poster includes an overview of VPD, including types (VP insufficiency, VP incompetency, and VP mislearning) and various etiologies of VPD. Speech disorders associated with VPD are presented with associated definitions and descriptions including resonance disorders, audible nasal emission, and articulation disorders. Obligatory features of VPD are outlined and compensatory articulation errors are described in great details with associated figures depicting these productions (e.g., glottal stops, pharyngeal fricatives, middorsum palatal stops, etc.). The poster includes a section on assessment with examples of stimuli and techniques for (1) perceptual judgments of resonance and nasal emission and (2) articulation testing. Lastly, evidence-based speech therapy, prosthetic, and surgical treatment options are reviewed. A treatment decision-making algorithm is presented to assist with clinical management. The importance of referral and collaboration with the child's cleft palate team is emphasized. The poster also includes a final section of references and web resources for the community-based SLP clinician. In sum, this poster serves as an educational tool to aid with assessment and treatment of children with repaired cleft palate and/or VPD.

Salary: Kerry Callahan Mandulak: salary at Pacific University for teaching a cleft palate-related course. Royalty: Kerry Callahan Mandulak: royalty for online education course through Advanced HealthCare Education. Professional: Kerry Callahan Mandulak: serves on ACPA Executive Council; serves on the Board of Directors for Smile Oregon

223 ALVEOLAR BONE GRAFTING SURGERY: CURRENT PRACTICES AND PATIENT OUTCOMES

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BACKGROUND & PURPOSE: Techniques and post-operative management of patients undergoing alveolar bone grafting vary, often without evidence-based rationale. The goal of this study was to describe our institutional experience and identify risk factors for unfavorable outcomes in patients undergoing alveolar bone grafting.

METHODS: This study included patients undergoing bone grafting from the anterior iliac crest between January 1, 2011 and April 17, 2013. Retrospectively, negative outcomes and complications including fistula formation, insufficient bone take and need for reoperation were identified and compared with variations in surgical technique and perioperative management. Using SPSS,

standard descriptive statistics were conducted. The Mann Whitney U Test and the Fishers Exact Test were used to examine differences.

RESULTS: Eighty-five patients, 53 males and 32 females, averaging 8.8-years-old (+2.9) were included. Seventy-five (87%) had clefts of the lip and palate, and the remaining had clefts of the lip and alveolus only. 89% underwent secondary grafting once, 8.2% twice, and 2.4% three times. The trap door technique was utilized in 47 patients (55%) and the crest was split in 38 patients (45%). The average time to post-procedure oral intake was 6 hours (+ 6.5 hours), and 78 (91.7%) were discharged within 24 hours. Complications, including fistula formation, insufficient bone take, readmission, re-operations and infection occurred in 16 (18.8%). There was no correlation related to age, cleft diagnosis, or harvest technique. Patients who had a prior bone-grafting procedure were more likely to develop a fistula post-operatively ($p < .001$) and to require a re-operation ($p < .001$). Additionally there was an increased reoperation rate ($p<0.05$) in males.

CONCLUSIONS: Our institutional experience is characterized by different operative and perioperative protocols. Our overall surgical outcomes were favorable. Poor outcomes were associated with number of prior procedures and male gender, but unrelated to other evaluated variables. The information in this study will help cleft teams counsel patients and their families with regards to expectations from bone grafting surgery. Furthermore, given no difference despite various techniques, it argues for standardization of one universal protocol thereby simplifying team dynamics and patient care.

224 A QUALITY IMPROVEMENT INITIATIVE TO IMPROVE FEEDING EDUCATION FOR FAMILIES OF INFANTS WITH CLEFT PALATE

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BACKGROUND & PURPOSE: Feeding a child with a cleft palate can be a challenging experience for families. The Cleft Palate Team typically serves as the primary resource for feeding education and coordinates advanced assessment and treatment, when required. Based on professional and parent feedback, focus groups, and reflection on practices, we discovered that parents of children with cleft palate were receiving variable, and sometimes conflicting, advice from units in the hospital including the NICU, inpatient floors, and clinic setting, which caused confusion. To address these challenges, our team developed a Cleft Palate Feeding Initiative to standardize feeding education and clinical practice, improve communication among specialists, ensure continuity of care, and increase family satisfaction.

METHODS: This poster includes a summary of components of the Cleft Palate Feeding Initiative at our institution. First, the professionals who educate families of infants with cleft palate, including speech pathologists, occupational therapists, nurses, dieticians and lactation specialists, were identified and invited to participate. Each discipline's role in feeding care was defined and required readings were assigned. Specific "Cleft-Craniofacial Feeding Competencies" were developed, which were modified from existing feeding/swallowing competencies for the pediatric population. The group also devised a cleft palate feeding management algorithm, which provided a step-by-step process for addressing feeding difficulties in infants with clefts. This algorithm includes "care entry" points ranging from prenatal visits through post-operative feeding care after palate repair. A cleft palate feeding kit was also developed as part of this initiative and will be described in the poster. This includes a special diaper bag with samples of cleft palate bottles/nipples, feeding brochures, a Cleftline™ Bear, and Feeding DVD from the Cleft Palate Foundation, which are given to parents of newborns with cleft palate. The kit is typically provided to the family at the prenatal appointment, nursery or NICU stay, so they have access to feeding supplies by the time their baby is born. Lastly, the poster will discuss our efforts to expand education for our institution's nurses and feeding therapists to standardize feeding management. Next steps will be described, including plans to measure patient outcomes and parent satisfaction.

225 OPTIMIZING THE SURGICAL TREATMENT OF THE INTERNATIONALLY ADOPTED CHILD WITH CLEFT LIP AND/OR PALATE – UNDERSTANDING THE FAMILY EXPERIENCE

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BACKGROUND & PURPOSE: Our center has seen a 5-fold increase in the number of international adoptees with oral clefts over the past 15 years. Treatment of these children is complicated by their older age, the variability of prior care, and the newly evolving family relationship. The purpose of our study is to characterize the experience of families going through post-adoption cleft surgery and to identify adoption-, family-, and child-specific characteristics that may help to determine the optimal preparation and timing for surgery.

METHODS: We conducted a qualitative study involving semi-structured interviews with parents of children who were adopted from another country with unrepaired cleft lip and/or palate who underwent surgery within one year following adoption. Families will be recruited until we reach thematic saturation. The study team included a plastic surgeon, craniofacial pediatrician, nurse, social worker, adoption medicine pediatrician, epidemiologist and quality of life researcher. The first 5 interviews were used for open coding from which we developed a coding system. Interviews were then coded in pairs; Dedoose software was used for all analyses.

RESULTS: Fifteen families have been interviewed. Reported parent stressors included the vulnerability of bonding and the possibility of perceived abandonment by their child. Reported child stressors included reminders of institutionalization and communication barriers. Conditions thought to be important before proceeding with surgery included the ability to communicate needs and establishment of at least one parent bond. Several parents reported that surgical recovery was beneficial for family bonding due to realized dependence. No families reported negative effects of surgery on family relationships. In our initial analyses, interviews revealed potentially modifiable stressors included: pre-surgical sedation, early post-operative return to families, avoidance of crib confinement, and accommodation of normal sleep routine. Tools that could reduce stress included: sign language for communication and labels/signs for providers so that hospital staff can appropriately recognize parents of adoptees.

CONCLUSIONS: Although family bonds are considered to be vulnerable early after adoption, surgical recovery was perceived to accelerate family bonding through realized dependence. Our preliminary data has revealed modifiable factors that may improve the family experience. Final analysis may reveal optimal timing for specific children.

226 MSX1 GENE C330T (P. G119G) AND [illegible] (P. G273C) POLYMORPHISMS IN IND[illegible]TS WITH NONSYNDROM[illegible] [illegible]S CPO)

Withdrawn

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BACKGROUND & PURPOSE: Non syndromic cleft palate only (NS CPO) is one of the most common congenital malformations that affect between 1 in 1000 - 2500 live births worldwide which is considered to be a genetically complex, multifactorial disease. Based on several association studies among the candidate genes with NS CPO, MSX1 gene emerged as one of strong candidate genes in different populations with NS CPO. The purpose of this study was to analyze the relationship between C330T (p. G119G) and G817T (p. G273C) polymorphisms in MSX1 gene and the risk of NS CPO in Indonesian patients.

METHODS: This study was case control design using samples from 22 NS CPO subjects and 43 control subjects. Venous blood samples were collected with informed consent then DNA was extracted and MSX1 gene were PCR-amplified then DNA sequencing from DNA fragments covering exon 1 C330T was performed by Sanger method. Digestion products containing exon 2 G817T were evaluated. Statistical analysis which was used to determine significantly of differences from polymorphisms frequency among both subjects was $\chi 2$. The odds ratio was used to determine a risk factor of NS CPO.

RESULTS: The study results indicated that Single Nucleotide Polymorphisms (SNPs) was identified at C330T and the frequency of T mutant allele was 12,5% in NS CPO subjects and 87.5% in control subjects. This difference wasn't significant statistically ($\chi 2=3,147$; $p > 0,05$). The odds ratio from all mutan alleles didn't show significant result statistically means that the risk factor can not be determined. Digestion products showed no positive correlation between G817T polymorphisms and NS CPO patients.

CONCLUSIONS: In conclusion, the polymorphisms of MSX1 gene C330T (p. G119G) and G817T (p. G273C) are not considered to be a risk factor that being an etiological role in CL/P development in Indonesian patients with NS CPO.

228 GROWTH OF CHILDREN WITH CLEFT-LIP PALATE FROM 2 TO10 YEARS OLD

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BACKGROUND & PURPOSE: Physical growth of infants and children is a key indicator of a health outcome. Inadequate physical growth may indicate a number of concerns that include inadequate nutrition, chronic health condition, genetic condition or a syndrome. Reports indicate that growth and nutritional problems are more frequent in children with cleft lip and palate (CLP) and isolated cleft palate (ICP) than in children with isolated cleft lip (ICL) and typical children. The growth problems in the first years of age have been attributed to environmental factors including the high frequency of infectious diseases and the different degrees of feeding difficulties for the children with cleft palate. After 2 years of age biological factors have a greater influence than environmental factors in regulating growth in normal children. In the literature there are speculations regarding growth hormone (GH) deficiency in children with CLP negatively impacting growth during the second or third year of life. The findings are controversial, with some authors reporting no associations between orofacialclefting and GH deficiency.There are many studies in the literature about nutritional status and growth of children with cleft lip and palate with less than 2 years of age but there are few studies in older children, specialy from 2 to 10 years of age. Therefore, the purpose is to study the growth of children with cleft-lip, cleft-palate or cleft lip and palate from 2 to 10 years and 11 months of age and to compare the different types of cleft between themselves and also the group of children with cleft with typical children.

METHODS: Weight and height measurements were collected from 125 children, aged from 2 to 10 years and 11 months, with isolated cleft lip (ICL), isolated cleft palate or cleft palate with or without cleft lip (CLP/ICP) without associated malformations and/or syndromes in a cross sectional and prospective study. Weight for age (W/A), height for age (H/A) and body mass index (BMI) of these children were compared to World Health Organization 2006/2007 (WHO 2006/2007) reference for typical children. Fisher exact test was used to compare the proportions of children with small body dimensions. The results presented here are preliminary.

RESULTS: Children with ICL (n:21) did not presented statistically significant difference of any of the measures studied when compared with children with CLP/ICP (n:104) (p>0,05). When the children of both group (n:125) were compared with WHO 2006/2007 reference only W/A presented statistically significant difference (p=0,001), while the other data did not show significance (p>0,05).

CONCLUSIONS: Children with ICL/CLP presented impaired W/A growth when compared with typical children (children without cleft).

229 REDUCTION OF FACIAL SWELLING AFTER ORTHOGNATHIC SURGERY: A RANDOMIZED CONTROLLED TRIAL COMPARING TWO DIFFERENT DOSES OF DEXAMETHASONE

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BACKGROUND & PURPOSE: The aim of this study was to compare the effects of two dosages (5 and 15mg) of dexamethasone for reduction of facial swelling following orthognathic surgery, and to measure the soft tissue swelling using 3D photogrammetry. In addition, we evaluated whether administration of glucocorticoids introduce an increased risk of complications.

METHODS: This was a randomized clinical trial, and comprised 68 patients undergoing orthognathic surgery including LeFort I osteotomy, bilateral sagittal split osteotomy and/or genioplasty for surgical corrections of dentofacial deformities. They were given 5 (group1) or 15mg (group 2) of dexamethasone at the beginning of operation. The choice of the dose was random and double-blind. For all patients, 3D photos were recorded over five time periods: T0 (preoperative), T1 (36 hours postoperatively), T2 (1week postoperatively), T3 (1month postoperatively) and T4 (6 months postoperatively). Out of the 5 patients in group 2, additional 3D photo at 24 hours, 36 hours, 48 hours, 60 hours postoperatively were taken to observe the serial changes of facial swelling immediately after surgery. The amount of facial swelling (in volume) at T1, T2, and T3 was measured by superimposition of 3D image with T4 in all patients. Serial change of facial swelling at 24 hours, 36 hours, 48hours, 60 hours postoperatively in 5 patients were measured to evaluate the timing of maximal swelling after operation. Possible complications as adrenal suppression, wound dehiscence, and wound infection associated with use of steroid were evaluated after surgery, as well as occurrence of acute postoperative nausea and vomiting.

RESULTS: 68 patients received the orthognathic surgery and enrolled in the study. Among them, 56 patients (25 in group1, 31 in group 2) had adequate 3D photos for evaluation and analysis. There was no significant difference of facial swelling in every period between group 1 and 2 (p>0.05). Average amount of facial swelling in 5 patients showed maximal level at 48 hours postoperatively. There was no significant difference on the occurrence of nausea and vomiting after operation between 2 groups. No patient was noted to have complications such as adrenal suppression, delayed wound healing, and wound infection associated with the steroid use.

CONCLUSIONS: The 3D photogrammetry superimposition is an accurate method to quantify facial swelling after orthognathic surgery. This prospective study did not show further beneficial nor adverse effects between 5mg or 15mg of dexamethasone for reduction of postoperative facial swelling.

230 THE FUNCTION OF IRF6 IN TGFB3-DEPENDENT PALATAL FUSION

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BACKGROUND & PURPOSE: Cleft lip/palate is a common congenital craniofacial disorder in human. The mutations in the interferon regulatory factor 6 (IRF6) gene cause an autosomal dominant disorder, van der Woude syndrome (VWS), which is the most common form of syndromic cleft lip/palate. In Irf6 knockout mice or Irf6 R84C missense mutation mice show intraoral adhesions between the epithelium, and causes cleft palate. One of the key components in controlling palatal fusion is transforming growth factor beta3 (TGFB3). Knockout of the Tgfb3 gene in mice results in cleft palate and knockdown of Tgfb3 by shRNA inhibits the fusion of two palatal shelves. TGFB3 regulates palate fusion through epithelial mesenchymal transformation (EMT), apoptosis, and lateral migration pathways. To date, biological functions of IRF6 in palate development remain largely obscure. In this study, we investigated the molecular mechanism of IRF6 on palate shelves fusion by mouse palate shelves organ culture.

METHODS: Palatal shelves were dissected from E13.5 C57BL/6 mouse embryo, and cultured with DMEM in a 37 ℃ incubator. To knockdown Irf6 and Tgfb3, palatal shelves were transferred to a 48-well plate and incubated with lentivirus for 24 hours. After lentivirus infection, palatal shelves were cultured for another 24 hours. The fates of palate and expression of target proteins were analyzed by immunostaining.

RESULTS: TGFB3 up-regulates IRF6 and promotes IRF6 nuclear translocation in palatal shelves. Knockdown of Irf6 expression delayed TGFB3-induced palatal fusion. Over-expression of IRF6 enhanced palatal fusion and rescued the shTgfb3-inhibited palatal fusion. These data indicate that IRF6 involves in TGFB3-mediated palatal fusion. Further molecular analyses showed that knockdown of Irf6 expression decreased the expression of EMT regulators, Zeb1 and Snai2. In addition, knockdown of Irf6 expression restored TGFB3-inhibited epithelial markers, ZO-1 and Plakophilin expression. Thus, TGFB3-increased Irf6 expression is responsible for EMT, and Irf6 regulates EMT through Zeb1/Snai2 during palatal fusion. Furthermore, loss of Irf6 protein inhibited caspase 3 activation in medial edge epithelial (MEE) cells, suggesting that Irf6 also involved in apoptosis of MEE.

CONCLUSIONS: Taken together, Irf6 plays an important role in TGFb3 regulated EMT and apoptosis pathways during palatal fusion.

231 DIGITAL IMAGING ANALYSIS OF NASOPHARYNGOSCOPY: ADVANCING THE SCIENCE OF MEASURING VELOPHARYNGEAL FUNCTION FOR SPEECH

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BACKGROUND & PURPOSE: Imaging techniques and measurement methods used for assessment of velopharyngeal (VP) closure for speech have remained unchanged for decades. Currently, the majority of cleft palate centers use flexible nasopharyngoscopy to assess VP function. Most clinicians rely on subjective descriptions of VP physiology such as estimates of gap size (e.g., small, large), or coarse estimates of closure (e.g., 90%). While image quality has improved (e.g., high-definition cameras), methods of measuring VP closure

have not been revised since first proposed by the 1990 International Working Group (Golding-Kushner et al. 1990). There is a significant need to examine new approaches and technologies that can be adapted to improve VP imaging measurement to benefit surgical planning and outcomes assessment. In this ongoing study, we are examining the validity and reliability of a new method of digital imaging analysis to measure VP closure during speech in children with VPD.

METHODS: In this retrospective study, videorecorded nasopharyngoscopic images were selected from 40 children with VPD. 9 participants had pharyngeal flaps. Still image pairs were selected from each exam during accurate oral consonant production: (Image 1) the VP port at rest ("open") and (Image 2) the maximum degree of VP closure during speech ("closed"). A primary and secondary rater traced the VP port in each image using digital imaging analysis software (Image Pro AnalyzerTM). The primary variable of interest was the ratio of VP closure. Additional measures of velar and lateral pharyngeal wall excursion were also obtained. A subset of image pairs was re-rated to assess intrarater reliability. Intra-class correlation coefficients were computed.

RESULTS: Preliminary analysis of 31 image pairs has been completed. Intra-rater reliability ranged from r=0.69-.71 for measurements of VP port area. Inter-rater reliability ranged from r=0.91-98 for VP port area and was r=0.95 for overall ratio of VP closure.

CONCLUSIONS: Preliminary results from this study suggest that digital imaging analysis is a reliable method to measure the ratio of VP closure during speech. Phase 2 of this study will include analysis of reliability of additional rater measurements, as well as comparison of VP closure measures to aerodynamic, acoustic, and perceptual indices of of VPD.

232 INTERNET SEARCHES: THE READ[illegible]F INFORMATION RELATED TO PARENTING OF A CH[illegible]

Withdrawn

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BACKGROUND & PURPOSE: In conjunction with physical treatments, multidisciplinary care plans should incorporate support programs focusing on parenting practices that increase children's confidence and promote continuous problem-solving within the family core. Such programs should be available to families through the cleft team and through several media resources, especially the Internet. Since families are increasingly utilizing self-help electronically-based resources, the questions that come to mind are: Are parents finding information on parenting a child with cleft on the Internet? If so, is the information easy to read and understandable?

METHODS: A websearch was conducted using the search engine software Google.com for the following terms: "parenting cleft lip and palate." The first 5 pages of results from Google.com were analyzed. Repetitions, advertisements, and resources deemed to be irrelevant to the search were excluded. Readability level was determined using an online readability calculator that utilized the Fletch-Kincaid, Fog, and SMOG (Simple Measure of Gobbledygook) scale. Frequencies were reported.

RESULTS: Forty-two websites were retrieved, forty were entered into readability analysis and two were excluded because they were protected against copying of information. The majority of websites (85%) were from the US, four from the UK, and one each from Australia and Nigeria. Only 16 websites out of 42 mentioned directly or indirectly guidance for parenting practices. The analysis of the Fletch-Kincaid, Fog scale, and SMOG scale resulted in reading levels ranging from ninth to tenth grade reading level.

CONCLUSIONS: Only 36% of the websites analyzed addressed successful parenting practices that should be implemented while raising a child with a cleft. Their average reading scores were above the national's average literacy score, which is at approximately the eighth grade level. Therefore, it is possible that this material is not fully comprehended by family members.

*233 CRANIOFACIAL MICROSOMIA: INVESTIGATING SPEECH OUTCOMES

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BACKGROUND & PURPOSE: Children with craniofacial microsomia (CFM) are at increased risk for impaired speech production due to variable combinations of mandibular hypoplasia, malocclusion, velopharyngeal dysfunction, facial nerve palsies, tongue abnormalities, and hearing loss. However, only a few small studies have assessed speech production characteristics in CFM. Comprehensive evaluation of speech outcomes can identify how speech is impacted by the common craniofacial malformations in CFM.

METHODS: Thirty videos of children with CFM and 5 controls were randomly selected from over 100 participants enrolled in a multi-center study (RC1 DE020270) conducted by the Facial Asymmetry Collaborative for Interdisciplinary Assessment and Learning (FACIAL) network. Standardized video of participants included syllable/sentence repetition and counting to assess production of sounds that require specific tongue placement. A speech-language pathologist systematically assessed videos and recorded the presence of structural and functional facial asymmetry, along with characteristics of velopharyngeal dysfunction, articulation, and motor speech.

RESULTS: Twenty-eight videos were of adequate quality for inclusion. Participants had a mean age of 9.5 years and included 50% males. Cases had asymmetric facial structure (n=22) and function (n=6), neither of which were present in controls. Ten cases demonstrated characteristics of velopharyngeal dysfunction, including resonance disorders (n=3), velopharyngeal mislearning (n=2), and nasal grimacing (n=5). One control had nasal grimacing. Thirteen cases demonstrated atypical articulation, including developmental substitutions/distortions (n=7), obligatory substitutions/distortions (n=2), and 4 with both. Two controls demonstrated atypical articulation with developmental substitutions/distortions (n=1) and one with both obligatory and developmental substitutions/distortions). Thirteen cases and no controls demonstrated motor speech differences. Variations included atypical labiofacial function (n=10), reduced jaw stability/control (n=3), and two with both. An additional 50 videos will be reviewed prior to presentation.

CONCLUSIONS: Findings from this pilot study suggest mild speech production differences in children with CFM. These findings support the need for additional research to better define these differences and ultimately improve understanding of how craniofacial structure in CFM impacts communication outcomes.

Salary: 10% of my salary is being funded by the T.E.E.N. Endowment through the Craniofacial Center at Seattle Children's Hospital.

234 VALIDATION OF 3D GAND CLASSIFICATION OF LESSER SEGMENT CONSIDERING THE VOLUMETRIC SHAPE OF THE ALVEOLAR CLEFT

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BACKGROUND & PURPOSE: The GAND classification was developed for 3D classification of unilateral cleft palate (UCLP) to help determine treatment strategies based on volumetric and shape analysis of the cleft defect and the position of the lesser segment. The 3D analysis of the lesser segment in relation to the greater segment allows the following classification: G – cleft size; A - Arch form, N – Nasal floor and D – dental assessment We intend to validate this classification for clinical assessment by multidisciplinary assessment with health providers who work with patients with cleft lip and palate.

METHODS: With IRB approval, subjects (n=25) with UCLP who underwent cone beam computed tomography (CBCT) prior to orthodontic treatment were enrolled (age range, 8-12 years). No exclusions were made regarding gender, race or ethnicity. To validate the classification CBCT images were analyzed by Plastic Craniofacial, OMFS, and ENT surgeons, an Orthodontist, a Prosthodontist, and a General Dentist. All examiners were previously educated with use of the GAND criteria for classification considering location and extent of the alveolar defects. CBCT images were analyzed with MIMICS software to determine cleft shape and volume.

RESULTS: 3D CBCT images allowed accurate measurements of volume and definition of cleft shape; systematic analysis of the cleft was possible with the analyzing software. Accurate measurement of the adjacent bone surrounding the teeth was also possible. The 3D analysis of the lesser segment in relation to the greater segment generated the following "G – cleft size; A - Arch form, N – Nasal floor and D – dental assessment: Statistical analysis (Kappa inter-rater agreement) demonstrated appropriate grading criteria and adequate inter-rater agreement for GAND classification.

CONCLUSIONS: The GAND classification is a useful adjunct for orthodontic, surgical and prosthetic treatment planning, and will facilitate practitioner communication, patient counseling and prognosis. 3D CBCT may also improve visualization of facial aesthetics and accurate assessment of teeth adjacent to the cleft area.

235 GROWTH AND PUBERTY OF PATIENTS WITH CLEFT PALATE FROM 10 TO 18 YEARS OLD

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BACKGROUND & PURPOSE: Cleft lip and palate has been associated to deficiency in the development of the pituitary and to brain structural abnormalities. This association could result in growth impairment or problems in pubertal development which motivated the present study. Purpose: To evaluate growth and puberty in patients with cleft lip and palate (CLP) without associated syndromes, 10-18 years old, and compare them with typical children

METHODS: We evaluated 212 patients with cleft lip and palate without associated anomalies or syndromes. Values were measured for weight, height, and pubertal stage and the Body Mass Index (BMI) was calculated. Graphs from the World Health Organization (WHO) 2007 were used as reference for body growth. For evaluation of puberty, delayed puberty was considered as the absence of pubertal characteristics in 13-year old girls and older and in 14-year old boys and older, and precocious menarca as the menarca before 9-year old girls . Data from Setian N et al, 2002 were used as reference for puberty. The Fisher's Exact Test (5% significance level) was used to compare the different types of cleft among them as well as to compare children with CLP with typical children.

RESULTS: These are preliminary data from a cross-sectional study with 113 boys (62.7%) and 79 girls (37.3%). A total of 166 patients (78.3%) had cleft lip and palate or isolated palate (CL+P) and 46 patients (21.7%) isolated cleft lip (ICL). There was no statistically significant difference in height between CLP groups (P=1.00) and those with typical children (P=0.62). In relation of BMI 19.8% of patients showed an overweight BMI and 3.8% underweight. There were no statistically significant differences between CL+P and ICL (P=1.00) and between children with CLP and typical children (P=1.00). The CLP patients presented puberty similar to typical children.

CONCLUSIONS: Growth and pubertal development in children with CLP were considered normal for the age group studied.

*236 COMPUTED TOMOGRAPHIC GENERATED ANTHROPOMETRIC MEASUREMENTS OF ORBITAL RELATIONSHIPS IN NORMAL INFANTS AND CHILDREN

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BACKGROUND & PURPOSE: Anthropometric measurements are a well-established method of craniofacial evaluation. There is limited data of soft tissue and bony orbital relationships in the pediatric population. Prior anthropometric data was generated by direct measurement and/or plain x-ray. Our aim in this study is to use computed-tomographic (CT) scans to establish soft tissue and bony anthropometric orbital measurements in normal infants and children.

METHODS: We retrospectively reviewed CT scans of 204 children between the ages of birth and 36 months. All scans were obtained with 1 mm or finer cuts. Soft tissue and bone windows were used in the analysis. Any children with known syndromes or craniofacial abnormalities were excluded. All images were oriented in the Frankfurt Horizontal Plane. We obtained Intercanthal (IC), Bony Interorbital (IO), and Bony Lateral Orbital (LO) distances. Statistical analysis included mean, standard deviation, SEM, a 95% CI, and evaluation of the IO to LO ratio.

RESULTS: We stratified patients into age groups: <3, 3-6, 6-9, 9-12, 12-18, 18-24, 24-30, and 30-36 months. There were average of 25.5 patients in each group (range 25-27). We determined the mean distances for each age group. Intercanthal distance ranged from 16.4 to 35.3 mm. Bony IO distance ranged from 9.8 to 29 mm. Bony LO ranged from 53.7 to 88 mm. (Ratio of IO to LO in all groups ranged from 0.16 to 0.34).

CONCLUSIONS: We established normal anthropometric measurements of the orbit in the pediatric population using fine cut CT scans. This has been especially important in infants where data is limited. These measurements will be a useful tool when evaluating hypo- and hypertelorism in children with craniofacial abnormalities.

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*237 GENETIC MEDICINE IN THE MULTIDISCIPLINARY CLEFT CLINICS: A PERSONALIZED MEDICINE APPROACH TO OPTIMIZE DIAGNOSIS, MANAGEMENT AND REVENUE

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BACKGROUND & PURPOSE: A multi-disciplinary approach optimizes surgical and medical care for CL/P patients. Genetics adds expertise incorporating family and medical history with dysmorphology to identify a unifying diagnosis. We quantified the effect of a genetic diagnostic workup, counseling, and anticipatory guidance on diagnosis and clinical revenue in an established multi-disciplinary cleft clinic over 11 months.

METHODS: IRB approval was obtained to retrospectively analyze visits (Aug 2012-July 2013) recorded in our genetics cleft database. Each patient received an individualized diagnostic workup; there was no prospective protocol. Database parameters included: age, gender, presenting/post-assessment diagnosis (i.e. syndromic vs. non-syndromic), recommended test (i.e. chromosomal microarray, single gene) and study (e.g. echocardiogram, abdominal ultrasound, ophthalmology exam, brain MRI, skeletal survey) results, and final diagnosis. Analysis was performed with Stata 11.

RESULTS: A board-certified geneticist and/or genetic counselor assessed 167 patients (51.2% of annual cleft clinic). 32 (19.2%) were new to Cleft Clinic and 124 (74.3%) had never seen a genetic professional. 56 (33.5%) patients had isolated cleft palate, 12 (7.2%) isolated cleft lip, 84 (50.3%) cleft lip & palate, and 15 (8.9%) had other craniofacial anomalies. There were 2X more LEFT-sided cleft lip and cleft palate than RIGHT, but no gender difference in clefting sidedness or type. 33 (19.8%) patients presented with a syndromic diagnosis; 10 cytomolecular, 23 by clinical means. After genetic consultation, 90 patients were classified as likely syndromic/syndromic for whom 65 microarrays/single gene tests and 121 studies were recommended. Approximately half were completed with the following abnormal proportions: microarray (27.8%), single gene (50.0%), echocardiogram (50.0%), abdominal ultrasound (15.8%), ophthalmology (46.2%), brain MRI (33.3%), skeletal survey (28.6%), confirming 14 additional syndromic diagnoses. A private foundation grant provided seed salary support for the geneticist and genetic counselors who, in turn, billed $95,802.30 for their professional services. Additionally $66115.43 was accrued in downstream institutional revenue from a portion of the aforementioned tests and studies.

CONCLUSIONS: In one year, we doubled our Cleft Clinic patient exposure to medical genetics. This personalized diagnostic approach was efficient and cost effective in determining new syndromic diagnoses, allowing us to optimize recurrence risk estimates and medical management for patients and their families. The genetic medicine contribution to this clinic should be monetarily self-sustaining and doubling our personnel will accommodate all Cleft Clinic patients at our institution.

Consulting Fees (e.g., advisory boards): Dr. Hoover-Fong is a paid consultant to BioMarin. This arrangement has been reviewed and approved by the Johns Hopkins University in accordance with its conflict of interest policies.

238 UNSTEADY NASALANCE TRACES AMONG SUSTAINED VOWELS IN TYPICAL ADULT SPEAKERS: PREVALENCE AND POTENTIAL CAUSES

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BACKGROUND & PURPOSE: Nasalance is a ratio of nasal-to-oral sound energy. Several protocols include sustained vowels, which are appealing because they require limited articulatory precision and no reading. Sustained vowels should yield stable nasalance over the course of the vowel. However, while conducting a normative study of adult speakers, vowel nasalance traces often showed considerable variability within the vowel sample. Variance within a sustained vowel production is unexpected and has not been widely discussed. The purpose of this study is to (1) determine the prevalence of elevated within trial nasalance variance and (2) identify factors that predict nasalance variability in sustained vowels.

METHODS: Subjects were 61 typical adult speakers (age 18-30 years) with normal hearing and no history of cleft palate. Participants produced 3 trials of 6 sustained vowels presented in random order. Twenty-one subjects were recalled for retest reliability. High quality audio recordings were captured simultaneously with nasometry and used to generate measures of laryngeal function (e.g., fundamental frequency, periodicity). Percent nasalance was transformed into rationalized arcsine units (RAU, Studebaker, 1985) to normalize the data. Within trial variation was identified using the standard deviation (sd) of nasalance and

traces were classified as unsteady if sd > 5 RAU.

RESULTS: Among 1,447 vowels produced, 20% were identified as unsteady. Nearly all participants (92%) produced at least one unsteady nasalance trace. Nearly one-third (31%) of the participants had unsteady nasalance traces for 25% or more of the vowels produced. Vowels /o/ and /u/ were significantly more stable than /i, e, ae/ (p=.05). Preliminary analysis of the effect of trial, fundamental frequency, periodicity, and gender were not associated with nasalance stability. RMS signal intensity is related to variance in nasalance (p <.001). An evaluation of potential subject and equipment factors will be included in the presentation.

CONCLUSIONS: These findings suggest that unsteady nasalance traces are common among typical adult speakers. Certain vowels are more likely to yield stable nasalance traces. Further study is needed to evaluate the utility of sustained vowels as a stable, reliable measure of nasalance in clinical and research applications.

239 MEMORY, LANGUAGE AND COGNITIVE FUNCTIONS OF CHILDREN WITH CLEFT LIP AND PALATE

Withdrawn

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BACKGROUND & PURPOSE: Children with cleft lip and palate, chronic conditions in rehabilitation are faced with a variety of special challenges that predispose to behavioral and cognitive disorders, justifying sectional and longitudinal studies to determine causality of cognitive and psychosocial factors. This study was proposed to investigate the neuropsychologic functions of memory and language of children with repaired cleft lip and palate (CLP).

METHODS: Participated in this study 72 children with repaired CLP (trans- pre- and post-incisive foramen), both genders, mean age of 10.7y, during fundamental and middle school all under treatment at a specialized center for rehabilitation of craniofacial anomalies. For the investigation the Colored Progressive Matrices, Bender-Santucci Gestalt Teste Visomotor and BANI-TS – Neuropsychological Assessment Battery Simplified were used. Kruskal Wallis test was used to compare the children grouped according the different types of cleft palate (significance level defined at 0.05).

RESULTS: Findings revealed that 78% of the children performed at intellectual level expected for their ages and 22% performed at borderline normalcy level. General score for neuropsychologic function was found at a mean performance of 70% during tasks, with operational memory found at the lowest performance level (45%), followed by cognitive-linguistic at 53%. Graphic perceptual-motor abilities related to visual-spacial function were found at 58% of performance level expected for the age, with the children in the trans-incisive foramen group performing at the lowest level (32%) when compared with children in the pre- and post-incisive foramen groups. Most efficient performance was found for synesthetic sensations skin and receptive language suggesting preserved input of information. There was no statistical significance for the difference found among types of CLP. The individuals in the pre-incisive foramen CLP group had best neuropsychologic performance with scores at 73.2% compared to individuals in the trans-incisive foramen CLP (69,7%) and pos-incisive group (67,1%).

CONCLUSIONS: Individuals with repaired CLP present with alterations in neuropsychologic functions in the associative cortical areas, specially operational memory for numbers and words, and in the cognitive-linguistic area, compromising semantic and pragmatic abilities.

240 IMPROVING MANDIBULAR ASYMMETRY ASSOCIATED WITH CONGENITAL MUSCULAR TORTICOLLIS USING AN EARLY INTERVENTION PROTOCOL

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BACKGROUND & PURPOSE: Torticollis is also known as wry neck or stiff neck. It is the third most common orthopedic diagnosis in infants (1). The majority of these patients are treated with physical therapy (PT) and rarely require surgical intervention. Congenital Muscular Torticollis (CMT) affects the sternocleidomastoid muscle (SCM) which acts to ipsilaterally laterally flex the head and contralaterally rotate the head. Deformational plagiocephaly (DP) often accompanies the CMT in these children. Although the vast majority of children with CMT demonstrate both lateral flexion and rotational components to their torticollis, we have observed mandibular asymmetry (MA) to occur more frequently when the lateral flexion component is more pronounced than the rotational component. In those patients with concerns for skull abnormality and/or suture fusion we obtained 3D CT scans to rule out craniosynostosis as a differential diagnosis to DP. In reviewing these CT scans we have identified that patients with MA have made significant improvement after 6 months or more of PT. It has been documented in the literature that patients with MA can lead to long term facial asymmetry after the age of 5 years (2). Currently, children presenting to our DP and CMT clinic under the age of 12 months are treated for DP with aggressive repositioning and /or helmet therapy. Their CMT is treated with PT until they are approximately one year of age or ambulating independently. The 3DCT scans were performed on the day of their initial evaluation or soon after to evaluate for craniosynostosis, and the follow up CT was completed approximately 6 months later to evaluate for late craniosynostosis. In reviewing the follow up CT, it was identified that the MA had improved in all of the pts.

METHODS: From July 2009 to July 2012 a retrospective study of symptomatic CMT patients treated with early PT for a minimum of 6 months was performed in order to evaluate the outcome of intervention as measured by the degree of improvement in MA. All patients underwent weekly PT treatment utilizing stretching and strengthening. Pre and post-therapy 3DCT scans were obtained to evaluate the degree of ramal height asymmetry (calculated ratio;affected/unaffected) and to rule out craniosynostosis. Patients were followed clinically and radiologically for evidence of improvement in MA.

RESULTS: 10 pts met criteria. The avg age of pt presenting was 5.5 mos (3-9), avg length of PT was 6 mos, avg follow up was 7.5 mos (5.5-9.6). CMT was left sided in 60%, right sided in 40%. MA, 2nd to shortening of the vertical ramal ht (RH) (CT confirmed) correlated 100% with the side of CMT. The pre PT RH ratio (affected/unaffected) was 0.87 and improved to 0.93 after PT. 1 pt had synostosis.

CONCLUSIONS: We identified a unique cohort of infants with MA associated with CMT. These pts uniformly demonstrate decreased ramus height ipsilateral to the affected SCM. PT initiated shortly after diagnosis improved ramus asymmetry,as shown by calculated RH ratios.

241 SCREENING FOR OBSTRUCTIVE SLEEP APNEA IN CHILDREN TREATED AT A MAJOR CRANIOFACIAL CENTER

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BACKGROUND & PURPOSE: Children with craniofacial differences are often at phenotypic risk for obstructive sleep apnea (OSA). Timely OSA diagnosis helps to ensure adequate support and intervention, when needed, to avoid the adverse sequelae of upper airway obstruction, namely neurocognitive and cardiovascular decline. This study aims to determine the incidence of positive screening for OSA in patients with craniofacial differences.

METHODS: An IRB approved retrospective chart review was performed on consecutive patients cared for by the craniofacial team at a large, urban craniofacial center from January 2011 to August 2013. Patients and families completed the Chervin Pediatric Sleep Questionnaire (PSQ), a validated tool has a sensitivity of 85% and specificity of 87% in predicting moderate to severe OSA in otherwise healthy children. Patients were stratified by clinical diagnoses and screening results were compared by Fisher's test.

RESULTS: A total of 866 patients completed the PSQ during the study period and 234 children with craniofacial diagnoses met inclusion criteria. The mean screening age was 9.02 +/- 4.72 years (range = 0.31-29.78) and 47% were male (109/234). The overall incidence of positive OSA screening was 29.5% (69/234). The most commonly reported symptoms were mouth breathing (45.3%) and being easily distracted (40.6%). Of the total population, 176 patients had an underlying genetic syndrome (75.2%) while 58 patients were non-syndromic (24.8%). Both groups were at equivalent risk for having OSA symptoms (29.3% vs 29.0%, P=1.0). Also, patients with an orofacial cleft in addition to a craniofacial diagnosis were at equivalent risk for positive OSA screening compared to patients without a cleft (26.8% vs 32.9%, P=0.48).

CONCLUSIONS: This preliminary study demonstrates an almost 30% incidence of positive screening for OSA in our pediatric craniofacial patients. Future work will characterize the sensitivity and specificity of the previously validated Chervin PSQ in craniofacial patients by performing routine polysomnography.

242 ANALYSIS OF THE PERCENTAGE OF PATIENTS RETURNING FOR CLEFT PALATE REPAIR FOLLOWING CLEFT LIP REPAIR

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BACKGROUND & PURPOSE: In developed countries, cleft lip repair is performed between three months and six months of age, followed by cleft palate repair around the age of one. However, in the developing world, cleft patients present at later ages, changing the time frame of these surgeries. Due to speech outcomes, palate repair is a more time sensitive procedure than lip repair, ideally performed before the second year of life. Multiple cleft care authorities have questioned the staging of lip repair before palate repair when working in developing nations. One concern is that patients may not return for cleft palate surgery after the cleft lip has been repaired. This study was designed to determine what percentage of patients with a cleft lip and palate (CLP) at a high volume center in Assam, India return for cleft palate repair after having their lip repaired.

METHODS: The study identified CLP patients who had received primary cleft lip repair at the Guwahati Comprehensive Cleft Care Center in Assam, India between January 2011 and December 2012 (n=718). An overall return rate for palate repair was analyzed. Patients were also stratified by age group (<6 years; 6 – 18 years; >18 years) and the return rate for each group was determined.

RESULTS: The overall return rate for all patients was 24.9% (n=179/718). For each age group, the return rate was as follows: <6 years: 30.1% (n=124/412); 6-18 years: 21.4% (n=37/173); >18 years: 13.5% (n=18/133).

CONCLUSIONS: Three quarters (75.1%) of CLP patients did not return to have their palate repaired after lip repair. This number may be skewed by adult patients in whom palate repair is not considered essential. However, two thirds (69.9%) of CLP patients under 6 years of age, those patients who could benefit most from palate repair, did not return to have this second surgery. The result of this large series provides evidence that patients of Northeast India often do not return for cleft palate repair after repair of their lip. This should encourage consideration to repair the palate first in this population.

243 THE MATERNAL RISK FACTORS FOR CLEFT LIP WITH OR WITHOUT CLEFT PALATE IN THE PHILIPPINES

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BACKGROUND & PURPOSE: Multiple factors have been identified in the occurrence of CLAP. However, local Filipino data is presently lacking. The identification of modifiable maternal risk factors may contribute measures to reduce occurrence of these malformations in the Philippines.

METHODS: A standardized data from 235 mothers of children with CLAP and 470 mothers of children without congenital anomalies were collected. Univariate and multivariate logistic regression analyses were used to estimate relative risks by odds ratios and 95% confidence intervals.

RESULTS: Univariate results suggest that maternal history of premature delivery, maternal history of GDM, periconceptual corticosteroid use, smoking, and first-trimester alcohol, coffee and soda drinking increased risk of CLAP. Logistic regression showed that smoking (OR 29.54; 95%CI, 9.72, 89.73), coffee drinking (OR 2.0; 95%CI, 1.20, 3.34) and alcohol drinking (OR 22.25; 95%CI, 11.44, 43.28) of mothers were predictors of having CLAP. Using the backward Wald stepwise elimination of non-significant exposures confirmed that smoking (OR 10.95; 95%CI, 5.93, 20.24), alcohol drinking of <5 drinks per sitting (OR 27.34; 95%CI,13.81,54.32) and >5 drinks per sitting(OR 10.47; 95%CI, 1.95, 56.21), and drinking at least 5 cups of coffee per day (OR 9.31; 95%CI, 2.01, 43.05) increase the odds of clefting. Corticosteroid use (OR 80.53; 95%CI, 9.35, 693.85) also increases the CLAP risk.

CONCLUSIONS: Preconceptual counseling for CLAP risk should focus on history of premature delivery; GDM; periconceptual medication use; smoking; and alcohol, coffee and soda intake in the first trimester. Modifying the occurrence of these risk factors may help in decreasing the occurrence of CLAP.

244 THREE-DIMENSIONAL COMPUTED TOMOGRAPHY ANALYSIS OF PHARYNX IN ADULT PATIENTS WITH UNREPAIRED ISOLATED CLEFT PALATE

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BACKGROUND & PURPOSE: This study was performed to investigate three dimensional differences of pharynx between adult patients with unrepaired isolated cleft palate (ICP) and normal adults using cone-beam computed tomography (CBCT).

METHODS: CBCT data of thirty-two unrepaired adult patients with non-syndromic ICP and thirty normal controls were acquired. Image processing and analyses were performed using Mimics software program. Linear (Ho-PNS/PNSc, Ho-Ba, Ba-PNS/PNSc, Angle Ba-Ho-PNS/PNSc, C1-PNS/PNSc, C2-T1, C3-T2; D t p, D t c2, D t c3; D pa p, D pa c2, and D pa c3), planar (A p, A c2, and A c3), and volumetric (V t, V p, V p-c2, and V c2-c3) measurement and comparisons were made on ICP patients and normal adults. The interobserver and intraobserver reliability of 3-dimensional pharyngeal analysis were determined by Pearson correlation coefficient. Statistical analyses comparing ICP patients with normal adults were performed using independent-samples t test, with the threshold of significance set at p=0.05.

RESULTS: Interobserver and intraobserver reliability were high. Pearson correlation coefficients ranged from 0.992 to 0.999 for interobserver measurements, and from 0.994 to 0.999 for intraobserver measurements. Anterior height (p=0.000), total depth (p=0.003), and length of the floor (p=0.034) of bony nasopharynx; posteroanterior diameter of pharyngeal airway at palatal plane (p=0.000); cross sectional area of pharyngeal airway at palatal plane (p=0.000); total volume (p=0.031), volume above palatal plane (p=0.024), and volume between palatal plane and C2 plane (p=0.022) were larger in ICP patients.

CONCLUSIONS: This imaging study revealed an enlarged nasopharynx in sagittal plane and increased nasopharyngeal airway volume at palatal plane in ICP patients.

245 COST ANALYSIS OF PALATAL REPAIR IN INTERNATIONAL ADOPTEES

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BACKGROUND & PURPOSE: Recent increases in the number of international adoptees undergoing palate repair have sparked interest in how this unique subpopulation compares to non-adoptees undergoing the same procedure. The purpose of this study is to describe the costs of palate repair in international adoptees and compare them to non-adoptees.

METHODS: All patients seen at a major cleft referral center, whose palate repair was billed between 2010 and 2013, were reviewed. Syndromic patients and patients with open account balances exceeding $40 were excluded. For each patient's surgical encounter we evaluated charges and payments to the surgeon, anesthesiologist, and hospital. Effects of adoptee and Medicaid status on these outcomes were estimated using linear regression.

RESULTS: 23 adopted and 121 non-adopted children met inclusion criteria. All adoptees were from China; they averaged 20.2 months of age on arrival in the US, and 23.4 months at surgery. Non-adopted children were, on average, 15.8 months old at the time of surgery. Average length of stay was 1.33 days for adoptees and 1.59 days for non-adoptees, (median stay 1 day for both groups). No adopted children were covered by Medicaid, whereas Medicaid covered 26.4% of non-adoptees. Adjusting for the effects of Medicaid, the $21.71 difference in anesthesiologist payment between adoptees and non-adoptees was not found to be statistically significant (p=0.912), nor was the $897.57 difference in Medicaid-adjusted hospital payments (p =0.472). Medicaid-adjusted surgeon payments, however, average $1,490.69 more for adoptees than non-adoptees (p = 0.028). Findings are similar for surgeon fees charged, with adoptees being charged $1,709.52 more than non-adoptees (p<0.0005). Repeating all analyses, excluding submucosal and Veau I repair cases, led to similar results.

CONCLUSIONS: Hospital and anesthesiology costs for adoptee palate repair are highly variable, but do not differ significantly from non-adoptees. Surgeon's fees and insurer reimbursement are somewhat higher for adoptees, even adjusting for the effects of Medicaid. Reasons for this difference are not immediately apparent and will be the focus of future research.

247 EFFECT OF SURGICAL TECHNIQUE ON MAXILLARY GROWTH IN PATIENTS WITH UNILATERAL CLEFT LIP AND PALATE: A SYSTEMATIC REVIEW

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BACKGROUND & PURPOSE: Surgical treatment of cleft lip and palate is well-known to have effects on the facial structures. Many studies analyzing various repair options are addressed in the literature, however there does not exist

universal agreement among surgeons regarding which technique least negatively affects maxillary growth. The objective of this study is to evaluate the effect of surgical technique on facial growth in patients with unilateral cleft lip and palate with specific reference to dental arch morphology.

METHODS: A comprehensive search strategy of three major literature databases (Medline, Ovid, Cochrane)was based on key words “cleft palate”, “maxillofacial development”, “cephalometry”, “Facial Growth”, “Malocclusion” . Results of the search were supplemented by retrospective review of article references and additional studies suggested by experts in the field. Articles excluded from study met one or more of the following exclusion criteria: not in English language, published before 1980, cleft other than unilateral cleft lip and palate, no description or poor description of surgical technique used, two stage cleft palate repair or simultaneous lip and total palate repair, unspecified age of surgery, follow-up of less than 4 years, age younger than 9mo, or age older than 24mo at time of repair.

RESULTS: Original search resulted in 491 abstracts after query was filtered by language, date of publication, and limiting search to human studies. After individual abstract review 26 articles were selected by the two principal investigators. A total of 8 articles met inclusion criteria and were selected for final review. Retrospective review of references yielded 2 additional articles that met inclusion criteria. Five studies assessed dental arch morphology using casts and measured outcome by the Golson Yardstick method. Six studies assessed facial growth by cephalometric analysis and one by dental cast measurements. The techniques reviewed by selected studies included von Langenbeck, Wardill-Kilner, two-flap palatoplasty, and supraperiosteal pushback. The dental arch morphology as assessed by Goslon Yardstick was variable and contradictory across studies for von Langenbeck and Wardill-Kilner techniques. However, there was a trend for improved outcomes in von Langenbeck technique compared to others as measured by Goslon scores. None of the techniques was found to be statistically superior in the studies that directly compared them by cephalometric analysis or Goslon scores. There was significant variability in methodology, outcome measurements, and low power across studies.

CONCLUSIONS: This systematic review emphasizes the need for further research in this area. There is need for prospective randomized controlled studies comparing different surgical techniques to arrive at conclusions of clinical significance.

248 SAFETY OF IBUPROFEN IN POSTOPERATIVE PAIN AFTER PALATOPLASTY

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BACKGROUND & PURPOSE: Postoperative pain in patients undergoing palatoplasty is a common controllable symptom typically treated with narcotics (Augsomwan et al., 2011). However, the safety of codeine and hydrocodone use in pediatric patients has recently been questioned with the growing number of fatalities reported among children receiving these medications (Sadhasivam et al, 2012). These deaths are thought to be caused by ultrarapid metabolization of narcotics secondary to a genetic variation of the liver microenzyme CYP2D6. (Sadhasivam et al, 2012). In fact, codeine and hydrocodone use is now discouraged after tonsillectomy (Nierengarten, 2012). Alternate forms of pain control after palatoplasty would be beneficial. Because hemorrhage is a known postoperative complication after palatoplasty (Rossell-Perry et al., 2013), ibuprofen and other NSAIDs that decrease platelet activation have typically been avoided. Otolaryngologists had employed a similar practice after adenotonsillectomy until multiple studies revealed that ibuprofen caused no increase in postoperative bleeding (Pickering et al., 2002; Krishna et al., 2003; Møiniche et al., 2003; Cardwell et al., 2005; Jeyakamur et al., 2008; Yaman et al., 2011). This may suggest an opportunity to use ibuprofen following palatoplasty, without increased postoperative hemorrhage. No data has been previously published reporting the safety of ibuprofen following palatoplasty. Our purpose was to determine the safety of ibuprofen for postoperative pain control following palatoplasty in pediatric patients.

METHODS: A retrospective chart review of patients from a tertiary-care pediatric hospital was performed on patients who received ibuprofen after palatoplasty from 2010 to 2013. Charts were reviewed for number of doses of ibuprofen given and the presence of postoperative bleeding in the hospital and at a three-week follow-up. Patient’s caretakers were then contacted by phone to ensure no postoperative bleeding had occurred after patients had returned home.

RESULTS: Thirty-two patients (16 male, 16 female) received ibuprofen after palatoplasty. Patients received a mean of 4.8 doses (range 1-17). No patients experienced postoperative hemorrhage before hospital discharge. Charts revealed no post-operative hemorrhage at three-week follow-up. 17 of 32 (53%) of patients caretakers were contacted by telephone and none reported postoperative bleeding.

CONCLUSIONS: Ibuprofen appears to not increase bleeding rates, and may offer a safe alternative to control pain following palatoplasty. Additional prospective studies will be needed to further evaluate its safety and efficacy on a larger scale.

249 VOICE ONSET TIME OF PERSIAN WORD-INITIAL PLOSIVES IN CHILDREN WITH CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Clefts of lip and palate may lead to articulatory and resonance disorders. In this study, Persian word-initial plosives of children with cleft lip and palate were acoustically compared to children without cleft. Index of voice onset time (VOT) as a time-domain parameter was used to characterize the articulatory behavior of the children with cleft lip and palate.

METHODS: Participants consisted of 15 children with repaired BCLP (7 M, 8 F; mean age= 8.2 years, SD=2.9) and 20 normally articulating children (9 M, 11 F; mean age= 7.6 years, SD=2.6). All children with CLP underwent two surgeries to repair the lip and palate at three to six months of age. None of the children had any known syndromes, voice disorders, or hearing loss. Based upon perceptual evaluation, three children with CLP were judged to have hypernasality and two were judged to have audible nasal air emission. None had oronasal fistula and four children had alveolar bone grafting. Moreover, all of the children with CLP were undergoing maxillary expansion with removable orthodontic appliances. All participants were native speakers of Persian. All recordings were made using a microphone and CSL in a quiet room. The speech stimuli consisted of seven monosyllabic CVC real and nonsense words spoken in isolation. VOTs of Persian plosives including /p, b, t, d, k, g, G/ in word-initial positions were measured manually using PRAAT software. Children with CLP removed appliances during recordings.

RESULTS: Mean VOT values for the voiced plosives /b, d, g, G/ in the experimental group were less than those of the control group. T-tests indicated that statistically significant differences occurred between the two groups only for the voiced plosives /d/ and /G/ ($p<0.001$).

CONCLUSIONS: In Persian-speaking children with CLP, there was a tendency for reduced VOT of voiced plosives in general and in particular for /d/ and /G/. Findings are discussed relative to possible velopharyngeal inadequacy that may facilitate voicing and pre-voicing in children with CLP.

250 PARENTAL AND CHILDREN’S SATISFACTION WITH CLEFT REPAIR AND RELATED ASPECTS IN MONGOLIA

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BACKGROUND & PURPOSE: In Mongolia, children with clefts receive surgical treatments, covered by the national health insurance and multidisciplinary team provides with the follow ups. But no studies of satisfaction among these patients or their families have been published. Thus, the purpose of this preliminary study was to determine parental and children’s satisfaction with treatment and related aspects.

METHODS: Fifteen Mongolian children with cleft lip and palate (male 7 and 8 female) ranging in age from 12 to 16 years (mean age: 9.00 ± 3.45 years), and 15 parents were included in this study. A questionnaire was designed to investigate four variables and used during an interview

RESULTS: Treatment aspects: Out of total 15 children, 3 omitted to answer this part of the questionnaire. Among 12 (100%) interviewed children, only 2 (11.7%) had all their pre-operative expectations fulfilled, where as 10 (88.3%) were dissatisfied. Seven patients received an orthodontic treatment, where as 2 (11.4%) patients and their parents dissatisfied with the results and 5 (88.6%) expressed satisfaction. From the total of 15 (100%) patients only 8 (53.3 %) received speech therapy, where as 4 (50%) patients and their parents were satisfied with the outcome of the treatment. Facial Appearance and Speech: Only 6 (40%) patients out of 15 (100%) answered the question on the overall

facial appearance and all of them dissatisfied with, whereas also only 5(33.3%) completed speech related questions with the dissatisfaction with their speech. Emotional and Social Aspects: Out of 12 children, 10 did not feel significantly socially or emotionally handicapped and receives positive attitude from the classmates and friend; 7 children answered questions on the issue of the relations with the opposite sex and only 2 found difficult in this aspect, where as 5 had boy or girlfriend. Perceived Success of Specialists: All patients and parents felt that the surgeons and orthodontists are very important in the process of holistic treatment but the speech therapy was not mentioned.

CONCLUSIONS: The results suggest that the patients and their parents were generally dissatisfied with the surgical treatment they had received and generally satisfied with the orthodontic treatment. Positive outcome showed in the emotional and social aspects, which might be with relate to the cultural specifics of Mongolians. Also there is a need of promoting information on the interdisciplinary team, especially speech therapy.

251 CULTURE AND BELIEFS ON ETIOLOGY AND TREATMENT OF CLEFT LIP AND PALATE

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BACKGROUND & PURPOSE: Cleft lip and palate (CLP) occurs worldwide with varying incidences. Cultural background, ignorance, and myth triggers some inaccurate beliefs of its etiology, which, may lead to non-acceptance of proposed treatment plan and/or utilization of untraditional techniques for treatment. Although adequate treatment of CLP leads to total restoration, not all parents are in favor of the traditional treatment regimen established in the North-American culture. In the USA, a conglomerate, of cultures and beliefs, culturally competent providers may be more competent in convening messages on diagnosis and treatment plan to immigrant and/or culturally diverse families.

METHODS: A systematic review of culture and beliefs on the etiology and management of cleft lip and palate was performed. The results for “perceived etiology” are presented by continent and categorized into: (1) supernatural; (2) mother’s fault; (3) environmental; and (4) genetic. The results for “treatment modalities” are presented by continent and categorized into: (1) no care; (2) spiritual care; and (3) traditional surgical care.

RESULTS: Supernatural belief has resulted in either no care or spiritual healing in Africa, South America and Asia. Unfortunately, infanticide has been reportedly associated with this belief in Africa, Asia and some areas of South America. Genetic belief resulted in surgical care in all continents. Mother’s fault resulted in traditional surgical care but with lack of support from family and community, resulting in exacerbated feelings of loneliness and desperation. Populations who tend to believe that causes were environmental (contaminated water, oil spillage and pollution, nuclear plant, chemical facility, smoke from firewood for cooking preserving and processing food) tended to pursue traditional surgical care.

CONCLUSIONS: Health care providers should understand the cultural background of their patients and families in order to establish realistic treatment options and satisfactory treatment results. North-American practitioners should follow the standards of care prescribed by the American Cleft Lip and Palate Association; nonetheless, their approach to the family ought to be culturally sensitive.

252 SURGICAL ANATOMY OF THE FACIAL NERVE AND INFERIOR ORBITAL NERVE DURING MIDFACE CRANIOFACIAL APPROACHES

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BACKGROUND & PURPOSE: Subperiosteal midface lift was first described by Tessier in 1979. Since then, there have been no publications specifically addressing the anatomical landmarks of the facial and inferior orbital nerves (ION) as they relate to midface re-suspension post craniofacial approaches. This cadaveric study assesses both the position of the buccal branches of the facial nerve (BBFN) as it relates to the facial skeleton and the course of the ION fascicles in the supraperiosteal plane and their impacts on surgical technique.

METHODS: Fourteen hemi-facial dissections in 7 fresh human cadavers were performed through a preauricular face-lift incision. A 25 gauge needle with brilliant green dye was used to mark the BBFN on the facial skeleton as they entered under the lateral border of the zygomatic major muscle. Midface dissection was then carried through a transconjunctival and upper gingival-buccal sulcus incision. The locations of the BBFN were documented in relation to the caudal border of the zygomatic-maxillary (ZM) suture. The ION was also identified and its fascicles were dissected in the supraperiosteal plane from the foramen until they passed superficially into the facial soft tissue.

RESULTS: On average there were 3 branches of the facial nerve innervating the zygomatic major muscle and 1.8 branches entering the muscle superior to the caudal border of the ZM suture. The most superior buccal branch of the facial nerve was found to lie at a mean of 6.8 mm superior to the inferior border of the ZM suture and at 1 mm elevation from the bone. The most inferior branch was at a mean of 7.2 mm inferior to the caudal border of ZM suture. On average the ION had 5.2 fascicles. They traveled for an average distance of 10.2 mm above the periosteum before they passed into a superficial plane.

CONCLUSIONS: Midface degloving during craniofacial surgery is common. The surgeon must be aware of the facial nerve anatomy during release of the upper masseteric ligament and inferior orbital nerve fascicles anatomy during placement of the periosteal suspension sutures.

253 EXPERIMENTAL JUSTIFICATION OF APPLICATION OF A MEMBRANE FROM AN UMBILICAL CORD FOR REPLACEMENT OF DEFECTS OF THE JAW.

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BACKGROUND & PURPOSE: Treatment of those children, who have a alveolar cleft is the most difficult task in combined treatment of patients with congenital abnormality of maxillofacial area. In this sense, elimination of congenital defects of the alveolar bone is one of the essential stages of surgical treatment of patients with Congenital Cleft Lip and Palate. It allows to normalize the split portions of the upper jaw. Consequently, it reduces the severity of post - surgical deformations. Purpose. Experimental justification of the usage of umbilical cord tissue in bone grafting of the alveolar bone defect in the upper jaw of rabbits.

METHODS: Methodology. In our experiments we used 30 non purebred rabbits at the age of 3-4 months with average weight of 2.0-2.5 kg. In all animals standard bone defects artificially were reproduced in the alveolar bone of the upper jaw at premaxillary-maxillary suture. Experimental reproduction of bone defects were performed according to the following procedure: it was made a linear incision of the mucous of the alveolar bone of the upper jaw, threw back mucoperiosteal flaps in premaxillary - maxillary suture, it was created through bone defect of 10 x 0.5 mm with fissure bur, then took autotransplantation of the ilium and filled the defect. Then mucoperiosteal flaps were laid into place and sewed with polyglycolic sutures. During experiment we used umbilical cord sheath - extraembryonic ectoderm formation with a thin elastic translucent structure, which has a variety of functions such as: promotion of advanced biological processes as well as anti-inflammatory, regenerative functions. Umbilical amnion is a film, which consists of fine fiber network with fibrillar nature, and is covered externally with amniotic membrane, which represented by ectodermal amniotic epithelium whose cells tightly located with each other.

RESULTS: In the first group 120 days after operation low-mineralized tissue, partially filling the defect was detected in the area of the defect as well as thin and discontinuous cortical bone was visible. In the second group the defect was completely filled with bone tissue. Apart of that, the whole area of the defect is covered with dense shadow. By day 120 after surgery we observed that almost completely filling of the bone defect area in the group of animals that were used membrane, whereas in the other group that was not observed.

CONCLUSIONS: Thus, the results of the pilot study suggests the effectiveness of cord membranes in eliminating artificially created defect of the upper jaw, which is expressed not only in getting the bone regeneration, but also in equal filling of the defect in the newly formed bone tissue. Accordingly, we consider that the experimental result that we obtained from our research can be basis for the clinical use of this membrane in children with CCLP during rehabilitation stage.

254 ASSESSMENT OF ALVEOLAR BONE CLEFT GRAFTING USING SWAG TECHNIQUE IN THE CLEFT CARE CLINIC; EGYPT

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BACKGROUND & PURPOSE: Secondary alveolar bone grafting (ABG) of the cleft alveolar ridge in the mixed dentition is a well-established treatment for patients with cleft lip and palate (CLP) for its well-known

advantages.Overviewing of the level of cleft care received by a group of Egyptian patients treated in the cleft care clinic (CCC) in 2012 by El-Kassaby A.W. [1] , discussing the challenges and ways to improve care. Findings showed that alveolar cleft grafting had received the least attention. In this study, above 9 years of age 85% of the patients didn't receive the ACG they needed .as for the performed; 12 % were successful and 13% failed[1].AIM of the study: is to assess the degree of success of ACG in the same clinic in another point of time comparing the Iliac bone (gold standard) and chin bone using the "Standardized Way to Assess Grafts" SWAG technique (Long et al.,1995). [1] El-Kassaby .A.W. Overview of the level of cleft care received by a group of Egyptian patients: challenges and ways to improve Egyptian Journal of Oral & Maxillofacial Surgery 2012, Vol 3 No 2.)

METHODS: A retrospective study was performed to operated ACG patients all cases were performed by the same surgeon using two different bone sources Iliac and chin . Radio graphs were projected and rated by orthodontists using the SWAG method where 0 is no bone, 4 reflects two-thirds fill, and 6 means complete fill. Vertical thirds were also assessed. The SWAG technique was validated for ABG assessment for overall bone (quantity) fill as well as in vertical thirds (location).

RESULTS: Significant improvement in the success rate of ACG in comparison with the previous study.All nasal floors were closed successfully and the SWAG technique is a good scale for assessment and a step for later inter-center comparisons.

CONCLUSIONS: The technique described by the Ameri-cleft is applicable as a bone scale and eases later inter-center comparison.SWAG reveals improvement of ACG .

255 FORMATTING THE SURGICAL MANAGEMENT OF TESSIER CLEFTS 3 AND 4

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BACKGROUND & PURPOSE: Tessier Clefts 3 & 4 are rare Craniofacial Clefts and the rarity of the same makes it a challenge for any Craniofacial surgeon to give the best possible result. The lack of well defined guidelines or procedures for management of Tessier clefts 3 & 4 gives us surgeons a basis to search a reliable but easy technique to correct the same. To overcome our difficulty in management , a formatted technique is being presented

METHODS: A prospective study was done of 5 patients who came to our centre with Tessier Craniofacial Clefts 3 & 4. The age range of the patients were 1.5 -29 years. All cases were clinically examined and rued out for any other impending medical conditions. The Surgical Defect was Formatted into 3 segments for ease of surgery and defining the defect and individually addressing it. The 3 segments were Lid Component, Lip Component , and NasoMaxillary Component. Each of the component defined the morbid anatomy and helped to restore the facial balance .

RESULTS: All the results were satisfactory. The technique gives us relative ease of identification of landmarks and dividing the morbid anatomy into 3 or more segments makes the repair rather easy with predictable results. The need for secondary /revision surgery also was discussed and deemed not necessary both by the patient and the surgeon .

CONCLUSIONS: The surgical management of Tessier 3 ,4 is a challenge , given the nature of these anomalies and lack of standard guidelines. To achieve a anatomically correct and reasonably well defined repair. The formatting technique appears to give predictable results . The "divide and rule " policy is simple and can be replicated in every case and is arguably the most recommended form of surgery to treat such complex Craniofacial Defects.

256 WHAT IS THE OPTIMAL AGE FOR CRANIAL VAULT REMODELING IN SYNDROMIC CRANIOSYNOSTOSIS? INSIGHTS FROM THE JOHNS HOPKINS EXPERIENCE.

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BACKGROUND & PURPOSE: Optimal timing of cranial vault remodeling in syndromic patients with craniosynostosis is controversial. The purpose of this study was to gain insight into the impact of age at repair on relapse rates through the Johns Hopkins experience.

METHODS: Retrospective chart review was performed for 58 patients surgically treated for syndromic craniosynostosis at Johns Hopkins Hospital between 1990-2013. Patient demographics, suture involvement, age at surgery, syndrome, surgical management, hospital course, and complications were recorded. Surgical procedures were assigned a Whitaker category based on need for reoperation as follows: (I) signified no additional surgery required, (II) signified soft tissue and lesser bone contouring revisions required, (III) signified major alternative osteotomies or bone grafting required, and (IV) signified the need for major surgical revision essentially duplicating the original surgery. Multivariable logistic regression analysis was used to determine the relationship between age at surgery and need for reoperation as categorized by the Whitaker scale, and to assign odds ratios (OR) for need for surgical revision by operative timepoint. Covariates included suture involvement, syndrome, race and gender.

RESULTS: 58 patients undergoing a total of 71 cranial vault remodeling procedures for syndromic craniosynostosis were identified. Average follow up was 6 years (SD 5 years). Patient demographics were as follows: 32 male (55%), 26 female, 39(45%) Caucasian, 10 Black, and 9 of another race. Syndromes were comprised of Crouzons (n=14), Aperts (n=12), other (n =12), Pfiffers (n=10), undiagnosed (n=6), and Seathre-Chotzen (n=4). Average number of sutures involved was 2.4 (range 1 to 5) as follows: right coronal (n=37), left coronal (n=38), sagittal (n=18), metopic (n=11), left lambdoid (n=7), and right lambdoid (n=6). Whitaker category for the 71 procedures was as follows: 31 in category I, 10 in category II, 3 in category III, and 27 in category IV. Multivariable logistic regression analysis for the effect of age on reoperation revealed a greater odds of major reoperation (category IV) in patients with less than 3 months of age (OR 5.6, p=0.015, 95% CI: 1.4-24.7) and 3-6 months of age (OR 4.3, p=0.03, 95% CI: 1.2-16.1), and a greater odds of no reoperation necessary (category I) in patients 6-9 months of age (OR 7.0, p=0.006, 95% CI: 1.7-27.9). Patients older than 12 months of age had a greater odds (OR 8.4, p=0.011, 95% CI: 1.6-43.2) of requiring minor operative revisions (category II).

CONCLUSIONS: Timing of surgery is an important factor to consider when planning vault remodeling in syndromic craniosynostosis. We found that operating before 6 months of age had greater odds of requiring a complete revision, and that patients undergoing remodeling after 12 months of age were more likely to require minor revisions. In our experience, the ideal operative window that demonstrated the greatest odds of requiring no additional surgery was 6-9 months of age.

257 INTER- AND INTRA-EXAMINER RELIABILITY OF DIGITAL MODELS VS PLASTER DENTAL MODELS USING HLD INDEX

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BACKGROUND & PURPOSE:In California, orthodontic care can be provided as free service for eligible patients as part of Medi-Cal dental program (Denti-Cal). To qualify for subsidized treatment the orthodontist must send dental study models of patients to Denti-Cal, the dental models are examined and scored manually by an eligible trained examiner in the Handicapping Labio-Lingual Deviation (HLD) Index California Modification. There are two purposes for this study, the first is to find the inter-examiner reliability between an orthodontist and gold standard (trainer for HLD index) before calibration and after calibration. The second purpose is find out if digital models can substitute plaster dental models in scoring HLD index.

METHODS:The study was retrospective study at the Department of Dentistry, section craniofacial orthodontics, CHLA, California. The material consisted of dental casts of patients who have been examined and being treated in the department. Rater one rated 68 casts before calibration, then he was calibrated by the Gold Standard and both scored the same casts independently nr: 78. For the second part of the study, models were examined by two examiners whom were calibrated by the gold standard and each measured independently each of the 78 study models manually using digital caliper to determine the score of index for each cast. 50 casts of these plaster models were scanned using high resolution scanner the Ortho-Insight 3D. The two examiners then measured each of the scanned dental casts digitally using a protocol laid out by the manufacturer of the machine, and determined the HLD index score for each of the casts. The data were collected and analyzed using the weighted kappa statistics (k) was to assess both intra- and inter-examiner reliability for the index.

RESULTS:Part I showed that pre-calibration for examiner 1 had a moderate agreement with the gold standard (k = .41), which was increased to an almost perfect agreement (k = 0.92) after calibration. In Part II, the Intra-rater reliability digital to plaster substantial for both rater 1 (k = 0.79) and rater 2 (k = 0.67). Combined k = 0.73.

CONCLUSIONS: 1) Calibration is necessary. (2) Plaster and digital gets similar results. (3) Raters have high reliability between them.

258 ORTHODONTIC MANAGEMENT AND FACTORS AFFECTING TREATMENT OUTCOMES OF PERSONS BORN WITH OROFACIAL CLEFTS AT THE UNIVERSITY OF GHANA DENTAL SCHOOL

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BACKGROUND & PURPOSE: Currently, there are two centers in Ghana where multidisciplinary management of clients with Orofacial Clefts includes Orthodontic treatment; these are the Korle-Bu Teaching Hospital in Accra, which is the largest hospital in West Africa and the Komfo Anokye Teaching Hospital in Kumasi The purpose of this study is to highlight the reported burden of this Craniofacial Abnormality in Ghana and the existing approach to orthodontic management. It also aims to identify socio-cultural factors that may influence orthodontic treatment outcomes including community perceptions, attitudes and practices as well as the measures taken to accommodate these factors.

METHODS: This study was undertaken at the Department of Orthodontics and Pedodontics at the University of Ghana Dental School. The records of Clients with Orofacial Clefts treated between the year 1996 to date were reviewed. Factors affecting treatment and management outcomes were recorded.

RESULTS: The total number of clients was 23 with age ranging from birth to 24years. Majority of the clients were in the 5-9yr. group (30%) and the 10-14 yr. group (30%). The gender distribution was 43% male and 57% female. 39% of clients had a presenting complaint of malalignment of upper teeth while 26% presented due to their referral from the Cleft Lip and Palate Panel Clinic. Majority of clients (43%) were treated with fixed upper braces only while only 13% were treated with both upper and lower fixed braces.

CONCLUSIONS: Orthodontic treatment with fixed braces is limited not only by cost but also by the clients' repulsion to the seemingly unaesthetic metal brackets and the lengthy duration of treatment. The clients also tend to have cooperation 'burnout' from numerous hospital visits they have had to endure from birth to manage their condition.

259 UTILIZING THE PARASCAPULAR FLAP TO ADDRESS PRUZANSKY III HYPOPLASTIC MANDIBLES: SURGICAL OUTCOMES OF 7 PATIENTS

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BACKGROUND & PURPOSE: Distraction osteogenesis is a well-established approach in correction of the hypoplastic mandible. It has been less successful in the treatment of Pruzanski Class III deformities. Despite early overcorrection, there is poor subsequent growth owing to absence of the condylar growth center. Various free tissue transfers have been utilized for pediatric ramus reconstruction, including rib, fibula, iliac crest, and scapula. Only scapula appears to include a viable growth center. We describe our experience utilizing the parascapular osteocutaneous free flap for mandibular reconstruction.

METHODS: From 1994 to 2013, 7 patients with grade III hypoplastic mandibles were candidates for mandibular reconstruction with a parascapular osteocutaneous flap. Flaps were performed at two different institutions and by two different senior surgeons. The average age at time of initial surgery is 5.3 years old. Distraction was performed on 2 patients in an effort to improve obstructive sleep apnea symptoms. Bone surveillance was conducted through cephalograms and computed tomography at average of 3.5 years follow-up (range 0.2 to 9.3 years). All patients received 1 week of perioperative cephalosporin antibiotic coverage.

RESULTS: All seven patients underwent successful transfer and no bone flap loss with stable clinical fixation noted up to 9.3 years of follow-up. One Goldenhar Syndrome patient underwent bilateral flaps 6 months apart and secondary mandibular distraction 1 year later. Complications include: hematoma (n=1), TMJ limited aperture(n=1), and partial bone resorption (n=1). N=1 syndromic patient was diagnosed within this cohort with Goldean Har syndrome (Pruzanski III) and Pierre Robin Sequence.

CONCLUSIONS: There are few reports of long term success in treating the severely hypoplastic mandible with free osteocutaneous scapula transfer. Our results suggest that the parascapular osteocutaneous free flap represents an effective surgical option with minimal donor site morbidity, good long term growth and appropriate qualities to make it our preferred method of madibular reconstruction.

260 POSTERIOR CRANIAL VAULT DISTRACTION IN A PATIENT WITH OSTEOPETROSIS AND PROGRESSIVE POSTNATAL PAN-CRANIOSYNOSTOSIS

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BACKGROUND & PURPOSE: We report a case of posterior cranial vault distraction in a patient with osteopetrosis. The purpose of this report is to present the unique surgical considerations in the treatment of craniosynostosis in osteopetrosis patients.

METHODS: Report of a single case

RESULTS: The patient presented at age 13 months with progressive pan craniosynostosis, vision loss, developmental delay, and sleep apnea. Genetic evaluation confirmed autosomal recessive malignant infantile osteopetrosis associated with a homozygous mutation in the TCIRG1 gene. Interval CT scan performed upon referral confirmed progressive synostosis of bilateral coronal, lambdoid and metopic sutures with volcano sign, inner table scalloping, narrowed optic canals, and marked skull base thickening. Bone marrow transplant (BMT) was indicated, but would have necessitated deferral of vault expansion for 6-12 months. Therefore urgent expansion of the posterior vault was performed at 14 months of age to treat elevated intracranial pressure. Two parasagittal distractors were used to distract a bioccipital craniotomy flap at a rate of 1 mm per day after a 3-day latency. Distraction progressed without complication and CT scan 4 months postoperatively showed appropriate bony generate, and the distractors were removed at 4 ½ months. The longer latency period was implemented given the uncertainties surrounding bone generation in this patient. The patient demonstrated rapid improvement in reaching developmental milestones, resolution and improvement in sleep apnea. He progressed to treatment for bone marrow transplant.

CONCLUSIONS: This is the first report of distraction osteogenesis in a patient with osteopetrosis. The characteristics of osteopetrosis including osteoclast dysfunction, absence of appropriate bone remodeling, bone deformation, sclerosis and fracture, are factors that could complicate distraction osteogenesis which requires guided generation of functional bone during a specified time window. However, craniofacial distraction was successful in this case with attainment of the desired vault expansion stabilized by adequate bone formation. The osteopetrosis patient with craniosynostosis presents a treatment dilemma where the timing of vault surgery must be balanced against that for curative BMT that can reverse many of the bone phenotypes over the course of months to years. In this case vault expansion was urgent at presentation, but early diagnosis and BMT might obviate the need for surgical intervention in the future.

261 MANDIBULAR VOLUMETRIC INCREASE FOLLOWING DISTRACTION OSTEOGENESIS.

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BACKGROUND & PURPOSE: Mandibular distraction osteogenesis (MDO) for the treatment of Pierre Robin sequence (PRS) enables mandibular lengthening and improves airway and feeding function. It remains unknown how the post-distracted mandibular volume compares to a normal control population. The aim of this study was to analyze mandibular volume and symmetry following bilateral MDO and compare post-distraction measurements to a non-distracted, normal age- and sex-matched control cohort.

METHODS: Demographic information and three dimensional-computed tomographic (CT) images were obtained from normal control and distracted PRS patients. Mandibular volume and symmetry indices were calculated and results statistically analyzed. P values ≤ 0.05 were considered statistically significant.

RESULTS: 24 CT scans and 48 hemimandibles were analyzed (8 control patients: mean age = 5.6 months, 3 females; 8 distracted patients: mean age pre-distraction = 1.8 months, mean age post-distraction = 5.3 months, 3 females). No complications were encountered in the distracted group. The mean pre- and post-distraction volume in the MDO group measured 7238.1 mm3 and 15360.6 mm3, respectively (P = 0.0003) and the mean percent increase in mandibular volume following distraction was 113.3%. The mean symmetry index increased after distraction from 0.91 to 0.95 (P = 0.31). Matched normal control mandibles measured 13488.6 mm3 versus post-distraction mandibles at 15360.6 mm3 (P = 0.40). Normal control and post-distraction symmetry indices were 0.99 and 0.95, respectively (P = 0.68).

CONCLUSIONS: Distraction resulted in a significantly increased mandibular volume and an observed preservation in mandibular symmetry. Post-distraction volume was increased compared to normal controls but remained less symmetrical.

262 ARE POSTOPERATIVE DRAINS AND CIRCUMFERENTIAL HEAD WRAPS NECESSARY AFTER CRANIAL VAULT RECONSTRUCTION?

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BACKGROUND & PURPOSE: The use of closed suction drains and circumferential head wraps after cranial vault reconstruction is currently based on physician preference and is the accepted standard of practice. This method of dressing and drain use adds to operative time, nursing care and may prolong hospital stay. This study evaluates postoperative outcomes with and without the use of surgical drains or head wraps in pediatric cranial vault reconstruction patients.

METHODS: Two hundred and thirty cranial vault reconstructions from 2006-2013 were retrospectively reviewed. Outcomes included postoperative complications and length of hospital stay. Mean lengths of stay and complication rates were evaluated with student t-test and chi-square, respectively. Patients were also divided into 4 groups (1, no drain or head wrap; 2, head wrap only; 3, drain only; 4, both drain and head wrap) and analyzed with ANOVA, comparing length of stay and complications.

RESULTS: Overall length of stay for all patients was 3.46 (±1.07) days. Closed suction drain use resulted in a longer stay then without a drain (3.66 [±0.90 days) vs 2.86 [± 1.34] days) (p=0.00). Patients with a circumferential head wrap had a longer length of stay compared to no wrap (3.74 [±0.89] vs 3.09 [±1.19] days) (p=0.00). Length of stay for the 4 groups of patients were as follows: Group 1: 2.94 (±1.36) days, Group 2: 2.16 (±0.98) days, Group 3: 3.24 (± 0.97) days, Group 4: 3.82 (±0.81) days. Patients with both a drain and head wrap (Group 4) were in the hospital 0.57 to 1.66 days longer than all other groups (p=0.00). Use of a drain only was found to have a shorter hospital stay compared to a head wrap only (p=0.013). The overall postoperative complication rate was 1.7% with no significant difference in complication rates between groups.

CONCLUSIONS: These results suggest no clear benefit with the use of a closed suction drain or circumferential head wrap after cranial vault reconstruction. Refraining from drain and dressing use may shorten length of hospital stay.

263 EFFECT OF LOUDNESS VARIATION ON VELOPHARYNGEAL FUNCTION IN CHILDREN WITH 22Q11.2 DELETION SYNDROME: A PRELIMINARY REPORT

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BACKGROUND & PURPOSE: Many children with 22q11.2 deletion syndrome (22qDS) exhibit velopharyngeal dysfunction (VPD) that persists after surgical intervention. The purpose of this study was to use pressure-flow testing to examine the effect of loudness on the extent and timing of VP closure during speech for children with 22qDS and mild symptoms of VPD. Hypotheses were formulated based on previous studies of individuals achieving greater VP gap closure under increased speaking effort (Fox & Boliek, 2012; McHenry, 2007).

METHODS: A single-case A-B design was utilized. Three females (ages 6, 6, and 14) with 22qDS underwent aeromechanical assessment of VP function and were cued to repeat words at their habitual then at an increased loudness level. Intraoral pressure, nasal airflow, VP orifice area, and duration of the nasal airflow pulse were measured across four stimuli (/pi/, /pa/, "hamper," and "I have a hamper"). Descriptive statistics and graphical measures were used to examine differences in VP orifice size and the timing of VP closure in the habitual vs. loud condition.

RESULTS: In general, the extent and variability of VP closure improved for Participant 1 and worsened for Participant 3 across stimuli in the loud condition. For the stimulus "I have a hamper," median VP gap size decreased by 5.8 mm2 for Participant 1. Participants 1 and 3 demonstrated a decrease in median duration of nasal airflow during "hamper" in the loud condition (decreases of 60 and 45 milliseconds, respectively). No trends in the extent and timing of VP closure were observed for Participant 2 potentially due to VP surgical history and/or fluctuating nasal airway resistance.

CONCLUSIONS: This pilot study is the first to examine the effect of loudness on VP function in the 22qDS pediatric population and presents new aerodynamic information regarding the plasticity of VP physiology in this group. Implications for behavioral speech treatment as an adjunct to surgical management of VPD in 22qDS, limitations of the study, and suggestions for future research will be discussed.

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As of March 12, 2014, the following companies/organizations had registered to exhibit at our annual meeting. Those companies that are deserving of special recognition for providing educational sponsorship and support for this meeting have their listings bolded. Please take time to visit the exhibitors and thank them for their interest in participating in our meeting.

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The Cleft Palate-Craniofacial Journal is an interdisciplinary international journal dedicated to current research on etiology, prevention, diagnosis, and treatment of craniofacial anomalies. 3dMD 3200 Cobb Galleria Parkway, #203 Atlanta, GA 30339 Tel: 770.612.8002 www.3dMD.com 3dMD provides high-precision, ultra-fast 3D and 4D facial and craniofacial surface imaging systems and sophisticated 3D image-fusion software for patient measurement, evaluation planning, and outcome simulation scenarios.

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Tel: 919.933.9044
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The American Cleft Palate-Craniofacial Association extends a Special Thank You to:
KLS Martin Group, Jacksonville, FL • Medical Modeling Inc, Golden, CO • Pentax Medical, Montvale, NJ
Mohammad Mazaheri, MDD, MSc, Lancaster, PA • Nationwide Children's Hospital, Columbus, OH • Stryker, Portage, MI
for their support at this year's meeting.

Summary of Events

PLEASE NOTE: Rooms are subject to change at the hotel's discretion. Please check at the registration desk or listen for announcements of room changes.

SUNDAY, MARCH 21 TIME	FUNCTION	ROOM
4:00PM-7:00PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix

MONDAY, MARCH 24 TIME	FUNCTION	ROOM
7:30AM-5:30PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
9:00AM-5:30PM	**Pre-Con Symposium I: Facial Asymmetries**	**Marriott 6**
10:30AM-11:00AM	Symposium Coffee Break	Marriott Foyer
12:30PM-2:00PM	Lunch Break (On Your Own)	
3:30PM-4:00PM	Symposium Coffee Break	Marriott Foyer

TUESDAY, MARCH 25 TIME	FUNCTION	ROOM
7:30AM-7:30PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
8:00AM-12:00PM	Primer on Team Care	Marriott 3-4
8:00AM-11:45AM	Pre-Con Symposium I: Facial Asymmetries	Marriott 6
10:00AM-10:30AM	Symposium Coffee Break	Marriott Foyer
12:30PM-2:00PM	Lunch Break (On Your Own)	
12:00PM-1:00PM	Primer on Team Care Lunch (Optional)	Marriott 2
12:00PM-1:30PM	ACPA/CPF Committee Chairs Meeting/Luncheon (Open to 2014 and 2015 ACPA/CPF Chairs)	Santa Fe
3:00PM-5:00PM	Exhibit Move-In	Marriott Foyer
	ACPA and CPF Committee Meetings	
1:30PM-3:30PM	International Outreach	Santa Fe
1:30PM-3:30PM	Americleft	Marriott 8
1:30PM-2:00PM	CPF DPMF	Austin
1:30PM-3:00PM	CPF Publications	Marriott 7
1:30PM-2:30PM	Archives	Boston
1:30PM-3:00PM	Parameters	Columbus
2:00PM-3:30PM	CPF Scholarship	Austin
2:30PM-3:30PM	Ethics	Boston
3:00PM-3:30PM	CPF Awards	Marriott 7
3:30PM-4:00PM	**Committee Coffee Break**	**Marriott Foyer 1-4**
	ACPA and CPF Committee Meetings (Cont.)	
4:00PM-5:30PM	Education	Santa Fe
4:00PM-5:00PM	ACPA Membership	Boston
4:00PM-6:00PM	CPF Research Grants	Austin
4:00PM-5:00PM	CPF Task Force on Adult Care	Columbus
4:30PM-6:00PM	ACPA Data Standards	Marriott 8
4:30PM-5:30PM	Journal Advisory	Marriott 7
5:30PM-6:30PM	ACPA Organizational Alliances	Marriott 7
5:30PM-6:30PM	Task Force on Models of TC	Columbus
5:00PM-6:00PM	ACPA Honors & Awards	Boston
5:30PM-6:30PM	**ACPA New Member Orientation**	**Santa Fe**
6:30PM-8:30PM	**Welcoming Reception**	**Marriott 5**
	Cash Bar/Hors d'oeuvres	

Summary of Events

WEDNESDAY, MARCH 26 TIME	FUNCTION	ROOM
6:30AM-6:30PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
7:00AM-8:00AM	Eye Openers – Group I	
	Course 1 (Commission on Approval of Teams)	Marriott 1
	Course 2 (Journal Manuscript)	Marriott 2
	Course 3 (Americleft Project)	Marriott 3
	Course 4 (VPD Management)	Marriott 4
7:30AM-8:20AM	Past Presidents' Breakfast	Denver
	Open to past and present ACPA/CPF Presidents	
7:00AM-5:00PM	Exhibits	Marriott Foyer
7:00AM-1:00PM	Poster Session A	Denver Foyer
8:30AM-9:00AM	Opening Ceremonies – *Celebrate the Wonder*	Marriott 6
9:00AM-10:00AM	Keynote Session: RJ Palacio	Marriott 6
10:00AM-10:30AM	Exhibits, Coffee Break	Marriott Foyer
	Poster Session A	Denver Foyer
10:30AM-12:30PM	General Session I	Marriott 6
12:30PM-2:00PM	Lunch Break (On Your Own)	
	2015 Program Committee Luncheon/Meeting	Marriott 2
	Ethics Roundtable Discussion/Optional Lunch	Marriott 3-4
	Commision on Approval of Teams Luncheon/Meeting	Columbus
1:30PM-6:30PM	Poster Session B	Denver Foyer
2:00PM-3:30PM	General Session II: Measuring Outcomes	Marriott 6
3:30PM-4:00PM	Exhibits, Coffee Break	Marriott Foyer
	Poster Session B	Denver Foyer
4:00PM-6:00PM	Discipline Forums	
	• Genetics/Ediatrics	Columbus
	• Mental Health	Denver
	• Nursing/Coordination	Marriott 5
	• Oral-Maxillofacial Surgery	Lincoln
	• Orthodontics/Prosthodontics	Marriott 3
	• Otolaryngology	Marriott 4
	• Pediatric Dentistry	Austin
	• Plastic Surgery	Marriott 2
	• Research	Boston
	• Speech-Language Pathology/Audiology	Marriott 1
6:00PM-7:00PM	Voyage of Discovery Through Leadership	Santa Fe
7:30PM-10PM	***CPF'S "Good Sports Event"***	***NCAA HALL OF CHAMPIONS***

THURSDAY, MARCH 27 TIME	FUNCTION	ROOM
6:30AM-6:00PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
7:00AM-8:00AM	Eye Openers – Group II	
	Course 5 (Speech Outcome Data)	Utah
	Course 6 (Speech Therapy: Strategies For VPD Correction)	Santa Fe
	Course 7 (Prenatal Cleft Counseling For Beginners)	Columbus
	Course 8 (Play-Based Therapy For Reducing Compensatory Articulation)	Lincoln
	Course 9 (Syndromic Vs NonSyndromic Clefting: Role of Genetics)	Denver
	Course 10 (Essential Elements of Multi-Site Nursing Research)	Austin/Boston
7:00AM-5:00PM	Exhibits	Marriott Foyer
7:00AM-6:00PM	Poster Session C	Denver Foyer
8:00AM-10:00AM	Junior Investigator Session	Marriott 6
10:00AM-10:30AM	Junior Investigator Award Panel Meeting	Denver
10:00AM-10:30AM	Exhibits, Coffee Break	Marriott Foyer

Summary of Events

THURSDAY, MARCH 27 — (CONTINUED)		
	Poster Session C	Denver Foyer
10:30AM-11:45AM	General Session III: Quality of Life Panel	Marriott 6
12:00PM-2:00PM	**ACPA/CPF Annual Awards Luncheon**	**Marriott 5**
2:30PM-4:00PM	Short Courses – Group I	
	Course A (Intro To Feeding & Swallowing Concerns)	Santa Fe
	Course B (Establishing Mental Health Services On CF Team)	Marriott 7
	Course C (Unilateral Cleft Lip Repair)	Denver
	Course D (Orthopedic and Orthodontic Treatment)	Utah
	Course E (Cleft Orthognathic Surgery)	Marriott 8
	Course F (Medical Management & Surveillance Protocols)	Austin/Boston
	Course G (Psycho-Social: Improving Outcomes)	Marriott 9
	Course H (Surgical Management of VPD in 22Q for Surgeon & SLP)	Lincoln
	Course I (Linking Bridge Btw Virtual & Actual Orthognathic Surgery	Columbus
	Course J (Plastic Surgery for the Rest of the Team)	Marriott 10
4:00PM-4:30PM	Exhibits, Coffee Break	Marriott Foyer
	Poster Session C	Denver Foyer
4:30PM-6:00PM	Short Courses – Group II	
	Course K (Furlow Palatoplasty: Surgical Technique & Outcomes)	Austin/Boston
	Course L (Speech Evaluation, Therapy & Collaborations)	Denver
	Course M (Dental & Ortho Preparation For Secondary ABG Surgery)	Marriott 7
	Course N (Care Of Child With Cleft: Prenatal Diagnosis to First Year)	Santa Fe
	Course O (Advanced Skills for Mental Health Providers on CF Teams)	Marriott 10
	Course P (Nasoalveolar Molding and Columella Elongation)	Marriott 8
	Course Q (Technique of Palate Repair)	Marriott 9
	Course R (Pierre Robin: Feeding Management Across Interventions)	Utah
	Course S (Managing Patients with Copy Number Variants/22Q)	Columbus
	Course T (A Keen Eye Towards Effective Team Coordination)	Lincoln
7:30PM-10:00PM	***71st Annual Gala – A Night Of Wonder***	***Indiana Roof Ballroom***

FRIDAY, MARCH 28 TIME	FUNCTION	ROOM
7:00AM-5:30PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
7:00AM-8:00AM	ASCFS Breakfast	Marriott 1-2
8:00AM-12:00PM	Poster Session D	Denver Foyer
7:00AM-5:00PM	Exhibits	Marriott Foyer
8:00AM-9:00AM	Concurrent Session A: ASCFS Linton Whitaker Lecture	Marriott 6
	Concurrent Session B: Alveolar Bone Graft Panel	Marriott 5
	Concurrent Session C: Barriers To Cleft Care Panel	Marriott 7-8
	Concurrent Session D: Improving MedicaL Adherence	Marriott 9-10
9:00AM-10:00AM	**ACPA Annual Business Meeting (Members Only)**	**Marriott 6**
10:00AM-10:30AM	Exhibits, Coffee Break	Marriott Foyer
	Poster Session D	Denver Foyer
10:30AM-12:00PM	Concurrent Specialty Sessions (Group 1)	
	Concurrent 1 (ASCFS Part I)	Marriott 6
	Concurrent 2 (Cleft Lip And Palate Surgery)	Marriott 5
	Concurrent 3 (Perspectives)	Marriott 9-10
	Concurrent 4 (Speech)	Marriott 3-4
	Concurrent 5 (Pierre Robin Sequence)	Marriott 7-8
12:00PM-1:30PM	Lunch (On Your Own)	
	ASCFS Luncheon/Business Meeting	Marriott 1-2

Summary of Events

FRIDAY, MARCH 28 — (CONTINUED)		
12:00PM-3:00PM	Second ACPA Council Meeting/Luncheon	Denver
1:00PM- 5:30PM	Poster Session E	Denver Foyer
1:30PM-3:00PM	Concurrent Specialty Sessions (Group 2)	
	Concurrent 6 (ASCFS Part II)	Marriott 6
	Concurrent 7 (Alveolar Bone Grafts)	Marriott 5
	Concurrent 8 (Craniofacial Biology)	Marriott 9-10
	Concurrent 9 (Psychosocial)	Marriott 3-4
	Concurrent 10 (Syndromes)	Marriott 7-8
3:00PM-3:30PM	Exhibits, Coffee Break	Marriott Foyer
	Poster Session E	Denver Foyer
3:30PM-5:00PM	Concurrent Specialty Sessions (Group 3)	
	Concurrent 11 (Craniosynostosis)	Marriott 6
	Concurrent 12 (Speech Surgery/VPD)	Marriott 5
	Concurrent 13 (Deformational Plagiocephaly)	Marriott 9-10
	Concurrent 14 (Nursing)	Marriott 3-4
	Concurrent 15 (NAM/Orthodontics)	Marriott 7-8

SATURDAY, MARCH 29 TIME	FUNCTION	ROOM
7:00AM-5:30PM	Registration	Marriott Foyer
	Speaker Ready Room	Phoenix
8:00AM-10:00AM	Concurrent Session E: Etiology, Outcomes, Quality of Care II	Marriott 6
	Concurrent Session F: ASCFS Synostosis Treatment Panel	Marriott 5
10:15AM-10:45AM	Coffee Break	Marriott Foyer
10:30AM-12:00PM	Closing General Session: Back Of The Book	Marriott 6
8:00AM-5:00PM	**Post-Conference Symposium: It Takes A Team!- Caring For The Individual With Cleft Lip And Palate – For Orthodontist And Speech-Language Pathologists**	**Marriott 7-8**
12:00PM-1:00PM	It Take A Team! Luncheon	Marriott 9-10
3:30PM-4:00PM	Break (For Both Speech and Orthodontics Sessions)	Marriott Foyer
1:00PM-5:00PM	It Takes A Team – Orthodontics	Marriott 8
	It Takes A Team- Speech	Marriott 7

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