

Friday, April 30th

1:00 – 1:10 Opening Remarks:
Sukgi Choi, MD, ASPO President
Paolo Campisi, MD, ASPO Program Chair

Session #1: **Moderator: Norman Friedman, MD**

1:10 – 1:18
A RANDOMIZED, PLACEBO CONTROLLED, DOUBLE-BLIND TRIAL USING CLONIDINE AND LOCAL ANESTHETICS TO REDUCE POST-TONSILLECTOMY PAIN
Jonathan R Moss, MD, MPH

1:18 – 1:26
THE USE OF LARYNGEAL MASK AIRWAY IN PEDIATRIC ADENOTONSILLECTOMY: A PROSPECTIVE, RANDOMIZED TRIAL
Cristina Baldassari, MD

1:26 – 1:34
DOES PERI-OPERATIVE DEXAMETHASONE INCREASE POST-OPERATIVE ADENOTONSILLECTOMY HEMORRHAGE?
Jonathan Walsh, MD

1:34 – 1:43 Discussion

Session #2: **Moderator: Carla Giannoni, MD**

1:43 – 1:51
INSURANCE SPECIFIC COMPARISON OF CHILDREN WHO ARE REFERRED FOR TYMPANOSTOMY TUBE PLACEMENT
Sundip H Patel, MD

1:51 – 1:59
PILOT TESTING OF A PARENT-DIRECTED INTERVENTION (PROJECT ASPIRE) FOR UNDERSERVED CHILDREN WHO ARE DEAF OR HARD-OF-HEARING
Sophie Shay

1:59 – 2:07
DISPARITIES IN SOCIODEMOGRAPHICS AND HEALTHCARE UTILIZATION FOR HEARING-IMPAIRED CHILDREN IN THE UNITED STATES
Emily F Boss, MD

2:07 – 2:15 Discussion

2:15 – 2:45 **Karl Storz Memorial Lecture:**
WHY NONE OF THE CURRENT HEALTH CARE REFORM PROPOSALS WILL SOLVE AMERICA'S HEALTH CARE PROBLEMS
Marc Roberts, PhD

2:45 – 3:15 Break with Exhibitors

3:15 – 4:05 **Panel:**
US HEALTH ECONOMICS AND THE PROSPECTS FOR MEANINGFUL HEALTH SYSTEM REFORM
Moderator: Ellis Arjmand, MD, PhD
Participants: Ken Kazahaya, MD, MBA; Dana Thompson, MD; Mark Del Monte, JD

Session #3: **Moderator: Dan Kirse, MD**

4:05 – 4:13

BIOFILM FORMATION ON SILICONE TYMPANOSTOMY TUBES WITH AND WITHOUT POLYVINYLPIRROLIDONE COATING

Carolyn Ojano-Dirain, PhD

4:13 – 4:21

A PROSPECTIVE STUDY OF THE EFFECT OF GASTROESOPHAGEAL REFLUX TREATMENT ON CHILDREN WITH OTITIS MEDIA

Edward McCoul, MD, MPH

4:21 – 4:29

PREVENTION OF RECURRENT ACUTE OTITIS MEDIA WITH NASAL IRRIGATIONS USING SALINE: A RANDOMIZED SINGLE-BLINDED PILOT TRIAL

Annie Lapointe, MD

4:29 – 4:38 Discussion

Session #4: **Moderator: Patrick Froehlich, MD**

4:38 – 4:46

AUDIOLOGICAL OUTCOMES OF SELECTIVE POLICY VENTILATION TUBE INSERTION IN CHILDREN WITH CLEFT PALATE – A 5 YEAR FOLLOW-UP STUDY

Marlene Soma, MBBS

4:46 – 4:54

OUTCOMES OF SPHINCTER PHARYNGOPLASTY AND SURGICAL MANAGEMENT OF VELOPHARYNGEAL INSUFFICIENCY: A 10-YEAR EXPERIENCE

Michael P Carlisle, MD

4:54 – 5:00 Discussion

5:00 Adjourn

Saturday Morning, May 1st

7:00 - 8:00

Breakfast Breakout Session 1:

BOTULINUM TOXIN USE IN PEDIATRIC OTOLARYNGOLOGY

Moderator: Sanjay Parikh, MD

Participants: Hamdy El-Hakim, MD; Christopher Hartnick, MD; Paolo Campisi, MD

Breakfast Breakout Session 2:

MANAGEMENT OF THE ATELECTATIC TYMPANIC MEMBRANE

Moderator: Diego Preciado, MD, PhD

Participants: Daniel Choo, MD; Adrian James, DM; Kenneth Grundfast, MD

Session #5: **Moderator: Sanjay Parikh, MD**

8:00 – 8:08

CT AND MR IMAGING CHARACTERISTICS OF ACUTE FULMINANT INVASIVE FUNGAL SINUSITIS IN CHILDREN

Eli R Groppo, MD

8:08 – 8:16

RESPIRATORY MUCIN EXPRESSION AND LOCALIZATION OF CYSTIC FIBROSIS WITH CHRONIC RHINOSINUSITIS PATIENTS

Melissa Amorn, MD

8:16 – 8:24

INFERIOR TURBINATE REDUCTION USING COBLATION IN A PEDIATRIC POPULATION: A PROSPECTIVE CLINICAL EVALUATION

Nathan C Page, MD

8:24 – 8:33 Discussion

Session #6: **Moderator: Scott McMurray, MD**

8:33 – 8:41

PEDIATRIC TRACHEAL RECONSTRUCTION USING CADAVERIC HOMOGRAFT

Evan J Propst, MD

8:41 – 8:49

ROLE OF PROSTAGLANDIN E2 AND TRANSFORMING GROWTH FACTOR BETA IN THE DEVELOPMENT OF SUBGLOTTIC STENOSIS IN AN ANIMAL MODEL

Adam Goodale, BS

8:49 – 8:57

TGF-BETA 2 AND 3 NULL MICE: ANALYSIS OF MORPHOLOGY AND THE BIOLOGICAL BEHAVIOR OF CHONDROCYTES IN THE CRICOID CARTILAGE

Efrain A Martinez-Alvernia, MD

8:57 – 9:05

AUTOMATED DYNAMIC CUFF PRESSURE MODULATION: A NOVEL DEVICE REDUCES ENDOTRACHEAL TUBE INJURY

Neil K Chadha, MD

9:05 – 9:15 Discussion

9:15 – 9:45 **Presidential Keynote Lecture:**

THE ROLE OF BOARD CERTIFICATION IN THE QUALITY IMPROVEMENT MOVEMENT

Robert Miller, MD

9:45 – 10:15 Break with Exhibitors

10:15 – 11:05 **Panel:**

SUB-CERTIFICATION IN PEDIATRIC OTOLARYNGOLOGY: DOING IT RIGHT

Moderator: Richard Rosenfeld, MD, MPH

Participants: Robert Miller, MD; Ron Kuppersmith, MD; John House, MD; George Zalzal, MD

Session #7: **Moderator: Marci Lesperance, MD**

11:05 – 11:13

DIFFERENTIAL COCHLEAR GENE EXPRESSION IN A RAT MODEL OF ACUTE PNEUMOCOCCAL OTITIS MEDIA

Michael S Cohen, MD

11:13 – 11:21

INNATE IMMUNITY GENE SINGLE NUCLEOTIDE POLYMORPHISMS AND OTITIS MEDIA

Sarah R Carroll, MD

11:21 – 11:29

MONOCYTE CHEMOTACTIC PROTEIN-1 DEFICIENCY LOWERS MIDDLE EAR INFLAMMATION
SUSCEPTIBILITY IN EUSTACHIAN TUBE OBSTRUCTION MODEL

Jennifer D McLevy, MD

11:29 – 11:38 Discussion

Session #8: **Moderator: Farrel Buchinsky, MD**

11:38 – 11:46

EFFECT OF ADENOIDECTOMY OF PEDIATRIC VOICE QUALITY: APPLICATION OF THE PEDIATRIC
VOICE-RELATED QUALITY OF LIFE SURVEY

Avinash V Mantravadi, MD

11:46 – 11:54

VOCAL FOLD IMMOBILITY FOLLOWING CARDIOTHORACIC SURGERY IN CHILDREN

Luthiana Frick Carpes, MD

11:54 – 12:00 Discussion

12:00 – 1:00 Lunch with Exhibitors

Saturday Afternoon, May 1st

1:00 – 2:00 Business Meeting (Members Only)

2:00 – 2:45 **Bluestone Lecture:**

HPV VACCINE: DISCOVERY AND PROSPECTS FOR DISEASE PREVENTION

Douglas Lowy, MD

2:45 – 3:15 Break with Exhibitors

3:15 – 4:05 **Robin Cotton Panel:**

PROPRANOLOL AND AIRWAY HEMANGIOMAS: WHEN AND WHEN NOT TO TREAT, WHY, FOR
HOW LONG?

Moderator: Christopher Hartnick, MD

Participants: Scott Manning, MD; Gresham Richter, MD; Noel Garabedian, MD

Session #9: **Moderator: Fred Kozak, MD**

4:05 – 4:13

PEDIATRIC HIGH FREQUENCY SENSORINEURAL HEARING LOSS

Kaalan Johnson, MD

4:13 – 4:21

GENOME-WIDE ASSOCIATION STUDY IDENTIFIES RARE DE NOVO COPY NUMBER VARIANT
(CNV) IN NON-SYNDROMIC MICROTIA

Maria A Artunduaga, MD

4:21 – 4:29

AUTOSOMAL DOMINANT PROGRESSIVE SENSORINEURAL HEARING LOSS DUE TO A NOVEL
MUTATION IN KCNQ4

Marci M Lesperance, MD

4:29 – 4:38 Discussion

Session #10: **Moderator: Paolo Campisi, MD**

4:38 – 4:46

PROPRANOLOL AS FIRST LINE TREATMENT OF HEAD AND NECK HEMANGIOMAS

Carine Fuchsmann, MD

4:46 – 4:54

HISTOLOGIC EVIDENCE OF LYMPHATIC MALFORMATION PERSISTENCE

Sharon L Cushing, MD

4:54 - 5:00 Discussion

5:00 Adjourn

7:00 ASPO Banquet

Sunday, May 2nd

7:00 Past President's Breakfast

8:00 Business Meeting (Members Only)

Session #11: **Moderator: Lesley Cochrane, MD**

8:35 – 8:43

THE PATTERNS OF OBSTRUCTION AND COLLAPSE IN CHILDREN WITH DOWN SYNDROME ON SLEEP NASOPHARYNGOSCOPY: A CASE CONTROLLED STUDY

Sumantra M Ghosh, MD

8:43 – 8:51

TEMPOROMANDIBULAR JOINT (TMJ) FUNCTION FOLLOWING MANDIBULAR FRACTURE IN CHILDREN: A 10-YEAR REVIEW

Shelby C Leuin, MD

8:51 – 8:59

A PILOT STUDY OF TONSILLECTOMY OBJECTIVE STRUCTURED ASSESSMENTS OF TECHNICAL SKILLS: CAN WE PREDICT TECHNICAL COMPETENCY?

Sung-Won Kim, MD

8:59 – 9:09 Discussion

Session #12: **Moderator: Daniela Carvalho, MD**

9:09 – 9:17

CARTILAGE SHIELD TYMPANOPLASTY IN CHILDREN: REVIEW OF 268 CONSECUTIVE CASES

Jerome Nevoux, MD

9:17 – 9:25

ROLE OF THE MASTOID IN MIDDLE EAR PRESSURE REGULATION

Cuneyt M Alper, MD

9:25 – 9:33

CONSERVATIVE MANAGEMENT FOR ACUTE MASTOIDITIS IN CHILDREN

David Bakhos, MD

9:33 – 9:45 Discussion

9:45 – 10:15 Break

Session #13: **Moderator: Ravindhra Elluru, MD, PhD**

10:15 – 10:23

SCREENING AND TREATMENT OF OXACILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN CHILDREN UNDERGOING OPEN AIRWAY SURGERY

Melissa McCarty Statham, MD

10:23 – 10:31

SUBMUCOSAL NERVE HYPERTROPHY IN LARYNGOMALACIA: HISTOPATHOLOGIC EVIDENCE

Patrick D Munson, MD

10:31 – 10:39

A NOVEL ENDOSCOPICALLY PLACED STENT TO RELIEVE GLOTTIC OBSTRUCTION CAUSED BY BILATERAL VOCAL FOLD PARALYSIS

Eitan Prisman, MD

10:39 – 10:48 Discussion

Session #14: **Moderator: Keiko Hirose, MD**

10:48 – 10:56

ROLE OF CONGENITAL CYTOMEGALOVIRUS (CMV) INFECTION IN PEDIATRIC HEARING LOSS

Stephanie Misono, MD, MPH

10:56 – 11:04

GENTAMICIN ENTRY INTO SENSORY HAIR CELLS IS DEPENDENT ON MECHANOTRANSDUCTION CHANNELS AND TIP-LINK INTEGRITY

Garani Nadaraja, MD

11:04 – 11:12

HEARING LOSS CAUSED BY CONGENITAL HUMAN CYTOMEGALOVIRUS INFECTION

Prashant S Malhotra, MD

11:12 – 11:21 Discussion

Session #15: **Moderator: Diego Preciado, MD, PhD**

11:21 – 11:29

POLYSOMNOGRAPHY VARIABLES THAT PREDICT ADVERSE RESPIRATORY EVENTS AFTER ADENOTONSILLECTOMY

Eric M Jaryszak, MD, PhD

11:29 – 11:37

COMPARISON OF POLYSOMNOGRAPHY OUTCOMES FOR MICRODEBRIDER-ASSISTED PARTIAL INTRACAPSULAR TONSILLECTOMY VS TOTAL TONSILLECTOMY

Jason Mangiardi, MD

11:37 – 11:45

THE EFFECT OF INTRANASAL FLUTICASONE FUROATE (FF) ON ADENOID INFLAMMATION IN CHILDREN WITH OBSTRUCTIVE SLEEP APNEA SYNDROME (OSAS)

Rania Esteitie, MD

11:45 – 11:55 Discussion

11:55 – 12:00 Closing Remarks/Adjourn

A RANDOMIZED, PLACEBO CONTROLLED, DOUBLE-BLIND TRIAL USING CLONIDINE AND LOCAL ANESTHETICS TO REDUCE POST-TONSILLECTOMY PAIN

Jonathan R Moss, MD, MPH

Department of Otolaryngology, Vanderbilt University

PURPOSE: The objective of the current study was to conduct a double-blind, placebo controlled, randomized clinical trial comparing the efficacy of local anesthetics with and without clonidine to reduce post-tonsillectomy morbidity when injected prior to performing a tonsillectomy.

METHODS: One-hundred-twenty children were randomized to one of three groups for pre-tonsillectomy injection of: 1) bupivacaine + lidocaine + clonidine, 2) bupivacaine + lidocaine, or 3) saline. The primary outcome variable was the total number of analgesic doses taken on post-operative days 1,3,5, and 7. Secondary outcome variables included total time and intravenous analgesic doses in the recovery room, pain scores and maximum tolerated diet.

RESULTS: The mean number of analgesic doses on post-operative days 1,3,5 and 7 were not significantly different ($p < 0.05$) between the local anesthetic plus clonidine group (mean 12.8, 95% CI [10.9-14.7]) or the local anesthetic only group (mean 12.9, 95% CI [11.2-14.7]) when compared to placebo (mean 11.9, 95% CI [10.3-13.5]). Furthermore, there was no statistical difference among any secondary outcome variables.

CONCLUSION: We found no statistical difference in the total number of pain medication doses on post-operative days 1,3,5 and 7 when comparing the pre-tonsillectomy injection of local anesthetics with or without clonidine to placebo.

THE USE OF LARYNGEAL MASK AIRWAY IN PEDIATRIC ADENOTONSILLECTOMY: A PROSPECTIVE, RANDOMIZED TRIAL

Cristina Baldassari, MD

Cristina Baldassari, MD (1)
Angela Peng, MD (2)
Jay Shapiro, MD (3)
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OBJECTIVES: To compare the use of flexible laryngeal mask airway (LMA) and endotracheal tube (ETT) in pediatric adenotonsillectomy.

DESIGN: Prospective, randomized trial. **SETTING:** Tertiary-care hospital

PATIENTS: 131 children (ages 2-12 years). Exclusion criteria were body mass index (BMI) greater than 35 and craniofacial abnormalities. Obstructive sleep apnea was the most common indication for surgery.

INTERVENTION: Children undergoing adenotonsillectomy were randomized to LMA or ETT. A standardized anesthetic protocol was utilized.

MAIN OUTCOME MEASURES: Primary outcome measure was laryngospasm. Secondary measures included operative and recovery times.

RESULTS: Sixty children were randomized to the LMA group, while 71 children underwent ETT intubation. There was no significant difference between the two groups in regards to age ($p=0.14$), gender ($p=0.14$), ethnicity ($p=0.75$), BMI ($p=0.99$), or ASA grade ($p=0.46$). The incidence of laryngospasm between LMA (14.3%) and ETT (10.7%) groups was not significantly different ($p=0.77$). In 10 patients, the LMA was changed to an ETT intra-operatively due to kinking and poor visualization. Surgical times between the LMA and ETT groups were 33.35 ± 13.39 and 37.76 ± 18.26 minutes respectively ($p=0.15$). Time between surgery end and extubation was significantly shorter in the LMA group ($p=0.008$) by 4.06 minutes. There were no significant differences ($p=0.49$) in post-anesthesia care unit recovery times.

CONCLUSION: When comparing the LMA and ETT, there were no differences in rates of laryngospasm. However, time between end of surgery and extubation was significantly less in LMA patients. LMA is more efficient, but poor visualization and kinking may prevent the routine use of this device in pediatric adenotonsillectomy.

DOES PERIOPERATIVE DEXAMETHASONE INCREASE POST-OPERATIVE ADENOTONSILLECTOMY HEMORRHAGE?

Jonathan Walsh, MD

Jonathan Walsh, MD (1)
James Hadley, MD (1)
Peter Bensen, MD (2)
Florin Seicaru, MD (2)

(1) Department of Otolaryngology, University of Rochester

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OBJECTIVE: To assess whether perioperative dexamethasone increases the risk of post-operative hemorrhage in children (age 1-18) undergoing adenotonsillecomy.

DESIGN: Retrospective review

SETTING: Academic medical center

PATIENTS: A total of 315 pediatric patients who underwent adenotonsillectomy during a one year period were evaluated.

MAIN OUTCOME MEASURES: All post-operative hemorrhage as recorded in the chart requiring Emergency Dept or Otolaryngology service evaluation. Additionally, dexamethasone dose, type of bleeding intervention, age, post-operative day of bleeding, and surgeon were recorded for subgroup analysis.

RESULTS: Complete records were available for 315 out of 354(89%)adenotonsillectomies performed at our institution from January 1 to December 31, 2008. Of the patients (age 1-18), 301 recieved perioperative dexamethasone. The dexamethasone group was subgrouped into low dexamethasone dose (< 0.1 mg/kg) (N= 29), medium dose (0.1 to 0.25 mg/kg)(N= 161), and high dose (> 0.25 mg/kg)(N= 104). A total of 7 post-operative bleeds were identified (2.2%). The perioperative dexamethasone group had 7 bleeds with a rate of 2.3% (95% confidence interval[CI] 1-4%). Four of the 7 bleeds(57%) occured on post-operative day zero. No bleeds were identified in the group without dexamethasone. No significant difference was shown between the dexamethasone group and the no steroid group(p= 0.56). Subgroup analysis failed to reveal any dexamethasone dose related increase in post-operative bleed rates.

CONCLUSIONS: Perioperative dexamethasone in pediatric adenotonsillectomy does not significantly increase the risk of post-operative hemorrhage. Additionally, there is no dexamethasone dose related association with post-operative hemorrhage. Cautious and judicious use of peri-operative dexamethasone is recommended.

INSURANCE SPECIFIC COMPARISON OF CHILDREN WHO ARE REFERRED FOR TYMPANOSTOMY TUBE PLACEMENT

Sundip H Patel, MD

Sundip H Patel, MD (1)
James W Schroeder Jr, MD (2, 3)

- (1) Department of Otolaryngology, University of Illinois at Chicago
- (2) Department of Otolaryngology, Northwestern University Feinberg School of Medicine
- (3) Department of Pediatric Otolaryngology, Children's Memorial Hospital, Chicago, IL

OBJECTIVE: To assess the differences in disease severity at time of referral for tympanostomy tube placement in children with private health insurance (PIN) and a state-based public health insurance program (PA).

DESIGN: Prospective study

SETTING: Urban pediatric hospital

METHODS: Referrals made to a pediatric otolaryngology group for recurrent acute otitis media (RAOM) or otitis media with effusion were reviewed. Consecutive patients were enrolled. Patient characteristics and disease data were collected at the time of the referral.

RESULTS: N= 183; 87 with PIN, 96 with PA. 67% with PIN were breast fed vs 38% in the PA group (p= 0.0001). 44% with PIN were in day care vs 52% in the PA group (p= 0.62). 2% of the parents with PIN smoked vs 10% in the PA group (p= 0.24). The median age in the PIN group was 19 months vs 28 months in the PA group (p= 0.0007). Children with PIN had 4 AOM and were treated with 5 courses of antibiotics in the 6 months prior to referral compared to 3 AOM and 3 courses of antibiotic in the PA group (p= 0.0009 and 0.0001).

CONCLUSION: Children with PIN are younger, have more episodes of RAOM, receive more antibiotic courses and more primary care visits in the 6 months prior to referral than their PA counterparts. Time with RAOM at the time of referral was longer in the PA group. The data presented may reveal health care access concerns for children with PA compared to their PIN counterparts.

PILOT TESTING OF A PARENT-DIRECTED INTERVENTION (PROJECT ASPIRE) FOR UNDERSERVED CHILDREN WHO ARE DEAF OR HARD-OF-HEARING

Sophie Shay

Sophie Shay (1)
Lyra Replinger, MS (2)
Marc W Hernandez, PhD (3)
Mary Ellen Nevins, EdD (3)
Dana Suskind, MD (2)

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(2) Department of Otolaryngology-Head and Neck Surgery, University of Chicago
(3) National Opinion Research Center, University of Chicago
(4) Oberkotter Foundation

OBJECTIVE: There is a significant disparity in outcomes of implanted children of low SES background compared with more affluent counterparts. The major factors thwarting success appear to be inadequate rehabilitation resources and a lack of parental knowledge and skills essential to an implanted child's listening and language development. To improve the outcome in implanted children of lower-SES background, we are developing Project ASPIRE, a professionally-supervised and parent-directed learning-program. As a critical step in intervention development, this pilot study aims to demonstrate the efficacy of Project ASPIRE in improving parental language knowledge and skills within our target population.

DESIGN: 4-week prospective, repeated measures study

PATIENTS: Eight families of low SES background with children with SNHL

MAIN OUTCOME MEASURES: 1) Parental knowledge change measured by questionnaires. 2) Parental behavior change (adult word count, conversational turns, television exposure) measured by LENA (Language Environment Analysis) recordings.

RESULTS: 1) Paired samples t-tests revealed that parental language knowledge questionnaires significantly improved from baseline at both 1-week post-intervention ($p= 0.003$, $n= 8$) and 4-week post-intervention ($p= 0.022$, $n= 7$). 2) Parental behavior change showed near significant improvement at 1-week post-intervention (adult word count $p= 0.073$, $n= 8$; conversational turns $p= 0.100$, $n= 8$), while changes in these measures returned to just above baseline at 2 and 4-weeks post-intervention.

CONCLUSIONS: As the first step in the iterative process, our findings suggest that there is promise for health behavior change intervention to help parents best promote their children's listening and spoken language development. Sustainability of improved language behaviors may require addition of LENA biofeedback.

DISPARITIES IN SOCIODEMOGRAPHICS AND HEALTHCARE UTILIZATION FOR HEARING-IMPAIRED CHILDREN IN THE UNITED STATES

Emily F Boss, MD

Kimberly L Levinson, MD, MPH (1)

Darrell J Gaskin, PhD (2)

John K Niparko, MD (3)

Emily K Boss, MD (3)

(1) Department of Obstetrics and Gynecology, Johns Hopkins University School of Medicine

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University of Maryland College Park

(3) Department of Otolaryngology-Head and Neck Surgery, Johns Hopkins University
School of Medicine

OBJECTIVES: This report aims to evaluate disparities in socioeconomic status and healthcare utilization in hearing-impaired children using a nationally-representative sample.

DESIGN: Cross-sectional analysis of stacked data from the 1997-2003 National Health Interview Survey, a voluntary U.S. household survey of the National Center for Health Statistics

PATIENTS/METHODS: Children with varied levels of hearing impairment were identified and grouped according to 3 levels of perceived hearing. Chi-squared and ANOVA models tested the association of individual sociodemographic variables with hearing status. Multivariate regression analyses examined the association of hearing impairment with family income, poverty status, and utilization of routine and specialty health services.

RESULTS: The stacked sample consisted of 76,012 children, of whom 2.6% had some hearing loss and 0.43% had marked hearing loss. Families of hearing-impaired children were more likely to report poorer health status, have Medicaid, live in single-mother households, and live below poverty level ($P < 0.01$). After adjusting for confounders, children with mild and marked hearing impairment were less likely to afford prescription medications [OR 1.89, 95% CI 1.44-2.48(mild); 2.72 95% CI 1.73-4.29(marked)], and less likely to have access to mental health services (3.26, 2.41-4.69; 2.62, 1.34-5.12), or dental services (1.65, 1.36-2.02; 1.62, 1.09-2.41). No difference was identified for access to routine/sick health services.

CONCLUSIONS: Compared to families of children without hearing loss, families of hearing-impaired children live closer to the poverty level and utilize some medical services with less frequency. Further identification of causal relationships between familial socioeconomic status and childhood hearing loss may help direct policy initiatives designed to mitigate healthcare disparities and improve access to services for hearing-impaired children.

BIOFILM FORMATION ON SILICONE TYMPANOSTOMY TUBES WITH AND WITHOUT POLYVINYLPIRROLIDONE COATING

Carolyn Ojano-Dirain, PhD

Patrick J Antonelli, MD (1)

Edith M Sampson, MS (1)

Carolyn Ojano-Dirain, PhD (1)

(1) Department of Otolaryngology, University of Florida

BACKGROUND AND OBJECTIVES: Tympanostomy tube (TT) biofilm formation may lead to refractory otorrhea and TT occlusion. TT surface modifications may reduce biofilm formation, post-TT otorrhea, and occlusion. The aim of this study was to determine if biofilm formation on silicone TTs is prevented by polyvinylpyrrolidone (PVP) coating.

METHODS: Silicone TTs with and without PVP coating were exposed to blood or saline. TTs were cultured with *Pseudomonas aeruginosa* or *Staphylococcus aureus*. After 4 days, antibiotics were added to kill planktonic bacteria. Biofilm formation was assessed by quantitative bacterial counts and scanning electron microscopy.

RESULTS: Human blood enhanced *S. aureus* biofilm formation on TTs with and without PVP ($p < 0.001$). *S. aureus* biofilm was similar on TTs with and without PVP coating. *P. aeruginosa* biofilm formation on TTs with PVP coating was significantly less than TTs without PVP after exposure to saline ($p = 0.0442$). Less biofilm was also found on PVP coated TTs after blood exposure, but this was not significant ($p = 0.1919$).

CONCLUSION: PVP coated TTs are resistant to *P. aeruginosa* biofilm formation relative to standard silicone TTs. The clinical significance of this finding warrants in vivo validation.

A PROSPECTIVE STUDY OF THE EFFECT OF GASTROESOPHAGEAL REFLUX TREATMENT ON CHILDREN WITH OTITIS MEDIA

Edward D McCoul, MD, MPH

Edward D McCoul, MD, MPH (1)

Nira A Goldstein, MD (1)

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(1) Department of Otolaryngology, State University of New York--Downstate Medical Center

OBJECTIVE: To demonstrate improvements in validated quality-of-life measures for otitis media (OM) and gastroesophageal reflux (GERD) and an objective score for pediatric reflux obtained by flexible fiberoptic laryngoscopy after treatment with anti-reflux precautions and therapy in children diagnosed with either recurrent acute otitis media (RAOM) or otitis media with effusion (OME) and GERD.

DESIGN: Prospective before-after intervention study

SETTING: Hospital-based pediatric otolaryngology practice in a metropolitan area

PARTICIPANTS: 42 patients, mean age 20.2 months (range 6 months to 6 years)

INTERVENTIONS: Validated quality-of-life assessments were made using the Otitis Media 6-Item Survey (OM6), and either the Revised Infant GERD Questionnaire (I-GERQ-R) or the GERD Symptom Questionnaire (GSQ) according to the child's age. Results of fiberoptic laryngoscopy were recorded using the Reflux Finding Score (RFS). Subjects received standard antireflux therapy for a 12-week period.

RESULTS: Follow-up data was available for 27 patients. OM6 scores were significantly improved following anti-reflux therapy compared to pre-treatment values (mean difference 1.62, 95% CI 1.20–2.04, $p < 0.001$, paired t test). Improvement was also seen for reflux survey scores on the I-GERQ-R (mean difference 7.71, 95% CI 3.86–11.56, $p = 0.001$) and GSQ (mean difference 32.40, 95% CI 14.70–50.10, $p = 0.003$), as well as objective improvement on the RFS (mean difference 6.00, 95% CI 3.85–8.16, $p < 0.001$). Four (9.5%) children had myringotomy tubes placed for continued OM.

CONCLUSIONS: Children with OME or RAOM and GERD have improved quality of life following treatment with antireflux therapy. Control of reflux may play a role in the management of OM.

PREVENTION OF RECURRENT ACUTE OTITIS MEDIA WITH NASAL IRRIGATIONS USING SALINE: A RANDOMIZED SINGLE-BLINDED PILOT TRIAL

Annie Lapointe, MD

Annie Lapointe, MD (1)
Marie-France Stephenson, MD (1)
Marie-Claude Quintal, MD (1)
Chantal M Giguère, MD (1)
Pierre H Arcand, MD (1)
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Thierry Ducruet, MSc (2)
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(3) Department of Pediatrics, University of Montreal

INTRODUCTION: Nasal cavity irrigations with a saline solution are often used to prevent recurrent acute otitis media (rAOM) in the pediatric population. However, no published scientific study corroborates or invalidates this practice.

GOALS: The main objective of this study was to determine the efficacy of nasal cavities lavages with an isotonic saline solution to prevent rAOM in a general pediatric population.

METHODS: The study was a pilot randomized controlled clinical trial. All patients with a diagnosis of rAOM adjudicated in our ENT clinic were considered eligible. The patients were randomized in 2 groups. The treatment group proceeded with regular saline water instillations while the control group did not. The primary outcome of the study was the incidence of rAOM observed during a 3 month period (2 AOM). Secondary outcome was the monthly AOM rate.

RESULTS: Twenty-nine patients were recruited. Twelve patients were randomized to the control group: 4 of them had no AOM, 8 had at least 1 AOM while 5 had 2 AOM. Seventeen patients were randomized to the treatment group: 11 had no AOM, 6 had 1 AOM while none had 2 AOM (Fisher, $p= 0.003$). The monthly AOM rate was calculated at 1.08 for the control group and 0.35 for the treatment group (T-test, $p= 0.02$).

CONCLUSION: Saline irrigations are simple, low-cost, accessible and have few if any side effects. Our results suggest that nasal cavity saline irrigations could effectively prevent rAOM. A larger scale randomized multicentric study is indicated to confirm external validity and to properly assess security issues.

AUDIOLOGICAL OUTCOMES OF SELECTIVE POLICY VENTILATION TUBE INSERTION IN CHILDREN WITH CLEFT PALATE - A 5 YEAR FOLLOW-UP STUDY

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INTRODUCTION: Middle ear effusion is common in the cleft palate population. This finding however is not always associated with a significant hearing loss. In 2001, our institution adopted a selective policy for the insertion of ventilation tubes in children with cleft palate. Children are assessed audiotically at the age of 3 months. Short term ventilation tubes are inserted at the time of cleft palate repair if there is a conductive hearing loss $> 55\text{dBnHL}$ (determined by ABR) in conjunction with type B high frequency tympanometry. The use of long term tubes has been avoided in this population. We have previously published short-term audiological results. We now present the 5-year follow up of our cleft palate cohort.

METHODS: Retrospective case note review

RESULTS: The audiological results of 40 cleft palate patients subjected to this selective policy were analysed. 35% underwent insertion of short-term ventilation tubes at the time of cleft palate repair. 24% required grommets at a later stage. Almost 90% of patients had normal air conduction thresholds in their better hearing ear by age 5. Approximately 75% of patients had persistently abnormal tympanometry.

CONCLUSION: Up to 90% of cleft palate children will have normal hearing by the age of 5 years. Early audiological assessment with ABR and tympanometry may help guide eligibility for ventilation tube insertion. The long-term use of ventilation tubes for hearing loss in these children may be inappropriate.

OUTCOMES OF SPHINCTER PHARYNGOPLASTY AND SURGICAL MANAGEMENT OF VELOPHARYNGEAL INSUFFICIENCY: A 10-YEAR EXPERIENCE

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PURPOSE: Recent reports have purported the efficacy of concomitant sphincter pharyngoplasty (SP) and Furlow palatoplasty for the management of velopharyngeal insufficiency (VPI). The outcomes and surgical management of 46 children who underwent SP for VPI by the senior author were reviewed to evaluate revision rate and the relationship of revision to prior or concomitant palatal lengthening.

METHODS: A ten-year retrospective assessment was undertaken. Variables included gender, diagnosis, cleft type, syndrome, age at palate repair and SP, and prior and/or concomitant palatal lengthening.

RESULTS: Of 46 patients, 6 (13%) required surgical revision. Regarding need for revision, no statistically significant differences were found concerning age, gender, cleft type, syndrome, or time between palate repair and SP. Indications for revision included persistent hypernasality (n= 2), inferior position (n= 2), flap dehiscence (n= 1), and obstructed sleep (n= 1). Postoperative improvement in velopharyngeal competence was documented in all revision cases. No patients required a second revision. Only 17% (n= 1) of patients requiring surgical revision had prior or concomitant Furlow palatoplasty, compared to 63% (n= 25) of patients who did not require revision pharyngoplasty ($P < 0.05$, Fisher's exact).

CONCLUSION: At our institution, sphincter pharyngoplasty is an effective procedure for the management of VPI, with a success rate of 87% when using need for surgical revision. This number improved to 100% after a single revision with elimination of VPI in all revision cases. Additionally, this study suggests that concomitant Furlow palatoplasty and sphincter pharyngoplasty may improve outcomes compared with SP alone. Further prospective studies are needed to elucidate this relationship.

CT AND MR IMAGING CHARACTERISTICS OF ACUTE FULMINANT INVASIVE FUNGAL SINUSITIS IN CHILDREN

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OBJECTIVES: To determine whether radiographic findings on computed tomography (CT) and magnetic resonance imaging (MRI) are sensitive predictors of acute fulminant invasive fungal sinusitis (AFIFS) in an immunocompromised pediatric population.

STUDY DESIGN: Retrospective case-control

METHODS: Cases were three immunocompromised children with confirmed AFIFS after surgical debridement/biopsy. Controls were four immunocompromised children histopathologically negative for AFIFS after surgery. CT and MRI scans were independently reviewed by two neuroradiologists blinded to surgical findings. Neuroradiologists evaluated for specific imaging features including extra-sinus involvement and focal loss of contrast enhancement (LoCE). Operative reports, histopathology, microbiology, and survival data were abstracted.

RESULTS: Demographic, comorbidity, and survival were similar between the two groups. The median age of the combined population was 7 years (range 4-17). The most common mode of immunocompromise was hematopoietic malignancy (85%). Of these patients, 57% had severe neutropenia (absolute neutrophil count < 250). There was moderate to almost perfect agreement ($\kappa = 0.50-1.00$) between the 2 radiologists for all imaging parameters. CT exhibited more variable sensitivity between reviewers than MRI (50-100% compared to 100% respectively). Both modalities exhibited high specificity with no false positives (100% specificity for both CT and MRI). LoCE exhibited 100% sensitivity and specificity for both reviewers.

CONCLUSION: MRI has a higher and less variable sensitivity than CT at diagnosing AFIFS. Both modalities exhibit excellent specificity. LoCE is a specific MRI imaging characteristic suggestive of AFIFS. MRI is potentially a more useful tool for screening immunocompromised pediatric patients with facial and sinus symptoms.

RESPIRATORY MUCIN EXPRESSION AND LOCALIZATION OF CYSTIC FIBROSIS WITH CHRONIC RHINOSINUSITIS PATIENTS

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OBJECTIVE: To analyze and compare the expression and localization of MUC5AC and MUC5B mucins in the sinus mucosa of patients with Cystic Fibrosis (CF) and Chronic Rhinosinusitis (CRS) to that of a control population.

METHODS: Immunohistochemistry (IHC) was performed on the sinus mucosa of 9 CF/CRS and 11 normal patients to detect expression and localization of MUC 5AC and MUC 5B mucins in these tissues. Morphometric analyses were used to quantify the number of goblet cells per high-powered field. An additional 8 CF/CRS and 6 control mucosal samples were studied using digital imaging to evaluate submucosal gland (SMG) area.

RESULTS: MUC5AC was only expressed in a subpopulation of goblet cells in both cohorts. MUC5B expression was localized to both a subpopulation of goblet cells and to SMG; however, SMG staining for MUC 5B was variable. Goblet cell hyperplasia was not observed in the CF/CRS group compared to the control. A statistically significantly increased area (4.4 fold) of SMG was detected in the sinus mucosa of CF/CRS patients compared to that of control patients (t-test, $p < 0.01$).

CONCLUSION: There was no significant difference in the expression of MUC5AC in CF/CRS and normal patients. However, significant SMG hyperplasia was observed in the sinus mucosa of CF/CRS patients, suggesting that MUC5B may contribute to the viscous quality of CF sinonasal secretions.

INFERIOR TURBINATE REDUCTION USING COBLATION IN A PEDIATRIC POPULATION: A PROSPECTIVE CLINICAL EVALUATION

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OBJECTIVE: The purpose of this study was to evaluate turbinate reduction surgery for treating nasal obstruction symptoms in a pediatric population who had failed maximum medical management.

METHODS: Study subjects included 11 patients (ages 9-16) with bilateral inferior turbinate hypertrophy and CT demonstrating no other structural abnormalities who had nasal obstruction symptoms unresponsive to at least 8 weeks of documented maximum medical management. Surgical reduction of the inferior turbinate was performed using the Reflex Ultra coblation plasma wand (ArthroCare Corp., Austin, TX). Sinonasal symptoms were evaluated using the SN-5 survey, and obstruction of the nasal passages was objectively assessed by a blinded reviewer who graded anterior rhinoscopy photos obtained during physical examination. Clinical outcomes were collected through 1 year postoperatively.

RESULTS: One patient was lost to follow-up. Overall SN-5 scores were significantly improved (baseline: 4.53 ± 1.1 ; 6wk: 2.3 ± 1.12 ; 6mo: 2.3 ± 1.10 ; 1yr: 2.5 ± 0.77 ; repeated measures analysis of variance, $p = 0.002$). SN-5 scores for individual SN-5 items were also significantly improved postoperatively through one year (Sinus Infection, $p = 0.046$; Nasal Obstruction, $p = 0.003$; Allergy Symptoms, $p = 0.005$; Activity Limitations, $p < 0.001$). At 1 year, 8/10 patients demonstrated evidence of decreased nasal obstruction (compared to baseline) as graded by blinded review of anterior rhinoscopy photos. Additionally, 7 patients reported taking no medications for nasal obstruction.

CONCLUSION: Inferior turbinate reduction using the coblation plasma wand appears to be an effective and safe surgical management option for treating pediatric patients with nasal obstruction symptoms due to inferior turbinate hypertrophy.

PEDIATRIC TRACHEAL RECONSTRUCTION USING CADAVERIC HOMOGRAFT

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PURPOSE: To examine the indications, risks and surgical outcomes following tracheal reconstruction using cadaveric homograft in children

METHODS: Retrospective chart review of children undergoing tracheal reconstruction using cadaveric homograft at a tertiary care pediatric hospital

RESULTS: Eleven children (5 male, 6 female; mean age 9.4 yrs + /- 5.3) underwent fifteen tracheal homograft reconstructions. Patients had an average of six procedures (range 1 to 16) prior to homograft reconstruction, including an average of 2.6 (range 0 to 6) laryngotracheoplasties. All patients had a severe grade 3/4 stenosis and all but one had a prior tracheotomy. A cervical approach alone was used in thirteen reconstructions and two required an additional sternal split with cardiac bypass. Homograft length averaged 3.2 cm (range 1.5 to 5) and patients were stented for an average of 7.1 months (range 2.8 to 11). Patients required an average of 7.7 procedures (range 2 to 19) afterward, including an average of 1.3 laryngotracheoplasties (range 0 to 3). Six patients have been decannulated, four remain tracheotomy dependent and one patient died.

CONCLUSION: Tracheal reconstruction using cadaveric homograft is an option in children who have undergone multiple airway surgeries and present with long-segment stenoses that can not be bridged using conventional methods. These patients must be followed closely postoperatively, subsequent procedures are often required, and decannulation rates are not guaranteed.

ROLE OF PROSTAGLANDIN E2 AND TRANSFORMING GROWTH FACTOR BETA IN THE DEVELOPMENT OF SUBGLOTTIC STENOSIS IN AN ANIMAL MODEL

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Acquired subglottic stenosis (SGS) is thought to result partly from an exaggerated or prolonged inflammatory response following mucosal injury, mediated in part by prostaglandin E2 (PGE2) and transforming growth factor β (TGF- β). In this study, pharmacological agents were used to modulate PGE2 and TGF- β levels to examine its role in SGS development.

METHODS: Laryngotracheal complex (LTC) were harvested from 24 C57BL/6 mice and subglottic mucosal injuries were elicited using electrocautery in 20 of these LTCs. The injured and uninjured LTCs were then transplanted into a subcutaneous pocket on the dorsum of 24 allogenic recipient mice. Recipient mice received daily intraperitoneal injections of either saline, Celebrex, or Cytotec for two weeks following transplantation. The transplanted LTCs were then harvested and analyzed histologically.

RESULTS: Animals administered Celebrex, a Cox-2 inhibitor, following subglottic injury showed no difference in lamina propria (LP) thickness secondary to scar deposition compared to uninjured animals (133.6 vs. 137.0 μ M, $p = 0.84$). A statistically significant increase in LP thickness was observed in injured animals without treatment (181.8 μ M, $p < 0.05$) and animals treated with Cytotec, a PGE2 agonist (200.2 μ M, $p < 0.02$). A significant decrease in luminal area following injury was observed only in animals treated with Cytotec ($p < 0.04$). Immunohistochemistry (IHC) demonstrated increased expression of TGF- β 1 in animals treated with Cytotec compared to Celebrex.

DISCUSSION: PGE2 appears to play a key role in hypertrophic scarring after subglottic mucosal injury. Modulation of PGE2 levels alters subglottic scar formation and TGF- β 1 expression.

TGF-BETA 2 AND 3 NULL MICE: ANALYSIS OF MORPHOLOGY AND THE BIOLOGICAL BEHAVIOR OF CHONDROCYTES IN THE CRICOID CARTILAGE

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OBJECTIVE: Transforming growth factor-beta (TGF-beta) 2 and 3 are thought to play an important role in the development and biological behavior of the cricoid cartilage. Previous studies in our laboratory demonstrate the influence of TGF-beta3 in luminal expansion, apoptosis and cell differentiation of the murine cricoid cartilage. We seek to determine if targeted gene deletion of TGF-beta2 or TGF-beta3 influences airway anatomy or chondrocyte biological behavior.

DESIGN: The cricoid cartilage from 15 (3 TGF-beta2^{-/-} mice, 3 TGF-beta2^{+ /+} mice, 5 TGF-beta3^{-/-} mice, 4 TGF-beta3^{+ /+}) 18.5 days embryonic age mice were analyzed to determine cell proliferation and apoptosis. In situ hybridization was done to determine the presence of collagen II. Morphology was determined from axial sections.

RESULTS: Histomorphology: Relative to wild type rings, TGF-beta2^{-/-} group demonstrated a small caliber cricoid with attenuated cartilage. TGF-beta3^{-/-} group demonstrated intermediate cartilage caliber with intermediate diameter rings. Chondrocyte biologic behavior: Both TGF-beta2^{-/-} and TGF-beta3^{-/-} mice demonstrate marked decreased in both chondrocyte proliferation and apoptosis markers relative to the wild-type litter mates. By in situ hybridization, TGF-beta2^{-/-} mice demonstrate no collagen II expression, whereas TGF-beta3^{-/-} mice demonstrate significant collagen II extracellular expression, equivalent to wild-type litter mates.

CONCLUSION: Because both TGF-beta2 and TGF-beta3 proteins are expressed in developing trachea, these are important growth factors for further investigation since their targeted gene deletion results in marked growth aberrations in the cricoid cartilage. Ultimately, these growth factors may have a therapeutic role in correction of the abnormally small trachea.

AUTOMATED DYNAMIC CUFF PRESSURE MODULATION: A NOVEL DEVICE REDUCES ENDOTRACHEAL TUBE INJURY

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DESIGN: Single-blind randomized controlled animal study using a previously validated live porcine model of accelerated intubation-related tracheal injury.

METHODS: Study approval was obtained by the animal care committee. Ten mature piglets (16-20 kg) were anesthetized and intubated using a cuffed endotracheal tube. The animals were randomized into two groups: 5 pigs had a novel device to modulate their cuff pressure between 25 cm H₂O during inspiration and 7 cm H₂O during expiration; 5 pigs had a constant cuff pressure of 25 cm H₂O. Both groups were ventilated under hypoxic conditions to accelerate intubation-related injury. Monitoring included oxygen saturation, heart rate, temperature, carbon dioxide, electrocardiogram, invasive arterial blood pressure, and blood gases. After 4 hours, the animals were sacrificed and the larynx and trachea harvested for blinded pathological assessment.

RESULTS: There were no differences in monitored parameters between the two groups. Overall, the cuff pressure-modulated pigs had significantly less damage than the constant cuff pressure pigs (mean grade 1.2 versus 2.1, $P < 0.001$). Subglottic damage and tracheal damage were significantly less severe in the modulated pressure group (mean grades 1.0 versus 2.2, $P > 0.001$; 1.9 versus 3.2, $P < 0.001$, respectively). There was no significant difference in glottic or supraglottic damage between the groups ($P > 0.05$).

CONCLUSIONS: This novel device reduced the risk of subglottic and tracheal injury by modulating endotracheal tube cuff pressure in synchronization with the ventilatory cycle. This could have far-reaching implications for reducing the risk of airway injury in patients undergoing long-term intubation. Further clinical study of this device is warranted.

DIFFERENTIAL COCHLEAR GENE EXPRESSION IN A RAT MODEL OF ACUTE PNEUMOCOCCAL OTITIS MEDIA

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OBJECTIVE: To study host responses of the cochlea to acute pneumococcal otitis media.

METHODS: Male Sprague-Dawley rats were randomly assigned to 7 groups (n = 4/group), including 1 control group without treatment, 3 sham surgery groups and 3 infected groups. The rat middle ear bullae were inoculated via a surgical approach with either 25 μ L phosphate-buffered saline (PBS; pH 7.2) or PBS containing 1×10^7 CFU/ml of opaque variants of *S. pneumoniae* 6A. Rats were humanely sacrificed at 1, 2 and 4 days post-infection and the cochleae were harvested. Total RNA was extracted and reverse-transcribed to cDNA. Relative gene expression levels were assessed using real-time PCR with gene-specific primers coding for inflammatory cytokines, toll-like receptors (TLRs), and bone morphogenetic associated proteins (BMPs).

RESULTS: The cytokines (IL-1 β , IL-6, and TNF- α) and TLRs (TLR2 and 4) were up-regulated in the bacteria-infected cochleae at 1, 2, and 4 days, whereas BMP protein-encoding transcripts were either down-regulated (BMP-1) or did not change.

CONCLUSIONS: Dramatic up-regulation of mRNA expression levels for cytokines and TLRs in the cochlea during early *S. pneumoniae* infection were demonstrated in a rat model of acute otitis media. These findings provide insight into the early host responses to pneumococcus-induced cochlear infection and may guide further investigation of associated cochlear ossification and hearing loss in pneumococcal meningitis.

INNATE IMMUNITY GENE SINGLE NUCLEOTIDE POLYMORPHISMS AND OTITIS MEDIA

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OBJECTIVE: Toll-like receptors (TLR) are important for activation of the innate immune system. Single nucleotide polymorphisms (SNPs) in TLR genes have been linked to increased susceptibility to various infections and TLR4-deficient mice have increased incidence and duration of otitis media (OM). We hypothesize that SNPs in TLR genes are more common in OM-prone children.

METHODS: Case control study. Cases (n= 70) included children under 18 years undergoing tympanostomy tube placement for OM. Control subjects (n= 70) included children 2-18 years undergoing surgery for non-otologic indication without a history of OM. Demographic data obtained by questionnaire. Genomic DNA was extracted from blood samples. Real time polymerase chain reaction genotyping was performed for TLR2 (rs5743708), TLR4 (rs4986790 & rs4986791), TLR9 (rs5743836 & rs187084), and CD14 (rs2569190).

RESULTS: Most common pre-op diagnosis in control subjects was obstructive sleep apnea (OSA). There were no significant differences between the groups in family history of OM, day care, smoke exposure or allergies. TLR9 rs187084 did trend toward significance ($p= 0.066$), while the prevalence of the other SNPs analyzed were not significantly different. Secondary analysis looking at OM and OSA cases compared to the remaining controls, shows that these groups have a higher incidence of TLR4, TLR9 and CD14 gene polymorphisms.

CONCLUSIONS: TLR gene SNPs are more common in the OM and OSA groups than the remaining controls. Continued research should further our understanding of the relationship between OM, inflammatory conditions in the head and neck, such as adenotonsillar hypertrophy, and innate immunity gene polymorphisms.

MONOCYTE CHEMOTACTIC PROTEIN-1 DEFICIENCY LOWERS MIDDLE EAR INFLAMMATION SUSCEPTIBILITY IN EUSTACHIAN TUBE OBSTRUCTION MODEL

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BACKGROUND: Eustachian tube obstruction (ETO) causes middle ear (ME) pressure dysregulation, which in turn leads to increased permeability of the mucosal vasculature and ME effusion, resulting in otitis media with effusion (OME). Our group has previously reported ETO-associated histo-morphometric changes to ME structure. However, the mechanism responsible for transducing biological signals associated with under-pressure and initiating ME mucosal inflammation is not known.

OBJECTIVE: To investigate the contribution of monocyte/macrophage recruitment and activity to ETO-induced OME and subsequent sequelae.

DESIGN: Wild type (WT, C57BL/6J) and Monocyte Chemotactic Protein-1(MCP-1) knockout (B6.129S4-Scya2) mice were each randomly assigned to 3 groups (n= 6/group), including 1 normal control group, 1 sham surgery group and 1 group receiving left ETO via cauterization. Each mouse underwent bilateral otoscopy weekly and the ME mucosa with bony bulla was collected after 4 weeks. Total ribonucleic acid was extracted and relative gene expression levels were analyzed using real-time quantitative polymerase chain reaction with gene-specific primers encoding inflammatory factors: tumor necrosis factor- α , (TNF), interleukin (IL)1- β , IL6, IL10, cyclooxygenase-2 (Cox2), and chemokine ligand-2 (Cxcl2).

RESULTS: ETO mice in both groups demonstrated ME effusion beginning at one week after surgery. The cytokines (TNF, IL1 β , IL6, and IL10), Cox2, and chemokine Cxcl2 were strongly up-regulated in the ME of the WT-ETO mice by comparison with that in MCP-1 knockouts.

CONCLUSIONS: WT-ETO mice are more susceptible to ETO-associated pathology, as shown in gene expression profiles coding for cytokine/chemokine clusters. Our findings suggest monocyte/macrophage participation in ETO-associated ME inflammation and OME, which may have clinical applicability.

EFFECT OF ADENOIDECTOMY ON PEDIATRIC VOICE QUALITY: APPLICATION OF THE PEDIATRIC VOICE-RELATED QUALITY OF LIFE SURVEY

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OBJECTIVES: (1) To measure the effects of adenoidectomy on pediatric voice quality with the Pediatric Voice-Related Quality of Life Survey (PVRQOL), an established, validated proxy instrument. (2) To evaluate a modified version of the survey with additional adenoid-specific questions.

STUDY DESIGN: Prospective, survey-based study

METHODS: Parents of a continuous, unselected population of pediatric patients undergoing adenoidectomy were administered a modified Pediatric Voice-Related Quality-of-Life Survey, which includes the original PVRQOL. Preoperative and postoperative surveys were compared using paired t-testing to evaluate voice changes due to adenoidectomy. Results from the original PVRQOL and the modified version were compared to one another and related to subjective assessment of vocal quality by parents.

RESULTS: 31 patients were enrolled (16 male, 15 female; age 9 months – 14 years, mean 5.1 years). Statistical analysis is available for the first 23 patients of this cohort; analysis is ongoing. Mean PVRQOL scores improved from 93.3 to 96.6 following adenoidectomy ($p < .05$). With addition of adenoid-specific questions to the PVRQOL survey (PVRQOL-A), scores increased from 90.2 to 97.2 postoperatively ($p < .05$). The increase in the difference between pre- and post-operative scores with addition of adenoid-specific questions suggests improved discrimination with PVRQOL-A. Parents generally found their child's voice to be "less nasal" after adenoidectomy with subjective improvements in clarity and projection.

CONCLUSION: Adenoidectomy improves voice-related quality of life as measured by parents using the validated PVRQOL. Modifications to the original PVRQOL survey make the proxy instrument more specific to vocal changes related to adenoid hyperplasia and clarify parents' perception of nasality.

VOCAL FOLD IMMOBILITY FOLLOWING CARDIOTHORACIC SURGERY IN CHILDREN

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OBJECTIVE: To determine the incidence of vocal fold immobility (VFI) following cardiothoracic surgery and to establish the variables associated with this outcome.

METHODS: Flexible laryngoscopy to assess vocal fold mobility was performed prior to surgery and again within 72 hours following extubation in all pediatric patients who underwent cardiothoracic procedures from November 19, 2008 to August 19, 2009. The operating surgeon recorded the surgical technique and also their impression of possible recurrent laryngeal nerve injury (RLNI). Presence of laryngeal symptoms following extubation was documented.

RESULTS: Of the 100 children included in the study, 8 had VFI following surgery. Children without VFI were older ($p=0.024$) and heavier ($p=0.026$). Children who underwent patent ductus arteriosus ligation (PDAL) had increased risk of VFI by 9.5 ($p=.0009$). Cautery and circulatory arrest were found to be associated with an increased risk of VFI by 8.15 times ($p=0.039$) and 6.82 times ($p=0.015$), respectively. The chance of VFI was also increased by 5.16 times ($p=.073$), 8.03 times ($p=.0035$) and 91 times ($p<.0001$) in patients displaying stridor, hoarseness and weak cry, respectively. Whenever the surgeon thought there was RLNI, the chance of VFI was increased by 11.28 times ($p=.0033$).

CONCLUSIONS: The incidence of VFI in children who underwent cardiothoracic surgery is higher in PDAL and in smaller and younger children. The use of cautery and circulatory arrest are associated variables and should be avoided whenever possible. Postoperative flexible laryngoscopy is indicated especially if impression of RLNI or presence of laryngeal symptoms.

PEDIATRIC HIGH FREQUENCY SENSORINEURAL HEARING LOSS

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OBJECTIVE: Review the clinical, radiographic, and laboratory characteristics of pediatric high frequency sensorineural hearing loss and formulate diagnostic and therapeutic protocols for this patient group.

DESIGN: Database review of inception cohort

SETTING: Pediatric tertiary referral Children's Hospital

PATIENTS: Pediatric patients in our Hearing and Deafness Research database with ≥ 20 dB high frequency sensorineural hearing loss.

MAIN OUTCOME MEASURES: Audiometric, imaging, and genetic testing data from our database to determine prevalence of abnormalities in this cohort.

RESULTS: Database analysis produced 2552 patients with hearing loss at both 1000 and 2000Hz, compared with 150 patients at 2000Hz only. When compared to the total, the patients with isolated high frequency loss were slightly older (average 8.7 vs. 4.8), had a lower percentage of identified risk factors (38% vs. 62%), but had GJB2 testing with similar frequency (51% vs. 55%), and similar positivity (4.7% vs. 6.9%). Abnormal temporal bone imaging was found in 11 of 51 tested (21.6%).

CONCLUSIONS: Children with isolated high frequency hearing loss present at a later age with less risk factors, yet have a similar prevalence of genetic testing and imaging abnormalities as other hearing loss patients. Diagnostic and therapeutic protocols in this cohort are discussed.

GENOME-WIDE ASSOCIATION STUDY IDENTIFIES RARE DE NOVO COPY NUMBER VARIANT (CNV) IN NON-SYNDROMIC MICROTIA

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Microtia is a congenital developmental anomaly of the external and middle ear that ranges in severity from mild malformation to the complete absence of the auricle. The prevalence rates range from 0.66 in England to 17.4/10,000 in Quito, Ecuador. Although, twin and family-based studies have suggested a significant genetic basis for non-syndromic microtia, no specific genetic defect has been identified. We hypothesized that some isolated microtia cases reflect a de novo (i.e. non-heritable) mutation that alters gene dosage of molecules that are required for ear development. To assess whether copy number variants (CNVs) contribute to its etiology we surveyed 41 microtia cases and their unaffected parents using the Affymetrix Human 6.0 SNP Chip array. After multiple testing, we identified one de novo CNV that was absent in 2,099 controls ($p = 0.019$; $OR > 100$). The finding was further re-confirmed by multiplex ligation-dependent probe amplification (MLPA). We have discovered a novel subchromosomal duplication associated with non-syndromic microtia. Chromosome 1q32.1 contains a gene involved with histone demethylase processes, which suggests that microtia may result from post-translational events that occur early in embryogenesis.

AUTOSOMAL DOMINANT PROGRESSIVE SENSORINEURAL HEARING LOSS DUE TO A NOVEL MUTATION IN KCNQ4

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OBJECTIVE: To identify the genetic etiology in a family with autosomal dominant progressive sensorineural hearing loss.

DESIGN: Prospective molecular genetic research study

SETTING: Academic research laboratory

PARTICIPANTS: 20 members of a family with hereditary hearing loss; 8 affected, 10 unaffected, and 2 spouses

INTERVENTIONS: Clinical data from questionnaires, interviews, serial audiograms, medical records; DNA samples obtained from saliva and/or peripheral venous blood

MAIN OUTCOME MEASURES: Type of hearing loss, age of onset, genome-wide linkage analysis, and candidate gene mutation analysis

RESULTS: Affected individuals presented with autosomal dominant non-syndromic high frequency progressive sensorineural hearing loss, with age of onset ranging from age 1 to 21 years. Genome wide linkage analysis of approximately 6,000 single nucleotide polymorphisms yielded evidence for linkage to an 18.9 Mb region on chromosome 1p34-p36, with a maximum logarithm-of-odds score of 3.8. This interval contains GJB3 (connexin-31) and a potassium channel gene, KCNQ4, responsible for DNFA2 deafness. Sequencing of the 14 coding exons and intron-exon junctions of KCNQ4 revealed a novel mutation, c.859G> C, which changes an amino acid from glycine to arginine (p.G287R). The mutation disrupts the highly conserved GYG motif (glycine-tyrosine-glycine) of the P-loop, hypothesized to be critical in maintaining pore structure and function. 89/89 ethnically matched controls were negative for the mutation. Clinical confirmatory genetic testing was offered to participating subjects.

CONCLUSIONS: Autosomal dominant high-frequency hearing loss is genetically heterogeneous, and linkage analysis is an efficient means to identify the etiology. Deafness in this family is caused by a novel mutation in KCNQ4.

PROPRANOLOL AS FIRST LINE TREATMENT OF HEAD AND NECK HEMANGIOMAS

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OBJECTIVE: To report efficiency of propranolol as first line treatment of head and neck hemangiomas in children and to present an optimized protocol for treating hemangiomas. **Material and method:** multicentric retrospective study of clinical files.

RESULTS: Forty children were treated, propranolol was the sole treatment and was introduced at 3.5 months of age (1.5-11 months). This treatment was effective in 38 out of 40 children within 5 days to 2 weeks. One subglottic hemangioma and 2 nasal tip hemangiomas did not respond or had only a partial response, but propranolol was started after several months of growth. After successful therapeutic involution, five recurrences were observed, when reintroduced propranolol proved to be effective again. Twenty-eight hemangiomas occurring in locations that would not have previously benefited from treatment were rapidly controlled with propranolol (parotid area, lips, nose). Mean duration of propranolol was 7.5 months. Treatment never had to be stopped because of side effects.

CONCLUSION: Propranolol appeared to be an effective treatment of head and neck hemangiomas, especially when started early within the rapid growth phase. Relapse was avoided if treatment was prolonged after involution. Effectiveness led to broaden indications to locations that previously did not benefit from treatment.

HISTOLOGIC EVIDENCE OF LYMPHATIC MALFORMATION PERSISTENCE

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OBJECTIVE: Tertiary lymphoid organs (TLO) are lymphoid aggregates present in lymphatic malformations (LM) in addition to a variety of other inflammatory, autoimmune and neoplastic conditions. The current study aims to determine the relationship between TLO density and the clinical behavior and location of LM.

METHOD: Quantification of TLO and lymphoid infiltrates in histologic sections from LM involving the neck and/or oral cavity was performed by 2 independent, blinded reviewers. This determined TLO density per mm². The association of clinically relevant outcome measures (stage, site, symptom persistence, age at surgery, adjuvant treatment) with TLO density was evaluated with an analysis of variance (ANOVA) and multivariate regression.

RESULTS: Histologic sections (117) from 28 patients with LM (mean follow-up = 10 years) were reviewed. More TLO and lymphoid infiltrates were seen in oral cavity than in neck specimens ($p= 0.0235$). In LM neck tissue, TLO density increased with increasing LM stage ($p= 0.0043$), but not for oral cavity LM. On multivariate regression total tongue TLO density was associated with persistent oral/neck symptoms ($p= 0.023$) and persistent macroglossia/oral bleeding ($p= 0.020$). No association between TLO or lymphoid infiltrate density was seen for steroid administration, sclerotherapy, spontaneous malformation regression or age at surgery.

CONCLUSIONS: This study demonstrates significant histologic associations between TLO/lymphoid infiltrates and LM clinical behavior and location. While further study is required to define the functional implications of lymphoid neogenesis in the pathogenesis of LM, these aggregates may serve as potential markers of disease course and ultimately aid in identifying novel therapeutic targets.

THE PATTERNS OF OBSTRUCTION AND COLLAPSE IN CHILDREN WITH DOWN SYNDROME ON SLEEP NASOPHARYNGOSCOPY: A CASE CONTROLLED STUDY

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OBJECTIVE: Identify the pattern of airway findings in Down syndrome (DS) children with sleep disordered breathing spectrum (SDB)

METHOD: Retrospective case control study in a tertiary pediatric centre. DS children presenting with a history of SDB and who underwent sleep nasopharyngoscopy (SNP), were identified from a prospectively kept surgical database. All SNP examinations were performed under spontaneous respiration using a uniform intravenous technique. Controls from the same database were identified, and pair-matched for age, gender, and Body mass index percentiles (BMI). The videorecordings of the SNP for all subjects were reviewed. Patients with comorbidities or who were syndromic were excluded from the control group. A comparison of proportions of obstructions (O), mixed (M) and collapses (C) findings in each group was performed.

RESULTS: Over a period of 4.5 years, 26 consecutive DS children were identified (11 girls, 15 boys; mean of 7.03 years, 1.16-14.97). They were matched with 26 controls (0.67-14.76 mean of 4.23 years). The DS group exhibited significantly more pharyngeal collapses, than the controls (O:M:C, 9:10:7, 11:10:0 respectively, $P < 0.05$) Though lingual collapses were noted in DS children, a significant number of circumferential collapses were seen.

CONCLUSIONS: Pharyngeal collapse dominates in DS children who exhibit SDB. Adenotonsillectomy is unlikely to improve their condition, and may pose an additional anesthetic risk to them post-operatively.

TEMPOROMANDIBULAR JOINT (TMJ) FUNCTION FOLLOWING MANDIBULAR FRACTURE IN CHILDREN: A 10-YEAR REVIEW

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INTRODUCTION: Mandible fracture is the most common pediatric facial fracture requiring hospitalization, with most fractures being condylar/subcondylar (C/SC). Current data is limited regarding functional outcome in children with C/SC fractures. The objective of this study is to assess TMJ dysfunction in this population.

METHODS: A retrospective chart review between 1999-2009 of all pediatric mandible fractures and a prospective telephone questionnaire of patients with C/SC fractures were performed. The Helkimo Anamnestic Dysfunction Index (HADI) was employed to quantify TMJ dysfunction as: none, mild, or severe.

RESULTS: 164 patients with mandible fractures were identified. Demographic characteristics include male/female (122/42) and mean/median age (9.9/10.0 years). 83 C/SC subjects accounted for 50.6% of the total mandible fracture group. The characteristics of the C/SC subgroup are: male/female (61/22), mean/median age (8.6/9.0 years), and unilateral/bilateral fractures (66/17). 32 C/SC patients completed the telephone questionnaire. The HADI distribution was 12(37.5%)—none; 4(12.5%)—mild; and 16(50%)—severe. Older children (10-18 years) had more severe dysfunction compared to younger children (1-9 years) ($p= 0.012$). No statistical difference was found between TMJ dysfunction and unilateral versus bilateral C/SC fractures ($p= 0.113$).

CONCLUSIONS: This study represents one of the largest series of pediatric C/SC fractures to be reported in the recent literature. The findings indicate increased severity of TMJ dysfunction in older children but no functional difference in those with unilateral versus bilateral fractures. Further investigation may be warranted regarding optimal treatments for the older pediatric population.

A PILOT STUDY OF TONSILLECTOMY OBJECTIVE STRUCTURED ASSESSMENTS OF TECHNICAL SKILLS: CAN WE PREDICT TECHNICAL COMPETENCY?

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BACKGROUND: The Accreditation Council for Graduate Medical Education (ACGME) mandates otolaryngology residency programs objectively evaluate operative competency. Objective assessments of surgical skills are uncommonly performed. The average number of tonsillectomies performed by US otolaryngology residents is > 150. We implemented a Tonsillectomy Objective Structured Assessment of Technical Skills (T-OSATS) to determine the average number of cases and average T-OSATS score needed to obtain competency.

METHODS: The attending evaluated the resident's performance with the 11 item task specific T-OSATS and gave a "competency" assessment after each tonsillectomy. The average score and number of cases needed to be assessed competent 90% of the time were determined by logistic regression models to predict probability of competency.

RESULTS: Over 200 assessments were performed. At 59 cases, there is a 90% probability of being assessed competent, and at 69 cases, there is a 95% likelihood of competency. (95% CI 74.0% - 99.2%) Sensitivity and specificity are 37.5% and 100% respectively. An average score of 4.91/5.0 correlates to an 85% probability of being assessed competent, and 4.96/5.0 is associated with 90% likelihood of competency. The average time to complete the T-OSATS, with feedback, was 59.5 seconds (SD 9.1 seconds).

CONCLUSION: With implementation of the 80 hour work week limitations for residents, new strategies for teaching and assessing operative skills are necessary. The average number of tonsillectomies performed needed to achieve competency in our study is 59 which is less than half the national average. It is feasible to objectively assess the tonsillectomy surgical skills with T-OSATS.

CARTILAGE SHIELD TYMPANOPLASTY IN CHILDREN: REVIEW OF 268 CONSECUTIVE CASES

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OBJECTIVES: To assess the efficacy of partial ossicular chain reconstruction using autologous cartilage.

PATIENTS AND METHODS: 248 children (268 ears) underwent partial ossicular chain reconstruction using a shaped block of tragal cartilage interposed between the head of the stapes and a large composite chondrocartilaginous underlay tympanic membrane reconstruction. Anatomical and audiological results were evaluated according to the AAO-HNS guidelines. Chi-squared tests and multivariate analysis were used for statistical evaluation.

RESULTS: The mean age at surgery was 10.9 years. First hand surgery was performed in 46.3% (124/268), 62.9% of which were for cholesteatoma and 32.3% for retraction pocket. The second look procedures (53.7%) included 84.7% of staged surgery. Audiometric results were available for 222 ears at one year and 78 ears at five years. Closure of the average air-bone gap (ABG) to within 20 dB was achieved in 62.2% of ears at one year. The mean pre- and post- operative (at one year) ABG were 25 ± 11.8 dB and 18.9 ± 10.3 dB respectively. Anatomic results were satisfactory in 87.3%. No cases of extrusion, resorption or displacement of the cartilage were encountered. No statistically significant difference was found between audiometric results at 1 and 5 years. Multivariate analysis showed only a significant negative correlation between pre- and post- operative ABG ($p < 0.05$).

CONCLUSIONS: Cartilage shield tympanoplasty is a reliable technique for partial ossicular replacement. Long-term hearing outcomes remain stable and satisfactory. Pre-operative ABG is the only predictive factor of the hearing outcome.

ROLE OF THE MASTOID IN MIDDLE EAR PRESSURE REGULATION

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OBJECTIVE: To determine the role of mastoid volume in middle ear pressure (MEP) regulation. The hypothesis was that inert gas exchange between blood and ME is slower for larger mastoids.

METHODS: The pneumatized areas of the bilateral mastoids were calculated from Schuller x-rays for 19 subjects with a range of pneumatized areas. Adults were seated in a reclined dental chair, fitted with a non-rebreathing mask and then breathed room air for 20 minutes (acclimation), a gas composition of 25% N₂O, 21% O₂, balance nitrogen for 30 minutes (experiment) and air breathing for 30 minutes (recovery). Bilateral MEPs were recorded by tympanometry every 2 minutes. The slope of MEP vs time for N₂O breathing was calculated to the first observation of Eustachian tube opening and divided by the blood-ME N₂O gradient to yield a time-constant.

RESULTS: There were no changes in MEP during the baseline period, but within 10 minutes of breathing the N₂O mixture, those pressures increased. Sufficient data were available in 16 right and 13 left ears to calculate a slope. The correlation for the right-left time-constant was .79. Regression of the time-constant for the right ear showed an inverse relationship with pneumatized mastoid area ($r = -.49$, $p = .056$). A better data fit was the curvilinear relationship predicted by past models of the mastoid acting as ME ear gas reserve.

CONCLUSION: Results indicate that the increased mastoid volume results in slower blood-ME inert gas exchange and supports the hypothesis that the mastoid acts as a middle ear gas reserve.

CONSERVATIVE MANAGEMENT FOR ACUTE MASTOIDITIS IN CHILDREN

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OBJECTIVE: To determine whether treatment of acute mastoiditis (AM) in children using antibiotics with retroauricular puncture and grommet insertion is effective compared with a "standard management" including mastoidectomy.

DESIGN: Retrospective study

SETTING: Tertiary pediatric center

PATIENTS: We identified 50 patients under 14 years old with AM who were admitted to our department (mean age: 32 months). Subacute mastoiditis and cholesteatoma were excluded. All children had received an antibiotic treatment. Before 2002, subperiosteal abscess (SA) was managed by a mastoidectomy. In the second period, after 2002, a conservative management was initially attempted in order to avoid mastoidectomy.

MAIN OUTCOME MEASURE: Proportion of cured children after conservative management of SA in AM.

RESULTS: AM occurred in 30 patients already treated by antibiotics before to hospital admission. At examination, one child had facial palsy. All except one (tempora-zygomatic swelling) had a post-auricular swelling. Myringotomy and/or retroauricular puncture had isolated bacteria in 38 cases. Streptococcus pneumoniae was identified in 28 cases. CT-scan (43 patients) had diagnosed 31 SA including 3 sigmoid sinus thrombosis and one subdural abscess. All children were cured without complications whatever the type of treatment. Comparing the 2 periods, the number of SA was quite similar (15/16) but the number of mastoidectomy was reduced (16/1). The length of the hospital stay of patients who underwent aspiration was shorter than that of patients who underwent cortical mastoidectomy.

CONCLUSION: Use of antibiotics combined with puncture and grommet insertion is an effective alternative to mastoidectomy in the treatment of AM with SA.

SCREENING AND TREATMENT OF OXACILLIN-RESISTANT STAPHYLOCOCCUS AUREUS IN CHILDREN UNDERGOING OPEN AIRWAY SURGERY

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OBJECTIVE: Nosocomial and community-acquired oxacillin-resistant *Staphylococcus aureus* (ORSA) infections and colonization are occurring with increasing frequency in pediatric patients. Complications of perioperative ORSA infections in patients undergoing open airway reconstruction may be devastating. We aim to examine ORSA colonization rates and the efficacy of a standardized ORSA screening and treatment protocol in children undergoing open airway surgery.

DESIGN: Case control

SETTING: Tertiary academic children's hospital.

SUBJECTS: Children undergoing open airway surgery January 2007-March 2009

INTERVENTIONS: A standardized preoperative evaluation ORSA colonization screening protocol was employed prior to open airway surgery. ORSA-colonized patients were treated with a standardized treatment protocol.

MAIN OUTCOME MEASURES: Percentage of ORSA-colonized patients treated with appropriate antibiotics, postoperative infections in ORSA-colonized patients
Results: 180 pediatric patients underwent 200 open airway surgeries. Average age at surgery was 6.1 years. 56% patients were male. Incidence of ORSA colonization was 31.5%, with colonized sites being the nares (73.8%), respiratory cultures (52.4%), rectal swabs (34.4%), and axillary swabs (18%). ORSA-colonized patients were treated with organism-sensitive antibiotics preoperatively in 91.9%, and postoperatively 93.8%, of cases. Perioperative infection rates were similar in ORSA-positive cases (16.7%) versus ORSA-negative patients (16.5%), $p = 0.98$. One non-ORSA colonized patient had graft failure due to beta-hemolytic *Streptococcus*. No anastomotic or graft failures were attributed to ORSA infection.

CONCLUSIONS: There is a high incidence of ORSA colonization in pediatric patients undergoing open airway surgery. Patient screening should be considered during the preoperative evaluation. ORSA-colonized patients treated with standardized antibiotic protocols have similar postoperative infection rates to non-colonized patients.

SUBMUCOSAL NERVE HYPERTROPHY IN LARYNGOMALACIA: HISTOPATHOLOGIC EVIDENCE

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PURPOSE: Neurosensory abnormalities have been attributed to the pathophysiology of laryngomalacia (LM). Histologic evidence of neural dysfunction has not been clearly demonstrated. The study compares supra-arytenoid tissue of infants with severe LM versus controls with specific focus on neural subunits.

METHODS: Over an 18 month period, supra-arytenoid tissue excised during cold-knife microlaryngeal supraglottoplasty was examined by histology. Control laryngeal tissue was harvested from age matched autopsy cases for comparison. On prepared and blinded pathologic slides, the largest submucosal nerve was spotted, image captured, digitized and measured for area and perimeter. Stromal abnormalities in both groups were also compared.

RESULTS: Supra-arytenoid tissue from 43 patients with severe LM (25 males and 18 females; age: median 4.9 months; range: 0.3-38 months) and 13 controls (12 males and 1 female; age: median 6 months; range: 0.8-17 months) were analyzed. Study groups were age-matched ($P= 0.67$). Marked submucosal nerve hyperplasia was identified in patients with LM compared to controls. LM nerve perimeter (median: 1765μ ; range $452-3877\mu$) was higher than in the control group (median: 948.7μ ; range $413-3253.3\mu$). This difference was statistically significant ($P= 0.002$). Nerve surface area (median: $182905\mu^2$; range $13938-961007\mu^2$) was also significantly higher in LM tissue versus controls (median: $60405\mu^2$; range $9409-726521\mu^2$ $P= 0.02$). An increased incidence of stromal abnormalities such as edema, submucosal myxoid degeneration, and lymphocytic infiltrate in LM tissue was also indentified.

CONCLUSION: Compared to controls, patients with LM demonstrate significant submucosal nerve hypertrophy and various stromal abnormalities. These findings support the hypothesis of altered neurosensory function in the pathogenesis of LM.

A NOVEL ENDOSCOPICALLY PLACED STENT TO RELIEVE GLOTTIC OBSTRUCTION CAUSED BY BILATERAL VOCAL FOLD PARALYSIS

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INTRODUCTION: Congenital bilateral vocal fold paralysis (BVP) is a rare but serious condition often requiring a tracheostomy to temporize the airway. In cases of idiopathic BVP, studies suggest waiting twelve months prior to laryngeal surgery because of a high rate of spontaneous recovery. Therefore a less invasive and reversible intervention would be optimal.

DESIGN: A prospective study in a piglet model

OBJECTIVE: To evaluate the efficacy of a novel spring-loaded stenting device designed to maintain laryngeal patency following surgically induced BVP.

METHODS: Eight mature Yorkshire piglets had BVP induced by surgical division of the recurrent laryngeal nerves. Stents were endoscopically deployed between the arytenoid vocal processes. Animals were recovered and monitored for stridor, diet and weight gain. Animals were sacrificed after five days. Airway resistance using a calibrated rhinomanometer was measured at baseline, induced BVP, stent insertion and at sacrifice.

RESULTS: Six of eight animals survived greater than five days with an average weight gain of 1.9 kg ($p=0.003$). Relative inspiratory resistance increased from baseline after inducing BVP (1.00 vs. 1.468, $p=0.0315$) and decreased to baseline levels with stent insertion (1.468 vs. 1.092, $p=0.0238$). Expiratory resistance was not significantly influenced by stage of measurement ($p=0.236$). Of the two animals not surviving the protocol, one had an unrelated anesthesia complication and the other a malpositioned stent.

CONCLUSION: The novel stent was successful in relieving inspiratory resistance associated with induced BVP, without compromising swallowing and daily function. This may hold promise in temporarily securing the pediatric airway in the setting of BVP.

ROLE OF CONGENITAL CYTOMEGALOVIRUS (CMV) INFECTION IN PEDIATRIC HEARING LOSS

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Background Studies abroad and in parts of the United States have linked congenital cytomegalovirus (CMV) infection and pediatric hearing loss. However the prevalence of congenital CMV infection in our patient population is unknown.

OBJECTIVES: 1. Determine baseline rate of congenital CMV infection in a single state, and 2. Compare to rate of congenital CMV infection among children with hearing loss.

METHODS: Case-control study enrolling children aged 4 years or older identified through a pediatric hospital using ICD-9 codes for hearing loss. Records were reviewed for audiological and medical data, including etiology of hearing loss. Hearing loss was defined as thresholds ≥ 20 dB at ≥ 2 frequencies. Demographically matched controls were identified at random through the Department of Health (DOH). Congenital CMV status was determined using quantitative PCR testing on newborn heelstick blood spots from cases and controls archived by the DOH.

RESULTS: Congenital CMV testing was performed for 224 cases and 224 controls. The rate of congenital CMV infection in controls was 1.3%, compared to 9.8% among cases (OR 10.5, 95% CI: 2.5, 44.8). An additional 132 cases underwent CMV testing for a total 356 cases. Children with congenital CMV infection tended toward higher rates of progressive ($p= 0.12$) hearing loss. Among children who underwent genetic testing, congenital CMV was nearly as common as connexin mutations.

CONCLUSIONS: In this study, children with hearing loss had significantly higher rates of congenital CMV infection than the general pediatric population. Congenital CMV infection may be associated with a significant proportion of hearing loss.

GENTAMICIN ENTRY INTO SENSORY HAIR CELLS IS DEPENDENT ON MECHANOTRANSDUCTION CHANNELS AND TIP-LINK INTEGRITY

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PURPOSE: Hearing loss from sensory hair cell death is a known side-effect of aminoglycoside treatment. How aminoglycosides enter hair cells is not completely understood. Current proposed mechanisms include endocytosis-mediated or via mechanotransduction (MET) channels. We hypothesize that blocking MET channels or disrupting stereocilia tip-links will preclude aminoglycoside entry into hair cells and thus protect hair cells from toxicity.

METHODS: Using organotypic cultures of postnatal mouse and rat cochleae, we tested the effects of three MET channel blockers (quinine, curare, and amiloride) and 1 endocytosis blocker (concanavalin A) on gentamicin toxicity and uptake. Our treatment paradigm consists of harvesting 3- to 4-day-old cochleae, then incubating in control media before treatment with gentamicin with or without blockers for 1 hour, and then control media for 1-4 additional days. In parallel, we investigated the degree of hair cell loss and gentamicin uptake in cadherin23-deficient mice, which have closed MET channels. Hair cell damage was assessed by hair cell counts and caspase-3 labeling. Gentamicin uptake was measured by direct immunostaining and time-lapse imaging of gentamicin conjugated to texas red in live cochlear organs.

SUMMARY OF RESULTS: Blockers of MET protected hair cells from gentamicin-induced loss and decreased its uptake into hair cells, where as the endocytosis blocker (concanavalin A) did not. Likewise, cadherin-23 deficient hair cells were protected from gentamicin toxicity and prevented caspase-3 activation and gentamicin uptake. These results suggest open MET channels are necessary for gentamicin toxicity and entry into hair cells. Supported by ASPO grant and NIDCD P30DC010363

HEARING LOSS CAUSED BY CONGENITAL HUMAN CYTOMEGALOVIRUS INFECTION

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OBJECTIVE: Describe the incidence, timing, and course of sensorineural hearing loss (SNHL) in neonates with human cytomegalovirus (HCMV).

DESIGN: Prospective, observational

SETTING: Tertiary care children's hospital and two community hospitals

PATIENTS: Neonates from 3 demographically diverse hospitals underwent HCMV screening between October 2003 and July 2007. Those positive for HCMV were prospectively enrolled. **Interventions:** Newborns were screened for HCMV by Direct Early Antigen detection of Fluorescent Foci (DEAFF) method using saliva samples. HCMV positive patients underwent newborn hearing screening and regular hearing evaluations to 3 years of age.

OUTCOME MEASURES: Newborn hearing screen results for DEAFF+ neonates. Incidence, degree, and pattern of hearing loss.

RESULTS: Of 20,029 newborns screened, 54 (0.27%) were found to have congenital HCMV by DEAFF viral screen. Failure rate for newborn hearing screening in HCMV neonates was 7.4% (4/54) vs. 0.91% of DEAFF- neonates (181/19,927). HCMV positive patients had a mean of 4.06 audiograms, over a median of 24 months (0.3-41.3). Four (7.4%) patients developed SNHL, 7/8 of these ears failed a newborn hearing screen. The one ear which passed the screen progressed to profound SNHL. Mean time to first auditory brainstem evoked response test was 3.3 months, when 4/8 ears showed a profound loss. SNHL further progressed in 3 ears and 7/8 ears now have a profound hearing loss.

CONCLUSIONS: Neonates positive for HCMV infection who fail a newborn hearing screen are likely to have, or develop, SNHL. They most often develop bilateral, profound SNHL in a progressive pattern.

POLYSOMNOGRAPHY VARIABLES THAT PREDICT ADVERSE RESPIRATORY EVENTS AFTER ADENOTONSILLECTOMY

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OBJECTIVE: To determine variables on polysomnography (PSG) which may potentially predict adverse respiratory events after adenotonsillectomy in patients with obstructive sleep apnea

STUDY DESIGN: Retrospective case-control study

SETTING: Free standing academic tertiary care pediatric hospital

PATIENTS: One-thousand one-hundred thirty-one patients with a preoperative PSG from July 2006 to December 2008 undergoing adenotonsillectomy by two attending surgeons. There were no exclusion criteria.

MAIN OUTCOME MEASURE: Variables from preoperative PSG were analyzed to determine predictors of postoperative respiratory complications. Logistic regression analysis was performed.

RESULTS: One-hundred fifty-one patients had a preoperative PSG (13.4%). Twenty-three of these patients (15.2%) had adverse respiratory events. The primary adverse event was desaturation requiring supplemental oxygen therapy, with one case of post-obstructive pulmonary edema. Patients with adverse events had significantly higher apnea-hypopnea index (AHI) (31.8 vs 14.1; $P = 0.001$), higher hypopnea index (22.6 vs 8.9; $P = 0.004$), higher body mass index (BMI) (24.7 vs 20.0; $P = 0.023$), and lower nadir oxygen saturation (72% vs 84%; $P = 0.0006$). Patients with adverse events had a prolonged hospital course (OR 32.1, 95% CI 7.8 – 131.4). There were no intubations or mortalities.

CONCLUSION: Polysomnography may be potentially used for predicting patients at higher risk for adverse respiratory events after adenotonsillectomy. Such knowledge is valuable in planning postoperative management and perhaps intra-operative anesthesia management. Predictors of increased respiratory complications include higher AHI, hypopnea index, BMI, and lower nadir oxygen saturation. An index is currently being developed and validated to predict higher risk patients.

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BARRIERS TO THE EARLY COCHLEAR IMPLANTATION OF DEAF CHILDREN

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BACKGROUND: Early cochlear implantation benefits congenitally deaf children and lowers the cost of their care to society. Nevertheless, many congenitally deaf children do not receive cochlear implants (CIs) until after age two years.

PURPOSE: Identify factors associated with delayed pediatric cochlear implantation.

PROCEDURE: Chart reviews and telephone interviews were used to collect information on 59 congenitally deaf children who received CIs in the last seven years at a university medical center in a state with mandatory newborn hearing screenings. Healthcare details and social characteristics were compared between the children who received CIs before and after age 2.

RESULTS: Major factors delaying CI surgery until after age two years include parents causing a delay, failure of newborn hearing screenings to identify hearing loss, other health issues delaying CI surgery, and delayed referrals for care after the initial hearing loss diagnosis and/or from local providers to the implant team. The following factors were associated with CI surgery after age 2: not receiving newborn hearing screening (RR= 2.63, p= 0.01), Medicaid healthcare coverage, family physician as primary care provider, single parent household, and living in a rural community. The following factors were associated with CI surgery before age 2: private health insurance (RR= 0.38, p= 0.07), pediatrician as primary care provider, direct referral to the implant team after initial hearing loss identification (RR= 0.23, p= 0.06), two parent household, and living in an urban community.

CONCLUSIONS: The results identify risk factors for delayed CI surgery and raise potential interventional targets to prevent delays.

**COMPARING THE INCIDENCE OF POST-TONSILLECTOMY
HEMORRHAGE AFTER COBLATION
AND ELECTROCAUTERY TONSILLECTOMY**

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INTRODUCTION: Coblation tonsillectomy was introduced in 1998 with early reports suggesting reduced post-operative pain and faster recovery time. Coblation uses plasma-mediated ablation to dissociate tissue bonds with relatively lower thermal effect (40° C to 70° C compared with > 100° C with electrocautery). A recent review by the Cochrane Collaboration group described a primary hemorrhage rate of 0 to 28% with no difference between tonsillectomy techniques in six studies (coblation versus other techniques). Secondary hemorrhage ranged from 0 to 50% in eight studies - seven had no difference between techniques and one study the bleeding rate was higher using Coblation®.

METHODS: Retrospective review of tonsillectomies at a tertiary care medical center. Electrocautery dissection (Force FX – Valleylab, Boulder CO) was performed in 904 patients and coblation (Coblation®PROcise XP™– Arthrocare Corp., Austin, TX), in 111 patients. Bleeding episodes were defined as when patients required operative control of bleeding. All tonsillectomies were performed by the senior author.

RESULTS: The bleeding rate after electrocautery dissection was 0.55% (5/904), and after coblation tonsillectomy was 6.3% (7/111). The difference was significant - $P < 0.0001$ (Fisher's exact test).

DISCUSSION: Our series demonstrates a significantly higher incidence of bleeding using coblation tonsillectomy as compared to electrocautery dissection. The existing literature is controversial with a few papers demonstrating an increase of secondary bleeding with coblation while others fail to show any difference. Possible explanations for variations in findings may include the technique and power used in electrocautery dissection, learning curve for coblation tonsillectomy and type of wand used, and surgeon experience.

DO FACULTY AND TRAINEES AGREE ON THE VALUE OF EX-VIVO METHODS FOR LEARNING REMOVAL OF ASPIRATED FOREIGN BODIES IN CHILDREN?

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PURPOSE: To compare Faculty (F) and Trainee (T) perception of novel simulated pediatric foreign body (FB) aspiration psychomotor and cognitive learning modalities. Residents are developing lifelong learning habits, which include responsibility for evaluating educational opportunities.

METHODS: Twenty four F and 43 T participated in a one day course including lectures, removal of FB from anesthetized piglets and high fidelity infant manikins; virtual endoscopy using fiberoptic equipment; and standardized patient (SP) exercises in obtaining informed consent and delivering "bad news." All participants were surveyed immediately afterward regarding the value and realism of these learning modalities for developing skills and processes relevant to management of FB aspiration, such as washing hands, assembling equipment, managing laryngospasm, etc. Likert scale ratings (0= not very valuable or effective to 4= very valuable, effective) were compared between F and T, using non-parametric Mann-Whitney U test. The survey was returned by 11 F(46%) and 31 T (72%). Median Likert scores for 1) individual skills, 2) skills grouped by Accreditation Council for Graduate Medical Education core competencies, and 3) realism, were diverse (range 0-4), but not significantly different between F and T, except F rated the animal modality less highly for selecting and assembling equipment ($p= 0.000$) and SP more highly for developing communication skills ($P= 0.016$).

SUMMARY: Faculty and Trainees generally agree on the relative value and realism of lectures and simulation-based modalities (animal, manikin, virtual endoscopy) for developing skills in the management of pediatric FB aspiration.

**THE PREVALENCE OF SLEEPINESS AND
THE RISK OF SLEEP DISORDERED BREATHING
IN CHILDREN WITH POSITIVE ALLERGY TESTING**

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PURPOSE: To evaluate the prevalence of sleep disordered breathing (SDB) and sleepiness in children with allergies and compare sleep-specific quality of life measures to those of children without allergies.

METHODS: Prospective case-control study at a tertiary care academic center. The parents of 16 pediatric patients with positive skin-prick allergy testing completed questionnaires including the Obstructive Sleep Apnea-18 (OSA18), the Pediatric Sleep Questionnaire (PSQ), and the Pediatric Daytime Sleepiness Scale (PDSS). Comparisons were made to controls from previously published studies.

RESULTS: SDB was suggested in 7% of children with allergy by the OSA18 and 33% using the PSQ, while only 1-4% of the general population has OSA. In addition, daytime sleepiness was suggested in 53% of children using both the PSQ and the PDSS. Patients with allergies had SDB and sleepiness scores higher than population normal values: OSA-18 of 40.9 versus 29.5, PSQ-SDB of 0.28 versus 0.06, PSQ-Sleepy of 0.36 versus 0.12, and PDSS of 14.9 versus 11.9. The difference between cases and controls was not significant with the total PSQ ($p=0.244$), but the PSG-sleepiness subscale was significantly greater in allergic patients ($p=0.0107$) and approached significance with the PDSS ($p=0.085$).

CONCLUSIONS: Children with allergies appear to have higher SDB and sleepiness scores than controls. While the small sample size limits interpretation, the findings suggest that children with allergic rhinitis are at increased risk for SDB and screening should be considered in this population. In addition, studies with a larger sample size are important to fully understand this relationship.

ALTERATIONS IN IMMUNOGLOBULINS' LEVEL AFTER TOTAL VS. PARTIAL TONSILLECTOMY

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BACKGROUND & OBJECTIVES: Palatine tonsils are secondary lymphoid organs active in sampling antigens and producing immunoglobulins (Ig) both locally and distally. The aim of this study is to compare changes in serum and saliva Ig level after total vs. partial tonsillectomy. The changes in quality of life were also assessed.

MATERIALS & METHODS: Children with obstructive tonsils undergoing total or partial tonsillectomy were recruited in a pilot study. Patients with recurrent tonsillitis or immunodeficiency were excluded. Blood and saliva samples were obtained immediately preoperatively and at the 1st follow-up visit. Serum Ig (G,M&A) and saliva secretory IgA concentrations were determined using radial immunodiffusion and Enzyme Immunoassay, respectively. A questionnaire was answered by the parents at one year follow-up.

RESULTS: Nineteen patients completed the study (11 partial, 8 total). Both groups were comparable in age and gender. No statistically significant changes noted in serum Ig's level in both groups, except for IgM which increased (p 0.018) after partial tonsillectomy, mainly in males (p 0.04), and in those aged 5 years and older (p 0.02). There was statistically non-significant decrease in secretory IgA level after both total (178.02 to 95.01 µg/ml) and partial (197.24 to 111.34 µg/ml) tonsillectomy. There was noticeable decrease in susceptibility to infections, and improvement in quality of life.

CONCLUSION: The effect of both types of tonsillectomy on Ig's level seems reassuring. The noted changes may represent a kind of immunological readjustment. The surgery (whether total or partial) has a positive effect on the quality of life of children.

RESULTS OF SURGICAL INTERVENTION IN 60 PATIENTS WITH PFAPA

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OBJECTIVE: To determine the efficacy of adenotonsillectomy in patients diagnosed with PFAPA (Periodic Fever, Aphthous Ulcers, Pharyngitis and Adenopathy)

SETTING: Tertiary care pediatric hospital

PATIENTS: 87 patients from 2002 to present. Patients were seen both by an otolaryngologist and a rheumatologist for confirmation of the PFAPA diagnosis.

OUTCOME MEASURES: 87 (41 female, 46 male) had adenotonsillectomy for relief of cyclical fevers secondary to PFAPA. Of the 87 patients, 27 did not meet criteria for inclusion in this study due to 1) less than 6 months of followup from surgery; or 2) were lost to followup, resulting in a group of 60 patients. Mean age at time of surgery was 62 months (range 18 to 197 months). Average duration of followup was 28 months (range 6 months to 7 years). Out of 60 patients, 57 had complete resolution of their symptoms immediately after surgery. Of the remaining 3 patients, 2 continued to have cyclical fevers. One child who met PFAPA criteria resolved their fevers 6 months after surgery.

CONCLUSIONS: Our findings showed complete resolution of symptoms in 57/60 PFAPA patients treated surgically. Patient who meet the clinical criteria for PFAPA should be offered adenotonsillectomy if they fail medical management. Critical to the management of this condition is the accuracy of the diagnosis and the long term follow up of patients to assess the efficacy of surgical intervention.

THE PUBLIC HEALTH IMPACT OF PEDIATRIC CAUSTIC INGESTION INJURIES

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OBJECTIVE: To determine the public health burden of pediatric caustic ingestion injuries.

BACKGROUND: Pediatric caustic ingestion injuries have been touted as a public health success in the United States as a result of targeted legislation. However, data supporting this success is unclear. Commonly cited prevalence figures suggest that approximately 5,000-15,000 cases occur in children each year, although these figures can be tracked to dated secondary sources.

METHODS: The 2006 Kids\ Inpatient Database provides data on a sample of all pediatric discharges in the United States during that year. Children with caustic ingestion injuries requiring hospitalization were identified by corresponding ICD-9 codes. Database analysis generated national estimates of summary statistics.

RESULTS: The prevalence of pediatric caustic ingestion injuries in the United States in 2006 is estimated to be 966 children (95% CI:875.31;1056.85). The economic burden is estimated at \$21,300,000 (95% CI:\$14,800,000;\$27,800,000) in total hospital charges. The mean charge per patient is estimated at \$22,186 (95% CI:\$15,943;\$28,429) with a median of \$8,743. The mean length of admission is 3.76 (95% CI:3.00;4.52) days with a median of 2 days. Logistic regression models suggest significant age ($p < .0001$), gender ($p < .0001$) and regional variations ($p = .040$).

CONCLUSIONS: The data suggests that the current public health burden of pediatric caustic ingestion injuries is far less than what is commonly cited. This supports the notion that legislative efforts have been successful. Despite the successes to date, these injuries continue to impose a significant burden on healthcare utilization. As such, a need exists to continue to investigate strategies to decrease this burden.

INCREASED PREVALENCE OF SLEEP DISORDERED BREATHING AND OBSTRUCTIVE SLEEP APNEA IN NON-SYNDROMIC CLEFT PATIENTS

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OBJECTIVE: The prevalence of sleep disordered breathing (SDB) and obstructive sleep apnea (OSA) in the cleft population has been reported to be increased, but has not been fully elucidated by polysomnography (PSG). The purpose of this study is to evaluate the prevalence of SDB/OSA in the non-syndromic cleft population.

DESIGN: Retrospective chart review from a tertiary pediatric hospital's craniofacial clinic including non-syndromic patients who had undergone cleft repair. Symptoms of SDB/OSA and results of PSG studies were reviewed. Patients: 589 patients met the inclusion criteria.

MAIN OUTCOME MEASURES: Medical records were reviewed for demographic data, SDB symptoms, surgical procedures, and PSG results.

RESULTS: Of the 589 patients, 220 (37%) had symptoms of SDB and 42 (7%) had PSG-diagnosed OSA. 48 patients underwent one or more PSG, with 51 of the 78 studies (65%) positive for OSA. The average age for identification of SDB was 4.8 years, and for obtaining the first PSG was 7.4 years. Surgical procedures to address SDB/OSA were undertaken in 106 patients (48%), with tonsillectomy and adenoidectomy the most common (47%). 48 patients (8.1%) also carried a diagnosis of Pierre Robin Sequence (PRS). In this subpopulation, 35 patients (71%) had symptoms of SDB/OSA.

CONCLUSION: There is an increased prevalence of SDB/OSA in the cleft population, with an even greater prevalence in PRS patients. Definitive diagnosis of OSA by PSG is under utilized. Surgical management of SDB/OSA should be followed by PSG to demonstrate either resolution/continuation of symptoms to ensure appropriate further management.

THE HEALTHCARE BENEFITS OF A NASOPHARYNGEAL AIRWAY IN THE MANAGEMENT IN CHILDREN WITH SYNDROMIC CRANIOSYNOSTOSIS

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OBJECTIVES: To evaluate the improvement in quality of life, using the Glasgow Children's Benefit Index (GCBI), of children with syndromic craniosynostosis who have had a nasal prong (nasopharyngeal airway/NPA) inserted as part of their airway management. We also sought to assess the improvement in sleep study parameters before/after NPA insertion and the correlation with GCBI findings.

METHODS: A retrospective data analysis and postal questionnaire was carried out. All parents were sent a letter explaining the study and a copy of the Glasgow Children's Benefit Inventory (GCBI). A pre-paid envelope was included and after a wait of 6 weeks, a further questionnaire was sent to non-responders. Pre and post NPA insertion sleep study's were obtained from our sleep lab.

RESULTS: 22 patients were included in the study (M= 8;F= 16: Age 5.8 ± 5)The cohort of patients were from 5 syndromic groups; Crouzons (12), Aperts (7), Pfeiffer (2), Prader-Willi (1). A 82% (n= 18) response rate was obtained. Statically significant improvement was noted in 3 of the 4 domains of the GCBI (physical health, vitality, and learning). No significant improvement was noted in the emotional component. There was significant improvement in the sleep study parameters however no correlation was found between this and GCBI findings.

CONCLUSION: NPA is a well tolerated and useful adjunct for airway management in children with syndromic craniosynostosis. It significantly improves quality of life in these group of patients as shown by the GCBI findings. Although sleep study parameters improved post-NPA insertion, these did not corellate with GCBI findings.

WHO NEEDS ADMISSION AMONG INFANTS WITH ACUTE OTITIS MEDIA?

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OBJECTIVES: To identify specific clinical indicators that can clarify the need or not for an invasive medical work-up and / or hospitalization of infants with acute otitis media (AOM).

METHODS: Retrospective chart review of infants with AOM admitted over 20 year-period. A random sample of infants presenting to the emergency room with AOM over the same period was included. Infants younger than 2 months belonged to group 1, those older to group 2. Demographic data, relevant history, physical examination, laboratory studies and treatment offered were reviewed.

RESULTS: Twenty-nine admitted infants were included, (13 in group1, 16 in group2). A sample of 55 outpatients was studied, two belonged to group 1. Compared to group2 inpatients, admitted group1 were less frequently febrile (15.4% vs. 56.2%, $p=0.02$), had benign mean white cell count ($p=0.014$) but had more otorrhea (53.8% vs. 31.2%, $p=0.04$). These grew gram negative organisms, mainly pseudomonas aeruginosa; those in group2 grew the usual AOM organisms. Blood cultures and lumbar punctures were negative. Group1 patients were more likely to be admitted (44.8% of total inpatients vs. 3.6% of total outpatients, $p < 0.001$). Admitted group2 patients had more otorrhea than non-admitted ones (31.2% vs. 3.7%, $p=0.019$) or a complication (43.1% vs. 0%, $p < 0.001$). There was no standard antibiotic regimen used in either group.

CONCLUSION: Infants younger than 2 months most often need admission for IV antibiotics. Older infants are more likely to need admission if they have otorrhea, high white cell count or a complication. Sepsis workup may not be a necessity.

POST-OPERATIVE COMPLICATIONS OF TONSILLECTOMY AND ADENOIDECTOMY IN VERY YOUNG CHILDREN

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OBJECTIVE: The current standard of care is to admit all children under the age of three undergoing tonsillectomy and adenoidectomy. As health care reform increasingly asks for evidence-based analysis for justifying medical decisions and expenditures there is increased interest in revisiting this current standard of care. Our study was undertaken to determine the current incidence of post-operative complications associated with tonsillectomy and adenoidectomy in very young children.

METHODS: A retrospective chart review of 105 cases of patients under the age of 3 years of age undergoing tonsillectomy and adenoidectomy, at a tertiary care hospital, was performed. Charts were reviewed for patient age, indications for surgery, unexpected peri-operative interventions and postoperative complications. Of the 105 cases, 20 patients were excluded due to inadequate postoperative follow-up records or the presence of severe underlying medical conditions.

RESULTS: Of the eligible 85 patient charts reviewed, 97.7% (82) underwent T&A for adenotonsillar hypertrophy and 2.4% (2) for chronic / recurrent tonsillitis. Among all cases reviewed the most common complication was dehydration (4.7%). Other complications included reactive airway disease (1.2%) and postoperative fever (1.2%).

CONCLUSION: In our retrospective analysis of patients less than 3 years old post-operative complications were generally mild and relegated most commonly to dehydration. There were no patients who experienced severe airway complications and only one patient required additional medical intervention in the recovery room. This data suggests that we may consider reevaluating the need for mandatory admission for all children less than three years of age undergoing tonsillectomy and adenoidectomy.

CURRENT TRENDS IN PARTIAL ADENOIDECTOMY

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OBJECTIVES: Previous studies have demonstrated that approximately 37 – 70% of patients that develop post-adenoidectomy velopharyngeal insufficiency (VPI) have no detectable palatal abnormalities preoperatively. The efficacy of partial adenoidectomy (PA) in patients with palatal abnormalities has been investigated, but its role in patients with normal-appearing palates has not. We sought to evaluate Pediatric Otolaryngologists' experiences and reported outcomes with PA, particularly in patients without preoperative risk factors for VPI.

METHODS: A survey was created using Zoomerang © and distributed to ASPO members after ASPO research committee approval. Data analysis was performed using Microsoft Excel ©

RESULTS: Out of 102 respondents, 12% perform PA on at least 95% of their adenoidectomy patients, while 74% perform PA on 10% or less. There was no significant difference ($p= 0.129$) in the mean proportion of patients undergoing total ($0.135\% + /-0.455$) and partial ($0.300\% + /-1.304$) adenoidectomy that developed VPI. There was also no significant difference ($p= 0.076$) in the mean proportion of patients undergoing total ($1.42\% + /-5.40$) and partial ($4.42\% + /-15.58$) adenoidectomy that required revision within the past year. 97% of respondents felt that PA reduces VPI in patients with preoperative risk factors, but only 46% felt that it has a similar effect on those without risk factors.

CONCLUSIONS: The use of PA on patients without risk factors for VPI varies greatly among Pediatric Otolaryngologists, as do opinions on its efficacy in these patients. The risk of VPI and the need for revision adenoidectomy in these patients appear to be similar between PA and TA, but further study is needed.

EFFECT OF EXTENDED MICROSCOPIC HEMOSTASIS ON HEMORRHAGE AFTER BIPOLAR TONSILLECTOMY

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OBJECTIVE: Post-tonsillectomy hemorrhage continues to be a potentially life-threatening complication despite the availability of a wide range of techniques. The rate of hemorrhage after bipolar cautery tonsillectomy ranges from 3.4% to 6.8%. Extended hemostasis involves cauterization of tonsil fossae blood vessels under microscopic view after removal of tonsils in addition to the routine cauterization during dissection. The effect of extended cauterization of blood vessels on post-tonsillectomy bleeding has not been investigated. The aim of the present study is to evaluate the effect of extended microscopic hemostasis on the rate of hemorrhage after bipolar tonsillectomy.

MATERIAL AND METHODS: The medical records of children underwent microscopic bipolar tonsillectomy between June 2008 and September 2009 were retrospectively reviewed to obtain information on relevant history and physical examination, diagnosis, characteristics of post-operative hemorrhage.

RESULTS: 320 children (163 male, 157 female) aged between 1 and 18 years (6+ 3.5 years) underwent tonsillectomy. Four of the 320 patients (1.25%) developed post-tonsillectomy hemorrhage. No primary post-tonsillectomy hemorrhage occurred. The hemorrhage was seen 5 to 13 days after the surgery. One patient had bleeding on postoperative day 13 after a trauma to neck. Of the four patients with post-tonsillectomy bleeding, one had blood clot with no active bleeding and three exhibited active bleeding after removal of blood clot. Three (age range: 6 to 13 years) of the 320 patients (0.9%) needed intervention to control active bleeding.

CONCLUSION: Extended microscopic hemostasis achieved by cauterization of tonsil fossae blood vessels after bipolar cautery tonsillectomy reduced bleeding rate compared to previous studies.

**PEDIATRIC OROPHARYNGEAL BURNS: A TEN-YEAR REVIEW
OF PATIENT CHARACTERISTICS, ETIOLOGIES,
TREATMENT METHODS AND OUTCOMES**

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OBJECTIVE: To summarize pediatric oropharyngeal burn(OP) injuries in order to develop an educational pamphlet to aid prevention.

DESIGN: Retrospective study of seventy-five patients with oropharyngeal burns treated at a regional children's hospital from January 1999 to January 2009.

METHODS: Data collected included demographics, etiology of burn, site of injury, medical and surgical treatments, need for endoscopy, duration of hospitalization, and complications.

RESULTS: Seventy-five patients were treated with 50 being males(66%). Mean age for the group was 4.28 years(median 2.67 years). The top five most common causes were chemical (25.3%), electrical(13.3%), hot liquids(13.3%), hair products(12%), and food(10.7%). Main sites of injury included lips(56%), tongue(48%), buccal mucosa(77.3%), palatal burns(22.7%). One third required PICU/Burn unit admission, 1/3 were admitted to floor, and 1/3 were discharged home from the Emergency Department(ED). Average duration of hospitalization was 5 days. Of those admitted, 30% received antibiotics and only 8 % received systemic steroids. Patients were made NPO on the first day of admission in 33.3% of patients and allowed to resume normal diet after surgical consultation. Only 9/75(12%)patients required intubation. Otolaryngology consultation was obtained in 10.7% of cases. Only 18% of all patients requiring surgical intervention with debridement being most common(> 60%). In this group, 20% received esophagogastroduodenoscopies due to ingestion of alkali substance. Over 94% of patients did not have complications.

CONCLUSION: Our review demonstrated that the most common cause of presentation to our ED for OP burns was detergent ingestion. By identifying the most common etiologies, educational handouts can be made for distribution to parents.

THE STATUS OF OTOLARYNGOLOGY EDUCATION IN FAMILY MEDICINE AND COMMUNICATION SCIENCES TRAINING

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OBJECTIVE: To characterize the methods used by training program directors to teach otolaryngology-related material in other disciplines, and determine the comfort level of graduate trainees to assess specific hearing disorders.

METHODS: A total of 682 online surveys were sent to program directors in the fields of family medicine, audiology and speech pathology. Participants were asked to delineate opportunities for, and methods of teaching otolaryngology-related material, and the degree to which otolaryngologists were involved in their curricula. They were also asked to rate their graduate trainees' ability to manage three clinical scenarios involving pediatric hearing impairment.

RESULTS: Survey response rates were 20% for family medicine programs and 40% for each communication science discipline. Virtually all family medicine (99%) and audiology directors (100%) indicated their programs dedicated time to teaching otolaryngology-related material; speech pathology programs do so much less frequently (66%). Otolaryngologists perform such teaching in 95% of audiology programs but in only 67% and 42% of family medicine and speech pathology programs, respectively. Directors rated the competence of their trainees to manage specific hearing disorders at an average of 3.4 on a 4 point scale for audiology and 2.6 for both family medicine and speech pathology graduates.

CONCLUSIONS: Audiology programs uniformly include otolaryngology interaction, family medicine programs appear committed to teaching otolaryngology-related material, and speech pathology programs have limited otolaryngology exposure. All three disciplines desire greater educational involvement by otolaryngologists, and all would benefit from a more formal evaluation of their trainees' skills relative to the management of pediatric ORL problems.

OTOLARYNGOLOGICAL MANIFESTATIONS OF NOONAN SYNDROME

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INTRODUCTION: Noonan syndrome (NS) is a rare autosomal dominant disorder that has associated anomalies including short stature, congenital heart defect, developmental delay, and characteristic facies, among other abnormalities. Articulation deficiency and language delay due to hearing loss are present. Otitis media has been shown to be more frequent in these children. To our knowledge, there have been no studies published in literature that specifically addressed the otolaryngological manifestations of NS.

METHODS: Retrospective chart review of pediatric patients diagnosed with NS from 1979-2009.

RESULTS: Nineteen patients were identified, ages 1-20 years, at time of study. Average age at the time of the chart review was 10.4yrs. There were equal number of males and females (10M, 9F). 8/19 (42%) received single specialty care at our tertiary care hospital. It is unknown if these subset of patients had otolaryngological care locally. 10/19 patients had history of feeding difficulty. 8/19 patients had speech delay requiring speech therapy. 10/19 (52%) patients received care from an otolaryngologist. 7/10 had pressure equalization tube placement (PET), 3/10 had adenoidectomy + /-tonsillectomy, and 1/10 had endoscopic sinus surgery. Of the subset of 11 patients who received multidisciplinary care at our institution, 10 of 11 (91%) required care of an otolaryngologist and 63% (7 of 11) required PET placement.

CONCLUSIONS: Although this study is limited due to small subset of patients, results suggest early otolaryngology involvement must be considered in care of children with NS, as many often have evidence for eustachian tube dysfunction and speech delay.

**STREPTOCOCCUS PYOGENES BIOFILMS ARE DETECTED
WITHIN TONSILLAR CRYPTS OF PEDIATRIC PATIENTS
WITH OBSTRUCTIVE SLEEP APNEA**

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OBJECTIVE: To examine tonsillar tissue for presence of *Streptococcus pyogenes* and organization into biofilm communities as a virulence factor

DESIGN: Ongoing, blinded molecular and histologic study of pediatric patients undergoing tonsillectomy
Methods: Tonsils from a pediatric population presenting for tonsillectomy due to obstructive sleep apnea or recurrent streptococcal infections were studied.

RESULTS: Immunohistochemical analysis using anti-*S. pyogenes* antibodies was positive in 5/10 patients who underwent tonsillectomy for obstructive sleep apnea. None of these patients were diagnosed with *S. pyogenes* infection in the prior 6 months. Tonsils of 3/7 patients with recurrent streptococcal infections were found to be positive for *S. pyogenes* by immunohistochemistry. Fluorescent microscopy with anti-*S. pyogenes* and anti-keratin 8 or anti-keratin 18 antibodies revealed *S. pyogenes* was localized to the tonsillar crypts. Similar analysis excluded *S. pyogenes* from lymphoid follicles. Scanning electron microscopy identified 3-dimensional communities of cocci similar in size and morphology to *S. pyogenes*. These dense communities closely resemble *S. pyogenes* biofilms we have seen in animal models of infection. Real-time reverse transcriptase-PCR of total RNA isolated from infected tonsils identified mRNA transcripts of *S. pyogenes* virulence factors.

CONCLUSION: Our ongoing study provides new experimental evidence that *S. pyogenes* may reside within the tonsils of a large percentage of pediatric patients with hypertrophied tonsils. We have localized these streptococcal communities to the tonsillar crypts, where they appear to have organized into a bacterial biofilm. These findings may explain some of the pathophysiology of tonsillar hypertrophy and influence future treatment options in children with obstructive sleep apnea.

TRACHEOSTOMY DEPENDENCY AND AIRWAY ANOMALIES IN ARTHROGRYPOSIS MULTIPLEX CONGENITA (AMC)

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INTRODUCTION: Arthrogyposis Multiplex Congenita(AMC) is a rare disorder characterized by multiple limb contractures of the upper and lower extremities with or without central nervous system involvement. Otolaryngologic manifestations of AMC have been described in the literature as early as 1976 and are most commonly linked to the neurogenic subtype. The role of the Otolaryngologist usually includes management of the respiratory difficulties or complications of aspiration pneumonia necessitating tracheostomy.

METHODS: Retrospective study of all children diagnosed with AMC at a tertiary children's hospital over the past twenty years to summarize airway anomalies in these infants.

RESULTS: Twelve children with AMC underwent tracheostomy. Tracheostomy was most often performed in the first six months of life and often in conjunction with a gastrostomy tube for feeding difficulties. The most common anomaly noted on endoscopic evaluation of airway in these patients was subglottic stenosis. The need for prolonged mechanical ventilation assistance was another common finding in this specific cohort, and only one child has been successfully decannulated thus far.

CONCLUSION: In patients with the neurogenic subtype of AMC, as manifested by respiratory difficulties such as airway compromise, severe dysphagia or aspiration, the role of the Otolaryngologist is essential in the management of the complex aerodigestive issues of these patients. In addition to tracheostomy, the placement of a gastrostomy tube appears essential in the long term management of these patients as well. As with any other patient with airway difficulties necessitating tracheostomy, these patients should be followed for interval improvement in symptoms and to assess for candidacy for decannulation.

A STUDY OF OTOLARYNGOLOGIC DISEASE AND BARRIERS TO CARE IN RURAL NORTHERN LAOS

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BACKGROUND: International medical missions should provide excellent medical care, prepare to manage complications, and augment local provider training. A key portion of a successful mission is to understand the disease pathology in the region and to recognize challenges to providing care.

PURPOSE: 1) To identify otolaryngology problems present in the northern provinces of the Lao People's Democratic Republic (PDR). 2) To identify barriers to care for this population. 3) To develop a strategy for further otolaryngology care in this region.

METHODS: Data were gathered from patients presenting to a mobile otolaryngology clinic in rural Lao PDR. Demographics and diagnoses were collected from clinic records. Information on barriers to care was collected from patients, local practitioners and non-governmental organizations.

RESULTS: A total of 1,583 pediatric and adult patients presented for evaluation. Of the 349 patients examined by a U.S.-trained otolaryngologist, 40% had chronic suppurative otitis media and 11% had other evidence of chronic eustachian tube dysfunction. 28% had hearing loss and 1.7% had acute otitis media (AOM). Identified barriers to care included transportation, financial resources, cultural and spiritual beliefs, poor public health infrastructure, poor patient education, and insufficient otolaryngologist training.

CONCLUSIONS: The majority of otolaryngologic disease seen in rural northern Laos was otologic. Early treatment of AOM and otitis media with effusion in children could prevent progression to the advanced ear disease that was observed. In addition to performing surgery, humanitarian organizations should work to improve public health services and education as well as invest in local physician training.

CURRENT PRACTICE PATTERNS IN TONSILLECTOMY

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OBJECTIVE: To describe the tonsillectomy techniques and management being used by practicing Otolaryngologists.

DESIGN: A 18 question survey was mailed to 798 board certified Otolaryngologists. Data was collected throughout the Fall of 2009.

SETTING: Tertiary referral center.

PARTICIPANTS: 380 Otolaryngologists responded to the survey and were included in the data analysis (47.8% response rate). 177 reported that they had completed a fellowship in Pediatric Otolaryngology.

MAIN OUTCOME MEASURES: Data regarding technique, instruments used, pre-operative evaluation, intra-operative medications, and post-operative care were collected from the surveys.

RESULTS: 82.1% of respondents perform subcapsular dissection. Most Otolaryngologists trained with either monopolar cautery (32.1%) or cold steel (24.2%). Currently, the Coblator is the most common instrument used for tonsillectomy (30%), followed by monopolar cautery (27.9%). The majority do not use intra-operative local anesthesia, but most do give a dose of Decadron (61%). Amoxicillin and Tylenol with Codeine are the most commonly prescribed medications following surgery. Approximately 2/3 recommend a soft diet.

CONCLUSIONS: The Coblator is the most commonly used instrument for tonsillectomy at this time. Most cite faster dissection, less bleeding, and/or less pain as the reason for its use. Intra-operative steroids and post-operative antibiotics continue to be prescribed by most Otolaryngologists. There were no significant differences in practice patterns between Pediatric and General Otolaryngologists other than the increased number of tonsillectomies performed by those who were fellowship trained.

COMPARISON OF TWO MINIMALLY INVASIVE TECHNIQUES FOR TREATMENT OF CHRONIC RHINOSINUSITIS IN YOUNG CHILDREN

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INTRODUCTION: Chronic rhinosinusitis (CRS) is a common diagnosis in young children. Maxillary sinus aspiration & irrigation with adenoidectomy (MSI) followed by an extended course of oral antibiotics has been shown to be an alternative to functional endoscopic sinus surgery. However, since MSI is not performed under direct visualization, it has inherent risk. This study analyzes the techniques of MSI and endoscopically guided middle meatus cultures & antral biopsy with adenoidectomy (EGC) in the 1) diagnosis of bacterial infection by culture, 2) time to resolution using double antibiotic therapy, and 3) associated morbidity of the two procedures.

METHODS: Retrospective review of 100 children with CRS.

RESULTS: Patients presented with a history of cough, nasal discharge, and congestion. The mean age was 3.7yrs. Symptom duration prior to treatment was 7.7mos in the 70 patients who underwent MSI and 9.2mos in the 30 patients who underwent EGC. MSI identified bacteria in 76% of patients compared to 78% in EGC patients ($p= 0.21$). The MSI group underwent antibiotic treatment for 8.6wks and achieved symptom resolution in 8.6wks compared to 5.6wks and 4.5wks respectively in the EGC group ($p= 0.06$ and 0.03). One patient who underwent MSI experienced epistaxis requiring nasal packing, and two patients had pseudoproptosis following irrigation. No complications were reported in the EGC group.

CONCLUSIONS: EGC is an effective treatment for young children with CRS. EGC and MSI are equally effective in obtaining diagnostic cultures. EGC decreases time to symptom resolution, and it lowers the risk of complication when compared to MSI.

ENDOSCOPIC ENDONASAL APPROACH FOR NASAL GLIOMAS

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Nasal Gliomas (NGs) are rare tumors of the midline frontonasal space arising from a miss closure of the anterior neuropore between the third day and the eighth week of embryonic development. These tumors were initially treated via a frontal craniotomy in order to control an uncertain intracranial extension. Recent advances in preoperative mapping and operative techniques in endoscopic endonasal surgery allow proposing an early endoscopic removal. The aim of the study is to evaluate this technique. We report a multicentric retrospective study of NGs diagnosed between 1992 and 2008 in two tertiary referral centers of Pediatric Otolaryngology. We reviewed all the clinical data, preoperative imaging, postoperative care and follow-up. Eighteen patients were identified, in which five were excluded of the study because of a unique extranasal component resected through an external rhinoplasty approach. Thirteen patients were included; in all cases but one (12) the NG extends only intranasally, in the remaining case NG extends extranasally too. All of the patients benefit from preoperative imaging with craniofacial MRI and CT-scan. All procedures were led with the computer assisted navigation system DIGIPOINTEUR (Collin-ORL, Bagneux, France). In all cases but three the resection was followed by a skull base plasty because of the bony defect or cerebrospinal leakage. The patients were discharged at home after a median of 1.5 days. No recurrence was observed with a median follow-up of 46 months. Early endonasal removal appears to be a safe and efficient procedure that presents a lower morbidity than transfacial or frontal craniotomy approaches.

CLINICAL OUTCOMES IN SINUSITIS SYMPTOMS AND PULMONARY FUNCTION IN CYSTIC FIBROSIS PATIENTS AFTER ENDOSCOPIC SINUS SURGERY

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OBJECTIVE: To retrospectively review changes in sinusitis symptoms and pulmonary function following endoscopic sinus surgery in patients with cystic fibrosis (CF).

METHODS: The charts of all patients with CF who underwent endoscopic sinus surgery from August 1, 2006 to August 31, 2009 at a tertiary pediatric hospital were retrospectively reviewed. Pulmonary function tests (PFTs) as well as respiratory and sinus symptoms were recorded from both prior to and following surgery.

RESULTS: Data were collected from 105 surgeries on 94 patients ages 3-58 years. Bronchoscopy with bronchoalveolar lavage (BAL) accompanied 79% of surgeries. PFTs were measured 3-255 days after surgery with an average of 48 days. There was no significant difference between pre- and post-operative PFTs for the sample as a whole. There was, however, a notable decrease in symptoms following surgery. Congestion dropped 27%, drainage 10%, cough 9%, sputum production 11%, and respiratory symptoms 3%. The subset of patients whose PFTs were measured within one month post-operatively did show a significant improvement in FEV1, although the increase in FVC was not significant. Patients whose PFTs were measured further out from surgery showed either no change or a significant decrease in FVC and FEV1. There was no significant change in PFTs for patients receiving BAL compared to those who did not.

CONCLUSIONS: Although symptomatic improvement has been exhibited, no study has shown that endoscopic sinus surgery improves post-operative PFTs in CF patients. A controlled, prospective trial is needed to define the relationship between upper and lower airway disease in these patients.

SKULL BASE SURGERY FOR PAEDIATRIC PARAMENINGEAL SARCOMAS

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INTRODUCTION: Parameningeal sarcomas are classically treated by chemotherapy and radiotherapy. Surgery is rarely indicated due to their close relationship to the skull base.

PURPOSE: To examine the place of surgery in the management of pediatric parameningeal sarcomas.

METHODS: retrospective study concerning 64 children that presented with parameningeal sarcomas between January 2000 and December 2007. Surgery was performed in 8 out of 29 children with primary sarcoma (27.5%) and 7 out of 35 radio induced sarcoma (20%). We reviewed the clinical data of these 15 patients (6 boys and 9 girls)

RESULTS: Age ranged from 20 months to 19 years (median 6 years 8 months), median follow-up 43 months (16-138). Tumor locations were infra-temporal fossa (9 patients), nasopharynx (2), ethmoid (1), maxillary bone (1), middle ear (1), and sphenoid (1). Three children had intracranial extension, 3 had metastasis and one had both. Surgery required 5 node dissections, 6 free flaps and one VII-XII anastomosis. Five children (1 primary sarcoma, 4 secondary sarcomas) experienced relapse. Nine children presented sequelae: 4 had facial palsy, one insipid diabetes, one trigeminal anaesthesia, one growth hormone deficiency, and one severe facial defect. To date, eleven children are relapse-free and 4 died.

CONCLUSION: Skull base surgery should be considered as a possible therapeutic option in parameningeal paediatric sarcomas, especially in children for which avoiding radiotherapy is important. When possible, better results are obtained for primary sarcomas than for secondary, nevertheless, it may be the only option for radio-induced cancers where radiotherapy is contra-indicated.

PYRIFORM APERTURE STENOSIS: CLINICAL REVIEW AND MANAGEMENT CONSIDERATIONS

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OBJECTIVE: To review clinical, radiologic, and genetic findings and management of neonates with pyriform aperture stenosis (PAS).

STUDY DESIGN: Retrospective review of neonates diagnosed with PAS from September 2000- to September 2009

SETTING: Tertiary care children's hospital

PATIENTS: Twenty four patients evaluated for respiratory distress with clinical and radiologic evidence of PAS.

INTERVENTIONS: Patients were closely monitored for oxygen desaturations, weight loss, bradycardia and cyanotic episodes. Genetics consultation and magnetic resonance imaging (MRI) of the brain were obtained in patients with presence of central incisor. A regimen of nasal steroids with a short course of nasal decongestants was started in all patients. Patients with persistent respiratory distress underwent surgical intervention.

RESULTS: Twenty four patients were identified with PAS. A central incisor was identified in 16 patients (66%). Six patients responded well with conservative management with nasal steroids. Two patients died due to severe congenital anomalies before any intervention was performed. Sixteen patients underwent surgical intervention. One patient was treated with nasal dilation with stents. A sublabial drill out approach was performed in 11 patients. Tracheotomy was performed in 4 patients with severe neurological deficits and seizure disorders who were considered poor candidates for a sublabial approach.

CONCLUSIONS: PAS is a rare condition, usually presenting with respiratory distress in the first days of life. PAS can be associated with neurologic, endocrine, and genetic abnormalities. A multidisciplinary approach to management is recommended. Surgical management should be tailored to the severity of the obstruction and the patient's comorbidities.

TRANSNASAL ODONTOID RESECTION IN CHILDREN WITH CHIARI I MALFORMATION AND VENTRAL BRAINSTEM COMPRESSION

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INTRODUCTION: In rare cases, children with Chiari I Malformations (CMI) suffer from irreducible ventral brain stem compression resulting in cranial neuropathies or brain stem dysfunction. In these circumstances, 360-degree decompression supplemented by posterior stabilization and fusion is required. In this report, we present the first experience using an endoscopic transnasal corridor to accomplish ventral decompression in children with CMI complicated by ventral brainstem compression.

METHODS: Two children presented with a combination of occipital headaches, swallowing dysfunction, myelopathy, and/or progressive scoliosis. Imaging studies demonstrated CMI with severely retroflexed odontoid processes and ventral brainstem compression. Both patients underwent endoscopic transnasal adenoidectomy and ventral decompression, followed by posterior decompression, expansive duraplasty, and occipital-cervical fusion.

RESULTS: In both patients, the endoscopic transnasal approach provided excellent ventral access for brainstem decompression. When compared with the transoral approach, endoscopic transnasal access presents four potential advantages: (1) excellent prevertebral exposure in patients with small oral cavities, (2) a surgical corridor located above the hard palate to decompress rostral pathology more easily, (3) avoidance of the oral trauma and edema that follows oral retractor placement, and (4) avoidance of splitting the soft or hard palate in patients with oral-palatal dysfunction from ventral brainstem compression.

CONCLUSIONS: The endoscopic transnasal approach does not traumatize the oral cavity and offers a more superior region of exposure when compared with the standard transoral approach. As this technique gains favor in the neurosurgical community, pediatric otolaryngologists may wish to familiarize themselves with this approach to manage children with pathology requiring ventral brainstem decompression.

**EXPRESSION OF FIBRONECTIN SPLICED VARIANTS,
INTERLEUKIN-1 β , AND COLLAGENS IN VOCAL FOLD MUCOSA
DURING SUBGLOTTIC INJURY IN RABBITS**

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BACKGROUND: Fibronectin (FN), one of the main components of connective tissue matrix is comprised of a family of about 20 isoforms generated by alternative gene splicing. Our group previously reported that the age-dependent activation of FN-EDA splice variant may play a fundamental role in differentiating fetal wound regeneration from postnatal wound scar formation during the early events of airway mucosal wound healing.

PURPOSE: To delineate molecular activities of the variant-inclusion FN transcripts, inflammatory and scarring-associated molecules in vocal fold mucosa during early events of laser-induced airway injury.

METHOD: Adult rabbits underwent cricothyroidotomy followed by CO₂ laser was used to induce subglottic injury, which also extended into the adjacent vocal folds. Vocal fold mucosal tissues were harvested at 12, 24, 48, and 72hrs post-injury and mRNA transcripts were assessed with gene-specific primers for total FN and alternatively spliced variants EDA and V, collagen components (Col1a1, Col1a2, Col3a1) and interleukin-1 beta (IL-1 β) using real-time qPCR.

RESULTS: Dose-dependent induction of EDA was detected at 48 and 72hrs after 5-watts injury and at 72hrs after 2-watts injury. At 72 hrs, Col1a1 and Col1a2 were up-regulated whereas the Col3a1c gene was selectively suppressed. Inflammatory cytokine IL-1 β was significantly induced at 24hrs and remained elevated at 72hrs in 5-watts injuries versus 2-watts injuries.

CONCLUSION: Dose-dependent inclusion of the FN-EDA domain correlates with induction of IL-1 β and increased collagen I/III transcripts, suggesting that the FN spliced variant EDA may be a key component leading to vocal fold scarring.

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**UTILIZATION OF LIPID LADEN MACROPHAGE INDEX IN
EVALUATION OF AERODIGESTIVE DISORDERS:
FACT VERSUS FICTION**

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OBJECTIVE: Currently there is no gold standard for laboratory evaluation of aspiration. The Lipid Laden Macrophage Index (LLMI) has been described as a marker to determine the degree of airway inflammatory processes. There is, however, a wide range of variability in the reported cases. The goal of this project is to review the LLMI levels in a large series of patients with a wide range of pulmonary disease to develop a better understanding of the range of LLMI in these patient populations.

DESIGN: A retrospective analysis of 490 patients who underwent bronchoscopy with bronchoalveolar lavage from 4/12/2006 to 7/14/2009 and had specimens sent for LLMI at a tertiary care medical center.

METHODS: Medical charts were reviewed for documented aspiration, major diagnoses, indication/s for bronchoscopy, surgeon performing the washings, and the site of lavage. These qualitative and quantitative variables were compared to the LLMI obtained from the procedure.

RESULTS: The cohort of patients examined ranged from 4 days to 28 years of age, and the average age at bronchoscopy was 5.4 years. Approximately 43% were female and 57 % were male. The highest mean LLMI was in children who were immunocompromised with a mean LLMI of 85.48. The second highest LLMI cohort was those with recurrent pneumonia, who had a mean LLMI of 65.01, followed by those patients with aspiration, who had a mean LLMI of 50.75. Children with chronic cough had the lowest average LLMI of 48.85. There was no significant variation between bronchoscopists with respect to LLMI.

CONCLUSION: In our retrospective review of 490 patients, variability was seen between the range of LLMI and the primary diagnosis. However, there is no correlation between the level of LLMI and specific disease process.

PROPRANOLOL VERSUS CONTEMPORARY SURGICAL MANAGEMENT TECHNIQUES FOR SUBGLOTTIC HEMANGIOMAS

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PURPOSE: To evaluate our experience with airway hemangiomas and to compare the outcomes of patients who have undergone surgical treatment to those undergoing treatment with propranolol.

DESIGN: A retrospective review of all patients undergoing primary treatment of airway hemangiomas over the past 6 years.

RESULTS: Twenty-four patients were treated for airway hemangiomas. Primary treatment consisted of laryngotracheoplasty with excision of lesion and thyroid alar graft (LTP) in 9 patients, laryngofissure with excision of lesion in 5 patients, laser treatment in 6 patients, systemic steroids in 1 patient and propranolol in 3 patients. The average number of procedures (mostly microlaryngoscopy/bronchoscopy) was LTP: 7.2, laryngofissure: 11.2, laser: 4.8, steroids: 5.0, propranolol: 4.7. The percent of patients having greater than grade 2 subglottic stenosis at presentation was LTP: 67%, laryngofissure: 100%, laser: 60%, steroids: 100%, propranolol: 100%. Prolonged systemic steroids were given to 33.3% of LTP patients, 40.0% laryngofissure, 83.3% laser and 33.3% propranolol. Laser treatments were initially used in 22.2% of LTP patients, 0% laryngofissure and 66.7% propranolol. The average length of treatment until hemangioma resolution was LTP: 4.3 months, laryngofissure: 13.0 months, laser: 3.6 months and steroids: 6.0 months. Currently our 3 propranolol patients are still undergoing treatment, but have been on propranolol for an average of 4 months with symptom resolution occurring at an average of 2 months. Patient satisfaction, complications and costs were also evaluated.

CONCLUSION: Optimal treatment of infantile airway hemangiomas remains controversial. Propranolol appears to be an effective treatment but may require a prolonged treatment time.

SUBGLOTTIC STENOSIS AND TRACHEOTOMY FOLLOWING INTUBATION FOR BRONCHIOLITIS

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OBJECTIVE: To determine the incidence of subglottic stenosis and tracheotomy in children requiring intubation for bronchiolitis. To evaluate modifiable risk factors in order to reduce the incidence of subglottic complications.

METHODS: Retrospective review of patients requiring endotracheal intubation for bronchiolitis from 2002 to 2008 at a pediatric hospital.

RESULTS: 168 patients were included in the study. More patients had subglottic pathology than in previous literature. 13/168 patients (7.74%) developed subglottic edema or stenosis (SGS). 7/168 (4.17%) required tracheotomy. Six patients with subglottic pathology were managed conservatively or endoscopically. There was no significant difference between the patients who developed SGS and those who did not based upon sex, age, prematurity, past medical or surgical history, RSV sero-status, or steroid and anti-reflux administration. Patients who were intubated a single time were significantly less likely to develop SGS (OR= 0.12; CI= 0.04-0.43), while those who were intubated greater than two times were significantly more likely to develop SGS (OR= 11.04; CI= 2.63-46.26). Patients with concurrent airway infections were also significantly more likely to develop SGS (OR= 9.88; CI= 1.25-77.88) as were patients intubated with a tube smaller than age-based recommended size (OR= 8.17; CI= 2.06-32.33).

CONCLUSION: Patients intubated for bronchiolitis developed a higher incidence of subglottic complications than reported in previous literature. Airway complications ranged from wheeze to severe SGS. Interventions included direct laryngoscopy and bronchoscopy, dilation, tracheotomy, and laryngotracheal reconstruction. Several modifiable risk factors were identified including concurrent airway infections, intubation more than twice, and smaller endotracheal tube. Measures to reduce these factors may improve outcomes.

ANALYZING THE RELATIONSHIP OF EOSINOPHILIC ESOPHAGITIS AND TRACHEOBRONCHIAL DISEASE IN A PEDIATRIC POPULATION

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BACKGROUND: Eosinophilic esophagitis (EE) is typically characterized by esophageal stricture, food impaction, or dysphagia. It is known to wax and wane depending on the treatment regimen. There has been an emerging association between pediatric EE and airway disease; however, no quantitative data is available due to scarcity of cases. The purpose of this study was to further examine the relationship between EE and airway disease and to determine over time if severity of EE temporally correlated with airway disease.

METHODS: A detailed chart review of 12 patients diagnosed with EE who had an airway lesion were included in this study. EE was diagnosed by esophageal biopsy with greater than 20 eosinophils/HPF. Multiple biopsies were taken from each patient; results were correlated to the presence or absence of airway disease as determined by concurrent findings on direct laryngoscopy and bronchoscopy. 78 esophageal biopsies were examined to determine this association.

RESULTS: 69% of positive biopsies for EE correlated with airway disease. This was in contrast to only 43% of negative biopsies that were associated with objective airway abnormalities. The odds ratio of airway disease given a positive biopsy for EE was 2.86 (95% CI: 1.11-7.38).

CONCLUSIONS: This study supports the association between exacerbation of EE and more severe airway disease and quantifies this correlation. At the time of biopsy-proven EE, patients were more likely to have airway disease than patients with negative biopsies. This data suggests that aggressive management of EE may alleviate airway disease in these patients.

EVOLVING TREATMENTS IN THE MANAGEMENT OF LARYNGOTRACHEAL HEMANGIOMAS: WILL PROPRANOLOL SUPPLANT STEROIDS AND SURGERY?

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OBJECTIVES: Among various reported treatments for laryngotracheal hemangiomas, recent accounts of propranolol therapy are encouraging. We present our institutional experience with managing 24 patients with laryngotracheal hemangiomas over the past seven years, with particular emphasis on six affected infants treated with propranolol therapy.

METHODS: A retrospective study examining the treatment of infants with symptomatic laryngotracheal hemangiomas at a tertiary pediatric hospital from 2002 to 2009.

RESULTS: Twenty-four symptomatic infants ranging in age from 1 to 18 months (median-3 months) underwent an initial trial of steroids. Thirteen patients underwent open surgical excision, nine requiring cartilage grafts and twelve were done in a single stage. Twelve surgical patients remain asymptomatic. One patient with diffuse mediastinal disease experiencing airway symptoms postoperatively improved on propranolol. Two patients underwent at least two laser ablations, four responded to systemic steroids alone, and one had microdebrider resection. In the last twelve months, six patients have had propranolol therapy. Four patients improved clinically within one week of initiating treatment. Two patients failed to respond to propranolol therapy: one patient subsequently underwent open excision and the other continues with a tracheostomy. There were no major complications from propranolol; minor complications included diarrhea and decreased appetite.

CONCLUSIONS: Surgical excision remains an effective treatment for subglottic hemangiomas. Carefully administered, propranolol may demonstrate efficacy as a first-line agent in certain select cases avoiding surgery, tracheostomy, or prolonged steroids; or as treatment of diffuse and unresectable disease. However, some lesions may be resistant to propranolol and require surgery or long-term steroids.

THE INCIDENCE OF ASPIRATION AMONG CHILDREN UNDERGOING SUPRAGLOTTOPLASTY FOR OBSTRUCTIVE SLEEP APNEA (OSA) WITH LARYNGOMALACIA

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OBJECTIVES: To determine the incidence of aspiration following supraglottoplasty at a children's hospital

STUDY DESIGN: Retrospective study

METHODS: Two thousand three hundred sixty (2360) patient charts from a children's hospital were reviewed retrospectively. Patients had already been treated for laryngomalacia with supraglottoplasty by the primary investigator. As is standard practice for the primary investigator, all patients who had a diagnosis of obstructive sleep apnea (OSA), either clinically or polysomnogram-proven, or had objective evidence of laryngomalacia on laryngoscopy (flexible, fiberoptic, or indirect), underwent microdirect laryngoscopy and bronchoscopy in the operating room with the patient spontaneously breathing. If floppiness of the aryepiglottic fold(s) were observed, the patients underwent supraglottoplasty, either laser-assisted or with laryngeal scissors.

RESULTS: Seventy-five patients (3.2%) had aspiration following supraglottoplasty. Forty (1.7%) of these patients had underlying neuromuscular problems. If these patients were excluded, the incidence of aspiration following supraglottoplasty was present in thirty-five patients (1.5%), which was statistically significant ($p < 0.0001$).

CONCLUSIONS: Supraglottoplasty does not significantly increase the risk of aspiration following supraglottoplasty in children with normal neuromuscular function. This risk should not be prohibitive for surgery, and, even in children with neuromuscular problems, should still be considered as a treatment option in management of their OSA.

THE UTILITY OF AIRWAY RADIOGRAPHS IN A BACTERIAL (EXUDATIVE) TRACHEITIS PREDICTIVE MODEL

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OBJECTIVE: To investigate the role of airway radiographs in the diagnosis of bacterial (exudative) tracheitis (BT) and to construct a predictive model for BT.

METHODS: A retrospective review was performed identifying subjects with an airway radiograph suggestive of BT from 2007-2008. Data collected included airway radiographic findings, demographics, clinical course, and operative intervention. A multivariable predictive model was created using logistic regression with significant risk factors. A risk score for BT was created from the model results. Statistical analysis was performed using SAS®v9.2.

RESULTS: 205 subjects were identified with 167 having complete data for analysis. 34 children had confirmed BT by endoscopy.

DEMOGRAPHICS: 14 females: 20 males. 25 patients required operative management. 12 subjects were intubated postoperatively. The positive predictive value of positive radiographic findings alone was 20%. Significant variables included in the model included diffusely irregular trachea ($P < .006$), an airway filling defect ($P < .0007$), and anterior neck pain ($P < .005$). Using risk scores created from the included variables, the final model for predicting BT had an area under the ROC curve (AUC) of 0.835.

CONCLUSION: In this study, airway radiographs have a low positive predictive value for the diagnosis of BT. Certain radiographic findings such as an irregular tracheal wall or tracheal filling defects strongly support BT. A predictive model to determine the probability of having BT using clinical and radiographic findings had an AUC of 0.835. This model may provide an improved method to identify patients with high probability for bacterial (exudative) tracheitis.

FACTORS PREDICTING POST-OPERATIVE RESPIRATORY DISTRESS IN INFANTS UNDERGOING ADENOTONSILLECTOMY FOR OBSTRUCTIVE SLEEP APNEA

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PURPOSE: Determine which preoperative risk factors are associated with post-operative respiratory distress in infants less than two years-old receiving surgical treatment for obstructive sleep apnea (OSA).

STUDY DESIGN: Retrospective study

METHODS: Surgical treatment included adenotonsillectomy with or without supraglottoplasty. Preoperative polysomnography (PSG) results, comorbidities and presence or absence of respiratory distress were recorded. Statistical analysis was performed to compare the group with respiratory distress to the group without respiratory distress in terms of preoperative apnea-hypopnea index (AHI) on PSG with a t test and medical comorbidities with chi-square analysis.

RESULTS: 121 children met inclusion criteria over a period of 5 years, and 27 children ultimately suffered from respiratory distress post-operatively. The mean AHI of patients without respiratory distress was 15.4 while the mean for patients with respiratory distress was 28.9 (p-value = < 0.0001). The group of children with severe OSA (AHI > 30) suffered from respiratory distress 61.1% of the time. Of the comorbidities analyzed, children with neurological or seizure disorders were found to be at increased risk of respiratory distress (p-value = 0.009). The remaining comorbidities, including craniofacial abnormalities, cardiac disorders, gastroesophageal reflux (GER), reactive airway disease (RAD), and failure to thrive (FTT), were not found to be statistically associated with the presence of respiratory distress.

CONCLUSIONS: Infants less than two years-old undergoing surgery for OSA with more severe OSA on PSG, especially AHI > 30, are more likely to suffer from respiratory distress. Infants with neurological or seizure disorders were also found to be at higher risk for developing respiratory distress.

A RETROSPECTIVE REVIEW OF CHILDREN PRESENTING FOR MEDICAL EVALUATION OF DYSPNEA WITH EXERCISE

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OBJECTIVE: To describe the characteristics and final diagnosis of children referred for medical evaluation of unexplained dyspnea with exertion.

DESIGN: IRB approved retrospective chart review of patients referred for exercise challenge testing in workup of dyspnea with exercise. Setting: Exercise clinic in pediatric tertiary care hospital.

RESULTS: 102 patients were evaluated, including 76 girls and 26 boys. The average age at time of exercise challenge testing was 14.6 years; average duration of symptoms before presentation was 2 years. The majority of patients were being treated for asthma. 87 % of patients presented with dyspnea or stridor with exertion. 16.6 % of patients were symptomatic spontaneously. 47 % of cases had moderate to severe symptoms, including trips to the emergency room and decreased participation in scholastic sporting events. 62.8 % had related medical problems, including asthma, allergies, sinusitis, depression, anxiety. Vocal cord dysfunction was diagnosed in 49 % of patients, including 40.2 % exercise induced and 8.8 % spontaneous; 34.3 % of patients had physiologic dyspnea; 7.8 % had exercise induced asthma; and 5.9 % were noted to have general deconditioning as the explanation of their dyspnea.

CONCLUSION: Vocal cord dysfunction (VCD) is a relatively common cause of dyspnea with exertion in children who have previously eluded medical diagnosis. This disorder predominantly affects adolescents, girls more commonly than boys. VCD is often misdiagnosed as asthma; this can lead to ineffective treatment with escalating doses of asthma medications. Increased awareness of VCD can lead to earlier treatment with more effective therapy.

**PROPRANOLOL IN THE THERAPEUTIC STRATEGY
OF INFANTILE LARYNGOTRACHEAL HAEMANGIOMA:
A PRELIMINARY RETROSPECTIVE STUDY**

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OBJECTIVE: To assess the efficacy of Propranolol on subglottic haemangioma in children

PATIENTS & METHOD: Multicentric (11 academic centers), retrospective study of clinical files of 14 children. Pre and post treatment endoscopies. Mean follow-up was 5.75 months.

RESULTS: Mean age at diagnosis was 2.3 (0.7-4) months. Before Propranolol introduction, mean percentage of subglottic stenosis was 68% (15-90). One patient had an associated supraglottic localization of hemangioma. None of the patients required a tracheostomy. Twelve children (85%) underwent steroid therapy during 5 (1-16) weeks and one received Vincristine for 35 weeks. Six (46%) underwent endoscopic surgery and one required external approach. Propranolol was introduced at 5.2 (0.7-16) months of age, 2.8 (0-13) months after diagnosis was made. This treatment was effective in all cases with a mean regression of the stenosis to 22% after 2 weeks and 12% after 4 weeks. Other medical treatments (steroids) could be stopped. In one patient, a side effect of Propranolol (severe asthma) motivated the use of another β blocker. In 4 patients, treatment was stopped after 5.25 (1-10) months with a relapse in 2 (50%) cases. One of these two patients developed a resistance to Propranolol and required an external surgical approach.

DISCUSSION: Propranolol (and maybe other β blockers) appears to be quickly effective and allows alleviation or cut-off of previous treatments. It should be now considered as a first-line therapy.

CONCLUSION: This retrospective study confirms that Propranolol is highly effective against subglottic localizations of haemangioma. However, recurrences are possible after early treatment interruption.

LARYNGOMALACIA AND DYSPHAGIA: A FRAMEWORK FOR MANAGEMENT AND PROGNOSIS

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PURPOSE: To assess the degree of dysphagia in infants with severe laryngomalacia (LM) and explore the role of supraglottoplasty on the functional swallow and recommended diet in this population.

METHODS: A seven year retrospective review of children with LM who underwent supraglottoplasty with pre and post operative videofluoroscopic swallowing study (VFSS) results. To quantify swallowing, dysphagia and diet scores were arbitrarily developed based upon VFSS data. Dysphagia scores ranged from 0 to 5 with 0= normal, 1= mild, 2-4= moderate, and 5= severe dysphagia. Diet scores represented the safest tolerable diet from thin liquids (0= normal) to no oral intake (5= NPO). The main outcome measure was improvement in the degree of aspiration or recommended diet following supraglottoplasty.

RESULTS: Twenty infants undergoing supraglottoplasty had complete VFSS data available. Dysphagia was identified in 90% (n= 18) before surgery with mild, moderate and severe dysphagia found in 10% (n= 2), 45% (n= 9), and 35% (n= 7) of patients. Two patients had normal preoperative swallows. Postoperative VFSS data revealed a normal swallow in 6 patients. Mild, moderate, and severe dysphagia was found in 25% (n= 5), 40% (n= 8), and 5% (n= 1) of patients postoperatively. Overall, 60% of patients improved in their dysphagia score following supraglottoplasty. The median time from surgical intervention to VFSS was 10.1 months. Diet scores improved in 65% of patients following supraglottoplasty.

CONCLUSION: Dysphagia is common in infants with severe LM. The extent of dysphagia and recommended safe diet improves following supraglottoplasty. Despite improvements, VFSS evidence of dysphagia remains present in a large percentage of infants with severe LM.

STATUS OF ASPIRATION BEFORE AND AFTER SUPRAGLOTTOPLASTY FOR LARYNGOMALACIA

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OBJECTIVE: To determine if creation of specific aspiration evaluation protocol both pre- and post-supraglottoplasty will improve post-operative aspiration management and risk-stratification for future laryngomalacia patients considered for supraglottoplasty.

METHODS: Retrospective case series and medical record review was conducted in a tertiary-care academic children's hospital on all patients who underwent supraglottoplasty for laryngomalacia between 2003-2008. Age, pre-operative symptoms, co-morbidities, age at supraglottoplasty, pre-operative and post-operative aspiration assessment (by history, modified barium swallow study, or functional endoscopic evaluation of swallow) and follow-up were recorded.

RESULTS: Thirty-eight patients, average age 9.3+/-14.8 months (range:1-81), underwent supraglottoplasty for laryngomalacia. Co-morbidities included: gastroesophageal reflux disease (GERD) (73%), seizures and/or cerebral palsy (10.8%), syndromes including Down's (21.6%) Preoperative examination revealed stridor in 83.8% and retractions in 54.1%. Eight patients (21.6%) had pre-operative aspiration history and 17 (45.9%) patients had pre-operative testing documenting penetration in 2 and aspiration in 4 patients. After supraglottoplasty, aspiration by history was present in 7 subjects; in the 13 subjects that underwent evaluation for aspiration 3 patients had penetration (2 new, 1 unchanged, 1 resolved) and 5 had aspiration (4 new, 1 unchanged, 3 resolved). Patients with co-morbidities other than GERD had higher risk for post-operative aspiration. Aspiration resolved in average of 34.4+/-32.5 months (range:0-93).

CONCLUSIONS: Aspiration was present in a small proportion prior to the supraglottoplasty. There were an increased but still small number that clinically aspirated post-operatively. Presence of co-morbidities was a good predictor while pre-operative aspiration evaluation was a poor predictor in identifying the patients at risk for post-supraglottoplasty aspiration.

INTEREST OF THREE DIMENSIONAL COMPUTED TOMOGRAPHY IMAGING AND VIRTUAL ENDOSCOPY IN LARYNGOTRACHEAL PATHOLOGY IN CHILDREN

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OBJECTIVE: To assess the interest and relevance of three-dimensional computed tomography and virtual endoscopy (VE) in diagnosis and follow-up of children with laryngo-tracheal pathology.

DESIGN: Retrospective review Patients and methods: 25 patients aged 17 months to 22 years (mean age 7 years-old) treated and followed up for laryngotracheal disease and having benefited from 3D CT-scan and VE between January 2007 and April 2009.

RESULTS: Indication for VE was laryngotracheal monitoring for 17 children: 8 post-intubation stenosis (4 tracheal and 4 subglottic), 7 congenital tracheal or subglottic stenosis and 2 subglottic hemangiomas. Subglottic and tracheal measurements were the same by rigid and VE (+/-1mm). These children had already undergone a mean of 5.44 conventional endoscopies for diagnosis and treatment. Among these 17 children assessed for follow-up, there was no need for further conventional endoscopy, information obtained by VE being estimated as sufficient. The other indication was laryngotracheobronchial assessment for 8 children showing mild laryngotracheal symptoms. The imaging was normal for 5 children and complementary rigid endoscopic examination was not required over the 6 months follow-up period. One VE revealed a Cotton grade I subglottic stenosis confirmed by rigid endoscopy. Another VE showed inferior tracheal obstruction and was completed by rigid bronchoscopy that revealed an intraluminal tumor.

CONCLUSION: Even if conventional endoscopy remains the gold standard for laryngotracheal assessment and treatment, VE is an interesting tool that allows accurate laryngotracheal follow-up for children needing a monitoring of their airway stenosis. It can spare them general anesthesia, successive endoscopy and repeated hospitalization. VE is also interesting in preliminary study for children with low suspicion of laryngotracheal symptoms.

AIRWAY HEMANGIOMA MANAGEMENT: A SURVEY OF ASPO MEMBERS

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OBJECTIVE: To evaluate self-reported treatment patterns for airway infantile hemangiomas (AIH), among pediatric otolaryngologists.

STUDY DESIGN: Web-based survey of American Society of Pediatric Otolaryngology (ASPO) physician members 2008. Directed multiple choice questions were given regarding AIH medical and surgical management. Results were analyzed using descriptive statistics, Fischer exact and Kruskal-Wallis nonparametric tests.

RESULTS: There was a 36.5% response rate (103/282). Most respondents (95%) practice in university or children's hospital settings, where 60% have multidisciplinary vascular anomaly teams. The mean number of newly diagnosed AIH annually was 1.46 (SD 1.31). Having a vascular anomaly team increased new AIH diagnoses each year ($p=0.042$). Respondents' preferred initial unilateral AIH management was medical alone (31%), surgical alone (27%) and combined medical/surgical (45%). Respondent's primary unilateral AIH invasive management was laser excision (38%), open excision (16%), microdebrider excision (5%) or steroid injection (5%). Primary treatment for bilateral or circumferential AIH included using steroids (28%), tracheotomy (23%), open excision (17%) and laser excision (12%). Steroids and antigastroesophageal reflux medications were used by > 75% of respondents. Vincristine and propranolol were each used by four respondents. Reported observed surgical complications included; subglottic stenosis (18/45), tracheotomy (7/45), failure of repeated procedures (5/45), death (2/45). AIH imaging AIH was used inconsistently.

CONCLUSIONS: This survey demonstrates wide variation in AIH treatment patterns, for a lesion that is diagnosed infrequently, but is associated with significant morbidity. This variation can be reduced with careful analysis of new treatment options.

UTILITY OF AIRWAY EVALUATION FOR INFANTS PRESENTING WITH AN APPARENT LIFE-THREATENING EVENT

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OBJECTIVES: Apparent life-threatening events (ALTEs) in infants constitute a significant challenge for health care providers. ALTE evaluation and management are poorly defined, and outcomes have not been clearly determined. Infants who suffer an apparent life-threatening event may be referred to a pediatric otolaryngologist to evaluate for underlying airway anomalies. Our objective was to determine the utility of bronchoscopy in diagnosing an underlying etiology for patients presenting with an ALTE.

METHODS: We collected data from infants ages birth to 12 months of age who presented to a children's hospital after an apparent life-threatening event during a 5-year time period. Patient records were cross-referenced with all patients that underwent laryngoscopy or bronchoscopy at our institution. The airway findings, interventions and eventual outcomes of these patients were determined.

RESULTS: 471 patients with ALTEs met inclusion criteria, of whom 9 subsequently had airway evaluation with bronchoscopy and/or laryngoscopy. Six of the nine patients had normal findings. Two of the nine patients were found to have laryngomalacia and underwent supraglottoplasty. One patient demonstrated supraglottic edema and copious secretions.

CONCLUSIONS: 98.1% of infants who have an ALTE do not have subsequent otolaryngological evaluation, and only 0.4% required surgical intervention. This study suggests that otolaryngologic evaluation is of low yield for well-appearing ALTE patients.

SURVEILLANCE BRONCHOSCOPY PRACTICE PATTERNS AND OUTCOMES AFTER TRACHEOTOMY IN CHILDREN YOUNGER THAN TWO YEARS OF AGE

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OBJECTIVES: Review frequency of bronchoscopy and outcomes in this patient group at our institution as well as report ASPO membership survey results.

DESIGN: 1) Retrospective study of all patients trached under 2 years of age between 1996-2006 at a tertiary children's hospital 2) ASPO approved and administered on-line surveys to the membership

METHODS: Data collected include demographics, medical-comorbidities, age at time of tracheostomy, indications, frequency of bronchoscopy, frequency of suprastomal granulomas (SSG) and need for intervention. ASPO survey composed of 14 questions on indications for bronchoscopy and treatment preferences for SSG.

RESULTS: A total of 201 infants were reviewed with 110 males (54.7%). Indications include ventilator dependence (32.2%), craniofacial anomaly(15%), cardiopulmonary insufficiency(15%), neuromuscular (15%), and subglottic stenosis(6.7%). Thirty patients (14.9%) were premature (mean gestational age 27 mos.) Median age at time of tracheostomy was 4 mos for premies and 3 mos. for full term infants. Overall, 109/201(54.2%) had at least one follow-up bronchoscopy after tracheotomy, and 52, 25, 14, and 5 patients had a second, third, fourth, and fifth bronchoscopy respectively. As of 2006, 57/201(28.4%) have been decannulated(mean time to decannulation 27.2mos.) and 12/57(21%) required a LTR to decannulate. There were 29(14.4%) deaths. At the time of the first, second or third bronchoscopy over 60% were noted to have a SSG with half of them requiring surgical intervention. There were no consistent patterns for SSG findings. Decannulated patients were more likely to have had bronchoscopy (mean 1.74 vs. 0.73) than non-decannulated patients. There was variable practice pattern in frequency of bronchoscopy by ASPO members in this patient population: only as needed, every 12mos, every 6 mos, every 3 mos, 38.2%,25%, 23.5%, 8.8%, respectively. Most important indication for bronchoscopy by ASPO members were prior to LTR or decannulation (100%, 91.5%), bleeding (75.9%), and difficult trach changes(69.6%). Lumen obstruction of 25-50 and 50-75% by SSG would likely receive intervention (30.1%, 13.7%) with skin hook eversion and removal being the most popular. **CONCLUSION:** Children receiving tracheotomy under 2 years of age deserve surveillance bronchoscopy during the duration of the tracheostomy. There is a high incidence of SSG which may require intervention and influence patency of airway and readiness for decannulation.

RECURRENT CROUP: USING ENDOSCOPIC FINDINGS TO CREATE A TREATMENT ALGORITHM

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OBJECTIVES: Review endoscopic findings for patients with recurrent croup and create a treatment algorithm for pediatric patients with this disease entity.

DESIGN: Retrospective study (2003-2009). Setting: A tertiary care children's hospital.
Participants: Children less than six years old with at least two episodes of croup symptoms by history.

MAIN OUTCOME MEASURES: Anatomic and inflammatory abnormalities of the larynx or tracheobronchial tree, diagnosed by flexible or rigid endoscopy; age at diagnosis; history of intubation or prematurity; infectious or spasmodic croup; need for surgical intervention.

RESULTS: 68 patients were diagnosed with recurrent croup. 50% were managed in the office, with most undergoing flexible laryngoscopy. The rest were examined in the operating room; approximately 60% were found to have structural abnormalities of the larynx or trachea, most commonly subglottic stenosis (SGS). 66% of patients with SGS were born prematurely. In addition, tracheobronchitis was diagnosed in approximately 70% of patients.

CONCLUSIONS: While rigid bronchoscopy is accepted as a diagnostic tool for recurrent croup, few studies have clearly defined parameters for the timing of rigid bronchoscopy. Office laryngoscopy can help delineate which patients should proceed to bronchoscopy. In a large series, we compare anatomic and inflammatory findings in both office and operating room endoscopy. We find either laryngeal or tracheobronchial inflammatory changes in many patients with recurrent croup, suggesting that reflux can contribute to the etiology of recurrent airway obstruction, and that these patients should be started on an anti-reflux regimen. We propose a treatment algorithm based for both medical and operative intervention.

UTILITY OF SURVEILLANCE TRACHEAL ASPIRATE CULTURES IN CHILDREN WITH TRACHEOSTOMY TUBES

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OBJECTIVE: Many physicians obtain surveillance cultures in children with tracheostomy tubes for the purpose of treating future acute infections. The aim of this study was to compare the colonizing bacteria found on routine surveillance with bacteria that are present during exacerbating respiratory infections.

DESIGN: Retrospective review **Methods:** 170 children were reviewed from 1/1/03 through 12/31/07. A database was constructed to record tracheal aspirates obtained during routine clinic visits and during hospitalizations. Consecutive cultures were compared for similarity of bacteria and antibiotic sensitivity when a clinic (healthy) culture preceded an inpatient (sick) culture (A), when a clinic culture preceded a clinic culture (B), and when an inpatient culture preceded an inpatient culture from a separate hospitalization (C). A web-based questionnaire was distributed to Pediatric Pulmonologists and Pediatric Otolaryngologists soliciting practice patterns pertaining to the utilization of surveillance tracheal aspirates.

RESULTS: A total of 300 cultures were reviewed. There were 62, 152 and 94 cultures in group A, B, and C respectively. The bacteria were the same 16%, 16%, and 19% of the time respectively. The bacteria and antibiotic sensitivity profile were the same 6%, 12%, and 9% of the time respectively. Our questionnaire revealed that 79 of 146 Pulmonologists and 5 of 33 Otolaryngologists obtain tracheal aspirates during routine clinic visits.

CONCLUSION: Our novel study shows that there is minimal similarity of bacteria or antibiotic sensitivity between consecutive tracheal cultures in children with a tracheostomy tubes. Routine surveillance cultures from these children are of limited value in treating acute respiratory exacerbations.

LATE-ONSET LARYNGOMALACIA: A CAUSE OF PEDIATRIC OBSTRUCTIVE SLEEP APNEA SYNDROME

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OBJECTIVES: To raise awareness of late-onset laryngomalacia in children with obstructive sleep apnea syndrome (OSAS) and to describe its presentation, diagnosis, and treatment.

METHODS: A retrospective study was performed of children 3-18 years old referred to the pediatric otolaryngology clinic between July 2006 and December 2008. The study population included patients with OSAS (diagnosed by polysomnography) who subsequently underwent airway endoscopy. Patients with significant craniofacial malformations or neurologic disorders were excluded. Data included history and physical, polysomnography, operative findings, operative interventions, and outcomes.

RESULTS: 70 patients met inclusion criteria. All had similar pre-operative findings, to include symptoms, body mass index percentile, tonsil size, and OSAS severity. The diagnosis of late-onset laryngomalacia was made by intra-operative airway endoscopy in 19 patients. In each case, the severity of laryngomalacia and degree of fixed obstruction from adenotonsillar hypertrophy were assessed and a decision was made to perform adenotonsillectomy, supraglottoplasty, or both to treat the patient's obstruction. Follow-up visits for 15 of the 19 patients revealed subjective improvements in 12 after the first surgery. Of the patients without initial improvements, one underwent adenotonsillectomy alone, then improved after supraglottoplasty, one underwent supraglottoplasty alone, then improved after adenotonsillectomy and the last underwent tonsillectomy alone and repeat endoscopy revealed no additional obstructive lesions.

CONCLUSIONS: Late-onset laryngomalacia may act alone or in concert with additional dynamic or fixed lesions to cause pediatric OSAS. Although there is no specific pre-operative indicator to diagnose laryngomalacia, it can be readily identified intra-operatively and effectively treated with supraglottoplasty, with or without adenotonsillectomy.

LOCATION OF AIRWAY OBSTRUCTION IN LARYNGOMALACIA

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OBJECTIVE: To describe the airway findings in children with laryngomalacia.

DESIGN: Retrospective review of patients diagnosed with laryngomalacia. Patients were classified as having anterior, lateral, and/or posterior laryngeal collapse based on flexible or direct laryngoscopy. Setting: Tertiary referral center.

PATIENTS: 130 patients diagnosed with laryngomalacia between July 2004 and August 2009.

MAIN OUTCOME MEASURES: Medical records were reviewed for demographic data, supraglottic and glottic airway findings, concomitant airway lesions, and need for intervention.

RESULTS: The mean gestational age and age at diagnosis was 36 and 15 weeks, respectively. Posterior laryngeal collapse was the most common site of obstruction followed by anterior and then lateral collapse. Arytenoid collapse and omega shaped epiglottis were the most common supraglottic anomalies seen together. 43% of patients had a secondary airway lesion and 6% of patients had vocal cord paresis or palsy. 7 patients required a tracheotomy and/or supraglottoplasty.

CONCLUSIONS: Most children with laryngomalacia are born at term or near term. Children with laryngomalacia tend to have more than one area of supraglottic collapse and almost half have a secondary airway lesion. All patients who required an intervention had more than one area of collapse and 57% of these patients had a secondary airway lesion.

NOVEL TECHNIQUE FOR BUTTRESSING MALACIC TRACHEAL SEGMENTS WITH RESORBABLE MICROPLATES DURING LARYNGOTRACHEAL RECONSTRUCTION

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OBJECTIVE: In patients undergoing laryngotracheal reconstruction (LTR), malacic segments of trachea may be encountered, posing challenges to successful reconstruction. These malacic segments may inadequately support cartilage grafts used in augmentation surgery, sometimes requiring cricotracheal or tracheal resection. We describe three patients who underwent a novel technique of LTR with resorbable microplate buttressing of malacic tracheal segments.

METHODS: A retrospective review examining the technique, treatment outcomes, and complications of three infants with subglottic stenosis and tracheomalacia requiring a microplate augmented LTR technique.

RESULTS: Three infants ranging in age from 26 to 32 months successfully underwent LTR for subglottic stenosis. Two infants had grade II-III stenosis, while a third had grade III stenosis. Two children underwent a double-stage LTR with resorbable microplates sutured bilaterally to support severely malacic tracheal segments. Both children were subsequently decannulated within 3 months and are doing well without any airway symptoms or complications. A cricotracheal resection would not have been feasible in one of these children due to the required length of resection and inadequate tracheal mobilization. A third child with bilateral vocal cord paralysis and subglottic stenosis recently underwent a single-stage LTR and had unilateral application of a resorbable microplate. In the short-term, this child has not exhibited any problems postoperatively.

CONCLUSION: LTR with resorbable microplate buttressing of malacic tracheal segments is technically feasible, safe, and can help avoid more extensive surgery requiring tracheal resection and anastomosis. Further experience with this technique may prove it as a valuable addition to the arsenal in airway reconstruction.

PEDIATRIC TRACHEOSTOMY WOUND COMPLICATIONS: INCIDENCE, MANAGEMENT, AND OUTCOMES

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OBJECTIVES: To define the incidence of wound complications in pediatric tracheostomy, discuss risk factors and management, and evaluate outcomes

STUDY DESIGN: Retrospective case series

SETTING: Free-standing tertiary care academic pediatric hospital

PATIENTS: Fifty-eight consecutive patients undergoing tracheostomy over 13 months. There were no a priori exclusion criteria.

MAIN OUTCOME MEASURE: Post-operative wound complications objectively and independently documented by an advanced practice nurse specializing in tracheostomy care. Secondary outcome measures included additional morbidity, mortality, and follow-up wound status.

RESULTS: The average age at tracheostomy was 36.2 ± 58.7 (SD) months. The most common indication for tracheostomy was pulmonary disease (39.7%), followed by neurologic impairment and laryngeal pathology. There were 17 (29.3%) postoperative wound complications with ten stage one wounds (17.2%), three stage 2 wounds (5.2%), three stage 3 wounds (5.2%), and one stage 4 wound (1.7%). There were no significant differences between the two groups in age ($P= 0.27$) or weight ($P= 0.39$). All patients with wounds received aggressive local wound care. Four patients had complete resolution at followup (6.9%), whereas seven patients had persistent skin or granulation issues (12.1%). There were five mortalities.

CONCLUSIONS: With attempts to classify tracheotomy wound breakdowns as “never events”, increasing emphasis is being placed on post-tracheostomy care. This study demonstrates that wound breakdown in pediatric tracheotomy patients is unfortunately rather common. These complications can be mitigated, though not prevented completely, with aggressive wound surveillance and specialized wound care. Normative descriptive data such as presented herein helps refute the concept of “never events” for this vulnerable population.

**IMPULSE OSCILLOMETRY SYSTEM:
A SUPPLEMENTAL TOOL FOR EVALUATING
UPPER AIRWAY PATHOLOGY**

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OBJECTIVE: The impulse oscillometry system (IOS) provides a non-invasive measurement of airflow resistance during tidal breathing, which is independent of patient compliance. Higher frequency IOS waves (R20) predominate in the presence of upper airway pathology, whereas lower frequency waves (R5) correlate with lower airway blockage. In cooperative patients, IOS may help clinicians to differentiate between upper and lower airway contributions to obstruction.

DESIGN: Retrospective case series of patients presenting with airway obstruction of unclear etiology. Setting: Tertiary, academic children's hospital

PATIENTS: Six patients, age between ten and twenty-one years, with symptoms suggestive of upper airway obstruction who underwent both IOS testing and endoscopic airway evaluation. Main outcome measures: IOS measurements (R5, R20) and endoscopy findings.

RESULTS: All six patients had IOS measurements indicating high upper airway resistance, as reflected by increased R20, which corresponded with abnormal endoscopy findings. Five out of six (83%) had normal R5. The patients were found to have either static or dynamic upper airway obstruction including laryngomalacia (n= 2), tracheal stenosis (n= 1), arytenoid dislocation (n= 1), vocal cord immobility (n= 1) and exercise-induced vocal cord dysfunction (n= 1).

CONCLUSIONS: IOS testing appears to be a valuable tool for assessing upper airway obstruction in children and may be particularly useful for the very young or developmentally delayed. Furthermore, serial IOS testing may allow monitoring patients with evolving or previously treated upper airway lesions without the need for radiologic or endoscopic procedures.

SINGLE STAGE LARYNGOTRACHEAL RECONSTRUCTION USING ANTERIOR AND POSTERIOR GRAFTS FOR THE MANAGEMENT OF SUBGLOTTIC STENOSIS

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PURPOSE: To review the outcomes of pediatric patients with laryngotracheal stenosis treated at our institution by single-staged laryngotracheal reconstruction (SSLTR) with anterior and posterior costal cartilage grafts. To compare our decannulation rate with rates published in the literature.

METHODS: Retrospective chart review of all patients undergoing procedures coded with 2008 CPT codes 31582 (laryngoplasty for laryngeal stenosis with graft or mold, including tracheotomy) or 31587 (laryngoplasty, cricoid split), between July 1, 2004 and June 30, 2008. Setting: Tertiary-care pediatric hospital.

RESULTS: Forty-two patients were identified of whom 13 underwent SSLTR with posterior and anterior grafts. The mean age was 2.2 years. Twelve children had Cotton-Meyer Grade 3 stenosis. In one child the degree of stenosis was not specifically stated in the operative note. One child developed significant granulation tissue at the anterior graft site one month after surgery. This tissue was removed endoscopically as was an exposed Prolene suture that appeared to be the etiologic agent. One child required reinsertion of the tracheotomy tube one month after SSLTR due to progressive stridor. One child was lost to follow up after 6 weeks although was doing well at that time. The remaining 11 children remain decannulated, for an overall decannulation rate of 92%. The mean follow up was 21 months (median = 18 months).

CONCLUSIONS: SSLTR with anterior and posterior grafting appears to be a safe and effective technique for managing patients with high-grade subglottic stenosis. Our overall decannulation rate of 92% compares favorably to that reported in the literature.

MANDIBULAR DISTRACTION OSTEOGENESIS FOR AIRWAY OBSTRUCTION IN CHILDREN UNDER THREE MONTHS OF AGE: LONG-TERM OUTCOMES

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OBJECTIVE: Our first aim was to examine the long-term outcomes and complications in infants with upper airway obstruction who underwent bilateral mandibular distraction osteogenesis (MDO) within the first 3 months of life. Our second aim was to identify any pre-operative characteristics that may predict the long-term outcome following early MDO intervention for airway obstruction.

METHODS: An institutional, retrospective chart review was performed. Inclusion criteria were bilateral MDO performed at less than 3 months of age with a minimum of 3 year follow up. A quantitative outcome measures scale was developed, and patients were scored based on long-term post-operative complications as well as airway and feeding goals. Factors such as a need for an additional surgical procedure were also considered.

RESULTS: Nineteen children were identified as having undergone MDO before 3 months of age and having greater than 3 years of follow-up data. The average age at distraction was 4.8 weeks (5 days – 12 weeks); the average length of follow up was 5.6 years (37 months – 122 months). Fourteen of these patients had isolated Pierre Robin Sequence (iPRS) and 5 children had syndromic PRS (sPRS). All patients with iPRS had a good or intermediate long-term result. Infants with comorbidities such as developmental delay, seizures or arthrogyposis had the poorest outcomes.

CONCLUSIONS: Bilateral MDO is a safe and effective means of treating airway obstruction and feeding difficulty in infants with PRS. The effects of this procedure, which carries a relatively low morbidity, persist through early childhood in most patients.

UTILITY OF MINIMALLY INVASIVE EVALUATION OF THE PEDIATRIC AIRWAY BY MAGNIFIED RADIOGRAPH

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OBJECTIVES: To understand the utility of magnified airway radiographs (MA) in evaluation of the pediatric airway.

STUDY DESIGN: Two-year retrospective chart review.

SETTING: Tertiary care pediatric specialty hospital.

SUBJECTS AND METHODS: Charts of all patients with magnified airway radiographs (MA) obtained from December 31, 2006 to December 31, 2008 were reviewed for age, indications, radiologic findings, and operative or office endoscopy findings. The radiographic results were compared to endoscopic findings.

RESULTS: 398 charts were reviewed. 88% of examinations were performed for stridor or wheezing. 204/238 patients with a normal MA and 107/160 patients with a positive MA had no endoscopy (78%). The 34 patients with endoscopy and normal MA, all had positive findings on endoscopy; 23 with laryngomalacia, 8 with tracheo- or bronchomalacia, and 4 with subglottic edema or stenosis. Of 73 patients with tracheomalacia, 13 had endoscopy, and 8/13 (62%) had trachomalacia on endoscopy. Of 59 patients with bronchomalacia, 4/11(36%) with endoscopy had bronchomalacia on endoscopy. Of 30 patients with subglottic stenosis by MA, 13/18(72%) had a subglottic finding on endoscopy. Of 20 patients with vocal fold immobility by MA, 4/6 (67%) had vocal fold immobility. Findings missed on MA were mostly glottic and subglottic. Most endoscopies were intraoperative. 15 flexible laryngoscopy examinations were performed without intraoperative examination.

CONCLUSION: MA is used as a screening test, possibly saving patients from intraoperative evaluation or flexible endoscopy. However, magnified airway radiographs cannot replace endoscopy for evaluation of the larynx.

**MULTI-DISCIPLINARY APPROACH TO
THE AIRWAY MANAGEMENT OF CHILDREN
WITH WEGENER'S GRANULOMATOSIS**

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OBJECTIVE: We propose a multidisciplinary approach to the management of airway stenoses in pediatric Wegener's granulomatosis (WG).

DESIGN: Retrospective chart review

PATIENTS: Patients treated at a tertiary children's hospital over the last 15 years with WG.

MAIN OUTCOME MEASURES: The records of all subjects with airway lesions were reviewed for clinical characteristics of airway involvement, as well as the medical and surgical treatment regimens.

RESULTS: Six of 27 pediatric WG subjects were identified to have airway lesions including vocal fold granuloma, subglottic stenosis, and multi-level stenoses. Three subjects did not require surgical procedures beyond endoscopy. One subject with SS required a laryngotracheal resection. The 2 remaining subjects with multi-level stenoses are the focus of this study. Both had SS and long-segment tracheal involvement and 1 had stenoses at the left mainstem as well as lobular involvement. These 2 subjects required extensive use of cyclophosphamide and methotrexate during initial treatment. Because of progressive airway disease, they subsequently received a newer chemotherapeutic agent with anti-CD20 function, rituximab, administered by rheumatology. Pulmonology and otolaryngology engaged in repeated flexible and rigid endoscopies with balloon dilations to stabilize the airway.

CONCLUSION: A coordinated multidisciplinary approach for WG patients with aggressive lesions is essential to attain the best-expected clinical outcome.

SUCCESSFUL TREATMENT OF BORDATELLA PERTUSSIS IN INFANTS USING SERIAL BRONCHOSCOPY IN CONJUNCTION WITH ECMO

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OBJECTIVES: To describe the use of serial bronchoscopy in conjunction with extracorporeal membrane oxygenation (ECMO) for the management of severe pertussis infections in infants and compare it to national outcomes data.

STUDY DESIGN: Retrospective case review.

SETTING: Tertiary referral practice.

PATIENTS: Infants treated for confirmed Bordatella pertussis infections in the NICU from 2000-2009.

MAIN OUTCOME MEASURES: Data collected includes: age at presentation, co-morbidity, length of ECMO, number of bronchoscopies, post-treatment pulmonary and neurologic function. Survival data is compared to national data from the Extracorporeal Life Support Organization (ELSO) database.

RESULTS: Three patients were treated with prolonged ECMO for pulmonary hypertension and fulminant cardiopulmonary failure secondary to Bordatella pertussis. Average age was 43 days (range 39-46). While on ECMO, they received serial bronchoscopies for removal of thickened secretions. Mean ECMO run was 503 hours (national mean 417 for survivors) and mean NICU stay 69 days. Mean number of rigid bronchoscopies was 5 (range 2-8.) Survival was 100% (national mean 28%) with no complications related to bronchoscopy. Two of the patients continue to require daily use of Pulmicort and Xopenex.

NEUROLOGICAL OUTCOME: one patient has no neurologic sequelae, one has severe encephalomalacia from intracranial hemorrhage related to anticoagulation for ECMO and one has cerebral palsy with developmental delay secondary to pertussis encephalopathy and infarction.

CONCLUSIONS: Pertussis infections in early infancy are often fatal secondary to thickened secretions and pulmonary hypertension. In our series, the use of serial bronchoscopy in conjunction with ECMO effected 100% survival.

ENDOSCOPIC MANAGEMENT OF SUPRAGLOTTIC STENOSIS FOLLOWING CAUSTIC INGESTION IN CHILDREN

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OBJECTIVE: To review the management of pediatric supraglottic stenosis secondary to caustic ingestion.

DESIGN: Case series

SETTING: Tertiary care children's hospital

PATIENTS: Two males, ages 30 and 36 months, who ingested lye and subsequently developed supraglottic stenosis.

MAIN OUTCOME MEASURES: Clinical course and management strategies

RESULTS: Initial endoscopic findings demonstrated necrosis of the supraglottis and proximal esophageal mucosal burns. Nasogastric tubes were used as stents to maintain patency of the esophagus. Over 2 months, both patients developed near-total supraglottic stenosis. The stenoses were characterized by fusion of the remnant epiglottis to the posterior supraglottis, obliteration of the vallecula, and the formation of lateral pharyngeal scar. Both children underwent tracheostomy tube placement, with one child requiring an emergent procedure due to acute airway obstruction. Supraglottic stenosis was managed endoscopically. The CO₂ laser was utilized to excise supraglottic scar in the midline and release lateral scar bands. Sutures were placed endoscopically to cover exposed cartilage with mucosa and enlarge the supraglottic opening. One child was decannulated after resection. He has maintained a stable airway for 12 years, yet he still requires esophageal dilation every 6 months. The second child has a patent supraglottis that is conducive to decannulation after 8 months follow-up, but still has the tracheostomy in place until esophageal reconstruction is completed.

CONCLUSIONS: Supraglottic stenosis is an unusual complication of pediatric caustic ingestion that is challenging to treat. Supraglottic stenosis is amenable to endoscopic repair with CO₂ laser resection of the scar.

**ENDOSCOPIC ENDOTRACHEAL STENT PLACEMENT AS
A MEANS OF DECANNULATION IN THE PEDIATRIC
TRACHEOTOMY-DEPENDENT POPULATION**

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PURPOSE: The placement of airway stents has been described in the literature as a possible way to alleviate airway obstruction due to tracheomalacia and tracheal stenosis. We describe our experience of seven cases of nitinol stent placement without fluoroscopic guidance in three children (ranging in age from two to eighteen years) as a means of achieving decannulation in otherwise tracheotomy-dependent patients.

METHODS: A retrospective review of medical records was performed of all pediatric tracheotomy-dependent patients who underwent endoscopic endotracheal stent placement for purposes of alleviating airway obstruction between January and December of 2008.

SUMMARY OF RESULTS: Complications of the procedure included stent migration and airway granuloma formation. Decannulation was eventually achieved in all patients studied. We believe that nitinol stents, which show promise in improving the quality of life of patients who have failed other means of decannulation, may be placed with endoscopic guidance alone without fluoroscopic radiation.

**SUBGLOTTIC STENOSIS: ANOTHER CHALLENGE
FOR INTUBATION AND POTENTIAL MECHANISM OF
AIRWAY OBSTRUCTION IN PIERRE ROBIN SEQUENCE**

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OBJECTIVE: To determine the endotracheal tube (ETT) size and incidence of subglottic narrowing in children less than one year old with Pierre Robin Sequence (PRS).

DESIGN: Retrospective review from 2005-2009.

METHODS: We reviewed the findings in infants with PRS who underwent diagnostic laryngoscopy and intubation by a pediatric otolaryngologist. Tube size was determined by minimal resistance, adequate ventilation, and an air leak at 20 millimeters (mm) of mercury ventilation pressure.

RESULTS: Fifteen children with a mean age of 72 days were reviewed. All patients, except one, were born full term. Subglottic narrowing was visualized in 4 patients (27%). The average inner diameter tube size was 3.4 mm for patients over one month old and 3.0 mm for patients under one month old. Patients that weighed less than 3.5 and greater than 3.5 kilograms required a mean ETT size of 3.1 and 3.3 mm tubes, respectively. 73% percent of all patients required a ½-1 ETT size smaller than what is recommended by intubating guidelines in the literature in regards to normative data based on age and weight.

CONCLUSION: Children with PRS may have a higher incidence of subglottic stenosis, and many may require a smaller ETT compared to the normal population. We suggest having a low threshold to downsize the ETT if intubation is difficult in these patients. Early diagnostic laryngoscopy evaluation with proper sizing of the ETT should also be considered, as this may prevent future complications of intubation in this patient population.

PEDIATRIC OPEN AIRWAY RECONSTRUCTION

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OBJECTIVE: To study the indications, outcome, and complications of pediatric airway reconstructions performed at a tertiary academic institution in the Middle East, over a period of one year. In addition, to find out if the recent formation of the pediatric airway team in the institution has a role in the outcome.

METHODS: A retrospective chart review of fifteen children who underwent open airway reconstruction surgery in one year (January 1 to December 31, 2008). Two groups were identified; one group had subglottis stenosis (SGS) alone (n= 8) and the other group had SGS associated with other pharyngolaryngotracheal pathologies (n= 7). Data collected are presenting features, classification of lesion, surgery performed, complications, and final surgical outcomes.

RESULTS: Three patients had grade II SGS (20%) and 12 patients had grade III SGS (80%). Complications included, 2 tracheocutaneous fistulas (13.3%), 1 subcutaneous emphysema (6.6%), and 1 graft necrosis with displacement (6.6%). Eleven patients (73.3%) underwent laryngotracheal reconstruction (LTR) and 4 patients (26.7%) underwent cricotracheal resection (CTR). Ten patients had a single stage reconstructive surgery (66.6%) and five patients had a staged reconstructive surgery (33.3%). Successful decannulation was achieved in 7 of the patients isolated SGS group (87.5%) and was achieved in 6 of the patients with other pharyngolaryngotracheal pathologies (85.7 %). The formation of pediatric airway team had significant impact on the positive impact.

CONCLUSIONS: This series illustrates the efficacy of single stage airway reconstructive surgery. Forming a pediatric airway team in a tertiary institution is the cornerstone of success.

USE OF THE PROPRANOLOL IN THE TREATMENT OF SUBGLOTTIC HEMANGIOMAS IN INFANTS

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OBJECTIVE: To evaluate the effectiveness of propranolol in the treatment of subglottic hemangiomas in infants.

PATIENTS: Four children 6 to 8 weeks of age with significant symptoms of stridor, retractions and airway obstruction that were diagnosed with left sided subglottic hemangioma with obstruction of the subglottis from 60 to 90% were begun on 2 to 3 mg per kilogram of propranolol. All children had additional steroid treatment for 2 to 6 weeks at initial diagnosis.

RESULTS: All 4 infants had resolution of their symptoms at 2 to 3 weeks following initiation of treatment and 3 of 4 have remained asymptomatic maintained on propranolol for 2 to 9 months following initial diagnosis with no additional steroid requirement. One child has required 2 courses of week long steroids once a month for the subsequent 2 months of treatment. Follow-up examination of the subglottis showed marked reduction in size of the hemangioma by 20 to 70% within 1 to 3 months after starting treatment.

CONCLUSIONS: The use of propranolol in the treatment of subglottic hemangiomas during their proliferative stage appears to have benefit in decreasing the size of the hemangiomas and resolving the symptoms of obstruction.

A DIFFICULT AIRWAY REGISTRY: A THREE YEAR RETROSPECTIVE REVIEW

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OBJECTIVE: To describe the outcome of a three year history of the Difficult Airway Registry (DAR) at our institution.

DESIGN: A 3 year retrospective review of 75 consecutive entries on a difficult airway database in the electronic medical record from its inception November 1, 2006 to present.

SETTING: An electronic health record supported medical alert system in an urban, tertiary, pediatric hospital first described in a poster presentation at ASPO in 2008.

SUBJECTS: 75 patients ages 3 weeks to 20 years who were identified as having a difficult airway by Pediatric Otolaryngology or Pediatric Anesthesia and placed in a registry.

RESULTS: There have been no sentinel events since the inception of the Difficult Airway Registry involving any patient with a known difficult airway or airway obstruction. To date, seventy five entries have been made on the difficult airway registry. These include: 45 males and 32 females, 20 children age 2 years or less. The most common diagnosis was mandibular hypoplasia involving 20 patients (26.6%). A syndrome, sequence or disorder was present in 41 patients (54.6%). Of these, the most common was one of the forms of Mucopolysaccharidosis seen in 8 patients (10.6%), Hurler's being the most frequently entered on the registry. An identifiable syndrome was present in 25 patients (33.3%) with Treacher-Collins being the most common. Limited neck extension or cervical spine fusion was present in 24 patients (32%). Another 16 patients had limited jaw opening or trismus (21.3%). Three patients identified on the registry were diagnosed with recurrent respiratory papillomatosis (8%). Of these two had subglottic extension of disease and additional laryngeal pathology, glottic stenosis and/or laryngomalacia, but these two eventually resolved and they were removed from the list. Overall, 11(14.6%) patients on the registry had tracheostomy tubes in place. Two were ultimately decannulated. In this 3 year period, 10 of the registry patients died (13.3%). Of these deaths, 4 patient deaths were associated with respiratory distress (40%). Three of these patients died with a tracheostomy in place. Two of these patients had tracheal stenosis, out of a total of four in the registry. Nine patients were eventually considered to have resolved their difficult airway. Two of these patients considered resolved after undergoing distraction of the mandible eventually died of unknown causes, and one with Hurler's syndrome of end-stage respiratory disease. The other six patients eventually considered resolved had either a congenital neck mass that had undergone excision or sclerotherapy or recurrent respiratory papillomata.

CONCLUSIONS: There have been no sentinel events since the institution of an electronic health record Difficult Airway Registry and associated alert system in the last three years. The patients most likely to be removed from the registry are those with congenital neck masses amenable to excision or treatment or a self-limiting disease of recurrent respiratory papillomata. A patient on the Difficult Airway Registry at our institution has a high risk for mortality. Tracheostomy does not often prevent death in these complex patients. Regular monitoring of these high-risk patients by a Difficult Airway Committee is warranted. For this reason we maintain that the DFA should remain the only medical alert that requires acknowledgement prior to opening the patient's record to prevent alarm fatigue.

USE OF THE HOLMIUM LASER AND DILATION IN DELAYED “A” FRAME TRACHEAL DEFORMITIES FOLLOWING LARYNGOTRACHEAL RECONSTRUCTION

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OBJECTIVE: To evaluate the effectiveness of the Holmium laser and dilation in endoscopically treating tracheal “A” Frame scarring deformities occurring years after laryngotracheal reconstruction (LTR).

PATIENTS: Children who developed symptomatic “A” frame narrowing of their trachea following LTR and who underwent Holmium laser treatment with balloon or rigid dilation.

TECHNIQUE: The Holmium laser was delivered endoscopically through a 550 micron fiber housed in a long Frazier type suction via suspension laryngoscopy with telescopic magnification. Balloon and/or rigid dilation followed lasering of the scar. Complete endoscopic documentation provided.

RESULTS: Three children ages 6 to 10 years developed significantly narrow slit-like “A” frame type deformities in the upper trachea following LTR. Two children who had anterior and posterior costal cartilage grafting for grade III subglottic stenosis developed progressively worsening scarring at the distal end of the anterior rib cartilage becoming significantly symptomatic 4 and 6 years following their LTR. One child had progressive scarring at the rib cartilage graft site 1 year following anterior costal cartilage grafting for upper tracheal stenosis. All children were symptomatic with stridor, obstructing breathing, and intermittent retractions. All children had significant improvement in their stenotic narrowing and complete resolution of their airway obstructive symptoms without complications. Initial treatments provided complete symptomatic relief for 6 to 12 months. Repeat treatments provided the same resolution of symptoms.

CONCLUSIONS: Use of the Holmium laser to treat symptomatic post LTR “A” frame stenotic deformities provides resolution of all airway obstructive symptoms. Definitive long term results of airway patency are unknown.

EVALUATION OF AIRWAY ANOMALIES IN ARTHROGRYPOSIS MULTIPLEX CONGENITA

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Arthrogyrosis Multiplex Congenita(AMC) is a rare disorder characterized by multiple limb contractures of the upper and lower extremities with or without central nervous system involvement. Otolaryngologic manifestations of AMC have been described in the literature as early as 1976 and are most commonly linked to the neurogenic subtype. The role of the Otolaryngologist usually includes management of the respiratory difficulties or complications of aspiration pneumonia necessitating tracheostomy. We reviewed all children diagnosed with AMC at a tertiary children's hospital over the past twenty years to summarize airway anomalies in these infants. Only twelve children with AMC underwent tracheostomy. Tracheostomy was most often performed in the first six months of life and often in conjunction with a gastrostomy tube for feeding difficulties. The most common anomaly noted on endoscopic evaluation of airway in these patients was subglottic stenosis. The need for prolonged mechanical ventilation assistance was another common finding in this specific cohort, and only one child has been successfully decannulated thus far. In patients with the neurogenic subtype of AMC, as manifested by respiratory difficulties such as airway compromise, severe dysphagia or aspiration, the role of the otolaryngologist is essential in the management of the complex aerodigestive issues of these patients. In addition to tracheostomy, the placement of a gastrostomy tube appears essential in the long term management of these patients as well. As with any other patient with airway difficulties necessitating tracheostomy, these patients should be followed for interval improvement in symptoms and to assess for candidacy for decannulation.

ADOLESCENTS WITH TRACHEOSTOMIES ON SOCIAL NETWORKING SITES: COMMUNICATION IN CYBERSPACE

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PURPOSE: Networking sites, such as Facebook and MySpace are popular avenues of social discourse among teens and young adults. These websites are also emerging as sources for support and acceptance, which bring people with common medical conditions together. Our aim was to determine whether social networking sites provided teens with tracheostomies a suitable environment to network with other users, to share the fact that they had tracheostomy, to post photographs of themselves, and finally to connect with other users with tracheostomies.

METHODS: We used our institution's tracheostomy database to obtain a list of all patients between ages of 11-18. Of these 33 patients, 24 had severe neuro-cognitive delays. We contacted the remaining nine subjects and asked them to complete a 5-question survey.

RESULTS: Of the nine teen subjects with tracheostomies, four were actively involved in the cyberspace community. Of these four subjects, all were on Facebook. Two of the four subjects connected with people that they didn't know in person and shared the fact that they had a tracheostomy with their online community. Three of the four subjects on Facebook posted pictures of themselves online and one subject posted YouTube videos often featuring her tracheostomy tube. Finally, we found that three of the four subjects stated that they had met others with tracheostomies online.

CONCLUSION: Internet sites appear to offer an avenue for teens with tracheostomies to network; additionally they are often willing to share pictures of themselves with the cyberspace social community.

SUBGLOTTIC STENOSIS IN INFANTS AND CHILDREN – EVALUATION OF THE USE OF BALLOON DILATOR

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Subglottic stenosis in the pediatric patients has been treated with a multitude of options including dilation, tracheotomy, open or endoscopic reconstruction. In this retrospective study we reviewed the charts of 80 pediatric patients undergoing dilation of subglottic stenosis due to different etiologies at a tertiary center from January 1999 to January 2008. The stenosis was graded from I-IV using the Cotton-Myer grading system and dilated as the primary or adjunctive treatment. The follow-up period was at least 12 months. The correlation between the age of the patient, the etiology, grade of the stenosis, number of dilations required, decannulation rate for tracheotomised patients, failure requiring a reconstructive procedure was studied and the results for metal dilators were compared with those for balloon dilator and discussed in detail.

THE VALUE OF ULTRASOUND VS. COMPUTED TOMOGRAPHY IN DIAGNOSING ABSCESES IN PEDIATRIC INFLAMMATORY NECK MASSES

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OBJECTIVE: To compare ultrasound (US) and computed tomography (CT) to diagnose abscess in pediatric inflammatory neck masses.

METHODS: Patients 0-18 years with history consistent with inflammatory neck mass underwent CT and US within 24 hours of enrollment. If treated surgically, operative findings were compared with imaging. If non-surgical, congruence between imaging modalities and clinical improvement were compared.

RESULTS: Two independent pediatric radiologists, blinded to surgical and test results, scored CT and US images in 19 patients, using a 10 point scale. 8 patients had surgery. Based on operative findings and follow-up, 6 patients had abscess; 13 did not. Assessment of test accuracy, defined as ROC curve values, sensitivity and specificity were estimated for readers (reader1/reader2) with the two modalities. For CT, reader results were 0.487/0.494, 33%/16.7% and 84%/76.9% respectively. For US, values were 0.455/0.712, 0.0%/66.7% and 69.2%/69.2%. Though sample size is small, differences were not significant and accuracy of CT and US appears similar. There is significant association between diagnosis of abscess and lesion location. Lesions in the submandibular space on US were more likely than lesions in other spaces to be abscesses (100% vs. 18.8%) ($p= 0.025$). There was no significant association with CT.

CONCLUSION: Our study is a unique prospective study directly comparing US to CT (standard of care) for diagnosis of inflammatory neck masses. In this preliminary review, the accuracy of CT and US in diagnosing neck abscess is similar. Based on lesion location, US may have improved diagnostic accuracy. Further enrollment is needed to improve study significance.

UMBILICAL CORD (UC)-DERIVED MESENCHYMAL STEM CELLS EXHIBIT ROBUST OSTEOINDUCTION ON NANOFIBERS

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INTRODUCTION: Adult adipose (AA)-derived mesenchymal stem cells (MSCs) have been shown to differentiate into various mesodermal lineages, including bone. Since children with craniofacial defects do not possess the same quantities of fat as adults, finding an alternative source of MSCs, is a reasonable strategy. UC could be an ideal source of MSCs in children. Biologically engineered tissues require scaffolds that mimic the 3-dimensional (3-D) extracellular matrix found in vivo. Nanofibers such as polycaprolactone (PCL) and poly lactic-co-glycolytic acid (PLGA), consist of submicron fibrils, and provide an ideal 3-D environment for engineering bone.

OBJECTIVES: To compare osteoinductive capabilities of MSCs derived from UC and AA, and to compare 2-dimensional (2-D) surfaces to PCL and PLGA nanofibers as substrates for tissue engineered bone.

METHODS: AA and UC tissues were harvested and osteogenesis was induced using media containing dexamethasone, β -glycerophosphate, and ascorbic acid on 3 different substrates: 2-D surfaces, PLGA and PCL nanofibers. Osteoinduction was evaluated qualitatively by staining for calcium deposition and quantitatively by real time PCR for Bone Morphogenic Protein-2 (BMP-2) and Alkaline Phosphatase (ALP).

RESULTS: Calcium deposition was seen on all substrates. UC showed greater osteoinduction than AA on 2-D surfaces as determined by increased BMP-2 (200-fold) and ALP (40-fold) mRNA. PLGA showed a 6-fold increase in BMP-2 mRNA when compared to PCL, and a 100-fold increase when compared to 2D surfaces.

CONCLUSION: UC MSCs have greater osteoinductive capacity than AA on all surfaces. Though nanofibers improve osteoinduction, PLGA appears to be a better substrate than PCL.

RETROPHARYNGEAL AND PARAPHARYNGEAL INFECTIONS IN CHILDREN - TREATMENT STRATEGIES AND OUTCOMES

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OBJECTIVE: To optimize treatment of retro- and parapharyngeal infections in children

STUDY DESIGN: Retrospective chart review

SETTING: Tertiary care referral center

PATIENTS: 101 consecutive pediatric cases of retro- and parapharyngeal abscesses;

RESULTS: Two thirds of patients were males. Their mean age was 52 months (range: 6-163). Upper airway obstruction was observed in three patients. In one child, the infection evolved towards a diffuse cervical cellulitis. Purely medical treatment was initially planned in 44% of patients. Failures requiring surgical drainage occurred in 18% of patients. In 56% of cases, surgical treatment was immediately decided, in all but one patient through an intraoral approach. It failed in 16% of patients, requiring a second surgical drainage. There is no difference in the duration of fever and of hospital stay between patients initially treated medically or surgically. Both medical and surgical treatment failures were associated with longer durations of fever ($p = 0.002$, and $p < 0.0001$, respectively) and of hospital stay ($p = 0.0006$, and $p = 0.0005$, respectively). The main prognostic factor was the aspect of the infection on CT-scan. An image of hypodense core surrounded by rim enhancement, with a largest long axis ≥ 20 mm on CT-scan, was more frequent in case of medical failure ($p = 0.02$). Surgical failure was associated with the same aspect, but with a largest long axis ≥ 30 mm ($p = 0.05$).

CONCLUSIONS: The present study suggests that the length of the largest long axis of retro- and parapharyngeal abscesses is a useful tool for establishing the treatment strategy.

IDENTIFICATION OF MUCINS SPECIFIC FOR THYROGLOSSAL DUCT CYST FLUID

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OBJECTIVE: To identify proteins specific to thyroglossal duct remnants vs. saliva in order to better treat patients with post-operative drainage following Sistrunk surgery. Past immunohistochemistry studies on archived tissue blocks from patients who have already undergone a Sistrunk procedure have shown the mucin MUC5AC to distinguish between thyroglossal duct and salivary tissue. We seek to further identify if this protein is secreted into the cyst and if it can be identified using universal laboratory techniques.

METHODS: Thyroglossal duct cyst contents/fluid and oral saliva were obtained from 10 patients at the time of Sistrunk procedure. Respiratory mucus was obtained from two separate pediatric patients at time of bronchoscopy for use as a positive control. Enzyme linked immunosorbent assay (ELISA) was then performed on the samples to identify the presence of MUC5AC.

RESULTS: Seven of ten thyroglossal duct cyst fluid samples were shown to have elevated immunosorbence, and therefore the presence of MUC5AC, while three did not. Both respiratory mucus samples were also found to have elevated immunosorbence. Three of ten oral saliva samples were shown to have higher immunosorbence than corresponding cyst fluid specimens. Histologic analysis of those samples demonstrated a lack of The fluid samples that did not have an elevated immunosorbence were found to lack the presence of respiratory epithelial lining under light microscope.

CONCLUSIONS: MUC 5AC is an accurate identifier of thyroglossal duct cyst fluid relative to oral saliva if the cyst is lined with respiratory epithelium.

THE UTILIZATION OF PRENATAL IMAGING IN THE EVALUATION AND MANAGEMENT OF FETAL HEAD, NECK, AND AIRWAY ANOMALIES – AN OTOLARYNGOLOGY PERSPECTIVE

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OBJECTIVE: To evaluate the utilization of prenatal imaging in the diagnosis and management of fetal head, neck, and airway anomalies.

STUDY DESIGN: An IRB approved retrospective study of prenatal imaging of patient with head, neck, and airway anomalies at a tertiary pediatric center. All patients underwent fetal imaging including ultrasound and MRI followed by multidisciplinary assessment at the fetal center. Variables analyzed included maternal age; fetal gender; gestation at assessment; pre and post natal imaging; gestation at birth; mode of delivery; interventions at time of delivery; and outcome of fetus.

RESULTS: 27 patients were included in the study. Mean maternal age was 29.6 years (18-40 years). Mean fetal gestation at presentation was 27 weeks (18-38 weeks). Diagnoses included Lymphatic Malformations (LM) (9), Cervicofacial Teratomas (9), Craniofacial Anomalies (5), Tracheal Atresia (2), Fetal Hemangioma (1), and Esophageal Duplication Cyst (1). 6 patients underwent termination following assessment. Mean gestation at delivery was 35 weeks (30-38 weeks). 6 patients were delivered via EXIT procedure, during which 2 patients (1 LM, 1 Teratoma) required intubation and 3 patients, all with teratomas, required tracheostomies. 10 patients were delivered via Cesarean section with 2 requiring intubation (1 teratoma, 1 LM). 3 patients had vaginal deliveries with no intervention. Prenatal diagnosis was consistent with postnatal diagnosis in 95% (20/21). Survival was 86% (18/21).

CONCLUSION: Advances in prenatal ultrasonography and MRI have improved the ability to diagnose congenital abnormalities in utero. This allows for accurate assessment of the head, neck, and airway to prevent unexpected problems at delivery.

COMPLETE VERSUS INCOMPLETE PREOPERATIVE EMBOLIZATION AND ITS ROLE IN JUVENILE NASOPHARYNGEAL ANGIOFIBROMA SURGERY

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OBJECTIVE: Successful management of juvenile nasopharyngeal angiofibromas has advanced greatly in the past decade. Improvement in transnasal endoscopic skull base surgery and more accurate preoperative embolization enable complete surgical resection with decreased blood loss, less morbidity and reduced hospitalization. Although preoperative embolization does generally decrease surgical blood loss, not all embolizations are complete. Embolization depends on the vascular supply of the tumor and particular techniques used in interventional radiology. Comparison of incomplete versus complete embolization in JNA cases were examined for their success in decreasing surgical blood loss.

METHODS: Retrospective review of 16 patients with tissue-diagnosed JNA from 2002-2009 were examined. Preoperative embolization (complete vs. incomplete), blood loss, endoscopic vs. combined approach, OR operative time, IR operative time, particle size, and residual vessels were examined. Paired t-test and p -value < 0.05 was used for statistical significance.

RESULTS: 16 patients ranging in age from 10 to 17 years underwent JNA embolization/surgery from 2002-2009. 13 underwent exclusively endoscopic approaches, 3 underwent combined approaches (2 caldwell-luc, 1 craniofacial approach). 6 underwent successful complete embolization, 10 underwent incomplete embolization. The most common residual vessel was the vidian artery. Complete preoperative embolization was statistically significant for less blood loss versus incomplete preoperative embolization ($p = 0.0442$). OR/IR operative time, and particle size were not significant factors. Follow-up ranged from 1 month to 7 years - mean of 2.6 years. 2 recurrences were noted in the post-operative period.

CONCLUSION: Complete preoperative embolization significantly statistically decreases surgical blood loss versus incomplete preoperative embolization. Particle size and operative time were not significant.

**HEAD AND NECK MANIFESTATIONS OF
LANGERHANS' CELL HISTIOCYTOSIS IN CHILDREN:
A 46-YEAR EXPERIENCE**

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BACKGROUND: Langerhans' cell histiocytosis (LCH) is a relatively uncommon disorder that is characterized by an abnormal accumulation of histiocytes. The pathogenesis of LCH is poorly understood, and its clinical severity can range from a disseminated, leukemia-like disease to a solitary lytic bone lesion. Head and neck manifestations are quite common in LCH and may often be misdiagnosed given the relative infrequency of the disease and its sometimes vague symptom complex.

METHODS: A retrospective analysis was performed on all patients that presented with a diagnosis of LCH to a single pediatric oncology center.

RESULTS: Eighty-eight patients with LCH were evaluated between 1962 and 2008. The average age at onset was four years. 84% of patients had at least one head and neck manifestation of the disease. Lytic skull lesions were the most common head and neck finding, as 44% of patients were affected. Cervical lymphadenopathy, skin changes of the face or scalp, and recurrent otitis media were the next most common manifestations. Surgical intervention was only required in 39% of patients, most commonly involving open biopsy of either a lytic bone lesion or an enlarged cervical lymph node. Chemotherapy and corticosteroids have been the mainstay of treatment. Radiotherapy was not commonly utilized. Overall mortality from LCH was 9%.

CONCLUSIONS: LCH may mimic common pediatric head and neck disorders such as otitis media, skin rash, or cervical lymphadenopathy. Familiarity with the symptom complex of LCH is especially important to the otolaryngologist in order to assist in early diagnosis of this disease.

**MINIMALLY INVASIVE VIDEO-ASSISTED THYROIDECTOMY
(MIVAT) FOR TREATMENT OF BENIGN SOLITARY THYROID
NODULES IN PEDIATRIC PATIENTS: A PRELIMINARY EXPERIENCE**

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OBJECTIVE: To evaluate the feasibility and evaluate our preliminary experience with minimally invasive video-assisted thyroid (MIVAT) surgery for the treatment for solitary thyroid nodules in the pediatric population.

STUDY DESIGN: Retrospective

METHODS: A chart review was performed to identify pediatric patients with solitary thyroid nodule less who underwent a MIVAT procedure from July 2008 to date. Inclusion criteria were solitary thyroid nodules less than 3.5 cm in size and had a minimum follow up of 3 months. End points of the study included technical success defined as completion of the procedure and assessment of feasibility in terms of complications.

RESULTS: Two female patients (ages 12 and 17) underwent a right MIVAT surgery for 2.1cm and 3.3 cm solitary thyroid nodules .Technical successful was a 100% with no conversion to open thyroidectomy. The operative times were 180 minutes and 150 minutes, respectively, and pathology was benign in both cases (follicular adenoma and nodular hyperplasia). No drain placement and discharge after 23 hour observation in both cases. There were no major complications. Recurrent laryngeal nerve and parathyroid glands were identified and preserved. The post operative scar was 2 cm. The patient and parents were satisfied with results with of surgery and resultant scar at last follow up.

CONCLUSION: MIVAT is a feasible and safe option for the management of solitary thyroid nodules in children.

TREATMENT OF INFANTILE PERIORBITAL HEMANGIOMAS AND THE EFFICACY OF PROPRANOLOL

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PURPOSE: Present the ophthalmologic complications and appropriate treatment of periorbital hemangiomas. To determine the effect of propranolol on treatment.

METHODS: The study population consisted of patients at a single tertiary children's hospital diagnosed with a periorbital hemangioma. The demographics, procedures, complications, and follow up were recorded.

RESULTS: Over a 3 year period, 51 patients with periorbital hemangiomas were treated. Patients without ophthalmologic complications were excluded, leaving 28 total patients in the study. There were 23 females and 5 males (ratio, 4.6:1). All patients were treated in the proliferative phase over an age range from 1 to 7.5 months (mean, 3.7 months). Ophthalmologic sequelae of the hemangiomas included visual field obstruction/ptosis (n= 18), pressure on globe (n= 8), astigmatism (n= 6), amblyopia (n= 4), strabismus (n= 1), proptosis (n= 1), and anisometropia (n= 1). The pre-propranolol group included 20 patients. Treatment consisted of steroid injections (n= 14, 70%) with a mean of 1.6 injections per patient, excision (n= 9, 45%), and vincristine (n= 2). Complications consisted of residual ptosis (n= 2) and epidermal steroid plaque (n= 1). The propranolol group included 8 patients. Treatment consisted of steroid injections (n= 3, 38%) with a mean of 1.0 injections per patient, excision (n= 1, 12.5%), and no surgical treatment (n= 5, 62.5%). Complications were increased somnolence (n= 2) while on propranolol. Follow-up in patients ranged from 7 to 36 months (mean, 20 months).

CONCLUSION: Timely intervention is often necessary to avoid long term ophthalmologic complications in patients with periorbital hemangiomas. Propranolol offers an effective treatment with minimal complications in a majority of patients when compared to previous methods.

THE IMPACT OF FACIAL NERVE ANATOMIC VARIATIONS IN FIRST BRANCHIAL CLEFT EXCISION SURGERY

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OBJECTIVE: First branchial cleft anomalies are a rare group of congenital malformations that account for fewer than 10% of all branchial cleft defects. We describe the facial nerve anatomic variations within our surgical experience and their implications on intra-operative time and outcomes.

METHODS: A retrospective review of all pediatric patients that underwent excision of branchial cleft cyst (BCC) with facial nerve dissection from 1997 - 2009.

RESULTS: Fourteen patients underwent resection of BCC, nine females and five males with an average age of 5.3 years. The left side was involved in ten patients while four had the lesions on the right side. Fistulas were more common (eight) than sinuses (six). Two patients underwent revision surgery. No permanent facial nerve damage were reported although two patients developed transient marginal mandibular nerve paresis. The average time of surgery was 3.5 hours. The branchial cleft anomaly was found deep to facial nerve in eight cases, superficial in four cases and bisecting branches of the nerve in two cases. Surgical time for each category did not demonstrate any statistically significant difference.

CONCLUSION: The most common location of the facial nerve has been reported as superficial, although in our group the branchial anomaly was most often found deep to the nerve. Nevertheless, this anatomic variation had no impact on the surgical time or the overall patient outcome when compared to the superficial group. Complete surgical excision of BCC is indispensable for the permanent cure, and adequate resection depends on the correct understanding of all the possible anatomical variations of the facial nerve.

OROPHARYNGEAL STENOSIS - A POTENTIAL COMPLICATION OF LINGUAL TONSIL AND TONGUE BASE PROCEDURES

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PURPOSE: This report describes oropharyngeal stenosis (OPS), an infrequent and serious complication of procedures intended to reduce lingual tonsil and/or tongue base hypertrophy and glossoptosis. This report also describes the manner in which OPS may be managed successfully.

METHODS: A review of all patients undergoing tongue base and/or lingual tonsil procedures over 30 month period was conducted. Patients who developed OPS are described, as are the surgical interventions required, including pharyngoplasty and steroid injections.

RESULTS: 126 patients underwent 136 operative procedures. 57 were multilevel, single-stage procedures, meaning that concurrent oropharyngeal and/or nasopharyngeal procedures were performed. Three multilevel, single-stage patients developed OPS for a complication rate of 5% (3/57). Patient 1 underwent lingual tonsillectomy and midline posterior glossectomy as well as adenoidectomy. Patient 2 underwent lingual tonsillectomy and soft palate reduction. Patient 3 underwent lingual tonsillectomy, radiofrequency tongue base reduction and adenoidectomy. Each patient required pharyngoplasty (scar release, debulking of fibrotic tissue, and reorientation of the scar) and triamcinolone injections in the operating room. OPS has not recurred.

CONCLUSION: OPS is a serious potential complication of lingual tonsil and/or tongue base surgery. Multilevel, single-stage procedures may increase the risk of OPS. Descriptions of OPS as a complication of lingual tonsil and/or tongue base surgery are few. As lingual tonsil and tongue base procedures become less technically difficult and more commonly performed, often in combination with surgery at other levels of the upper aerodigestive tract, due diligence requires consideration of this potential complication and its management.

PROPHYLACTIC THYROIDECTOMY IN CHILDREN WHO ARE CARRIERS OF RET GENE MUTATION

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The molecular examination of the proto-oncogen RET allows the detection of patients with risk of suffering of medullary thyroid carcinoma in early ages. The goal of this work was to 1) give the prevalence of histopathological abnormalities in children having a RET gene mutation, 2) study the post-operative complications in this population and 3) to present the different techniques of recurrent nerve monitoring in children. A retrospective case study between 2001 and 2008, 8 children with a proven RET mutation. The age was ranging from 2.3 yrs to 18 yrs, all children but one had a familial history of medullary thyroid carcinoma. The last one had a familial history of multiple endocrine neoplasia type 2 (MEN 2). All children underwent a total thyroidectomy. Mean follow-up was 3.5 years. Among the 8 children, C-cell hyperplasia was found in 2 cases, a medullary thyroid carcinoma in 4 children, and normal thyroid histology in 2 children. The youngest child with a medullary carcinoma was 3.5 yrs old. During surgery, recurrent nerve monitoring was done in young children using ever an EMG through an endoscopic or an open cervical approach, or a peroperative video assessment of vocal fold motion. No children developed hypoparathyroidism, nor recurrent laryngeal-nerve palsy postoperatively. All patients are clinically free of disease after a mean follow-up of 3.5 years.

CONCLUSION: Medullary thyroid cancer occurs at a very young age in carriers of RET mutations. In such children prophylactic thyroidectomy is likely to be recommended as soon as possible, with a low morbidity.

**INTERVENTIONAL SIALENDOSCOPY FOR
TREATMENT OF JUVENILE RECURRENT PAROTITIS:
A PRELIMINARY EXPERIENCE**

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OBJECTIVE: Juvenile recurrent parotitis (JRP) is a difficult clinical problem with management options including conservative medical management or superficial parotidectomy in resistant cases. The objective was to evaluate our preliminary experience with interventional sialendoscopy for the treatment for JRP.

STUDY DESIGN: Retrospective case series

METHODS: A chart review was performed to identify pediatric patients with recurrent JRP who underwent interventional sialendoscopy from July 2008 to date. Patients included had failed conservative management and had a minimum follow up of 3 months. Procedure involved sialendoscopy followed by irrigation of the duct and instillation of steroid (Kenalog-40) under endoscopic control. End points of the study were technical success defined as completion of the procedure, symptom control, and assessment of feasibility in terms of complications.

RESULTS: Two patients (ages 6 and 11) were identified within 6 months with a diagnosis of JRP failing conservative management. Both patients had left-sided recurrent parotitis. Technical success was 100%. Acute masseteric bend posed a challenge for navigating the scope in one patient. One patient required marsupialization of Stensen's duct. No major complications resulted from the procedure. Endoscopic findings included a blanched stenotic duct with intraductal debris (2/2, 100%). No major complications such as post operative infection or facial palsy occurred. In both cases, parents were satisfied with results with no new episodes of JRP reported at last follow up.

CONCLUSION: Our preliminary experience suggests that interventional sialendoscopy is a feasible option for the management of recalcitrant JRP. Surgical technical points are discussed and updated results will be presented.

EXIT PROCEDURE TO MANAGE GIANT CONGENITAL CERVICAL TERATOMAS

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OBJECTIVES: 1) Present an airway management algorithm for otolaryngologists leading airway management during an EXIT procedure for congenital cervical teratomas 2) Report the range of acute and long-term aerodigestive cares needed for patients requiring EXIT procedures at birth for occlusive cervical teratomas

METHODS: Design: Retrospective chart review. Three children born between 1995 and 2003 presented to a tertiary care hospital for known intra-uterine airway obstruction. Each of these patients was diagnosed in-utero with a giant congenital cervical teratoma. Arrangements were made for an EXIT (EX utero Intrapartum Treatment) procedure. This procedure, based on a modified Caesarian section under general anesthesia, provides for an immediate surgical airway intervention while maintaining uteroplacental respiration for the neonate.

RESULTS: All three patients survived and achieved adequate airways with no evidence of hypoxic events. Further, two of the three have also achieved extubation/decanulation; the third has remained tracheostomy-dependent despite two laryngotracheal reconstructions. One patient requires life-long thyroid/parathyroid replacement and one required thyroid supplementation for 3 years until she was successfully weaned. Two exhibit left vocal cord paralysis, but are asymptomatic.

CONCLUSIONS: An otolaryngologist plays a crucial role in EXIT procedures. These procedures avert the severe and typically non-viable airway compromise caused by giant congenital cervical teratomas. The otolaryngologist's airway management skills are especially critical during the limited window of uteroplacental gas exchange. Further, the otolaryngologist's skills in airway reconstruction, airway monitoring, voice assessment and swallowing remain crucial in subsequent years. With proper management, these children often achieve decanulation/extubation with normal voice and swallowing function.

**EXPRESSION OF THE PATTERN RECOGNITION RECEPTORS
IN MOUSE MIDDLE EAR EPITHELIAL CELLS
INDUCED BY LIPOPOLYSACCHARIDE**

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Otitis media (OM) is one of the most common diseases in infants and children. Lipopolysaccharide (LPS), a principal endotoxin of the outer membrane of Gram-negative bacteria, is present in a high percentage of the human middle ear (ME) effusions including those that are negative for bacteria by culture. Recent studies have elucidated how LPS is recognized by monocytes and macrophages of the innate immune system via toll-like receptors (TLRs) that are innate recognition molecules important for immune responses against pathogens. In this study, gene expression patterns of Cd14 and TLRs in mouse middle ear epithelial cells (mMEEC) in culture were profiled at 6h, 12 h, 24 h and 48 h after 100ug/mL LPS (*Pseudomonas aeruginosa*) treatment using real-time PCR. Results demonstrated that Cd14 and TLRs are expressed in untreated mMEEC with the order TLR4> CD14> LBP> TLR9> TLR2. TLR2 was dramatically induced at 6 h and TLR4 and TLR9 were dramatically induced at 48 h after LPS treatment. LBP and Cd14 are induced from 6 h to 48 h after LPS treatment. Our data suggest that these innate recognition molecules are the first line of defense in the ME mucosa and participate in the early process of the MO pathogenesis.

**COMPARISON OF EXTENDED HIGH FREQUENCY DPOAES
AND BEHAVIORAL THRESHOLDS IN CHILDREN
WITH AND WITHOUT HISTORIES OF OTITIS MEDIA**

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OBJECTIVES: Examine extended high frequency hearing (EHFH) in children with and without histories of otitis media (OM) using behavioral audiometry (BA) and distortion product otoacoustic emissions (DPOAE).

POPULATION: Two groups of children were enrolled. One group was followed with monthly documentation of middle ear status and yearly hearing testing. The second group included children with tympanostomy tubes and age-matched controls.

METHODS: Children underwent otoscopy and tympanometry prior to hearing evaluation to confirm normal middle ear status or patent tubes. BA testing was performed at 8 different frequencies from 500Hz to 20000Hz. DPOAEs with frequency sweeps from 1500 to 16000Hz (F2) were done at stimulus levels (L1/L2) of 65/55 and 55/45.

RESULTS: The mean hearing thresholds at 500Hz to 8000Hz were normal. For the control children the EHFH thresholds were 24dB, 41dB and 77dB compared to those in the tube group 31dB, 56dB and 89dB at 12000Hz, 16000Hz and 20000Hz, respectively ($P < 0.05$). The hearing levels for the longitudinal group fell between these. There was a significant difference in amplitude of the DPOAEs between tube and control groups with higher amplitude in the control group and lower amplitude in the tube group, although significance was not achieved at all frequencies.

CONCLUSION: Both BA and DPOAE showed that children with a minimal history of OM had significantly better EHF hearing thresholds than children in the tube group. Also, it appears that OAEs are a viable option for monitoring hearing levels and may be reflective of hearing in the high frequencies.

PEDIATRIC TEMPORAL BONE FRACTURES: CURRENT TRENDS AND COMPARISON OF CLASSIFICATION SCHEMES

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OBJECTIVES: 1) Characterize the current presentation of pediatric temporal bone fractures
2) Compare two classification schemes for temporal bone fractures and identify factors that predict complications.

DESIGN: Retrospective medical record review.

SETTING: Tertiary-care, academic children's hospital.

PATIENTS: All children presenting from 1999 to 2009 with CT-proven temporal bone fracture and audiologic follow-up.

INTERVENTION: All CT scans were reinterpreted by a dedicated head and neck radiologist. All fractures were characterized as otic capsule sparing (OCS) or otic capsule violating (OCV), as well as transverse (T) or longitudinal (L). Outcome: CT findings, mechanisms of injury, sensorineural hearing loss (SNHL), conductive hearing loss (CHL), and facial nerve injury (FNI).

RESULTS: 71 children met inclusion criteria. 54(76%) children had longitudinal fractures versus 17(24%) with transverse fractures. 64(90%) had OCS versus 7(10%) with OCV. The otic capsule was involved in 7.4% of longitudinal fractures and 17.6% of transverse fractures. 11(15%) had facial weakness, 72% of whom had a visualized fracture through the facial nerve course. SNHL was detected in 14 (20%) patients and CHL in 17(23.9%). All patients with fractures classified as both transverse and OCV had SNHL. The OCS/OCV and T/L classification schemes were directly compared for statistical significance in predicting SNHL, CHL, and FNI using the Fisher's exact test. Both OCS/OCV and T/L were predictors of SNHL ($p = .0025$ and $p = 0.0143$, respectively). Neither classification significantly predicted CHL or FNI ($p = 0.787$ vs. 0.825 ; $p = 0.705$ vs. 0.755).

CONCLUSIONS: Both Otic Capsule Sparing/Otic Capsule Violating and Transverse/Longitudinal classification schemes predict SNHL, but are not predictive of facial nerve injury or conductive hearing loss.

RADIOLOGIC INCIDENCE OF SUPERIOR SEMICIRCULAR CANAL DEHISCENCE IN INFANTS AND CHILDREN

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OBJECTIVES: 1) To report the incidence of radiologic superior semicircular canal (SCC) dehiscence in the pediatric population. 2) To correlate the thickness of bone overlying the superior SCC with age in children.

DESIGN: Retrospective review of temporal bone CT scans

SETTING: Tertiary-care children's hospital

PATIENTS: 514 temporal bone CT scans performed between November 1st, 2007-August 1st, 2009.

MAIN OUTCOME MEASURES: 1) Incidence of radiologic superior SSC dehiscence. 2) Measurement of thickness of bone overlying the superior SCC at its thinnest point. 3) Analysis of the height of bone overlying the superior SCC according to age of the patient.

RESULTS: Temporal bone CT scans of 514 patients were included (1028 ears). Average age was 8.8 years. Superior SCC dehiscence was detected in 24/514 patients (4.7%). Seven patients had bilateral dehiscence (0.7%); therefore, 31/1028 temporal bones had radiologic dehiscence (3.0%; 95% CI = 2.1% -4.2%). There was no significant difference in rates of dehiscence by age group ($p= 0.79$). Post-hoc subgroup analysis revealed that 15.2 % of patients < 1 year old had radiologic dehiscence compared with 4.0% of patients > 1 year old ($p= 0.007$). The thinnest portion of bone overlying the superior SCC measured an average of 0.99mm. The average measurement in patients < 1 year old was 0.42mm compared with 1.03mm in patients > 1 year old.

CONCLUSIONS: Superior SCC “dehiscence” can be noted on CT scan of the temporal bone of infants and young children. However, this finding may be considered a normal finding, especially in infants < 1 year old. Likely, it is a reflection of the developing temporal bone instead of a pathologic finding.

AN OBJECTIVE COMPARISON OF LEAKAGE BETWEEN COMMONLY USED EAR PLUGS

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OBJECTIVE: To quantify the volume and rate of water leakage past commonly prescribed ear plugs.

DESIGN: Investigational study using commercially available ear plugs and external ear model.

OUTCOMES MEASURED: The total volume and rate of water that leaked past the ear plug and subsequent 1.14 mm defect in the tympanic membrane over separately measured 30, 60, 120, and 180 second intervals. Scenarios tested included a control with no ear plug, custom molded (Precision Laboratories, Orlando, FL.), Mack's (Warren, MI), Doc's (Santa Cruz, CA) and cotton balls coated with petroleum jelly.

RESULTS: All plugs tested resulted in less leakage at all time points when compared with no plug ($p < 0.05$). At 30 seconds, the custom molded, Mack's and Doc's plugs all showed significantly less leakage when compared to the cotton ($p < 0.05$). At 60, 120 and 180 seconds, Mack's, Doc's, and cotton plugs all showed significantly less leakage compared to the customized plug ($p < 0.05$). At 120 and 180 seconds Mack's plugs had significant less leakage than the cotton plug ($p < 0.05$).

CONCLUSIONS: All 4 tested ear plugs showed significantly less leakage compared to using no plug at all. Among the types of plugs, the molded variety (Mack's) showed the least volume and lowest leakage rate. However, Doc's and cotton plugs were more effective than the customized ear plugs. If the clinician feels middle ear water exposure should be minimized, then use of ear plugs, particularly the moldable variety, merit further consideration.

**RADIOLOGIC FINDINGS IN CHILDREN
WITH POSTMENINGITIC SENSORINEURAL HEARING LOSS
PRIOR TO COCHLEAR IMPLANTATION**

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OBJECTIVE: To determine the utility and accuracy of CT and MRI for cochlear implant surgical planning

PATIENTS: 22 pediatric patients with post meningitic deafness between 1996-2009 were retrospectively analyzed

MAIN OUTCOME MEASURES: Images were reviewed by 2 pediatric neuroradiologists blinded to clinical data. The radiologic and operative findings were correlated

RESULTS: 43 ears in 22 patients were analyzed. 33/43 showed cochlear ossification (CO) on high resolution CT and 20/26 showed CO or cochlear fibrosis (CF) on MRI. Comparing the operative findings (at time of implantation) for 24 ears to the radiologic findings, CT (n = 24) had a sensitivity of 100% and specificity of 53% while MRI (n= 15) had a sensitivity of 100 % and a specificity of 58 % for assessment of ossification or fibrosis at the round window and basal turn of the cochlea. Average age of diagnosis was 18.5 months (6-62 months) and implantation 56 months (10-154 months). Average time between diagnosis and imaging was 16 months (6-118 months) and average time between imaging and surgery was 19 months (1 week-17 months).

CONCLUSION: This study highlights the utility of CT and MRI in patients who are postmeningitic CI candidates. When findings of CO on CT were equivocal, the addition of MRI demonstrating fibrosis and /or ossification was useful. We recommend utilizing both CT and MRI for assessment of CF or CO as part of surgical planning for CI as the presence of fibrosis or ossification can make surgery more challenging

INCIDENCE OF OTITIS MEDIA WITH EFFUSION AND HEARING LOSS IN INFANTS WITH CLEFT PALATE

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OBJECTIVE: Otitis media is known to be associated with cleft palate, however controversy still exists as to the prevalence of the condition and its appropriate management. The objective of this study was to evaluate the incidence of otitis media and hearing loss during the first year of life in patients with cleft palate.

METHOD: A retrospective study of 298 new patients seen at a tertiary cleft center was conducted. Patients with known syndromes or chromosomal abnormalities and those not seen within the first year of life were excluded. Data for otoscopic exams, tympanometric testing and audiometric testings were collected and analyzed from 225 patients.

RESULTS: By roughly 3.5 month of age, 66% of patients had OME or AOME by otoscopy and 89% by tympanogram. Myringotomy performed within the first year of life (mean 6.8 months of age) documented OME or AOME in 92.5% of patients. Newborn hearing screens were normal in 75% of patients, however 77% of patients developed bilateral and 8% unilateral hearing impairment prior to palatoplasty. After tympanostomy tube placement, 9% of patients had bilateral and 6% had unilateral hearing impairments.

CONCLUSION: Otitis media in the cleft palate population does not appear to be universal at birth, but, by 6 month of age, the prevalence of the disease in cleft palate patients is > 90%. Moreover, hearing in the cleft palate population is adversely affected during extant disease and improves with tympanostomy tube placement.

**MIDDLE EAR EFFUSION, TUBE PLACEMENT, HEARING LOSS
AND SPEECH IN THE CLEFT PALATE POPULATION
5 YEARS AFTER PALATE REPAIR**

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OBJECTIVE: Compare the numbers of ENT visits and ventilation tubes, the degree of hearing loss and the duration of speech therapy between Furlow (FP) and straight line (SLP) palatoplasties in cleft palate (CP) patients.

METHODS: A 5 year retrospective study of 111 patients followed at a tertiary CP center without known syndromes/chromosomal abnormalities or those not seen within 2 years of birth. Twenty-eight patients had FP and 83 had SLP.

RESULTS: The number of ENT visits overall was 5.2 ± 3.1 and 6.6 ± 3.8 ($p = 0.056$) and the average number of visits for OME for those without tubes was 0.52 ± 0.74 and 1.04 ± 1.19 for FP and SLP groups ($p = 0.007$). After primary palatoplasty, 5 (18%) and 48 (58%) patients in the FP and SLP groups had ventilation tubes inserted ($P = .035$). The average number of tubes was 0.5 ± 1.1 and 1.7 ± 2.2 ($p < .001$), the cumulative time with tubes was 25.5 ± 13.3 and 33.6 ± 16.4 months ($p = .0128$) for FP and SLP groups ($p = 0.007$). Audiograms performed within 12 months of patients' 5th birthday showed 28% (19/67) in the SLP group and 11% (2/18) in the FP group had a > 25 db hearing loss in at least 1 ear ($p = .218$). The duration of speech therapy was 9.0 ± 14.8 and 15.7 ± 24.5 months in the FP ($N = 27$) and SLP ($N = 83$) groups ($p = 0.09$); there was no difference in developmental language delay, 19% (5/27) and 16% (13/83) for the FP and SLP groups ($p = .767$).

CONCLUSION: Compared to SLP, FP was associated with fewer ENT visits over all and for OME, fewer ventilation tubes, and, possibly, a shorter duration of speech therapy.

COCHLEAR NERVE DEFICIENCY AND INTERNAL AUDITORY CANAL MORPHOLOGY IN CHILDREN WITH CHARGE SYNDROME

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OBJECTIVE: To describe cochlear nerve deficiency and abnormalities of the internal auditory canal (IAC) seen in children with CHARGE syndrome.

DESIGN: Case series

SETTING: Tertiary children's hospital

PATIENTS: Children with CHARGE syndrome evaluated between 2006 and 2009

MAIN OUTCOME MEASURES: Morphology of the inner ear, IAC, and cochlear nerves, auditory-evoked brainstem response (ABR) results

RESULTS: Of the 11 patients with CHARGE diagnosis, 12 ears demonstrated profound SNHL. The remaining ears presented with conductive hearing loss, mixed hearing loss, or mild to moderate SNHL. CT evaluation was refused in one case and delayed in one case due to parental decision. Of 18 ears evaluated with CT, 89% had severe abnormalities of the inner ear including hypoplasia or aplasia of the semicircular canals and abnormalities of the cochlea and vestibule. CT evaluation revealed a stenotic IAC in five ears (although profound SNHL was noted in only three). The three most recent patients with bilateral profound SNHL underwent MRI evaluation of the eighth nerve, and all six ears were noted to have absent cochlear nerves. CT scans in four of these ears revealed normal appearing IAC's.

CONCLUSION: The dysmorphic inner ear is well described in CHARGE patients, however cochlear nerve deficiency has not been considered a common etiology for SNHL in these patients. Because of the implications of cochlear nerve deficiency in therapeutic decision-making (i.e. cochlear implantation), MRI evaluation of the eighth nerve should be performed in CHARGE patients with profound SNHL. CT alone is inadequate in evaluating for cochlear nerve deficiency.

CHARACTERISTICS AND OUTCOME OF VERTIGO IN CHILDREN AND ADOLESCENTS

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BACKGROUND: Vertigo is an uncommon complaint in the pediatric and adolescent population. Moreover, the differential diagnosis of this problem is not as in adults, requiring a modified diagnostic work-up and management strategy.

OBJECTIVES: To characterize the etiology of vertigo in the pediatric and adolescents age groups and to describe the course of the conditions over time.

METHODS: A cross sectional retrospective study including a cohort of children and adolescents presenting to a tertiary otoneurology clinic with vertiginous complaints in the years 2003-2008. A detailed medical history for vestibular symptoms and migraine was obtained from the patient or his parents. All patients underwent a full otolaryngologic and otoneurologic physical examination, and audiological evaluation. Further testing was carried-out as indicated. Follow up of patients was performed using a questionnaire completed by parent and patient.

RESULTS: Thirty three patients were evaluated with a mean age of 14 years. The most common etiology for vertigo was migraine followed by acute labyrinthitis/neuritis and psychogenic dizziness. Twenty-seven percent had pathological findings on otoneurological examination. Sixty-eight percent had a pathological ENG results. With respect to treatment, 17 patients were referred to further treatment by other disciplines, 10 had a self-limited disease. A follow up questionnaire was completed addressing issues such as quality of life, symptoms and treatment compliance.

CONCLUSIONS: Various vertiginous syndromes might present with similar signs and symptoms in the pediatric and adolescent population. The diagnostic work-up and treatment plan of the vertiginous child is challenging and might require collaboration and involvement of several medical disciplines.

THE ETIOLOGY OF PERSISTENT CONDUCTIVE HEARING LOSS IN CHILDREN

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OBJECTIVE: To determine the etiology of persistent pediatric conductive hearing loss (CHL) in children and determine the utility of temporal bone computed tomography (TBCT) scan to identify causes of persistent CHL.

DESIGN: Retrospective case series at a tertiary care academic center.

METHODS: 3,396 pediatric records with CHL from 1993-2008 were reviewed, revealing 180 cases of persistent CHL. Forty-five had diagnostic TBCT scans available for review. Patients with CHL due to cholesteatoma, tympanic membrane perforation, or middle ear effusion were excluded

RESULTS: Overall, 28/45 (62%) had multiple anomalies. 27/45 (60%) had microtia, atresia, or stenosis (MAS) and 19 (70%) of these had additional anomalies. Of the 18 without MAS, 7/18 (39%) had normal CT scans. Four of these seven (57%) were found to have ossicular abnormalities on surgical examination. Evidence of otosclerosis was found in 4/18 children (22%) with evidence of cochlear otosclerosis on TBCT in 1/18 (6%) and stapes fixation in 3/18 (17%). TBCT was normal in the 3 patients with stapes fixation. Temporal bone CT was useful in identification of persistent CHL etiology in 37/45 (82.2%) cases.

CONCLUSIONS: Temporal bone CT evaluation is useful in the diagnosis of persistent CHL and multiple anomalies are commonly seen in these patients. Microtia, atresia and canal stenosis were the most common conditions associated with persistent CHL. For those patients without MAS, ossicular chain abnormalities were the most common finding on TBCT while otosclerosis and stapes fixation were identified surgically in a majority of those with normal temporal bone CTs.

MIDDLE EAR IMPLANT FOR HIGH-GRADE EAR ATRESIA IN CHILDREN UNDER TEN YEARS

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PURPOSE: To describe the operative procedure and to present the results of hearing rehabilitation with the middle ear implant Vibrant Soundbridge®(VSB) in young children with ear atresia.

DESIGN: Retrospective case study

SETTING: Pediatric tertiary care medical center

RESULTS: Two boys aged 9 and 6 years with high-grade ear atresia and pure conductive hearing impairment were implanted with the VSB device. Preoperative average air conduction was 61 and 65 dBHL, respectively. The conductive hearing impairment was bilateral in both cases and children were fitted with hearing aids: air conduction device fitted on the contralateral ear in one case (ossicular anomaly and partial ear canal stenosis) and BAHA softband in the other case presenting with a contralateral high-grade ear atresia. We used a retroauricular incision taking in account the need for a future auricular reconstruction and the Floating Mass Transducer of the VSB implant was coupled in one case to the stapes after removal of the malformed incus-malleus complex, in the other case to the incus. The average postoperative air conduction free-field threshold with VSB activated was 32.5 dBHL and 35 dBHL, respectively. There was no intra- or postoperative surgical complication.

CONCLUSION: VSB middle ear implant is a promising new approach for hearing rehabilitation in young children with high-grade ear atresia.

SURGICAL PLANNING FOR CONGENITAL AURAL ATRESIA

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OBJECTIVE: Surgery for congenital aural atresia (CAA) remains a difficult procedure. The lack of landmarks, anomalous of facial nerves and middle ear anatomy as well as the limited space for middle ear reconstruction make it difficult to reconstruct sound conduction system even with the development of new techniques with active middle ear implant for hearing rehabilitation. The aim of this study was to investigate the validity of an artificial temporal bone devoted to surgical planning for CAA.

DESIGN: Descriptive study

SETTING: University hospital, tertiary pediatric center

METHOD: A helical computed tomography (CT) scan was used to acquire high resolution data of children with CAA. DICOM data were converted into .stl files after data processing. CAA temporal bones were prototyped using stereolithography. The validation of the prototype needed several steps. First of all, we have studied on CT scan the positional relationship between the facial nerve and other structures of the CAA and prototyped temporal bones. Visualization of anatomic landmarks during temporal bone drilling of the prototyped temporal bones was also performed.

MAIN OUTCOME MEASURE: Differences on CT scan between CAA and prototyped temporal bones. Simulate implantable middle ear prosthesis on prototyped temporal bones.

RESULTS: Four CT scan of CAA temporal bones were selected to make prototype temporal bones using stereolithography. Measurement of distances and volumes showed no significant difference between CAA and prototyped temporal bones. Four simulations of implantable middle ear prosthesis were made successfully.

CONCLUSION: These prototypes made using stereolithography appear as good model for surgical planning in CAA.

**RADIOGRAPHIC TEMPORAL BONE ANOMALIES
IN A CONSECUTIVE SERIES OF CHILDREN
WITH IDIOPATHIC SENSORINEURAL HEARING LOSS**

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OBJECTIVE: To evaluate the prevalence of temporal bone anomalies (TBA) detected on computer tomography (CT) among children with idiopathic sensorineural hearing loss (SNHL) and determine if a correlation exists between presence of anomalies and SNHL severity.

METHOD: a cross sectional observational study in a tertiary pediatric centre. Consecutive children (≥ 7 years of age) with SNHL were searched for in clinic records and billing database. Those with incomplete information or acquired SNHL were excluded. We collected demographics, secondary diagnoses, TBA, type of TBA, severity of SNHL (mild, moderate, severe or profound). A prevalence value, correlation analysis between presence of TBA on CT and severity of SNHL, and best subset regression analysis were performed.

RESULTS: From records spanning a 9-year period, 105 patients were included. 52 were males, mean age 8.25+/-8.16 years, 95% CI = 1.29. Twenty-seven (25.71%) had TBA. There were 10 cochlear dysplasias, 10 large vestibular aqueducts, 4 semi-circular canal dysplasias, and 11 had other miscellaneous anomalies (endolymphatic duct abnormalities and cochlear nerve hypoplasia). Thirty-four patients had mild SNHL, 26 moderate, 22 severe and 10 profound. The severity of SNHL and presence of TBA correlated significantly (coefficient = 0.481, $p < 0.00001$). The severity of SNHL and the presence of a 2ry diagnosis were the only significant predictive factors of TBA ($P < 0.001$)

CONCLUSION: A quarter of consecutive, homogenously investigated children with SNHL had TBA on CT. We demonstrated a correlation between the severity of SNHL and the presence of TBA, and identified it, along with 2ry diagnoses as significant predictive factors.

A LARGE-SCALE, INTERNET ACCESSIBLE, AUDIOLOGIC-OTOLOGIC-GENETIC DATABASE FOR PEDIATRIC HEARING RESEARCH (AUDGENDB)

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OBJECTIVE: Major advances in pediatric hearing research require analyses of clinical data from multiple specialties in large cohorts of patients. We are developing an integrated biomedical-computing infrastructure, the AudGenDB, that incorporates audiologic, otologic, and genetic data, and is designed to meet the present and future needs of hearing researchers. Our ultimate goal is to establish a data sharing resource available to qualified hearing researchers via the Internet.

METHODS: A team composed of audiologists, otolaryngologists, geneticists, and medical informaticists has been developing a large-scale relational database and robust web-based user interface. Monthly extraction of data from the electronic medical record ensures that patient records contain the latest clinical information.

RESULTS: AudGenDB has successfully incorporated 113,347 complete audiograms, 109,234 tympanograms, 4236 radiology reports, and 22,604 surgical procedures from 32,700 patients. An intuitive user interface permits queries on demographics, hearing loss severity, type, and laterality, radiology interpretations, genetic data (e.g., GJB2 mutational analysis), and existence of SNP array data for 3880 patients. Users will soon be able to query progression, audiogram configuration, complete ABR datasets, high-resolution genomic data, complete temporal bone images with measurement capability, otologic medical/surgical history, and lab results. Incorporation of data from a second major pediatric center is underway.

CONCLUSIONS: We have developed the first large-scale database resource for pediatric hearing research. Using an intuitive web-based interface, both beginner and advanced users can access abundant audiologic, otologic, radiologic, and genetic datasets. By design, this resource is self-renewing and will continue to grow, as we establish interfaces with additional pediatric centers.

AUDIOLOGIC FINDINGS IN CHILDREN WITH MITOCHONDRIAL DISORDERS

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INTRODUCTION: About three in one thousand children suffer from early-onset deafness. Fifty percent of these cases can be attributed to genetic causes. It has been estimated that 1% of pre-lingual hearing loss is due to mutations in mitochondrial DNA. Furthermore, causative mtDNA mutations have been found in 5-10% of patients with post-lingual nonsyndromic hearing loss.

METHODS: An IRB-approved retrospective chart review of the electronic medical records in the Nemours system from 2004 to the present was undertaken using ICD-9 code 277.87 (mitochondrial disorder). The records were then searched for audiologic data.

RESULTS: 149 patients were identified with mitochondrial disorders. Twenty-six had documented audiometric data. Fifteen of the twenty-six patients (57%) had hearing loss, and eleven patients had normal hearing (42%). Ten subjects had sensorineural hearing loss (38%). Two patients had conductive hearing loss (7.7%), and two patients had an as yet undefined hearing loss (7.7%). Finally, one patient had a mixed hearing loss (3.8%).

CONCLUSION: This is one of the largest collections of audiometric data on children with mitochondrial disorders. Our 38% rate of sensorineural hearing loss correlates well with previous case series. This data justifies a prospective study of hearing loss in this population with standardized audiologic batteries to better understand the incidence, characteristics, and site of lesions, and possible progression of hearing loss in patients with mitochondrial disorders.

COGNITIVE DEVELOPMENTAL ASSESSMENT OF HEARING IMPAIRED INFANTS BEFORE COCHLEAR IMPLANTATION

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OBJECTIVE: To review cognitive assessments of prelingually deaf infants (PLDI) who present for cochlear implantation (CI).

DESIGN: Retrospective

SETTING: Academic children's hospital

INTERVENTION: Pre-implant administration of the Bayley Scales of Infant Development (Bayley)

METHODS: Infant CI candidates' records from July 2004 to September 2009 with pre-implant Bayley scores were reviewed. Demographic, medical and perceptual data were extracted with Bayley scores. The Bayley is a behavioral assessment of cognitive development. Age equivalent (AE) and developmental quotient (DQ) scores (AE divided by actual age) for cognitive and motor domains were derived.

RESULTS: 22 infants met criteria. Cognitive and motor AE tended to be lower than actual age although most infants fell within the normal range. Of the demographic and medical factors, only actual age was significantly related to Bayley DQ. Older infants (based on a median split of age) had lower mean motor DQ than younger infants. Post-implant Multisyllabic Lexical Neighborhood Test (MLNT) data were available for 12 infants. Participants were stratified into high and low groups based on median split of Bayley DQ. The high motor group demonstrated higher mean MLNT than the low motor group. No such effect was found for the cognitive domain.

CONCLUSION: Assessment of PLDI using the Bayley provides objective behavioral data regarding cognitive and motor functions. However, results based on normative data from infants without hearing impairment should be interpreted with caution due to possible auditory bias. The motor domain may be less biased than the cognitive domain.

THE OTOLOGIC MICROBIOME: A CASE STUDY ON BACTERIAL MICROBIOTA IN A PEDIATRIC PATIENT WITH CHRONIC SUPPURATIVE OTITIS MEDIA

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HYPOTHESIS: Metagenomic analysis of specimens from a pediatric patient with Chronic Suppurative Otitis Media will show significant correlation between the middle ear, adenoid, and tonsil microbiota.

BACKGROUND: Tonsils and adenoids are oropharyngeal lymphoid tissues hypothesized to be reservoirs of otopathogens and are often removed in pediatric patients with chronic middle ear infections. However, the tonsil and adenoid bacterial microbiota have not been fully elucidated and their association with the middle ear microbiota remains unknown. 16S rRNA gene-based pyrosequencing analysis is capable of characterizing complex bacterial communities with high sensitivity.

METHODS: Middle ear, adenoid, and tonsil specimens from a pediatric patient were collected and underwent cell lysis and DNA isolation. Pyrosequencing was performed on the 454®FLX platform. Pyrosequencing data was processed, quality-checked, and taxonomically classified to generate an abundance-based matrix. Ecological analyses were performed.

RESULTS: We detected a total of 14 unique bacterial families, with 6, 7, and 11 bacterial families from the middle ear, tonsil, and adenoid specimens, respectively. Pseudomonadaceae dominated the middle ear microbiota at 92% relative abundance, whereas Streptococcaceae dominated the tonsil microbiota at 80%. Multiple bacteria including Pseudomonadaceae, Streptococcaceae, Fusobacteriaceae, and Pasteurellaceae dominated the adenoid microbiota.

CONCLUSIONS: 16S-based pyrosequencing revealed diverse, previously unknown bacterial communities in a set of pediatric middle ear, tonsil, and adenoid specimens. While the middle ear and tonsil microbiota had minimal overlaps, the adenoid microbiota encompassed bacteria detected from both specimen types. This suggests that the adenoid may be a source site for both the middle ear and tonsil microbiota.

**OUTCOME OF CONGENITAL CMV
SENSORINEURAL HEARING LOSS IMPLANTATIONS:
CEREBRAL ANOMALIES**

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INTRODUCTION: Congenital infection by cytomegalovirus is thought to be responsible of 20 to 30% of all sensorineural hearing losses, some of which require cochlear implantation.

PURPOSE: To examine the outcome of cochlear implants for children presenting with congenital CMV infection and the correlation with cerebral anomalies identified on the MRI.

SETTING: A tertiary care academic center of pediatric otolaryngology

METHODS: Retrospective study concerning 220 children who received a cochlear implant in the department between 1998 and 2009. Thirteen were identified objectively for congenital CMV infection either on medical record (8), blood spot test (1) or highly evocative MRI images (4).

RESULTS: Age at implantation ranged from 1 year ½ to 16 years (mean 4 years 8 months). All but two had cerebral lesions identified on the MRI: periventricular white matter anomalies, ventricular dilations, polymicrogyria, calcifications. Four presented with neural sequelae as hypotonia and 2 developed psychiatric disorders. Three groups could be identified according to the outcome: a positive group (7 patients) for which results are close to normal patients, an intermediate group (2 patients) of slow progressing patients, and an unfavorable group (3 patients). In the latter group, psychiatric disorders led to explantation or abandon of the implant for 2 patients and the last patient has little benefit from the cochlear implant.

CONCLUSION: Cochlear implantation in children with congenital CMV infection have unpredictable benefits. MRI anomalies are as frequent in the 3 groups and therefore do not seem to help anticipate neurological and psychiatric outcomes.

EUSTACHIAN TUBE FUNCTION AND HEARING OUTCOMES IN CHILDREN AFTER CLEFT PALATE REPAIR

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OBJECTIVE: Review hearing and Eustachian tube function over five years after cleft palate (CP) repair.

DESIGN: Retrospective study of all patients undergoing CP repair by a single plastic surgeon at a tertiary children's hospital from January 2000 through March of 2003.

METHODS: Data collected include patient demographics, age at time of tube placement, speech awareness threshold(SAT) before and after tubes, number of sets of tubes required until achieving type "A" tympanogram, and type of tubes used.

RESULTS: During the study period 142 children underwent primary CP repair with 72 being males (50.7%). History of recurrent acute otitis media was found in 58% of patients, and presence of middle ear effusion was found in 93/95(97.9%) cases in which this data was available. Pre-tube insertion SAT was > 35db in 36%(right ear) and 40%(left ear) of subjects, while 80% of patients had SAT of < 25dB post-tube insertion. Tubes were placed at the same time as primary CP repair in only 41/142(29%) cases (mean 13.7mos), prior to CP repair in 59/142(41.5%) cases (mean 8 mos), and after CP repair in 15/142(10.6%) cases (mean 28mos). Most common type of tubes used as a first procedure was the Sheehy collar-button tubes while "T" tubes were used in only 4 cases. Mean age at time of CP repair was 18.8mos(median 12mos). On average patients required at least 2 sets of tubes until achieving type "A" tympanogram during the 5 years following-up.

CONCLUSION: Over half of infants with CP receive ventilation tube insertion prior to primary CP repair. For patients who had consistent audiologic follow-up, an average of 2 sets of tubes are necessary to achieve type "A" tympanogram. It may be more cost-effective to use "T" tubes at the time of first set of tube placement.

INDIVIDUALIZED TREATMENT OF LATERAL SINUS THROMBOSIS- IS MASTOIDECTOMY NECESSARY?

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OBJECTIVES: Evaluate the necessity of mastoidectomy in the treatment of lateral sinus thrombosis (LST).

STUDY DESIGN: Retrospective case review and review of the literature.

SETTING: Tertiary referral practice.

PATIENTS: Patients treated for LST as a complication of acute otitis media from 1999-2009.

MAIN OUTCOME MEASURES: Data extracted included: age at presentation, presenting symptoms, prior otologic history, physical exam findings, therapy administered, length of treatment and hospital stay and complications.

RESULTS: Six children met the search criteria. Mean age at presentation was 8 yrs (range 2-14). None had any significant past surgical or medical history. All 6 patients presented with significant headaches and ocular complaints, 3 with papilledema. Five patients had acute otitis media (AOM) upon presentation, of which 3 had received more than one course of outpatient antibiotics. Two patients had a history of recurrent ear infections. All patients were treated with broad antibiotic coverage. They received anticoagulant therapy for an average 9.15 months (range 4-24). Surgical management was as follows: 3 patients received myringotomy and tube placement, 2 received mastoidectomy and 1 patient received no surgical intervention. The average length of stay was 20.1 days (range 9-39.) All six patients recovered without complications.

CONCLUSIONS: All studies regarding LST in the literature have limited number of patients, and the treatment varies broadly. Despite the surgical treatment most patients seem to have good prognosis. The necessity of mastoidectomy for the treatment of LST as a complication of acute otitis media must be tailored to each patient.

MATHEMATICAL MODEL FORMALIZING RELATIONSHIP BETWEEN PERFORMANCE WITH A COCHLEAR IMPLANT AND PREDICTIVE VARIABLES

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OBJECTIVE: To assess the relationship between performance with a cochlear implant in children and variables such as: demographics, time of use and device features.

METHODS: We built an indicator of performance, named K, reflecting five complementary aspects of cochlear implant outcomes: acceptance, perception, understanding, expression and intelligibility. K ranges from 1 (worse result) to 5 (best result).

PATIENTS: A cohort of 101 children implanted with the Advanced Bionics cochlear implant was assessed retrospectively. For each subject, the database contains the following information: age at implantation, malformation, etiology, level of hearing before implantation, familial background, type of processor, type of implant, coding strategy, K at regular instants after activation. We used a multinomial logistic regression to model the relationship between K and all explanatory variables.

RESULTS: Among the best models trading off quality of fit against number of variables, the simplest one contains three variables: time of device use, level of hearing before implantation and coding strategy. Such a model allows to separate the effects of the variables and quantify their statistical effect: duration of use is the most significant one, and the strategy is the less significant one. The evolution of predicted K with the three variables is in close adequation with clinical observation.

CONCLUSION: This model needs to be refined with new patients entering the database. It may be used to predict performance of newly implanted children, and to assess more deeply the family background impact on outcomes.

USHER SYNDROME: CHARACTERISTICS AND OUTCOMES IN PEDIATRIC COCHLEAR IMPLANT RECIPIENTS

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OBJECTIVE: To evaluate of the characteristics and outcomes of pediatric cochlear implant recipients diagnosed with Usher syndrome (US).

DESIGN: Retrospective study (1991-2009).

SETTING: Tertiary care children's hospital.

PARTICIPANTS: Children who received a cochlear implant who were diagnosed with US either before or after implantation.

MAIN OUTCOME MEASURES: Cochlear anatomy based on pre-operative imaging, age of independent ambulation, age at implantation, electroretinography and ophthalmologic findings, speech perception scores, and communication mode.

RESULTS: 24 of 712 (3.4%) cochlear implant recipients were diagnosed with US based on the results of electroretinography. Pre-operative imaging revealed no evidence of cochlear malformations. Average age at implantation was 48 months (range: 7 months to 11.5 years). Average age of independent ambulation was 21.4 months (range: 12-30). Open set speech perception and communication mode data will be presented.

CONCLUSIONS: We present the largest series of patients with the diagnosis of US who have undergone cochlear implantation. As expected, their cochlear anatomy as seen on neuroimaging was normal. Significant delay in independent ambulation was present in this population secondary to abnormal vestibular function associated with US type 1. The majority of children developed significant speech perception and oral communication skills. Early implantation of US children provides them with the opportunity to develop useful hearing and oral communication.

HEARING IMPAIRMENT IN CHILDREN AFTER MENINGITIS: 10 YEARS RESULTS

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Meningitis is an important and prevalent aetiology of sensorineural hearing loss. An evaluation over ten years of childhood cases of meningitis treated in Coimbra's Paediatric Hospital included children from 1 day to 14 years old, admitted in the emergency department.

OBJECTIVE: Audiologic evaluation and follow-up of children after meningitis

STUDY DESIGN: Retrospective case review

SETTING: Tertiary referral centre

PATIENTS: Children from 1 day to 14 years old, admitted in the emergency department of a paediatric hospital
Intervention: Auditory and neurologic complete assessment

MAIN OUTCOMES MEASURES: Clinical otological and neurological examination, impedancimetry, otoacoustic emissions, auditory brainstem evoked potentials and tonal audiometry, depending on age

RESULTS: The incidence of sensorineural hearing loss was twenty-six percent (13% bilateral). In 20% of these cases the aetiological agent was unknown. *Neisseria meningitidis* was responsible for 40% of hearing loss cases. The other aetiological agents identified were *Streptococcus pneumoniae*, *Streptococcus B*, *E. coli* and *Haemophilus Influenza*, each one responsible for 10% of the cases. Children with hearing impairment had a high incidence of neurological sequelae (40%).

CONCLUSIONS: Early auditory assessment after meningitis is of great importance in order to identify any ear damage that could determine restricted access to sound and lack of progress in development of auditory skills and speech. Later diagnosis could compromise outcomes and treatment options.

**SPONTANEOUS OVAL WINDOW CSF LEAK IN A CHILD
WITH CONGENITAL INNER EAR MALFORMATIONS:
CASE REPORT AND LITERATURE REVIEW**

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Congenital inner ear anomalies associated with spontaneous CSF leak are rare. We present literature review and case of a two year old male with bilateral severe inner ear abnormalities and spontaneous congenital CSF rhinorrhea. A two year old boy with bilateral profound sensorineural hearing loss presented with CSF rhinorrhea. HRCT of the temporal bone and MRI revealed hypoplastic right internal auditory canal, absent right cochlea and cochlear nerve, as well as left common cavity deformity. The left internal auditory canal appeared normal with an intact cochlear nerve. B2-transferrin testing confirmed the CSF leak. No obvious sinonasal or tegmen source for the CSF leak was radiographically identified. The patient underwent exploratory left tympanomastoidectomy. Intraoperatively, extensive clear fluid was seen emanating from a stapes footplate defect. Muscle and fat were used to pack around the oval window, and to obliterate the middle ear, the mastoid cavity and the eustachian tube. The patient re-developed CSF rhinorrhea on postoperative day 10, requiring re-exploration. Stapedectomy was performed. The vestibule and oval window were firmly packed with muscle, fascia and fat. Patient has not had any further recurrence. Patients with common cavity abnormalities have a high incidence of recurrent meningitis and perilymphatic fistulae. There must be a high index of suspicion for CSF leak in patients with persistent rhinorrhea and co-existent congenital inner ear abnormalities. This case and the literature raise the question that, at the time of a cochlear implant, children with inner ear anomalies should have a concurrent middle ear exploration of the oval window.

HARMONIC SYNERGY HOOK BLADE TONSILLECTOMY- A SMALL SERIES

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PURPOSE: To evaluate the use of the new harmonic SYNERGY platform and hook blade in pediatric tonsillectomy.

METHODS: 21 consecutive tonsillectomies were performed using the Harmonic SYNERGY hook blade (Ethicon Endo-Surgery). The patients ranged in age from 3-17 years old and were diagnosed with either chronic adenotonsillitis or obstructive sleep apnea. Outcome measures evaluated include: 1) postoperative pain during the first 7 days using the Wong-Baker faces pain scale, 2) time to return to normal diet, 3) number of complications of dehydration or bleeding, and 4) number of postoperative patient calls with concerns/problems.

RESULTS: The average pain score for the group in the first 7 postoperative days was 2.43 (range 0.43 to 3.86) with 0 being no pain and 5 being the worst possible pain. By postoperative day 2, 95% (18/19) of the patients had returned to a soft diet with the remaining patient returning to soft foods on day 6. In this series there were no incidents of postoperative bleeding or dehydration. Only 1 of the 19 patients called with a question about ear pain on day 5. Two patients were excluded from the study results because they did not report any data although it should be noted that they did not have any postoperative complications.

CONCLUSIONS: Advances in harmonic technology have led to improved device design for head and neck surgery. The Harmonic SYNERGY hook blade is a safe and effective instrument for pediatric tonsillectomy, and further prospective controlled investigation is warranted.

AN AIRWAY HEMANGIOMA UNRESPONSIVE TO PROPRANOLOL

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BACKGROUND: The effectiveness of propranolol for the treatment of cutaneous and airway hemangiomas has been demonstrated in a few recent case reports. The present report seeks to provide contrast to the current literature by describing a bronchial hemangioma that showed no response to propranolol administration.

METHODS: A case report with bronchoscopic photo documentation is presented along with a complete review of the literature on the subject.

RESULTS: In this case a 3-month-old boy presented with increased work of breathing and respiratory distress and was found to have a bulky hemangioma on the anterolateral wall of the upper left mainstem bronchus, obstructing 95-98% of the left mainstem bronchus. The child was treated with systemic steroids with some mild clinical improvement but had a persisting bulky bronchial hemangioma. He was then started on propranolol in attempt to avoid long-term use of steroids or the need for surgical intervention. After 34 days of Propranolol repeat endoscopy showed no improvement and the laser was required for definitive treatment.

CONCLUSION: Although previous literature describes favorable results with the use of propranolol in treating cutaneous and airway hemangiomas, the current case demonstrates a lack of response of a bronchial hemangioma to this novel treatment.

ENDOVASCULAR MANAGEMENT OF A TRACHEO-INNOMINATE ARTERY FISTULA IN A PEDIATRIC PATIENT

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OBJECTIVE: To present a rare case of tracheo-innominate artery fistula managed with endovascular stenting in a pediatric patient.

STUDY DESIGN: Case report and review of the literature.

SETTING: A tertiary care children's hospital.

METHODS: A detailed clinical history, flexible bronchoscopic findings, CT imaging, intraoperative angiography imaging, and current literature are reviewed.

RESULTS: A five year-old male with history of anoxic brain injury after near-drowning, had a tracheostomy tube placed. Four years later he presented with a history of massive hemorrhage from the tracheostomy tube which ceased prior to arrival in the emergency department. A second episode occurred and quickly stopped after a cuffed tracheostomy tube was placed. A bedside flexible bronchoscopy showed a pulsatile anterior tracheal wall with erosion. The patient was taken emergently to the operating room and was prepared for interventional angiography as well as possible sternotomy. An endovascular stent was properly sized and placed under fluroscopic guidance within the innominate artery; no further bleeding occurred.

CONCLUSIONS: Tracheo-innominate artery fistula as a complication of tracheostomy is a life-threatening emergency, and minimally invasive approaches have not been well documented in the literature. Innominate artery endovascular stenting can avoid the morbidity of an open procedure; this can be a successful treatment option in the pediatric population.

**SIALENDOSCOPY FOR RECURRENT PAROTITIS
ASSOCIATED WITH SJOGREN SYNDROME:
A CASE REPORT**

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BACKGROUND: Sialendoscopy has been performed in the adult population since 1990 and has more recently begun to be utilized in children with salivary disease for both diagnostic and therapeutic purposes. Current literature supports the use of pediatric sialendoscopy for diagnosis and treatment of salivary stones, salivary duct stenosis, and juvenile recurrent parotitis. One of the more rare causes of recurrent parotitis in children is the autoimmune disorder, Sjogren syndrome, but there are currently no reports of sialendoscopy as a diagnostic or therapeutic tool in this population.

OBJECTIVES: To describe the findings on sialendoscopy of a pediatric patient with recurrent bilateral parotitis associated with Sjogren syndrome and to assess its therapeutic potential in this patient population.

DESIGN: Case report and literature review

RESULTS: A 13 year old female presented with recurrent bilateral parotitis which was recurring with increasing frequency and affecting her overall health and quality of life . Preoperative imaging demonstrated microcalcifications of her bilateral parotid glands. She was found to have a positive SS-A antibody and was diagnosed with Sjogren Syndrome. Sialendoscopy was then performed and findings included thick sludge in Stenson's duct with no salivary stones or duct anomalies identified. The ducts were flushed with saline and steroids. Follow-up has demonstrated no further episodes of recurrent parotitis.

CONCLUSIONS: Sjogren Syndrome should be considered in all patients with recurrent bilateral parotitis. Sialendoscopy appears to be a potentially valuable diagnostic and therapeutic tool for pediatric patients with Sjogren syndrome.

ENDOSCOPIC RESECTION OF A JUVENILE NASOPHARYNGEAL ANGIOFIBROMA USING THE COBLATION TECHNIQUE

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Juvenile nasopharyngeal angiofibroma (JNA) is a benign tumor of the nasal cavity found most often in adolescent males. Although not malignant, this tumor can be locally destructive which requires its removal. In recent years, with advancements in endoscopic surgery and pre-operative embolization, there has been a trend towards endoscopic resection of JNAs. Coincident with this trend has been the development of coblation technology. The coblation device utilizes a low temperature, sodium chloride radiofrequency based technology. The handheld device contains a malleable shaft with suction and cauterization capabilities. This technology has been shown to be both safe and efficacious in pediatric tonsillectomies. Its use has recently been expanded to endoscopic sinus surgeries as well as head and neck procedures. Patients undergoing coblation assisted polypectomies have been shown to have a reduced intra-operative estimated blood loss. The highly vascular nature of JNA makes the use of an integrated suction/ dissection/ cautery device particularly beneficial during endoscopic resection. Here we report the case of a 17 year old male who presented with an Andrew's stage IIIa JNA of the right nasal cavity. After preoperative embolization he underwent a totally endoscopic resection utilizing the coblation device. We discuss the pre-operative presentation, imaging studies, surgical technique, and short term follow up of this patient.

**ROLE OF MANDIBULAR DISTRACTION FOR FEEDING
DIFFICULTY IN NEONATES WITH MICROGNATHIA:
AN EARLY EXPERIENCE WITH 4 CASES**

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OBJECTIVES: To investigate the role of mandibular distraction osteogenesis in neonates with feeding difficulties secondary to micrognathia.

METHODS/STUDY DESIGN: Retrospective chart review and case series at a tertiary-care referral center.

RESULTS: In our small series of neonates with micrognathia, 75% (3/4) of the patients who underwent mandibular distraction were able to avoid tracheostomy and gastrostomy tube placement. The patients were able to be discharged on an average of 28 days after mandibular distraction with some oral intake, with or without supplementation with enteral feedings. Surgical complications were usually related to wound infections and were able to successfully managed with antibiotic use and did not require removal of the mandibular distraction devices.

CONCLUSION: In children with micrognathia, feeding difficulties may be resolved with early intervention with mandibular distraction. Delaying intervention for airway obstruction may necessitate longer feeding tube assistance, and the presence of additional neurological, cardiopulmonary, and/or craniofacial disorders compounds the problem and often complicates the ability for micrognathic neonates to resolve their feeding difficulties.

A LARGE JUGULAR BULB DIVERTICULUM IMPINGING ON THE OSSICULAR CHAIN

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OBJECTIVES: Jugular bulb (JB) abnormalities are uncommon in children. We present a unique case of a large jugular bulb diverticulum (JBD) in a child enveloping the ossicular chain and review the spectrum of clinical symptoms associated with JB abnormalities.

DESIGN: Case report and literature review

METHODS: Review the clinical and radiologic findings in a child with large JBD and review the reported cases of surgically or radiologically-confirmed JBD in the English literature

RESULTS: A 7 year-old male presented to the ER with left traumatic bloody otorrhea due to a pencil. Otoscopy revealed a left central tympanic membrane perforation and the unexpected finding of a purple bulging mass behind his right tympanic membrane. An audiogram showed bilateral conductive hearing loss (CHL), worse in his right, non-traumatized ear with an air-bone gap of 10 - 40 dB. CT of the temporal bones revealed a large right JBD extending into the middle ear cavity and impinging on the ossicular chain. Literature review identified only less than 10 cases of JBD in children; many were asymptomatic while others had CHL or sensorineural hearing loss (SNHL).

CONCLUSIONS: JBD is not present only in adults and can occur in children. Physical examination in concert with radiologic imaging is usually sufficient to evaluate JB abnormalities and is critical in preoperative planning whenever otologic surgery is undertaken.

ENDOSCOPIC USE OF BIPOLAR RADIOFREQUENCY PLASMAABLATION (COBLATION) FOR LYMPHATIC MALFORMATION OF THE LARYNX

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PURPOSE: Lymphatic malformations (LM) are benign vascular lesions that arise from embryological disturbances in lymphatic development. Treatment modalities include aspiration, surgical excision, and sclerotherapy. Large lesions involving deep structures of the neck, tongue, mediastinum, and larynx present therapeutic challenges and can lead to significant complications including airway compromise. Recently, bipolar radiofrequency plasma ablation (Coblation) has been described as an effective treatment for LMs of the tongue without destroying vital structures. We confirm the efficacy of coblation of LMs of the tongue and describe endoscopic coblation of a laryngeal LM.

METHODS: We report two cases of LMs at a tertiary care children's hospital. One child with LM of the tongue and intermittent swelling and bleeding requiring hospitalization was treated with coblation as previously described. Another, with LM of the neck and chest and previous airway compromise requiring a tracheostomy, was found to have supraglottic involvement. She underwent endoscopic coblation of the supraglottic LM to the submucosal surface. Both children had previously undergone surgical excision and sclerotherapy and presented with locoregional recurrence.

RESULTS: There were no complications in either patient. Four months postoperatively, there was no recurrence in the tongue, and no episodes of bleeding, swelling, or dysphagia. Endoscopic coblation of the laryngeal LM was safe and technically feasible.

CONCLUSIONS: Our results support coblation as a safe and effective treatment of lymphatic malformations of the tongue. Further application of radiofrequency ablation in endoscopic management of LM of the larynx may prove as effective and ultimately assist in decannulating tracheotomy tube dependent children.

TWO RARE CAUSES OF NASAL OBSTRUCTION IN NEONATES: NEUROGLIAL HETEROTOPIA AND SALIVARY GLAND ANLAGE TUMOR

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PURPOSE: To report 2 rare causes of nasal obstruction in neonates: Salivary Gland Anlage Tumor of the nasopharynx and Neuroglial Heterotopia.

METHODS: Report of two well illustrated cases and review of relevant literature.

SUMMARY: First patient was one month old and presented with worsening breathing and feeding difficulties. Physical examination revealed bilateral nasal obstruction caused by a large nasopharyngeal mass. Magnetic-resonance and computed-tomography imaging were helpful in identifying the mass and excluding surrounding structures involvement, but couldn't lead to a diagnosis. The mass was removed by endoscopic surgery and pathologic study led to salivary anlage tumor diagnosis. Follow-up showed no relapse 1 year after surgery. The second patient was a two months old boy that presented with a left nostril nasal mass he had since birth causing breathing and feeding difficulties. Physical examination also revealed a broad nasal dorsum. Computed-tomography and magnetic resonance imaging showed the lesion and allowed eliminating any intracranial communication. Excisional biopsy was performed by transnasal approach and histopathologic studies revealed heterotopic neuroglial tissue.

CONCLUSION: Causes of nasal obstruction in the neonatal period are varied and can be life-threatening for the newborn. Even if they are rare, neuroglial heterotopia and salivary anlage tumor must be kept in mind. Their diagnosis is done by histopathology and their treatment is complete surgical excision.

**LARYNGOTRACHEAL RECONSTRUCTION FOR LARYNGEAL
TRAUMA AFTER A DOG BITE TO THE NECK - A CASE REPORT
AND REVIEW OF THE LITERATURE**

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A five-year old girl presented to the trauma bay following an attack by a German Shepherd dog. At presentation, the patient was in no acute distress without any evidence of airway obstruction or hemorrhage. The patient was not heard crying or speaking after the attack. The patient suffered two penetrating injuries to the neck. The first injury was a three centimeter horizontal laceration in the midline neck just inferior to the level of the hyoid bone. Bare cartilage was seen at the base of this wound. The second injury was a five millimeter laceration to the left neck inferior to the angle of the mandible. The patient was emergently taken to the operating room and was intubated without difficulty by the anesthesiologist. Otolaryngology and trauma surgery jointly explored the neck wounds. Exploration of the midline neck wound revealed a complete laryngofissure of the the thyroid cartilage with avulsion of both true vocal cords from the anterior commissure. The anterior portion of the larynx suffered significant injury. Given the extent of the injuries, a tracheotomy was performed through a separate incision. Afterwards, an open reduction and internal fixation of the thyroid cartilage, repair of the anterior commissure and laryngeal stent placement were performed. Post-operatively the patient did well and was successfully decannulated, phonating and tolerating a normal consistency diet. After the initial assessment of airway, breathing and circulation; the management of penetrating laryngeal trauma focuses on the restoration of a safe physiologic airway, swallowing and communication.

**POSTERIOR FOSSA ARACHNOID CYST –
A POTENTIAL REVERSIBLE CAUSE OF
SENSORINEURAL HEARING LOSS IN A CHILD**

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Sudden hearing loss in children is relatively rare and once present is difficult to reverse. Arachnoid cysts are benign, intracranial cysts filled with cerebrospinal fluid that are usually encountered in the middle cranial fossa. If present in the posterior fossa, they can cause tinnitus, vertigo and possibly hearing loss. We report the rare presentation of a young child with sensorineural hearing loss and tinnitus presenting to the emergency room due to the acute onset of symptoms. The patient underwent a CT scan revealing a posterior fossa arachnoid cyst. The patient underwent an endoscopic approach to the cyst by pediatric neurosurgery. To our knowledge, this is the second case of an arachnoid cyst causing reversible sensorineural hearing loss in a child. We will present the case along with surgical pictures and a preoperative and postoperative audiogram showing the complete recovery of hearing after surgery.

EPIDURAL ANESTHESIA: A SAFE AND EFFECTIVE ALTERNATIVE FOR EXIT PROCEDURE

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PURPOSE: To report the first case of EXIT procedure where maternal epidural anesthesia was used successfully to save a newborn life with epignathus tumor.

METHODS: EXIT procedure is traditionally performed under deep inhalational anesthesia, which causes uterine relaxation improving utero-placental gas exchange. However, this may lead to a significant increase in maternal blood loss subsequently compromising the infant's life. Alternatively, epidural anesthesia may allow us to perform EXIT procedure without the aforementioned risk of maternal hemorrhage. We report the first and unique case of using epidural anesthesia with EXIT procedure to save the life of a full-term infant with the largest reported epignathus tumor in the English literature.

SUMMARY: 1. The advantages and disadvantages for epidural anesthesia in EXIT procedure as compared to deep inhalational anesthesia are detailed. 2. The indications and outcome of the use of EXIT procedure are described in a stepwise fashion to emphasize the role and need of this procedure and saving lives of embryos with a compromised airway in utero. 3. The uniqueness of this report stems from several factors that include reporting the first case of using maternal epidural anesthesia in EXIT procedure and the safe delivery of a patient with the largest epignathus tumor described in the English literature to date.

**MANAGEMENT OF CONGENITAL EXTERNAL
AUDITORY CANAL STENOSIS ASSOCIATED
WITH PRENATAL ISOTRETINOIN EXPOSURE**

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PURPOSE: To describe the clinical and radiologic findings in a case of isotretinoin embryopathy-like syndrome and discuss management of hearing loss, congenital external auditory canal (EAC) stenosis, and EAC cholesteatoma.

METHODS: Review of medical, audiological, and radiological records.

RESULTS: An 8 year old female presented with bilateral moderate conductive hearing loss, bilateral microtia, left EAC stenosis, and right EAC atresia, secondary to prenatal isotretinoin exposure. Comorbidities included developmental delay, ventricular septal defect, hypotonia, and retinal maldevelopment. The left EAC was sharply upsloping with a 2 mm-diameter meatus. Computed tomography (CT) scan of the temporal bone demonstrated normal middle and inner ears bilaterally; serial CT scans over 6 years demonstrated progressive development of left canal cholesteatoma. Implantation of a right BAHA system was performed, followed by left canalplasty and excision of cholesteatoma with facial nerve monitoring. An endaural incision was utilized to avoid compromising future microtia repair. Postoperative left-sided hearing improved to mild low-frequency conductive hearing loss rising to normal at 2000 Hz and above.

CONCLUSIONS: Despite extensive precautions for its use, isotretinoin remains a cause of major birth defects, including sensorineural, conductive or mixed hearing loss. Congenital EAC stenosis is much less common than congenital atresia or acquired stenosis; optimal surgical approaches vary depending on hearing status and facial nerve anatomy. Close monitoring for development of canal cholesteatoma is necessary.

DISK BATTERY ASPIRATION IN A YOUNG CHILD-CASE PRESENTATION AND REVIEW OF LITERATURE

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Disc battery ingestion has been reported as cause for serious adverse events including vocal cord paralysis, massive bleeding, tracheal-esophageal fistula, cervical osteomyelitis and death. Reports of batteries as ear or nasal foreign bodies are also prevalent. In 2007, the American Association of Poison Control Centers reported 476 incidences of disc battery exposure in which 59% had no associated morbidity, 9% had moderate to major morbidity and no deaths were reported. Despite the tendency for disc batteries to become foreign bodies in children there are no reports of an aspirated battery in the searchable English literature. We present the diagnostic workup and management of an aspirated disc battery in a previously healthy 4-year-old male. Diagnosis was confounded by lung consolidation obscuring the foreign body on chest radiograph, with a total of 6 days elapsing from presentation to removal. Pathophysiology and radiographic characteristics are reviewed. This report highlights the importance of high clinical suspicion for airway foreign bodies in the case of pediatric lobar pneumonia and suspicion for disc battery in the case of any coin-shaped foreign body.

CINE MR IMAGING WITH SIMULTANEOUS AUDIO TO EVALUATE PEDIATRIC VELOPHARYNGEAL INSUFFICIENCY

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OBJECTIVE: To develop a protocol linking simultaneously-acquired cine magnetic resonance imaging (MRI) with audio recordings of specific phonatory tasks in order to evaluate velopharyngeal insufficiency (VPI) in children.

DESIGN: IRB-approved development and application of a novel dynamic cine MRI modality linked to simultaneously recorded audio.

SETTING: A tertiary care multidisciplinary pediatric airway center.

PATIENTS: Healthy, normal adult volunteers (n= 3) and children (n= 5, 9.3-18.9 years, mean 12.4 years) currently followed in the multidisciplinary pediatric airway center with VPI, who had previously undergone nasopharyngoscopy (NP) and/or videofluoroscopy (VF).

Interventions: Cine MRI with simultaneously-acquired audio files was performed on three healthy, normal adult volunteers to optimize the protocol and then on five pediatric volunteers meeting the inclusion criteria.

MAIN OUTCOME MEASURE: High resolution, clear cine MR images with clear audio recordings of specific phonatory tasks.

RESULTS: A cine MRI VPI protocol was developed using three healthy normal adult volunteers that links simultaneously-acquired cine MR images with audio recordings of specific, validated phonatory tasks. Five school-aged children with VPI, followed in our multidisciplinary airway clinic were then enrolled and underwent cine MRI using this protocol. The cine MR images and audio recordings acquired were of sufficient diagnostic quality to evaluate VPI closure patterns in school-aged children with VPI.

CONCLUSIONS: Cine MRI linked to audio is a quick, safe and well-tolerated dynamic diagnostic imaging tool that has the potential to guide more precisely the selection and application of surgical technique for VPI.

ACOUSTIC ANALYSIS OF SPEECH STIMULI AND LISTENER ASSESSMENT OF SEVERITY LEVEL IN CHILDREN WITH VELOPHARYNGEAL INSUFFICIENCY

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PURPOSE: When linked with auditory-perceptual measures of speech, acoustic measurements provide an enhanced approach to evaluating severity in those with velopharyngeal insufficiency (VPI). The present study analyzed auditory-perceptual and acoustic measures in an effort to index speech severity and determine the consistency of these measures with one another.

METHODS: Participants were 15 children (aged 8-14 years) with VPI and 15 age- and gender-matched controls. Participants' VPI was related to cleft palate (n= 12), post-adenoidectomy (n= 2) and adenoid atrophy (n= 1). All children produced a speech protocol that included seven sentences commonly used for VPI assessment. Thus, 105 sentences from each group were analysed. All sentences were initially assessed independently by three experienced listeners and rated for "severity" using visual analogue scaling procedure. These same speech samples were then acoustically analyzed with a focus on spectral characteristics of each child's sentences. Data obtained were then analyzed to determine if perceived severity varied with specific measures obtained from acoustic analyses.

SUMMARY OF RESULTS: Auditory-perceptual assessments of speech severity were found to exhibit good reliability both within and between listeners relative to severity judgments of the sentence stimuli. In contrast, objective acoustic analyses of sentences indicated that specific parametric measures (e.g., within the frequency, intensity, temporal domains) were inconsistency linked to perceptual ratings of severity. However, transitional acoustic measures and resonant frequencies obtained from isolated words extracted from these standard sentences were found to be more consistent with severity ratings. The application of auditory-perceptual and acoustic assessments as an index of clinical change will be outlined.

VELOPHARYNGOPLASTY: THE TRANSVERSE PHARYNGEAL FLAP TECHNIQUE REVISITED

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OBJECTIVE: To describe Kapetansky's velopharyngoplasty technique and to report its results

DESIGN: Restrospective medical record study

SETTING: Tertiary pediatric center

PATIENTS: We performed the procedure in 38 children with velopharyngeal insufficiency in whom appropriate speech therapy had failed (average age: 7,09 years). Preoperative phonation was type IIM in 40,5% and II in 59,5% of the cases. In contrast to the original technique described by Kapetansky, we ancroched the flaps to the azygos muscle in order to avoid making a longitudinal incision in the velum, wich is often scared in children. We analysed the early (6 months) and late operative results (more than one year).

MAIN OUTCOME MEASURE: Speech assessment before surgery using the Borel-Maisonny scale and at 6 months and 22 months after surgery. Velopharyngeal insufficiency was classified as normal, inconsistent, mild, moderate and severe.

RESULTS: The sutures disunited early postoperatively in one case. The postoperatively course was uneventful in all other cases. Under direct vision, the velopharyngeal sphincter appeared dynamic in 33 cases late postoperatively. After 6 months, phonation was type I in 7 cases, IIB in 22 cases, IIM in 7 cases and III in 2 cases. Long-term phonation was type I in 17 cases, IIB in 16 cases and IIM in 4 cases. Preoperative satisfaction study revealed that 75% of parents and children complained of severe impairment in phonation. Following surgery, 77% of the parents and children stated that phonation had become normal.

CONCLUSION: Velopharyngoplasty using the Kapetansky's technique revisited results in a satisfactory improvement rate.

INJECTION MEDIALIZATION LARYNGOPLASTY IN CHILDREN

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OBJECTIVE: To review our experience with vocal fold injection medialization in children.

DESIGN: Retrospective case series and medical record review.

SETTING: Tertiary-care academic children's hospital.

PATIENTS: All pediatric patients at our institution who underwent injection laryngoplasty for vocal fold medialization from 2003 to 2009.

MAIN OUTCOME MEASURES: Age, gender, indication for injection, injection material, surgical and anesthetic technique, effect on voice and swallowing, and complications.

RESULTS: 13 patients underwent 27 injections. Mean age was 8.0 years (range 1.3 to 18 years). Etiology of glottic insufficiency included prolonged intubation (6 patients, 46.2%), PDA ligation (2 patients, 15.4%), other cardiac surgery (2 patients, 15.4%), neck surgery or trauma (2 patients, 15.4%), and post-viral (1 patient, 7.7%). Eight patients had vocal fold paralysis or paresis, 3 had vocal fold atrophy, and 2 had vocal fold scarring. Indications for surgery included hoarseness (11 patients), dysphagia (3 patients), and aspiration (5 patients). Materials injected included Gelfoam (n= 13), Radiesse Voice (n= 9), and Radiesse Voice Gel (n= 5). The average number of injections per patient was 2.1 (range 1-9). Patients experienced improvement in symptoms (subjective or objective) after injection in 24/27 cases (88.9%). 15/16 injections (93.8%) in patients with hoarseness led to improvement. 11/13 injections (84.6%) in patients with dysphagia or aspiration led to improvement. One patient experienced two days of inspiratory stridor postoperatively, which resolved spontaneously. There were no other complications.

CONCLUSIONS: This study supports injection laryngoplasty as a safe and effective intervention for children with glottic insufficiency. Further prospective studies are necessary to confirm these findings.

NATURAL HISTORY OF VOCAL FOLD PARALYSIS IN ARNOLD-CHIARI MALFORMATION

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PURPOSE: Neurologic disease is the most common cause of bilateral vocal fold paralysis in children. Arnold-Chiari malformations (ACM) account for the majority. Early decompression results in the resolution of preoperative symptoms in the majority of patients. The purpose of present study is to describe the typical amount of time needed for the recovery of vocal fold function following neurosurgical management to allow for improved family counseling, airway management, and appropriate follow up and monitoring.

METHODS: Prospective case series. Inclusion criteria included diagnoses of both ACM and vocal fold paralysis. All children were followed with office flexible laryngoscopy at two-month intervals following diagnosis until complete return of vocal fold motion was noted. Return of recurrent laryngeal nerve function was confirmed with intraoperative laryngeal electromyography (EMG); one child additionally underwent EMG during partial return of vocal fold function.

SUMMARY OF RESULTS: Four patients met the inclusion criteria. Mean age at neurosurgical decompression was 3.1 months (range 1-7.5). Three subjects demonstrated bilateral paralysis; one had a left-sided paralysis. Three subjects, including the child with unilateral paralysis, required tracheotomy. Partial return of vocal fold motion was seen at a mean of 6.5 months after decompression (range 4-9). Complete return of function was seen at a mean of 9.5 months (range 7-12). One child underwent EMG when vocal fold function was initially seen to return, with low-amplitude activity seen. The patient demonstrated full amplitude when EMG was repeated following return of full abduction. EMG likewise confirmed return of motion in the three other subjects.

PREVALENCE OF HOARSENESS IN THE CLEFT PALATE POPULATION

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OBJECTIVE: The prevalence of hoarseness in the cleft population is thought to be increased above normative controls. The goal of this study is to determine the prevalence of hoarseness in the cleft population.

DESIGN: Retrospective chart review from a tertiary pediatric hospital's craniofacial clinic. Non-syndromic patients with cleft palate who had undergone cleft repair were eligible for inclusion. Patients were excluded if they had previous tracheostomy or significant hearing loss.

PATIENTS: 487 patients met inclusion criteria.

MAIN OUTCOME MEASURES: Medical records were reviewed for demographic data, presence of hoarseness, velopharyngeal insufficiency (VPI), gastroesophageal reflux disease (GERD) and findings on direct laryngoscopy.

RESULTS: Of the 487 patient, 27 (5.5%) had complaints of hoarseness, 13 males and 14 females. The average age at initial complaint was 4.6 years, with slight differences according to gender; 4.2 years for males and 5.0 years for females. Of those with hoarseness, 19 (70.4%) had VPI and 8 (29.6%) had concomitant GERD. 2 patients (7.4%) had GERD in the absence of VPI. 11 patients underwent direct laryngoscopy, with 9 (33.3%) having vocal fold nodules and the remaining 2 (7.4%) having edema and/or thickening of the vocal folds.

CONCLUSION: The 5.5% prevalence of hoarseness in this study is similar to the reported prevalence in the normal pediatric population of 6-34%. These results suggest that there is no difference in the cleft population, or that hoarseness is either under-recognized and/or under-reported. More studies are needed to fully elucidate the true prevalence and any correlation with VPI and/or GERD.

THE USE OF INTRAOPERATIVE LARYNGEAL ELECTROMYOGRAPHY TO EVALUATE STRIDOR IN CHILDREN WITH ARTHROGRYPOSIS

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OBJECTIVE: Arthrogyrosis is a rare, congenital condition characterized by multiple joint contractures of the extremities associated with muscle weakness and fibrosis. The otolaryngologic manifestations of this disorder may include stridor, hypomobile tongue, expressionless facies, chronic aspiration, and Pierre Robin sequence among others. Prior reports of vocal fold immobility associated with arthrogyrosis have been attributed to recurrent laryngeal nerve paralysis rather than cricoarytenoid joint restriction. The objective of this study was to determine if children with arthrogyrosis and vocal fold immobility demonstrated laryngeal electromyographic findings consistent with recurrent laryngeal nerve paralysis or cricoarytenoid joint restriction.

METHODS: A retrospective, institutional chart review of children with otolaryngologic manifestations of arthrogyrosis was performed and 6 children were identified. Three of these patients had vocal fold immobility documented by flexible laryngoscopy. These 3 children were prospectively evaluated with direct laryngoscopy and intraoperative laryngeal electromyography (L-EMG).

RESULTS: Of the 3 children with arthrogyrosis and vocal fold dysfunction, flexible laryngoscopy performed at the time of each procedure confirmed vocal fold immobility or significant restriction of motion. Intraoperative L-EMG tracings obtained from all 3 patients demonstrated motor unit action potentials without evidence of denervation.

CONCLUSION: This series, while small, suggests that vocal fold dysfunction related to arthrogyrosis may be attributable to cricoarytenoid joint restriction or poor laryngeal coordination rather than recurrent laryngeal nerve paralysis as originally postulated.

**PEDIATRIC LARYNGEAL TRAUMA:
A CASE SERIES OF FIVE PATIENTS
AT A TERTIARY CHILDREN'S HOSPITAL**

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BACKGROUND: Pediatric blunt or sharp laryngotracheal injuries are infrequent because of the softer cartilages and the protection of the prominent mandible. These injuries usually occur secondary to striking furniture or via the “clothesline” injury.

METHODS: We present five cases of pediatric laryngotracheal injury (thyroid cartilage, true vocal cords, cricoid cartilage, cricotracheal junction, and posterior tracheal wall).

RESULTS: We examined the need for intubation, need for tracheostomy, length of intubation, length of hospital stay, interval until direct laryngoscopy, use of steroids, post-injury swallowing, and post-injury phonation.

DISCUSSION: The patients with thyroid cartilage fracture, cricoid cartilage fracture, and posterior tracheal wall tear required open repair. The tracheal wall injury and cricoid fracture were repaired with sutures and the thyroid cartilage fracture with a plate and screws. No laryngeal stents were placed. Two open repairs were performed within 24 hours of injury. All of the patients were intubated either prior to arrival or upon arrival to the ED except one. All except for the vocal cord hematoma patient underwent direct laryngoscopy on the day of arrival. All but one patient received steroids. CT was not helpful in diagnosis or decision regarding treatment. The patient with posterior tracheal wall injury experienced persistent dysphagia and dysphonia, which may have been secondary to intraoperative dissection.

CONCLUSION: Open repair is usually indicated for blunt injuries to the neck. In cases of cricoid fracture, oral intubation may prove less difficult than tracheostomy. CT adds little information about the integrity of the larynx not already known by physical examination.

SPEECH DEVELOPMENT IN PREVIOUSLY APHONIC CHILDREN FOLLOWING CRICOTRACHEAL RESECTION

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PURPOSE/OBJECTIVE: To determine the pattern of speech development in children who have been aphonic since birth after airway reconstruction via partial cricotracheal resection.

METHODS: Preoperative and postoperative communication abilities were assessed by means of a validated parental survey (Pediatric Voice Outcomes Survey) supplemented by speech-language pathology assessments.

RESULTS: Seven patients were available for review. All patients underwent tracheotomy by 2 months of age, and all were incapable of vocal sound production prior to cricotracheal resection. Postoperatively, all patients initially produced vegetative laryngeal sounds. Ultimately, they all progressed through a babbling stage to eventual voluntary speech vocalizations within four months.

CONCLUSION: Speech development progresses very rapidly through normal developmental stages after airway reconstruction. The time to acquisition of voluntary laryngeal vocalizations appears to be independent of the age of the child at the time of surgery, but dependent upon a period of canonical babbling.

VINCRIStINE-INDUCED VOCAL CORD PARALYSIS IN CHILDREN: A CASE SERIES AND REVIEW

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OBJECTIVES: To discuss three new cases of vincristine-induced vocal cord paralysis (VIVCP) in children and to review the diagnosis and management of this neuropathy.

STUDY DESIGN: Retrospective case series and literature review.

METHODS: Diagnosis was confirmed by flexible laryngoscopy in all children.

RESULTS: Fifteen cases of VIVCP in children have been previously documented in the literature. Of the three children in our case series, one had unilateral VIVCP and two had bilateral VIVCP. Laryngeal paralysis lasted 4 months, 1 month (on two occasions), and over 3 years in the three patients, respectively.

CONCLUSIONS: Clinicians must evaluate children with suspected VIVCP for concomitant symptoms and signs of vincristine neuropathies. Flexible laryngoscopy and CT scan of the base of skull to the aortopulmonary window are strongly recommended. Laryngeal electromyography and direct arytenoid mobility assessment should be considered prior to laryngeal surgery. VIVCP usually resolves upon vincristine dose-reduction, frequency-reduction, or cessation. Further studies are needed to delineate appropriate vincristine dosing in patients with vincristine neurotoxicity and cancer, identify effective neuroprotectants, and determine an algorithm for the laryngeal surgical management of bilateral vocal cord paralysis.

ARABIC VERSION OF VOICE HANDICAP INDEX IN CHILDREN (PRELIMINARY STUDY)

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INTRODUCTION: The Pediatric Voice Handicap Index (VHI) is a valid tool for assessing self-perceived voice handicap in children.

OBJECTIVE: To develop an Arabic version of pediatric Voice Handicap Index (pVHI) for future use in Arabian pediatric population.

MATERIALS & METHODS: The original English pediatric VHI which is composed of 23-items was shortened to 10-items and translated into Arabic by a committee of two Pediatric Otorhinolaryngologists and one Phoniatician. The translated Arabic version was administered to the parents of 137 children without voice disorders or communication disorders.

RESULTS: The subjects of our study had lower scores which were comparable with control groups of different worldwide pediatric VHI studies. Also, there was not a significant effect of gender on VHI subscales ($P > 0.025$).

CONCLUSION: Future testing of our developed Arabic pVHI with dysphonic groups to confirm its reliability in differentiating control subjects from dysphonic subjects.

COMPARISON OF POLYSOMNOGRAPHY OUTCOMES FOR MICRODEBRIDER-ASSISTED PARTIAL INTRACAPSULAR TONSILLECTOMY VS. TOTAL TONSILLECTOMY

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OBJECTIVES: To compare the improvement in pediatric sleep-disordered breathing (SDB) as determined by polysomnography (PSG) of two surgical approaches, microdebrider-assisted partial intracapsular tonsillectomy and adenoidectomy (PITA) versus Bovie electrocautery complete tonsillectomy and adenoidectomy (T&A).

DESIGN: Retrospective cohort

SETTING: Hospital-based pediatric otolaryngology practice

PARTICIPANTS: The study includes 30 children, mean age 9.4 yrs, found to have SDB by PSG who have undergone either PITA (15 participants) or T&A (15 participants) as treatment. The groups were matched by age, severity of pre-operative Apnea-Hypopnea Indices (AHI) and time since surgery. **INTERVENTIONS:** Participants were evaluated post-operatively with standardized history and physical examination and home unattended overnight PSG.

RESULTS: Median change in AHI was -1.70 for the PITA group and -2.30 for the T&A group, although there was substantially more variability in the T&A group. A mixed linear model (MLM) evaluating the relation of surgical group with change in AHI demonstrated no significant differences in group means ($F[1,13]= 0.31, P= .590$) but the variances differed significantly between the groups (residual likelihood ratio chi-square= 5.24, $df= 1, P= .022$). Five of 15 (33%) PITA patients and 4 of 15 (27%) T&A patients had postoperative AHI scores of 5 or less; this difference was not statistically significant (exact test $P= 1.000$). A MLM evaluating change in clinical examination score and surgical group found no significant difference between groups in either mean ($F[1,14]= 0.24, P= .630$) or variance (chi-square= 0.116, $df= 1, P= .733$).

CONCLUSIONS: Our study demonstrates minimal differences in PSG and clinical outcomes between PITA and T&A for treatment of pediatric SDB.