THE TRIOLOGICAL SOCIETY
108TH ANNUAL MEETING PROGRAM
BOCA RATON, FLORIDA
MAY 13 - MAY 16, 2005

FRIDAY, MAY 13, 2005 - ROYAL PALM BALLROOM VI-X

7:00 BUSINESS MEETING (members only)

7:10 NEW FELLOW INDUCTION CEREMONIES AND MEMBER RECEPTION

8:00 - Noon SCIENTIFIC SESSION

8:00 WELCOME AND REMARKS BY THE PRESIDENT
Patrick E. Brookhouser, MD*, Omaha, NE

8:10 INTRODUCTION OF GUEST OF HONOR, ROBERT H. MILLER, MD MBA*, Houston, TX
Patrick E. Brookhouser, MD*, Omaha, NE

8:20 - 8:35 PRESIDENTIAL CITATIONS
Father Val J. Peter, JCD, STD, Boys Town, NE
Joseph P. Atkins, MD (posthumous)
Edward S. Cohn, MD, Omaha, NE
Jerome C. Goldstein, MD*, Lake Worth, FL
Michael E. Johns, MD*, Atlanta, GA
Edward R. Laws, MD, Charlottesville, VA
Michael D. Maves, MD MBA*, Chicago, IL
Robert J. Ruben, MD*, Bronx, NY

MODERATORS
PATRICK E. BROOKHOUSER, MD*, OMAHA, NE
MYLES L. PENSAK, MD*, CINCINNATI, OH

8:35 **MOSHER AWARD PRESENTATION FOR TRIOLOGICAL SOCIETY THESIS**
Lymphatic Mapping and Sentinel Lymphadenectomy for 106 Head and Lesions: Contrasts Between Oral Cavity and Cutaneous Malignancy
Francisco J. Civantos, MD*, Miami, FL

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation the participant should be able to appropriately select candidates for the sentinel node procedure, and understand the limitations and advantages of the technique in the head and neck region.

OBJECTIVE: To present our results in 106 head and neck sentinel lymph node biopsies (SLNB). SLNB has low complication rates. SLNB can more accurately identify and stage the nodal basins at risk. For selected patients, lymphatic mapping may allow for minimally invasive sentinel lymphadenectomy without completion selective lymphadenectomy. **METHODS:** One hundred and six patients with cutaneous and oral lesions underwent intralesional radionuclide injection and lymphoscintigraphy (LS) on IRB approved protocols and 103 of these underwent successful SLNB. Patients with oral cancer underwent concurrent selective neck dissection after narrow-exposure SLNB. Patients with cutaneous malignancy underwent SLNB alone and only received regional lymphadenectomy based on positive histology or clinical indications. Data were tabulated for anatomic drainage patterns, complications, histopathology, and recurrence. **RESULTS:** No dysfunction of facial or spinal accessory nerves occurred from SLNB. Lymphatic drainage to areas outside of expected lymphatic basins occurred in 13.6%. Predictive value of a negative sentinel node was 98.2% for cutaneous malignancies and 92% with oral cancer. Sixteen percent of oral cancers were upstaged after extended sectioning and immunohistochemistry of the sentinel node. **CONCLUSIONS:** LS and SLNB can be performed with technical success in the head and neck. More accurate staging and mapping of lymphatic drainage may improve the quality of standard lymphadenectomy. SLNB does involve a small risk of missing positive disease. Whether the failure rate is greater than that of selective lymphadenectomy without gamma probe guidance is not known. New studies should focus on refinements of technique, validation of accuracy, and biologic predictors of metastases.

8:45 **FOWLER AWARD PRESENTATION FOR TRIOLOGICAL SOCIETY THESIS**
Frequency Map Variations in Squirrel Monkey Primary Auditory Cortex
Steven W. Cheung, MD*, San Francisco, CA

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation, the participants should be able to explain how frequency maps are constructed from data derived from microelectrode recordings in primate primary auditory cortex, discuss frequency map variations as coordinate transformations in polar coordinate space, and explain the requirement for robust metrics to attribute accurately features of central auditory reorganization to specific deficits in altered communication.

OBJECTIVE: To evaluate variation patterns in frequency maps in primate primary auditory cortex (AI). **STUDY DESIGN:** Prospective. **METHODS:** Thirty-four squirrel monkeys underwent microelectrode mapping experiments in AI using tone pip stimuli. Characteristic frequency (CF) was measured. The spatial locations of highest CF isofrequency contours (minimum length: 1 mm) and highest CF neuronal clusters on the temporal gyral surface were analyzed. **RESULTS:** Isofrequency contours at least 1 mm long with CFs > 2.9 kHz (75% cases) are accessible on the temporal gyrus. Variability of the highest CF isofrequency contours accessible on the temporal gyrus has an interquartile range from 2.9 to 5.1 kHz (mean 4.3 kHz). The highest CF isofrequency contours are located mainly in rostral AI, while the highest CF neuronal clusters flanking fully expressed isofrequency contours are equally distributed in rostral

and caudal locations. **Conclusions:** Squirrel monkey AI frequency map variations are sizable across animals and small within single animals (interhemispheric comparison). AI frequency map variations, modeled as translations and rotations relative to the lateral sulcus, are independent transfers. Inter-animal frequency map variations suggest caution must be exercised when interpreting nominal frequency map changes that are attributed to hearing loss and auditory learning effects.

8:55 **HONORABLE MENTION FOR CLINICAL RESEARCH FOR TRIOLOGICAL SOCIETY THESIS**
Acute Bacterial Meningitis: Implications for Sensorineural Hearing Loss
George T. Hashisaki, MD*, Charlottesville, VA

Educational Objective: At the conclusion of the presentation, the participants should be able to 1) explain the potential role of inflammation within the cochlea in the setting of pneumococcal meningitis; 2) discuss the progression of sensorineural hearing loss associated with pneumococcal meningitis.

Objective: Delineate the time course of frequency-specific hearing loss in acute pneumococcal meningitis in an animal model. Correlate histologic changes within the cochlea with the pattern and timing of hearing loss associated with pneumococcal meningitis. Determine the etiology of sensorineural hearing loss associated with acute pneumococcal meningitis. **Study Design:** Prospective, case-control study in a rat model. **Methods:** Using a rat model, acute pneumococcal meningitis was induced by an intrathecal injection of 10^5 colony forming units (CFU) of *streptococcus pneumoniae* type III bacteria. Control animals received an intrathecal injection of an equivalent volume of sterile phosphate buffered saline (PBS). In order to delineate the time course of frequency-specific hearing loss in the same animal subject, a subset of animals was tested by click and tone pip auditory brainstem response (ABR) testing at 12, 18, and 24 hours following the bacterial injection. These animals were then sacrificed and the temporal bones were processed for histologic evaluation. A second subset of animals was tested by ABR and sacrificed at the sequential time points of 6, 12, 18, and 24 hours post-injection. The temporal bones were processed for histologic evaluation. The temporal bones were evaluated by two observers using light microscopy. The histologic evaluation was performed without the knowledge of whether the subject animal received the bacterial injection or the control (PBS) injection. **Results:** All infected subjects developed hearing loss as measured by ABR. The frequency specific ABR data indicated that subjects developed high frequency hearing loss first, mid frequency hearing loss, and finally low frequency hearing loss as time progressed. The histologic findings from the second subset of animals demonstrated a sequential inflammatory response within the cochlea beginning in the basal turn of the scala tympani. The inflammatory response progressed to the mid and apical turns of the cochlea over time, involving the scala vestibule as well. No inflammatory cells were seen within the scala media. **Conclusions:** In this animal model of acute pneumococcal meningitis, a progressive hearing loss was shown. Using tone pips of different frequencies, serial ABR results indicate that the animals developed a high frequency hearing loss as early as 12 hours following an intrathecal injection of *streptococcus pneumoniae* type III bacteria. The hearing loss progresses to involve the mid frequencies and then the low frequencies. The histologic findings support this frequency-specific time course of hearing loss, with the basal cochlea demonstrating the earliest inflammatory changes. Given the tonotopic organization of the cochlea, the progression of basal to apical cochlear inflammation correlates with the temporal pattern of high to low frequency hearing loss. These findings support that changes within the cochlea are responsible for the hearing loss associated with bacterial meningitis.

9:05 **HONORABLE MENTION FOR BASIC RESEARCH FOR TRIOLOGICAL SOCIETY THESIS**
Diameter of the Cochlear Nerve in Endolymphatic Hydrops: Implications for the Etiology of Hearing Loss in Meniere's Disease
Cliff A. Megerian, MD*, Cleveland, OH

Educational Objective: At the conclusion of the presentation the participants should be able to explain the various pathological findings that are present in Meniere's disease affected inner ears and compare the relationship between hearing loss, endolymphatic hydrops severity and the degree of cochlear nerve degeneration in an animal model of endolymphatic hydrops.

Objective: Endolymphatic hydrops (ELH) is an important histopathological hallmark of Ménière's disease. Experimental data from human temporal bones as well as animal models of the disorder have generally failed to determine the mechanism by which ELH or related pathology causes hearing loss. Hair cell and spiral ganglion cell counts in both human and animal case studies have not, for the most part, shown severe enough deterioration to explain associated severe sensorineural hearing loss. However a limited number of detailed ultrastructural studies have demonstrated significant reductions in dendritic innervation densities, raising the possibility that neurotoxicity plays an important role in the pathology of Ménière's disease (MD) as well as experimental endolymphatic hydrops (ELH). This study tests the hypothesis that neurotoxicity is the primary mediator of injury to the hydropic ear and is reflected in measurable deterioration of the cochlear nerve in the animal model of ELH. This study also explores the previously presented hypothesis that cochlear injury in ELH is mediated through the actions of nitric oxide (NO) by evaluating whether hearing loss or various measures of cochlear damage can be ameliorated by administration of an agent that limits excess production of NO. **Study Design:** Part one of the project involves the surgical induction of endolymphatic hydrops and correlation of long term hearing loss with histological parameters of ELH severity as well as cochlear nerve and eighth cranial nerve diameter measurements. In part two, aminoguanidine is administered orally to a separate set of hydropic animals in an attempt to limit cochlear injury presumably mediated by NO. **Methods:** Guinea pigs are subjected to surgical induction of unilateral endolymphatic hydrops after establishing baseline ABR thresholds at 2, 4, 8, 16, and 32 kHz. Threshold shifts are established prior to sacrifice at 4 to 6 months and temporal bones processed for light microscopy. Measurements of cochlear nerve and eighth cranial nerve maximal diameters as well as average maximal diameters are carried out and correlated to hearing loss and a semi-quantitative measure of hydrops severity. The identical experiments are carried out in animals treated with aminoguanidine, an inhibitor of inducible nitric oxide synthase. **Results:** The mean maximal diameter ($n = 14$) of the hydropic cochlear nerve was significantly reduced (432.14 ± 43.18 vs. 479.28 ± 49.22 microns, $p = 0.0025$) as compared to the control nerve. This was also seen in measures of the eighth cranial nerve (855.71 ± 108.82 vs. 929 ± 81.53 microns, $p = 0.0003$). Correlation studies failed to show correlation between hydrops severity and a cochlear nerve deterioration index ($r = -0.0614$, $p= 0.8348$). Similarly, hearing loss severity failed to correlate with cochlear nerve deterioration ($r = 0.1300$, $p = 0.6577$). There was a significant correlation between hearing loss and hydrops severity ($r = 0.6148$, $p = 0.0193$). Aminoguanidine treated animals ($n = 5$) also sustained nerve deterioration to the same degree as non-treated animals and there appeared to be no protective effect (at the dosage administered) against ELH related hearing loss, hydrops formation, or nerve deterioration. **Conclusions:** ELH results in significant deterioration of cochlear nerve and eighth cranial nerve maximal diameters in the guinea pig model. These findings are in accord with and extend previous studies which detected ultrastructural evidence of dendritic damage and indicate that neural injury is of sufficient severity to result in light microscopic evidence of cochlear nerve and eighth cranial nerve deterioration. These data support the concept that the principle pathological insult in ELH is a form of neurotoxicity, especially in light of previous studies which indicate relative preservation of hair cells at similar points in time. The lack of correlation between the severity of hydrops and nerve deterioration suggests that nerve deterioration is independent of hydrops severity.

9:15 **HONORABLE MENTION FOR CLINICAL RESEARCH FOR TRIOLOGICAL SOCIETY THESIS**
Aerodigestive Tract Invasion by Well-Differentiated Thyroid Carcinoma: Diagnosis, Management, Prognosis, and Biology
Judith Czaja McCaffrey, MD*, Tampa, FL

Educational Objective: At the conclusion of the presentation, the participants should be able to discuss the signs, symptoms, workup, diagnosis and treatment of patients with aerodigestive tract invasion by well-differentiated thyroid carcinoma. In addition, participants will be able to propose a cellular mech-

anism for the invasion of well-differentiated thyroid carcinoma into the aerodigestive tract.

OBJECTIVE: 1) To define *invasive well-differentiated thyroid carcinoma* (IWDTC); 2) to determine prognostic factors for survival in IWDTC; 3) to describe and compare types of surgical resection to determine treatment efficacy; 4) to offer a staging system and surgical algorithm for management of IWDTC; and 5) to examine alterations in expression of adhesion molecules in thyroid tissue and propose a cellular mechanism for invasion. **STUDY DESIGN:** *Clinical:* Retrospective review of patients with IWDTC followed over 45 years. *Basic Science*: Quantification of expression of E-cadherin and ß-catenin in thyroid tissue. **METHODS:** *Clinical:* Patients were divided into three surgical groups-Group 1: complete resection (N = 34), Group 2: shave excision (N = 75), Group 3: incomplete excision (N = 15). Cox regression analysis was used to determine significance of prognostic factors. Kaplan-Meier plots were used to evaluate survival. $P < .05$ was significant. *Basic Science:* Immunohistochemical staining was used with antibodies against E-cadherin and ß-catenin in normal thyroid tissue (N = 10), Group 2: conventional papillary thyroid carcinoma (N = 20), Group 3: invasive well-differentiated thyroid carcinoma (N = 12). Intensity scores were given based on protocol. One-way ANOVA was used to evaluate differences between groups. Post hoc ANOVA testing was completed. $P < .05$ was significant. **RESULTS:** *Clinical*: There was a statistically significant difference in survival for patients with and without involvement of any portion of the endolarynx or trachea. ($P < .01$) There was a significant difference between all 3 surgical groups when compared ($P < 0.001$). When complete and shave groups were compared with gross residual group there was a significant decrease in survival in incomplete resection group ($P < .01$). Cox regression analysis demonstrated that invasion of larynx and trachea were significant prognostic factors for poor outcome. The type of initial resection was significant on multivariate analysis. *Basic Science*: A significant difference between the three thyroid tissue groups for E-cadherin expression was demonstrated on one-way ANOVA testing. When controls were compared with either experimental group in post-hoc ANOVA testing, differences between all groups were demonstrated ($P < .001$). **CONCLUSIONS:** *Clinical:* Laryngotracheal invasion is a significant independent prognostic factor for survival. Patients undergoing shave excision had similar survival when compared with those undergoing radical tumor resection if gross tumor did not remain. *Basic Science:* There is a decrease in membrane expression of E-cadherin in invasive WDTC and loss of this tumor suppressor adhesion molecule may contribute to the invasive nature of well-differentiated thyroid carcinomas.

9:25 **HONORABLE MENTION FOR BASIC RESEARCH FOR TRIOLOGICAL SOCIETY THESIS**
Differential Effects of Preoperative Versus Postoperative Radiation on Ex Vivo Gene Therapy-Directed Osteogenesis
Brian Nussenbaum, MD*, St. Louis, MO

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should: 1) understand the basic science concept of bone regeneration using *ex vivo* gene therapy; and 2) learn about the difficulties of regenerating bone in segmental defects treated with preoperative or postoperative radiation.

OBJECTIVES: The primary objective of this study is to determine the effects of radiation on *ex vivo* gene therapy-directed osteogenesis using bone morphogenetic protein-7 (BMP-7). This is important because bone reconstruction in the head and neck region is frequently performed in the context of pre- or postoperative radiation**. STUDY DESIGN:** Animal study using Fisher rats. **METHODS:** The 3 groups consisted of rats treated with a either a single 12 Gray (Gy) dose of radiation 2 weeks after surgery, a single 12-Gy dose of radiation 2 weeks before surgery, or no radiation. A 9 millimeter critical-sized calvarial defect was created and periosteum was excised. Within each of these groups, defects were treated with either an inlay calvarial bone graft or syngeneic dermal fibroblasts transduced *ex vivo* with an adenovirus containing the cDNA for BMP-7. Gross inspection, histology, and histomorphology were used to evaluate wound healing. **RESULTS:** None of the bone grafts had evidence of healing at the wound margins in the radiated or non-radiated defects by 4 weeks after surgery. The non-radiated gene therapy treated defects revealed near-100% bone regeneration by 4 weeks after surgery. At the same time point, bone was successfully regenerated in the gene therapy treated defects that received postoperative radiation but less bone was formed that was architecturally disorganized as compared to the non-radiated defects. This contrasted significantly with the preoperatively radiated gene therapy treated defects that revealed areas of dense bone in a non-confluent pattern admixed with adjacent cells having the morphologic appearance of hypertrophic chondrocytes, suggesting continued endochondral ossification. **CONCLUSIONS:** These results indicate that both pre- and postoperative radiation have detrimental effects on bone regeneration induced by BMP-7 *ex vivo* gene therapy. The characteristics of these negative effects were different, however, dependent on the timing of radiation. These findings have significant implications for translating bone tissue engineering approaches to patients with cancer-related segmental bone defects.

9:35 Audience Q&A

9:40 - 10:10 BREAK

10:10 - 11:10 **PANEL: OTO-HNS MANAGEMENT OF COMBAT INJURIES IN 21ST CENTURY WARFARE**
Moderator: Michael E. Hoffer, CDR, MC, USN*, San Diego, CA
Panelists: J. Christopher Post, COL, MC, USAR*, Pittsburgh, PA
John D. Casler, MD*, Bethesda, MD
Michael A. Keefe, CAPT, MC, USN, San Diego, CA

TRIO/ALA PLENARY SESSION GUEST LECTURES

11:20 **TRIOLOGICAL SOCIETY OGURA LECTURE**
Unprofessional Behavior: Enough Is Enough
Gerald B. Healy, MD*, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of the Ogura Lecture the participants should be able to undertand the characteristics of disruptive physician behavior. In addition patterns of behavior will be discussed and remedial processes suggested.This problem appears to be more pervasive as pressures of practice increase.

11:40 **AMERICAN LARYNGOLOGICAL ASSOCIATION DANIEL C. BAKER, JR. LECTURE**
Laryngology Fellowship: Future Directions in Otolaryngology-Head and Neck Surgery
Harold C. Pillsbury, MD*, Chapel Hill, NC

Noon ADJOURN/LUNCH WITH EXHIBITORS

SUNDAY, MAY 15, 2005 - ROYAL PALM I-V

7:00 - COURSES - ROOM LOCATIONS WILL BE POSTED

7:45

ULTRASONOGRAPHY OF THE NECK
David L. Steward, MD*, Cincinnati, OH

MANAGEMENT OF BENIGN VOICE DISORDERS
Robert H. Ossoff, MD*, Nashville, TN
C. Gaelyn Garrett, MD*, Nashville, TN

PEDIATRIC SINUS SURGERY
Rodney P. Lusk, MD*, Omaha, NE

MINIMALLY INVASIVE THYROID SURGERY
David J. Terris, MD*, Augusta, GA

7:50 - Noon **SCIENTIFIC SESSION**

PRESIDENTIAL SYMPOSIUM

7:50 **Medical Education in the 21st Century**
Michael E. Johns, MD*, EVP for Health Affairs & CEO, The Robert W. Woodruff Health Sciences Center, Emory University, Atlanta, GA

8:10 **Evolving Patterns in Otolaryngology Resident Training**
Bruce J. Gantz, MD*, Professor & Head, Department of Otolaryngology, University of Iowa, Iowa City, IA

8:25 **Certification and Maintenance of Certification in Otolaryngology**
Robert H. Miller, MD MBA*, Executive Director, American Board of Otolaryngology, Houston, TX

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants will have a clear understanding of the current process of and the future plans for physician certification.

8:40 **Special Presentation**

8:45 **Burnout in Academic Chairs of Otolaryngology—Head and Neck Surgery**
Michael M. Johns, MD, Atlanta, GA
Robert H. Ossoff, DMD MD*, Nashville, TN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to explain the important factors associated with the development of burnout among otolaryngology department chairs.

OBJECTIVES: The purpose of this study was to determine the prevalence of burnout in otolaryngology chairs and to identify the factors that are associated with burnout. **STUDY DESIGN:** A cross-sectional questionnaire based study of 120 academic chairs of otolaryngology in the United States was performed. **METHODS:** A confidential questionnaire was mailed to US otolaryngology chairs assessing: 1) demographic information; 2) professional stressors; 3) personal and professional life satisfaction; 4) a self-efficacy survey; 5) a spousal support survey; and 6) the Maslach Burnout Inventory—Human Services Survey (MBI-HSS). Statistical analyses were performed using Pearson correlation and analysis of variance. **RESULTS:** The response rate was 89%. MBI-HSS scores demonstrate 3% of chairs experiencing high burnout, 81% of chairs with moderate burnout, and 16% of chairs with low burnout. On average, chairs have low depersonalization scores, low-moderate emotional exhaustion scores, and moderate personal accomplishment scores. High emotional exhaustion and/or depersonalization were correlated with low self-efficacy, low spousal support, and other factors. High personal accomplishment was correlated with increased time spent performing administrative duties. Duration as chair, age, and hours worked per week were not associated with increased burnout. **CONCLUSIONS:** Most otolaryngology chairs experience moderate levels of burnout. The biggest risk factors for burnout include low self-efficacy, low spousal support, disputes with the medical school dean, department budget deficits, and nights/weekends worked. These findings may help department chairs identify and prevent burnout and may help in developing programs to minimize burnout in our field's academic leaders.

LARYNGOLOGY SESSION MODERATORS
LAUREN D. HOLINGER, MD*, CHICAGO, IL
ROBERT H. OSSOFF, MD*, NASHVILLE, TN

8:55 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Fatal Apnea in Piglets Via the Laryngeal Chemoreflex: Postmortem Findings as Anatomic Correlates of SIDS in the Human Infant
Mark A. Richardson, MD*, Portland, OR

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to 1). describe the current incidence of SIDS (sudden infant death syndrome) and characteristic post-mortem findings; 2) understand the LCR (laryngeal chemoreflex) and how it is generated; 3) describe one pathophysiologic pathway for SIDS to occur.

OBJECTIVE: Intrathoracic petechiae are a prominent diagnostic finding in sudden infant death syndrome (SIDS) victims. In this study, the laryngeal chemoreflex (LCR) was elicited experimentally to discover whether intrathoracic petechiae would be produced by way of the LCR. The hypothesis was that water stimulation of the larynx in piglets, leading to death by prolonged apnea, would produce postmortem findings similar to those found in SIDS victims. **STUDY DESIGN:** Using the piglet as an animal model, the LCR was initiated via water stimulation of the larynx, resulting in death. Normoxic and hypoxic conditions were established before the stimulation. The piglets were studied postmortem to determine the relationship between the physiologic mechanisms of the LCR and characteristic pathologic findings in SIDS. **METHODS:** Using protocols approved by animal care, 14 mixed-breed piglets aged 7-14 days were sedated with a ketamine/xylazine mixture. Respiratory and pressure monitoring devices were affixed and light anesthesia maintained with surital infusion. In 10 of the piglets, a small catheter was placed between the arytenoid cartilages, and 5cc of tap water was introduced over 1 second. The LCR ensued, producing periods of central apnea bordered by gasping efforts and resulting in hypoxemia and death in all cases. Four piglets underwent this manipulation in normox-

ic conditions. Six breathed a hypoxic gas mixture for 1 hour to bring their PO2 down to below 50 torr before water was introduced into the larynx. Four control piglets breathed the hypoxic gas mixture for 1 hour (without water stimulation or LCR) before sacrifice via surital overdose. Within 24 hours of death, all piglets underwent thoracoabdominal autopsy by a blinded evaluator experienced in SIDS pathology. **RESULTS:** The autopsies revealed nothing remarkable in the abdominal viscera of any of the experimental animals. Thymus, heart, and lungs were graded 0 to 4 to indicate the degree of petechiae on external surfaces. Average cumulative scores (ACS) were applied to each animal. The control (hypoxic) piglets had no petechiae (ACS 0.0). The normoxic experimental piglets had moderate petechiae (ACS 3.5). The hypoxic experimental piglets had more prominent petechiae (ACS 6.3). **CONCLUSIONS:** Stimulation of the laryngeal chemoreflex, leading to death by prolonged apnea, produces postmortem findings in piglets similar to those found in SIDS victims. Petechiae were more severe among piglets pretreated with a hypoxic mixture of gases. This study supports the hypothesis that initiation of the laryngeal chemoreflex may produce pathologic features often prominent in SIDS.

9:05 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**

Diagnosis of Unilateral Recurrent Laryngeal Nerve Paralysis: Laryngeal Electromyography, Subjective Rating Scales, Acoustic and Aerodynamic Measures

Steven A. Bielamowicz, MD*, Washington, DC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the patterns of denervation and reinnervation seen on laryngeal electromyography. In addition, the participant should understand the relationship of laryngeal electromyography with subjective rating scales, acoustic and aerodynamic measures.

OBJECTIVE: Diagnostic laryngeal electromyography (LEMG) and laryngeal function studies are used to evaluate patients in a multi-disciplinary voice clinic; however, the utility and interaction of these measures has not been delineated. In this study, we correlated specific LEMG patterns with etiology of injury, time from onset of injury, patient perception of symptom severity, acoustic measures, and laryngeal aerodynamic measures. We hypothesized that these measures would provide unified objective and subjective data for patients with vocal fold paresis and further support the widespread utility of these assessments. Also, we developed a paradigm for the assessment of laryngeal muscle tone using objective measures and LEMG. **STUDY DESIGN:** This is a retrospective review of patients having received LEMG, acoustic and aerodynamic testing, and a subjective rating scale (the Glottal Closure Index (GCI)) for unilateral recurrent laryngeal nerve (RLN) paralysis/ paresis. **METHODS:** Seventy-five individuals diagnosed with unilateral vocal fold paralysis/ paresis (UVFP) participated in this study. Entrance criteria included a diagnostic LEMG within 6 months of onset; a unilateral RLN injury on LEMG; a normal contralateral thyroarytenoid and bilateral cricothyroid muscles as seen on LEMG; a viral, intubation, iatrogenic or idiopathic etiology; and reduced or absent adduction and/or abduction of one vocal fold. All subjects completed the GCI at the time of their evaluation, including acoustic and aerodynamic measures. Analysis of variables used Chi-squared analyses and multiple factor ANOVA's. **RESULTS:** An iatrogenic etiology was statistically significantly associated with poor tone on LEMG compared with other etiologies ($p = 0.05$). The timing of injury relative to LEMG demonstrated a statistically significant effect; those individuals evaluated after 3 months demonstrated more nascent units, a sign of reinnervation, compared with individuals evaluated prior to 3 months ($p < 0.02$). Individuals with fewer normal motor units on LEMG had significantly higher mean translaryngeal airflows ($p = 0.044$) compared to those with more numerous normal motor units. Individuals with poor recruitment have significantly shorter maximum phonation times ($p = 0.034$) and higher mean flows ($p = 0.044$) than individuals with good recruitment during voicing tasks. Individuals with better laryngeal tone as noted on LEMG had significantly lower mean flows ($p = 0.06$) than those with poorer laryngeal tone. **CONCLUSIONS:** Specific LEMG patterns are most commonly identified relative to the etiology of the UVFP and time course since RLN injury. LEMG appears to reflect vocal fold muscle tone as seen on laryngeal function studies. These studies provide a uniform and understandable assessment of laryngeal function in patients with UVFP. The routine use of LEMG, laryngeal function studies, and subjective rating scales for the diagnosis of UVFP is warranted.

9:15 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**

Identification of Laryngeal Muscle Cell-Surface Receptors Using Random Peptide Phage Library

Paul W. Flint, MD*, Baltimore, MD

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation participants will have a basic understanding of 1) the molecular characterization of skeletal and laryngeal muscle; 2) application of phage display techniques for identification of cell-surface receptors; and 3) current concepts relevant to retargeting of adenovirus vectors.

OBJECTIVE: The ultimate goal of this study is to improve the efficiency of gene transfer in mammalian muscle by developing targeted adenoviral vectors. Altering the tropism of viral vectors to recognize tissue specific antigens is one method to achieve this goal. This approach requires identification of cell-surface receptors and the insertion of target peptide sequences into the adenoviral fiber protein. In this study, phage biopanning was performed on cultured rat skeletal and laryngeal muscle to identify cell-surface receptors. **STUDY DESIGN:** *In vitro* cell culture and *in vivo* animal model. **METHODS:** Non-binding and binding phage to cultured skeletal and laryngeal muscle were screened for muscle specific surface peptides. *In vivo* studies were then performed using muscle specific phage. **RESULTS:** Skeletal muscle-specific binding by the YAXXXPM phage was observed by *in vivo* immunostaining. Phage titering demonstrated a 10^9-fold increase in skeletal muscle binding compared to non-target tissue. A peptide sequence (NPXXXKH) specific for laryngeal muscle yielded a 10^7-fold increase in phage titer compared to non-target tissue. **CONCLUSIONS:** These results identify muscle cell surface receptors that may be used as potential targets for genetic modification of adenovirus tropism. Moreover, phage specificity for skeletal and laryngeal muscle indicates specific muscle groups may be targeted.

9:25 **Prevalence of Laryngeal Irritation Signs Associated With Reflux in Asymptomatic Volunteers: Implications for ENT Diagnosis of GER/LPR**

Claudio F. Milstein, PhD, Cleveland, OH
Douglas M. Hicks, PhD, Cleveland, OH
Tom I. Abelson, MD, Cleveland, OH
Mary M. Oldenburgh, RN, Cleveland, OH
Michael F. Vaezi, MD, Cleveland, OH
Joel E. Richter, MD, Cleveland, OH

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to identify ENT signs commonly associated with reflux, but in a normal population asymptomatic for GER/LPR, in order to increase specificity of their diagnostic exam.

OBJECTIVES: 1) to determine the prevalence of ENT findings in the normal asymptomatic population; 2) to determine whether findings differ depending on the instrumentation technique used; and 3) to increase specificity of diagnosis of reflux in endoscopic laryngeal examinations. **STUDY DESIGN:** Prospective study. **METHODS:** 52 nonsmoker volunteers (24 male, 28 female), mean age of 42.7 years, with no history of ENT abnormalities or gastroesophageal reflux disease (GERD) underwent both rigid and flexible videostroboscopic examinations with a digital endoscopic unit. A group of three expert judges reviewed the oral and transnasal exams blindly and independently for physical signs of irritation/inflammation commonly associated with reflux. **RESULTS:** Results

showed a high incidence of posterior commissure bar (53.2%), arytenoid complex edema/erythema (76.3%), and pseudosulcus (37.2%). Moreover, some signs were more frequently detected on flexible transnasal examinations than with rigid transoral exams: posterior pharyngeal wall (<0.01), interarytenoid irritation (<0.01), arytenoids complex irritation (<0.01), ventricular obliteration (<0.01), and pseudosulcus (<0.01). **CONCLUSIONS:** Several signs of posterior laryngeal irritation (e.g., interarytenoid bar, erythema of the medial wall of the arytenoids), which are generally considered to be signs of LPR, are present in a high percentage of non-symptomatic individuals, raising question about their diagnostic specificity. Moreover, these signs were more often detected with flexible transnasal examinations than with rigid transoral exams, suggesting that endoscopic technique may induce a bias. The significance of this study is that it will help establish the range of normality for improved sensitivity and specificity of the ENT exam in predicting acid reflux related findings.

9:35 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Changing Impact of Gastroesophageal Reflux in Medical and Otolaryngology Practice
Kenneth W. Altman, MD PhD*, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to appreciate the increasing number and role of physician office visits for gastroesophageal reflux disease.

OBJECTIVE: Gastroesophageal reflux disease (GERD) is an increasing problem affecting outpatient office visits over time, and the disease is increasingly managed with prescription pharmacotherapy. **STUDY DESIGN:** Retrospective national medical database review utilizing the National Ambulatory Medical Care Survey (NAMCS). **METHODS:** Twelve years of data (1990-2001) were examined with visits weighted to provide United States estimates of care. Average annual frequencies and visit rates were calculated. Issues in GERD treatment were examined, including prescriptions and physician/patient counseling. **RESULTS:** Between 1990 and 2001 there was a significant increase in US ambulatory care visits for GERD, from a rate of 1.7/100 to 4.7/100. Office visits to otolaryngologists increased from 89,000 to 421,000. Over the same time periods, prescriptions of proton pump inhibitors increased from 13.2% to 64.6%. Average annual diet counseling was provided at 27.2% of encounters, tobacco cessation counseling was provided at 3.9%, and stress management was discussed at 3.9%. **CONCLUSIONS:** During the 1990's there was a substantial increase in the use of ambulatory care services for GERD. Physician prescribing patterns for GERD has emphasized the predominant role of proton pump inhibitors. However, the use of physician counseling for lifestyle modification of factors known to affect GERD remains very low.

9:45 Audience Q&A

9:50 - 10:20 BREAK

HEAD AND NECK SESSION MODERATORS
ERNEST A. WEYMULLER, JR., MD*, SEATTLE, WA
DAVID W. EISELE, MD*, SAN FRANCISCO, CA

10:20 **Estrogen Metabolite Ratio of 2-Hydroxyestrone:16a-Hydroxyestrone as a Marker and Mechanism for Proliferative Thyroid Disease**
Edwin K. Chan, MD, New York, NY
Daniel W. Sepkovic, PhD, Hackensack, NJ
Stimson P. Schantz, MD*, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to demonstrate an understanding of the role estrogen metabolism plays in proliferative thyroid disease. The participants should also be able to discuss the potential use of estrogen metabolites as a biomarker for proliferative thyroid disease.

OBJECTIVES: The objective of the study is to illustrate a relationship between proliferative thyroid disease and estrogen metabolism through the use of estrogen metabolites as biomarkers for thyroid disease. **STUDY DESIGN:** A case control study was performed utilizing 49 subjects with proliferative thyroid disorders and matching them to 49 controls. Urinary estrogen metabolite ratios were obtained, measuring 2-hydroxyestrone, an anti-proliferative metabolite, to 16a-hydroxyestrone, a proliferative metabolite. **METHODS:** 20 cc of urine were collected from each patient and samples were analyzed using an enzyme-linked immunoassay (ELISA) for 2OHE1: 16aOHE1 ratios. The estrogen metabolite ratios were stratified into low (0-1.00), medium (1.01-2.00) and high (>2.00). Each patient was placed into one of these stratified groups according to their estrogen metabolite ratio. A comparison of the number of subjects vs. controls at each stratified level was analyzed for statistically significant differences. **RESULTS:** 51% (25/49) of the cases had a low 2/16 ratio compared to 31% (15/49) in the control group while 20% (10/49) of the control group had a high 2/16 ratio as compared to 8% (4/49) in the case group. The median ratio was much higher in the control group, 1.4 vs. 1.0 among the case group. All of these differences were statistically significant (p-value < 0.05). **CONCLUSIONS:** Increased 16a-hydroxyestrone activity compared to 2-hydroxyestrone activity appears to be one mechanism involved in the pathogenesis of proliferative thyroid disease. In addition, urinary estrogen metabolite ratios may be useful as a biomarker for these disorders, perhaps in identifying patients at risk for proliferative thyroid disease.

10:30 **Parathyroid Hormone as a Predictor of Hypocalcemia Following Total Thyroidectomy**
Allan D. Vescan, MD, Toronto, ON Canada
Ian J. Witterick, MD, Toronto, ON Canada
Jeremy L. Freeman, MD, Toronto, ON Canada

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the merits of using parathyroid hormone assay as a predictor of hypocalcemia in patients undergoing total thyroidectomy.

OBJECTIVES: The aims of this study are to ascertain whether parathyroid hormone (PTH) assay prior to total thyroidectomy, followed by levels immediately thereafter in the recovery room and post-operatively are a reliable predictor of hypocalcemia at our institution. In addition, to determine the feasibility of early discharge home from hospital following total thyroidectomy based on post-operative PTH levels. **STUDY DESIGN:** Prospective clinical study. **METHODS:** Fifty-nine patients undergoing total thyroidectomy at our institution were enrolled in the study. Pre-operative levels of parathyroid hormone, serum calcium, ionized calcium and albumin were drawn. In the post-operative phase, the same biochemical markers were taken in the recovery room within one hour of the procedure and at a standard time the morning following the procedure. Discharge planning took place as per existing standards. **RESULTS:** Fifty-nine patients were reviewed. PTH levels below 1.2 pmol/L (p-value 0.001) within one hour of completion of total thyroidectomy were predictive of risk for developing hypocalcemia requiring replacement therapy. PTH levels below 1.2 pmol/L (p-value 0.001) on the morning following the procedure were predictive of hypocalcemia requiring supplementation. Sensitivity for PTH assay as a predictor of hypocalcemia one hour post-operatively is 100% with a specificity of

98%. **Conclusions:** At our institution PTH assays drawn post-operatively are predictive of patients who are at risk for developing hypocalcemia. Early identification of at risk patients will facilitate prompt calcium replacement therapy and potential safe early discharge from hospital.

10:40 **RET Proto-Oncogene Polymorphisms/Haplotypes and Risk of Differentiated Thyroid Cancer: A Case Control Analysis**
Tang Ho, MD, Houston, TX
Guojun Li, PhD, Houston, TX
Chong Zhao, PhD, Houston, TX
Qingyi Wei, MD PhD, Houston, TX
Erich M. Sturgis, MD*, Houston, TX

Educational Objective: At the conclusion of this presentation, the participants should be able to demonstrate an understanding of the risk relationship between common RET single nucleotide polymorphisms and differentiated thyroid carcinoma.

Objectives: To determine if common (allele frequencies > 5%) single nucleotide polymorphisms (SNPs) located in exons 2, 7, 11, 13, 14 and 15 of the RET proto-oncogene are associated with risk of differentiated thyroid carcinoma (DTC). **Study Design:** A hospital based case control study of DTC patients, benign thyroid disease (BTD) patients, and cancer free controls. **Methods:** 101 DTC case subjects, 62 BTD case subjects, and 174 control subjects were frequency matched on age, sex, and race with similar rates of tobacco, alcohol, and radiation exposure. PCR-RFLP assays were utilized for genotyping. Multivariate logistic regression analysis was performed to calculate adjusted odds ratios (OR) and 95% confidence intervals (CI). Haplotype distributions were estimated using Bayesian analyses. **Results:** The genotype distributions were similar between DTC case subjects and control subjects with the exceptions of RET 7 and RET 14 ($p = 0.003$ and 0.047, respectively), and for RET 14 the genotype distributions between BTD and control subjects ($p = 0.064$). Polymorphic allele frequencies were similar between the groups except for RET 14 ($p = 0.051$ and $p = 0.068$ for DTC and BTD cases, respectively). RET 7 heterozygous polymorphic genotype was associated with a significantly increased risk of DTC after multivariate adjustment (OR = 2.0, 95% CI = 1.2—3.4, $p = 0.012$). When compared to the most common haplotype (GGGTCC), no RET haplotype was associated with a significant increased risk of DTC. **Conclusions:** Exon 7 polymorphism of RET may be associated with increased risk of DTC. However, the sample size is relatively small and larger investigations are needed.

10:50 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Risk Stratification in Papillary Thyroid Carcinoma: Correlation with Glutathione S-Transferases and Genomic Instability
Nestor R. Rigual, MD*, Buffalo, NY

Educational Objective: At the conclusion of this presentation, the participants should be able to discuss the relevance of genomic instability and Glutathione S Transferase polymorphisms to the prognosis of well-differentiated thyroid cancer patients.

Objectives: Tumor progression has been attributed to the accumulation of DNA damage throughout the genome followed by selection of advantageous mutations; the source of this DNA damage may result from failure of systems that maintain genomic integrity or from increased susceptibility to external DNA damaging agents. Glutathione S-transferases (GSTs) are enzymes involved in the metabolism/detoxification of many carcinogens and mutagens and may play a role in preserving genome integrity. The GSTM1 and GSTT1 genes have a null allele in which the entire gene is absent, in a significant proportion of the general population. The objectives of this study are to examine the contribution of these null genotypes to genomic instability in papillary thyroid cancer (PTC) and to assess the relationship of GST genotype with clinicopathological parameters. **Study Design:** Prospective sequential analysis. **Methods:** GSTM1 and GSTT1 genotypes of 35 matched normal and papillary thyroid cancer specimens were determined by PCR using primers specific for the coding sequences of each gene. Genomic instability (GI) was measured by inter-(simple sequence repeat) PCR (ISSR PCR) for each tumor/normal pair. A genomic instability index (GII), the percentage of altered PCR products, was obtained for each tumor. Individual clinicopathological parameters of tumor aggressiveness studied included: age, extrathyroidal extension (ETE), tumor grade/subtype, metastasis and tumor size, tumor stage and sex. The GAMES prognostic scoring system, which combines several of these parameters was also included. Statistical analysis was performed using the Chi square (χ^2) or Mann Whitney (MW) test. **Results:** The patient population consisted of 24 females and 11 males ranging in age from 13 to 82 (median, 43). Histopathology confirmed 29 cases were classical, follicular or sclerosing well-differentiated variants of PTC 5 were tall cell variants and 1 was a columnar variant. GSTM1 and GSTT1 null genotypes were found in the normal tissues of 16 of 35 (%) and 9 of 35 (%) patients, respectively. No losses of these genes were detected in the corresponding tumor specimens. No association with any of the previously stated individual clinicopathological parameters was observed. However, there was a statistically significant association between the GSTM1 null genotype and increased risk of recurrence and death as assessed by the GAMES prognostic scoring system. Elevated GII was associated with patients' use of tobacco and stage of tumor, but was not associated with either GST null genotype. **Conclusions:** The significant association between the GSTM1 null genotype and the risk of recurrence and death as predicted by the GAMES prognostic scoring system suggests that the presence of GSTM1 confers some protection against the DNA damage that facilitates the evolution to disease associated with higher risk. This protection does not confer a resistance to the onset of disease, since a majority of the patients were non-null for both GSTs tested. The lack of association between GII and GST genotype suggests that GSTs do not prevent the type of DNA damage measured by ISSR PCR. The association of the GSTM1 null genotype with the higher risk GAMES category implies that GST genotyping may be a useful prognosticator in combination with GAMES.

11:00 Audience Q&A

Rhinology Session Moderators
Rodney P. Lusk, MD*, Omaha, NE
David W. Kennedy, MD*, Philadelphia, PA

11:05 **Evaluation of the Effectiveness of Long-Term Antimicrobial Therapy on Quality of Life in Patients With Chronic Rhinosinusitis**
James A. Hadley, MD, Rochester, NY
Ameet S. Singh, MD, Rochester, NY *(Presenter)*
Donna J. Rekkerth, FNP, Rochester, NY

Educational Objective: At the conclusion of this presentation, the participants should be able to identify patients with symptoms of chronic rhinosinusitis requiring medical therapy as well as consider alternative medical therapies and understand improvement in the quality of life in these patients.

Objectives: To evaluate the objective improvement in the quality of life (QOL) in patients treated with long-term antimicrobial therapy for signs and symptoms of chronic rhinosinusitis (CRS). **Study Design:** Prospective, non-comparative, non-randomized, pilot study evaluating the overall improvement of subjects' QOL and clinical efficacy of clarithromycin in the treatment of patients with symptoms of CRS. **Methods:** Patients were selected based on the clini-

cal diagnosis of CRS and positive radiological criteria. Subjects were treated with 500mg of extended release clarithromycin tablets for 16 weeks and were evaluated biweekly. Improvements in patients' QOL were assessed based on a pre- and post-study Rhinosinusitis Disability Index questionnaire (RSDI) as well as clinical assessments. **RESULTS:** Results demonstrate a substantial improvement in the QOL of patients undergoing long-term antimicrobial treatment with clarithromycin. Significant objective clinical improvement was noted in the majority of patients based on the pre- and post-study RSDI as well as clinical assessments during the course of the study. Comparison of pre- and post-study sinus CT imaging did not demonstrate any substantial improvement. Minimal to no side effects of clarithromycin were observed in the majority of subjects during the course of treatment. **CONCLUSIONS:** Macrolides have demonstrated a broad range of biological response modifying effects on inflammation, tumor cells, airway secretions, and host defenses. Although their clinical effects have been demonstrated in chronic lower airway diseases, their role in diseases of the upper airway such as CRS have yet to be defined. This study illustrates the clinical benefits of long-term clarithromycin use in patients with CRS.

11:15 **Treatment of Chronic Rhinosinusitis With High Dose Terbinafine: A Double Blind, Placebo Controlled, Randomized Study**

David W. Kennedy, MD*, Philadelphia, PA
Frederick A. Kuhn, MD*, Savannah, GA
Daniel L. Hamilos, MD, Boston, MA
S. James Zinreich, MD, Baltimore, MD
Pascal J. Pfister, MD, Basel, Switzerland
Amir A. Tavakkol, PhD, East Hanover, NJ

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be better able to understand that chronic rhinosinusitis patients treated with the oral antifungal terbinafine do not show improvement greater than placebo in a randomized clinical trial.

OBJECTIVES: To evaluate the role of the antifungal terbinafine in the treatment of patients with chronic rhinosinusitis. **STUDY DESIGN:** Randomized double blind, placebo controlled multicenter pilot study. **METHODS:** Fifty-two adults with chronic rhinosinusitis received terbinafine 625 mg/day (N=25) or placebo (N=27) once daily. Sinus secretions were collected at screening for mycology. CT was graded for extent of opacification at baseline and end of week 6 using a modification (total opacification = 50) of the Lund-Mackay scoring system. Patients recorded rhinosinusitis symptoms on a visual analog scale and completed the Rhinosinusitis Disability Index (RSDI). **RESULTS:** Positive fungal cultures were found in forty-one patients (17 terbinafine, 24 placebo). One subject from each group had no week 6 data. The mean opacification scores pre- and post-treatment were 25.1, 23.1 in placebo and 24.5, 21.2 in terbinafine group. In patients with positive fungal cultures, least squares means for percent change from baseline (SE) were -10.5 (6.4) for placebo (n=23) compared to -13.3 (8.1) for terbinafine (n=16); 95% CI, (-18.6, 24.3); p=0.79. Investigator therapeutic evaluations and sinus symptom scores were not significantly different between the two groups at baseline or at study completion. **CONCLUSIONS:** This study did not validate the use of an oral antifungal agent (terbinafine) in the treatment of chronic rhinosinusitis even when nasal irrigation samples were positive for fungus on culture. Even at high dose, terbinafine may not have reached therapeutic levels in the nasal secretions. It is also possible that the fungi isolated are not a major pathologic factor.

11:25 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Direct Nasopharyngeal Reflux of Gastric Acid Is a Contributing Factor in Refractory Chronic Rhinosinusitis

John M. DelGaudio, MD*, Lilburn, GA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should understand the relationship of pharyngeal reflux to refractory chronic sinusitis.

OBJECTIVES: To determine if there is a difference in the prevalence of reflux in patients with refractory chronic rhinosinusitis (CRS) compared to control patients, including whether direct nasopharyngeal reflux occurs in CRS patients. It is hypothesized that refractory CRS patients have a greater incidence of laryngopharyngeal reflux (LPR) and nasopharyngeal reflux (NPR) events, and that NPR is a significant etiologic factor for CRS in these patients. **STUDY DESIGN:** Prospective study. **METHODS:** The study group consisted of 38 patients with a history of at least one endoscopic sinus surgery (ESS) with continued CRS symptoms and mucosal inflammation on endoscopy. The first control group consisted of 10 patients who had at least 1 ESS procedure and had no symptoms of CRS or mucosal inflammation a minimum of 1 year postoperatively. The second control group consisted of 20 subjects with no history of CRS or sinus surgery. All patients completed reflux symptom scales, a SNOT-20, and a sinusitis symptom scale, and underwent nasal endoscopy to grade the nasal mucosal findings. Patients underwent a 24 hour pH study with a specially designed probe with sensors located in the nasopharynx, 1 centimeter above the upper esophageal sphincter (UES), and the distal esophagus. The pH recordings were evaluated for NPR events less than pH 4 and 5. Reflux at the UES probe was considered pathologic if there were more than 6.9 episodes for the entire study or the reflux area index (RAI) exceeded 6.3. Esophageal reflux was defined as abnormal if > 4% of the study time was spent at pH < 4. Statistical analysis was performed with Fisher's exact test to compare the reflux parameters and with analysis of variance and Tukey post hoc analysis for the symptom and exam scores. **RESULTS:** No statistical difference was found between the 2 control groups for any parameters at any sites. When a single outlier was dropped from the non-CRS control group, less NPR was found in the non-CRS group compared to the successful ESS control group (p=.03). Because these groups were statistically homogenous they were collapsed into a single control group. Compared to the control group, the study group had significantly more patients with NPR events pH < 4 (39% vs. 7%, p=.004), and an even greater difference in the number of patients with NPR events pH <5 (76% vs. 24%, p=.00003). At the UES, 74% of the study group had > 6.9 reflux episodes, compared to 38% of control patients (p=.006). The UES RAI was abnormal for 58% of the study group compared to 21% of the control group (p=.007). The study group also had more gastroesophageal reflux (66% vs. 31%, p=.007). For nasopharynx and UES reflux parameters, the differences between study and control groups increased when the patients with isolated frontal recess disease were removed from the dataset. The study group also had higher scores on all symptom and exam scores (p=.001 for each scale). **CONCLUSIONS:** Patients with persistent CRS after ESS have more reflux at the nasopharynx, UES, and distal esophagus than controls. The greatest difference is in NPR, especially pH<5. This is the first study to document NPR in CRS patients and it is likely to represent an important causative factor of refractory CRS in adults.

11:35 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Endoscopic Surgery of the Anterior Skull Base

John D. Casler, MD*, Bethesda, MD

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participant should be able to: 1) understand the historical development of endoscopic approaches to the skull base; 2) understand the indications for applying endoscopic techniques to the treatment of skull base lesions; 3) understand the potential advantages and disadvantages of endoscopic approaches to the treatment of skull base lesions.

OBJECTIVE: Traditional surgical approaches to the anterior skull base often involve craniotomy, facial incisions, disruption of skeletal framework, tracheotomy, and an extended hospital stay. As experience with endoscopic sinus surgery has grown, the techniques and equipment have been found to be adaptable to treatment of lesions of the anterior and central skull base. A minimally invasive endoscopic approach theoretically offers the advantages of avoiding facial incisions, osteotomies, and tracheotomy. Surgery should be less painful, recovery quicker, and hospital stays should be shorter. This study attempts to

assess endoscopic approaches to the anterior and central skull base for its ability to achieve those goals. **Study Design:** Retrospective review of 72 cases performed at a single institution from November 1996 to July 2003. A subgroup of 15 endoscopic pituitary tumor patients is compared to a similar group of 15 patients who underwent traditional open transsphenoidal surgery for their pituitary tumors. **Methods:** Patient records were analyzed and information tabulated for age, sex, pathology, location of lesion, operative time, use of image-guided surgical systems, blood loss, length of ICU stay, duration of operative pain, length of post-op hospitalization, complications, and completeness of resection. **Results:** 86.1% of cases were done exclusively endoscopically. 13.9% used a combination of endoscopic and open techniques. An image-guided surgical system was used in 83% of cases. Hospital length of stay was 2.3 days for the exclusively endoscopic group as opposed to 8 days for the combined group. With the pituitary patients, operative times were similar between the two groups (255.13 minutes vs. 245.73 minutes), blood loss was less in the endoscopic group (l25.33m1 vs. 243.33m1), pain duration was less in the endoscopic group (10/15 patients pain-free on POD 1 vs. 2/15 patients pain-free in the open group), ICU stay and hospital length of stay were both less in the endoscopic group. Complication rates and completeness of resection was similar in both groups, although the open group had a higher rate of complications related to the approach to the sella. **Conclusions:** This study demonstrates the safety and efficacy of judicious endoscopic approaches to anterior skull base lesions. An outcomes assessment in pituitary surgery demonstrates advantages of an endoscopic approach in appropriate cases.

11:45 **Klebsiella Rhinoscleromatis of the Membranous Nasal Septum**
Jeffrey H. Spiegel, MD, Boston, MA
Teresa V. Chan, MD, Boston, MA *(Presenter)*

Educational Objective: At the conclusion of this presentation, the participants should be able to identify diagnostic signs and symptoms of rhinoscleroma and its otolaryngologic manifestations and be familiar with treatment recommendations for infection with Klebsiella rhinoscleromatis.

Objectives: Rhinoscleroma is a chronic infectious granulomatous disease which usually presents with mass lesions in the respiratory tract. Rhinoscleroma is endemic to areas of Southeast Asia, Central America, tropical Africa, Central and Eastern Europe and the Middle East and has been associated with low socioeconomic status. In the past, rhinoscleroma was infrequent in the US but with current immigration trends, the incidence of rhinoscleroma may be rising. There is often a delay in diagnosis in non-endemic areas due to unfamiliarity with the disease, the stage dependent clinical and histological manifestations, and the fact that only 50-60% of cultures are positive. We present a literature review on presentation and management of rhinoscleroma along with a case of rhinoscleroma presenting as a granulomatous mass of the bilateral membranous nasal septum. **Study Design:** Case report, literature review. **Methods:** A patient from Central America presented with progressive growth of a painful mass of the anterior membranous nasal septum. Culture of this granulomatous solid mass grew Klebsiella rhinoscleromatis. We review the literature and present the salient diagnostic and treatment aspects of this infection. **Results:** Rhinoscleroma is a chronic infectious granulomatous disease which usually presents with mass lesions in the respiratory tract anywhere from the nose to the trachea. The nose is involved in 95-100% of cases. There are three stages of the disease: catarrhal-atrophic, granulomatous or hypertrophic and sclerotic. Diagnosis is made either by positive Klebsiella rhinoscleromatis culture or classic histological findings of Mikulicz cells and transformed plasma cells with Russell bodies. Late diagnosis leads to increased morbidity in the form of nasal and airway obstruction and nasal deformity from erosive processes. **Conclusions:** Klebsiella rhinoscleromatis is endemic in some regions outside of the United States. Its transmission and pathogenesis are poorly understood. Immigration patterns may result in increased presentation of rhinoscleroma in the United States. The organism is difficult to grow on standard culture media, and delayed diagnosis can result in significant morbidity. Increased awareness of tropical infections may improve diagnostic accuracy.

11:55 Audience Q&A

Noon ADJOURN/LUNCH WITH EXHIBITORS

6:00 - 7:30 MEET THE AUTHORS POSTER RECEPTION - Grand Pre-Assembly

7:30 TRIOLOGICAL SOCIETY PARTY - Beach Club
(Tickets may be purchased online at www.cosm.md or onsite)

Monday, May 16, 2005 - Royal Palm VI-X

7:00 BUSINESS MEETING (members only)

7:45 - 8:30 COURSES - ROOM LOCATIONS TO BE POSTED

PEDIATRIC AIRWAY MANAGEMENT - 2005
Lauren D. Holinger, MD*, Chicago, IL

TYMPANOMASTOIDECTOMY WITH CANAL WALL RECONSTRUCTION AND MASTOID OBLITERATION
Bruce J. Gantz, MD*, Iowa City, IA

COCHLEAR IMPLANTATION UPDATE
Harold C. Pillsbury, MD*, Chapel Hill, NC
Craig A. Buchman, MD*, Chapel Hill, NC

FACIAL REJUVENATION PROCEDURES
J. Regan Thomas, MD*, Chicago, IL

8:35 - Noon SCIENTIFIC SESSIONS

8:35 - 9:10 SPECIAL PRESENTATION
SURGICAL REIMBURSEMENT - PAY FOR PERFORMANCE: A VIEW FROM THE TOP OF ORGANIZED MEDICINE
8:35 **Edward R. Laws, MD,** President, American College of Surgeons, Chicago, IL

Educational Objectve: Participants will understand the relationship between pay for performance initiatives and evidence-based medicine, particularly in the management of surgical patients.

8:50 **Michael D. Maves, MD MBA*,** EVP and CEO, American Medical Association, Chicago, IL

9:05 Audience Q&A

INTRODUCTION OF 2005-06 PRESIDENT - Stanley M. Shapshay, MD*, Boston, MA

MONDAY, MAY 16, 2005
CONCURRENT SESSION I - OTOLOGY - ROYAL PALM VI-X

9:10 PANEL: COCHLEAR IMPLANTATION IN INFANTS
Moderator: Bruce J. Gantz, MD*, Iowa City, IA
Panelists: Richard T. Miyamoto, MD*, Indianapolis, IN
P. Ashley Wackym, MD*, Milwaukee, WI

MODERATORS
P. ASHLEY WACKYM, MD*, MILWAUKEE, WI
BRUCE J. GANTZ, MD*, IOWA CITY, IA

9:45 **Effects of Hypothermia on Auditory Function Following Cochlear Implantation**
Thomas J. Balkany, MD*, Miami, FL
Adrien A. Eshraghi, MD, Miami, FL
Marek Polak, PhD, Miami, FL
Jiao He, MD, Miami, FL
W. Dalton Dietrich, PhD, Miami, FL
Thomas R. Van De Water, PhD, Miami, FL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to have a better understanding of the otoprotective effect of hypothermia on the hearing function of the cochlea.

OBJECTIVES: To test the hypothesis that mild hypothermia has a protective effect against hearing loss caused by cochlear implant (CI) electrode insertion. **STUDY DESIGN:** An animal study evaluated the protective effect of mild hypothermia on reducing electrode trauma induced hearing loss. The unilateral trauma site was selected at random. Contralateral untraumatized cochleae served as controls for both the mild hypothermia and normothermia groups. ANOVA analysis determined significance; $p<0.05$. **METHODS:** Eighteen Fisher 344 rats underwent CI electrode insertion in one ear; the contralateral cochlea served as a control. In group 1 (normothermia), rectal temperature was maintained at 37 throughout the experiment. In group 2 (mild hypothermia), rectal temperature was lowered to 34 C during the period beginning 30 minutes prior to electrode insertion and lasting 30 minutes afterwards. Multiple frequency auditory brainstem response (ABR) and distortion product otoacoustic emission (DPOAE) testing of all ears was performed immediately before and after surgery and on days 1, 3, 5, and 7. **RESULTS:** Immediate post-insertion ABR threshold change of approximately 30dB was noted in both groups 1 and 2. However, progressive loss of auditory sensitivity of approximately 15dB over 7 days was seen only in group 1. An identical pattern was seen with DPOAE testing. That is, progressive loss of DPOAE amplitude was also prevented by mild hypothermia (group 2). **CONCLUSIONS:** Mild hypothermia has a protective effect against the progressive component of hearing loss following CI electrode insertion.

9:55 **Open Set Speech Perception With ABI**
Vittorio Colletti, MD, Verona, Italy
Robert Shannon, PhD, Los Angeles, CA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to demonstrate that speech recognition in ABI patients correlate with modulation threshold.

OBJECTIVES: Only a small percentage of ABI recipients treated for NF2 have proved capable of identifying words using only the sound from the ABI. Recently, the ABI was applied to a series of patients with no cochlear nerve or with cochlear disorders. A significant number of these patients have prove capable of understanding speech, including effortless telephone use. In the present study a series of psychophysical tests were administered to determine the cause of the difference in performance between tumor (T) and non-tumor (NT) ABI patients. **STUDY DESIGN:** Retrospective case review. **METHODS:** Fifteen patients with ABIs participated in the investigation. Three were NF2 patients and 12 NT subjects. Patient ages ranged from 24 to 61 years. Eleven were males and 4 females. Auditory rehabilitation in auditory disconnection due to cochlea and/or cochlear nerve disorders. Stimulation thresholds, forward masking and modulation detection were correlated with speech recognition. **RESULTS:** There was a significant correlation between modulation detection thresholds and speech understanding and a significant difference in modulation detection between T and NT patients. **CONCLUSIONS:** The difference in modulation detection between the two groups suggests a difference in the survival of specific cells in the cochlear nucleus that support modulation. The pattern of results suggests a separate pathway of auditory processing that is specialized for modulated sounds and that pathway is critical for speech understanding. NF2 tumors may selectively damage this pathway resulting in poor speech recognition with prosthetic stimulation.

10:05 **Laser Eustachian Tuboplasty**
Dennis S. Poe, MD*, Boston, MA
Ralph B. Metson, MD*, Boston, MA
Johannes F. Grimmer, MD, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss eustachian tube pathophysiology, medical treatment, and the role surgery may play in treatment of irreversible disease.

OBJECTIVES: There is increasing evidence that the dynamic cartilaginous "valve" portion of the eustachian tube (ET) may be the principal site of pathophysiology. We hypothesized that endoluminal laser dilation of the cartilaginous portion may improve middle ear ventilation in patients with chronic otitis media with effusion (OME). This is a follow-up report on an ongoing study of laser eustachian tuboplasty (LETP). **STUDY DESIGN:** Prospective, IRB approved surgical trial in a tertiary care medical center. **METHODS:** Fifteen patients with intractable middle ear effusions recurring after repeated tympanostomy tube placement were treated with unilateral LETP. Endoscopic surgery was outpatient, under general anesthesia, and used combined transnasal and oral approach-

es. An Argon or 980nm diode laser vaporized an appropriate amount of mucosa and cartilage on the posterior wall of the tubal lumen. Outcome measures were presence or absence of middle ear effusion or atelectasis on micro-otoscopy, impedance tympanometry, and slow motion video ET analyses. **RESULTS:** Follow-up was 6 - 39 months. 6 month results were: normal 8 (53%), retracted TM (type C tympanograms, normal hearing, no effusion) 3 (20%), and OME recurred 4 (27%). 24 month results for 12 patients were: normal 4 (33%), retracted TM 3 (25%), and OME 5 (42%). Failures were associated with allergies, reflux, and inflammatory middle ear disease. There were no significant complications. **CONCLUSIONS:** Results support the hypothesis that LETP is efficacious in the treatment of some cases of intractable middle ear effusion. Further study will be necessary to determine whether LETP is a suitable alternative to repeated tympanostomy tube placement in carefully selected patients failing medical treatment.

10:15 **Does Pregnancy Adversely Affect the Hearing in the Otosclerotic Patient?**
William H. Lippy, MD*, Warren, OH
Leonard P. Berenholz, MD, Warren, OH
John M. Burkey, MA, Warren, OH
Arnold G. Schuring, MD*, Warren, OH

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the historical background of the controversy and inform their patients that there is no objective information in this study that demonstrates a deleterious impact of pregnancy on hearing in the otosclerotic patient.

OBJECTIVES: To evaluate the effect of pregnancy on women with otosclerosis. **STUDY DESIGN:** A retrospective study of women who had undergone stapedectomy. The women were equally divided into two groups; one group with children and a control group without children. Air and bone conduction, as well as discrimination were measured before and after stapedectomy in both groups. The women were also divided into subgroups based on whether they had breastfed their children. **METHODS:** Fifty-four women with average age of 39.5 years were evaluated. Seventy-four ears were studied. **RESULTS:** All patients were tested before and after stapedectomy. Mean pure tone air conduction thresholds, from 250 Hz. through 8000 Hz., were not depressed in women with children versus those women without children. Mean pure tone bone conduction thresholds, from 500 Hz. through 4000 Hz., in women with children were better than women without children. Four frequency (500-4000 Hz.) pure tone averages revealed better air conduction (p=.002) and better bone conduction(p=.022) in those women with children. There was no decrease in either group in discrimination. Within the group with children no significant correlation was found between number of children and hearing loss. Also no correlation was found between breastfeeding and the amount of hearing loss. **CONCLUSIONS:** We found no adverse effect on hearing in otosclerotic women who had children. Even with increasing numbers of pregnancies, no deleterious impact was noted. Air conduction, bone conduction and discrimination were not decreased in women with children. No significant correlation was found between the number of children and hearing loss, and breastfeeding and amount of hearing loss.

10:25 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Shape-Memory Alloy Prosthesis in Otosclerosis Surgery
Glenn W. Knox, MD*, Jacksonville, FL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the characteristics of shape memory alloys and their role in middle ear surgery, and compare the Nitinol prosthesis to other prosthesis types used in middle ear surgery.

OBJECTIVE: The aim of this study is to determine the efficacy of a shape-memory alloy, Nitinol, as a component of an improved stapes prosthesis. **STUDY DESIGN:** Prospective laboratory and clinical study to develop a Nitinol stapes prosthesis. **METHODS:** Various diameters of Nitinol wire and temperature transition variants were analyzed with regard to ease of deformation, response to heating, and strength. The size and geometry of the closed hook was determined by measurement of 50 incus cadaver bones. Several heat sources for activating the shape memory were evaluated, including electrocautery, lasers, and warm water. Trial surgeries were then performed on human temporal bones in the laboratory. The closure characteristics of the Nitinol loop were studied. MRI testing at 1.5 Tesla was performed to determine safety during MRI studies. Preliminary human subject trials were then instituted. **RESULTS:** In all cases, a low heat condition was ample to activate the shape memory characteristics of the hook and return it to a closed position after it had been opened. Laser power was generally set well below the power needed for removing bone. The Nitinol loop closed snugly around the incus with application to the top of the hook with a low temperature laser setting. Almost any heat source was effective. MRI testing at 1.5 Tesla showed no movement of the prosthesis. Preliminary results in human subjects showed excellent air-bone closure. The Nitinol loop holds uniform contact around the incus. **CONCLUSIONS:** The Nitinol piston greatly simplifies the stapedectomy procedure by taking the need for a hand operated instrument out of the surgeon's hands. Because of the nature of the Nitinol wire, it can never over-crimp. All these characteristics make the prosthesis advantageous for otosclerosis surgery.

10:35 Audience Q&A

10:40 - 11:00 BREAK

MONDAY, MAY 16, 2005
CONCURRENT SESSION I - OTOLOGY - ROYAL PALM VI-X

MODERATOR
RICHARD T. MIYAMOTO, MD*, INDIANAPOLIS, MN

11:00 **The Effect of Gabapentin on the Sensation and Impact of Tinnitus**
Carol A. Bauer, MD, Springfield, IL
Thomas J. Brozoski, PhD, Springfield, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should understand the benefits and limitations of using gabapentin as a treatment for tinnitus.

OBJECTIVES: Determine the effect of gabapentin on subjective and objective aspects of tinnitus. **STUDY DESIGN:** Single blind placebo controlled trial using an A-B-A treatment schedule. Tinnitus etiology was classified as either secondary to acoustic trauma or non-trauma related causes. **METHODS:** Forty participants enrolled in the study. Inclusion criteria included scores >30 on the Tinnitus Handicap Questionnaire (THQ) and <13 on the Beck Depression Index and ability to perform psychophysical loudness matching. Participants were tested for tinnitus loudness using a computer based matching procedure. Subjective evaluation of tinnitus handicap, general health and the sensory features of the tinnitus were obtained with the THQ, the Short Form 36 Quality of

Life survey, and a tinnitus experience questionnaire. Evaluations were performed at 7 points during the 20 week trial. **RESULTS:** Gabapentin was ineffective in altering either the objective or subjective measures of tinnitus in the non-trauma group. A significant reduction in objective tinnitus loudness was obtained in the trauma group. In contrast, gabapentin did not improve subjective evaluation of tinnitus handicap or loudness. **CONCLUSIONS:** Gabapentin significantly decreased the objective loudness of chronic tinnitus associated with acoustic trauma but had no effect on the loudness of tinnitus unassociated with trauma. Gabapentin did not significantly alter subjective evaluations of tinnitus for either trauma or non-trauma participants. The failure to obtain significant subjective improvements in tinnitus, while highly significant objective improvements were obtained in trauma associated tinnitus, may be related to the relatively short time period of the drug-dose treatments used in the present trial.

11:10 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Clinical Manifestations of Superior Semicircular Canal Dehiscence
Lloyd B. Minor, MD*, Baltimore, MD

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation the participants should be able to demonstrate an understanding of the following topics related to superior semicircular canal dehiscence syndrome: signs and symptoms, physiological tests, imaging studies, treatment options, surgical techniques.

OBJECTIVE: To determine the symptoms, signs, and findings on diagnostic tests in patients with clinical manifestations of superior canal dehiscence in order to investigate hypotheses about the effects of superior canal dehiscence. To analyze the outcomes in patients who underwent surgical repair of the dehiscence. **STUDY DESIGN:** Review and analysis of clinical data obtained as a part of the diagnosis and treatment of patients with superior canal dehiscence at a tertiary care referral center. **METHODS:** Clinical manifestations of superior semicircular canal dehiscence were studied in patients identified with this abnormality over the time period of May 1995 - July 2004. Criteria for inclusion in this series were identification of the dehiscence of bone overlying the superior canal confirmed with a high-resolution temporal bone CT and the presence of at least one sign on physiological testing indicative of superior canal dehiscence. There were 65 patients who qualified for inclusion in this study based upon these criteria. Vestibular manifestations were present in 60 and exclusively auditory manifestations without vestibular symptoms or signs were noted in 5 patients. **RESULTS:** For the 60 patients with vestibular manifestations, symptoms induced by loud sounds were noted in 54 patients and pressure-induced symptoms (coughing, sneezing, straining) were present in 44. An air-bone on audiometry in these patients with vestibular manifestations measured 19 ± 14 dB at 250 Hz; 15 ± 11 dB at 500 Hz; 11 ± 9 dB at 1000 Hz; and 4 ± 6 dB at 2000Hz. An air-bone gap ≥ 10 dB was present in 70% of ears with superior canal dehiscence tested at 250 Hz, 68% at 500 Hz, 64% at 1000 Hz, and 21% at 2000 Hz. Similar audiometric findings were noted in the 5 patients with exclusively auditory manifestations of dehiscence. The threshold for eliciting a VEMP response (mean $\pm$ s.d.) from affected ears was 81 ± 9 dB NHL. The threshold for unaffected ears was 99 ± 7 dB, and the threshold for control ears was 98 ± 4 dB. The thresholds in the affected ear were significantly different from both the unaffected ear and normal control thresholds ($p < 0.001$ for both comparisons). There was no difference between thresholds in the unaffected ear and normal control ($p = 0.2$). There were 20 patients who were debilitated by their symptoms and underwent surgical repair of superior canal dehiscence through a middle cranial fossa approach. Canal plugging was performed in 9 and resurfacing of the canal without occlusion of the lumen in 11 patients. Complete resolution of vestibular symptoms and signs was achieved in 8 of the 9 patients after canal plugging and in 7 of the 11 patients after resurfacing. **CONCLUSIONS:** Superior canal dehiscence causes vestibular and auditory symptoms and signs as a consequence of the third mobile window in the inner ear created by the dehiscence. Surgical repair of the dehiscence can achieve control of the symptoms and signs. Canal plugging achieves long-term control more often than does resurfacing.

11:20 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
The Dehiscent Middle Fossa: Occurrence, Manifestations, Associated Findings and Long-Term Results of 24 Surgical Explorations for Superior Semicircular Canal Dehiscence
Gerard J. Gianoli, MD*, Baton Rouge, LA

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation, the participants should be able to better understand occurrence, associated findings of SSCD and long term results of repair of SSCD.

OBJECTIVE: Identify occurrence of SSCD on CT scan, associated anatomic anomalies of the middle fossa and review a series of SSCD repair. **STUDY DESIGN:** Retrospective review**. METHODS:** Part I - Temporal bone CT scans (n=120) were reviewed for the presence of SSCD. Part II - Temporal bones with CT scan findings of SSCD (n=47) analyzed for middle fossa anomalies. Part III - The clinical findings in repair of 24 SSCD cases. **RESULTS:** Part I - Findings of SSCD on high resolution CT were noted in 11.6% of cases. Part II - Among 47 CT scans with findings of SSCD, 81% had tegmen dehiscences, 53% had geniculate ganglion dehiscences and 11% had findings of encephaloceles. Part III - In addition to previously reported preoperative symptoms, many patients had Meniere's syndrome. All patients demonstrated significant improvement or complete resolution of symptoms postoperatively with an average follow up of 5 years. All patients that had Meniere's type spells had complete elimination of these spells. Four patients with SSCD who underwent surgery for repair of encephaloceles or CSF leak were asymptomatic preoperatively. **CONCLUSIONS:** Evidence of SSCD on routine CT has been identified in 11.6% of temporal bones. Middle fossa anomalies are found associated with SSCD suggesting a common etiopathogenesis—"dehiscent middle fossa". SSCD has been identified in patients who are asymptomatic. Meniere's syndrome has been identified in association with SSCD. The long-term follow up in this study confirms the initial short-term success reported in other studies.

11:30 **Transmastoid Occlusion of the Superior Semicircular Canal: Treatment for Superior Semicircular Canal Dehiscence**
Patrick W. Slater, MD, Austin, TX
Kavita Malhotra, MD, Shreveport, LA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the anatomy, pathophysiology, and diagnosis of superior semicircular canal dehiscence. The participants should have an understanding of the transmastoid approach to occlude the canal to treat superior semicircular canal dehiscence.

OBJECTIVES: To evaluate the efficacy of a transmastoid approach to occlude the superior semicircular canal. **STUDY DESIGN:** Prospective surgical series. **METHODS:** Surgical intervention, with transmastoid superior semicircular canal occlusion on three patients with superior semicircular canal dehiscence were entered into the study. One patient had bilateral disease but required only unilateral surgery. These patients all had superior semicircular canal dehiscence documented by high resolution CT scan (0.625mm). Physical, audiometric, and vestibular testing was performed in each case. All testing was consistent with the diagnosis of superior semicircular canal dehiscence. Each patient had been treated with conservative medical therapy, and this had failed to resolve their vertigo. **RESULTS:** All three patients had complete resolution of their vertigo. Audiometric testing showed complete preservation of the hearing of two patients and a complete hearing loss in the third. ENG testing showed resolution of the positional nystagmus. All patients had significant improvement in their post-surgical vestibular impairment questionnaire at 6-12 months. **CONCLUSIONS:** The transmastoid approach to occlude the superior semicircular canal is a viable treatment option for patients with superior semicircular canal dehiscence. This approach has a significant less severe complication profile than a middle fossa craniotomy. Resolution of vestibular symptoms related to the canal dehiscence is treated successfully. The hearing loss of one patient is concerning, and methods to prevent this in the future are discussed.

11:40 **Canal Wall Reconstruction and Mastoid Obliteration Tympanomastoidectomy: Seven Years of Experience**
Bruce J. Gantz, MD*, Iowa City, IA
Eric P. Wilkinson, MD, Iowa City, IA *(Presenter)*
Marlan R. Hansen, MD, Iowa City, IA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to compare and contrast the different methods used for the surgical management of cholesteatoma, particularly with regard to recidivism rates, and discuss the pros and cons of each approach. Participants should also be able to discuss the benefits of a hybrid approach to cholesteatoma removal with a canal wall reconstruction technique.

OBJECTIVES: The objective of this study was to evaluate the authors' experience with canal wall reconstruction (CWR) tympanomastoidectomy with mastoid obliteration in the treatment of cholesteatoma. This technique involves bone pate obliteration of the mastoid with removal and reconstruction of the posterior canal wall as a single unit. **STUDY DESIGN:** Institutional review board (IRB) approved retrospective case review. **METHODS:** Retrospective review was performed of all patients undergoing CWR tympanomastoidectomy with mastoid obliteration from 1997 to 2004. Data included pre- and postoperative audiometry, findings at second look surgery with ossiculoplasty, and postoperative complications including wound infection and canal wall displacement. **RESULTS:** 130 ears in 127 adults and children underwent the procedure. Mean time postoperative was 48 months (range 2-94 months) and mean clinic follow-up was 26 months (range 0-81 months). A second look ossiculoplasty was performed in 102 (78%). 98% of ears remain safe without evidence of recurrence. Initiation of 48 hours of IV antibiotics lowered the postoperative infection rate from 14% initially to 4% for the last 88 ears. Recurrence occurred in two patients (1.5%) requiring conversion to a canal wall down mastoidectomy. **CONCLUSIONS:** A canal wall reconstruction technique can provide improved intraoperative visualization of the middle ear and mastoid without creating a mastoid bowl and may reduce the incidence of recurrent disease. A single procedure is used for all patients with cholesteatoma, including children. Avoidance of wound infection is possible with postoperative intravenous antibiotics.

11:50 **Posterior Canal Wall Viability and Hearing Results Following Reversible Canal Wall Down Mastoidectomy**
John T. McElveen, Jr., MD*, Raleigh, NC
Naohiro Yoshida, MD PhD, Sendai, Japan
Calhoun D. Cunningham III, MD, Raleigh, NC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the reversible canal wall down mastoidectomy technique and its potential outcomes in the management of acquired cholesteatomas.

OBJECTIVES: To determine the outcomes of patients undergoing reversible canal wall down mastoidectomy for cholesteatoma. **STUDY DESIGN:** Retrospective review of patients undergoing treatment of acquired cholesteatomas using the reversible canal wall down technique at a tertiary otologic referral center. **METHODS:** The clinical and audiometric findings in 11 patients who underwent reversible canal wall down mastoidectomy over a seven year period were reviewed. Clinical assessment focused on long-term viability and stability of the posterior canal wall, presence of residual cholesteatoma, and postoperative hearing outcomes. **RESULTS:** In all 11 patients, the stability of the posterior canal wall was maintained. One patient developed a displacement of the posterior canal wall following a postoperative wound infection. This was corrected during a second look procedure, and the posterior canal wall has remained stable. Three patients had mild epithelitis of the posterior canal wall that resolved with topical antibiotics. In two patients undergoing a second look procedure, a small keratin pearl was identified in the epitympanum. The ossicular chain was preserved in five of the 11 patients. In two of the remaining six patients, continuity of the incus and stapes was re-established using bone cement. **CONCLUSIONS:** The reversible canal wall mastoidectomy technique appears to be a viable alternative to traditional approaches used to treat cholesteatomas. This technique is very useful in maximizing exposure in patients with extensive cholesteatomas, and in patients with more limited cholesteatomas, this approach allows for preservation of the ossicular chain. Long-term follow-up has confirmed the viability and stability of the posterior canal wall.

Noon Audience Q&A/ADJOURN

MONDAY, MAY 16, 2005
CONCURRENT SESSION II - GENERAL OTOLARYNGOLOGY
ESTATE BALLROOM

MODERATORS
JESUS E. MEDINA, MD*, OKLAHOMA CITY, OK
C. RON CANNON, MD*, JACKSON, MS

9:10 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Development and Validation of an Objective Instrument to Measure Surgical Performance at Tonsillectomy
David W. Roberson, MD*, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should understand: 1) principles of building an objective tool to measure surgical skill; 2) the different domains that need to be included, including technical skills, patient care skills, and leadership/communication skills.

OBJECTIVE: The goals of this project were 1) to develop and validate an objective instrument to measure surgical performance at tonsillectomy; 2) to assess its inter-observer and inter-observation reliability, and construct validity; and 3) to design a simplified form suitable for routine use in otolaryngology surgical evaluation. **STUDY DESIGN:** Prospective, observational data collection for an educational quality improvement project. **METHODS:** The evaluation instrument was based on previous instruments and pilot testing. 55 tonsillectomies were scored during academic year 2002-2003: 45 by residents, five by fellows and five by faculty. **RESULTS:** Inter-observer and inter-observation reliability was high. On technical items, faculty outperformed fellows, who outperformed residents ($p < .0001$ for both comparisons). On the "global" scale (overall assessment), residents improved an average of 1 full point (on a five point scale) during a 3 month rotation ($p = .01$). In the sub-scale of "patient care," results were less clear cut: fellows outperformed residents who in turn outperformed faculty, but only the fellows to faculty comparison was statistically significant ($p = .04$), and residents did not clearly improve over time ($p = .36$). Factor analysis demonstrated that technical items and patient care items factor separately, and thus represent separate skill domains in surgery. **CONCLUSIONS:** It is possible to objectively measure surgical skill at tonsillectomy with high reliability and good construct validity. Factor analysis demonstrated that patient care is a distinct domain in surgical skill. Although the inter-observer reliability for some patient care items reached statistical significance, it was not high enough for "high stakes testing" purposes. Using reliability and factor analysis results, we propose a simplified instrument for use in evaluating trainees in otolaryngologic surgery.

9:20 **Medical and Surgical Management of Orbital Subperiosteal Abscesses in Children**
Lance E. Oxford, MD, Dallas, TX
John T. McClay, MD, Dallas, TX

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the presentations and outcomes of children with subperiosteal orbital abscesses secondary to acute sinusitis. Participants should be able to explain differences in the presentations of patients managed medically compared to patients treated surgically. Participants should be able to discuss our criteria for which children with medial orbital abscesses may be managed medically.

OBJECTIVES: To evaluate the presentations and outcomes of pediatric orbital abscesses secondary to acute sinusitis treated both medically and surgically. **STUDY DESIGN:** Retrospective review of children admitted with orbital abscesses secondary to acute sinusitis from January, 1995 to July, 2002. **METHODS:** Records of 43 patients were reviewed. **RESULTS:** Thirty-eight abscesses were medially located and 5 were superiorly located. Children with superior orbital abscesses were older (mean 12.4 years) than patients with medial orbital abscesses (mean 6.5 years, p=0.01). 18 patients resolved their infection with medical management only and 25 patients underwent surgical drainage. Abscess drainage was performed endoscopically in 18 and externally in 7 patients. Purulence was identified in 22 of 25 surgical patients. Compared to 22 patients with drained purulence, the 18 patients with abscesses managed medically had significant differences ($p<0.05$) for: chemosis in 2/18 (11.1%) vs. 14/22 (63.6%), proptosis in 10/18 (55.6%) vs. 20/22 (90.9%), elevated intraocular pressure in 0/18 (0%) vs. 11/22 (50%), severe restriction of extraocular movements in 1/18 (5.6%) vs. 12/22 (54.5%), and vision loss of 20/40 or worse in 1/18 (5.6%) vs. 7/22 (31.8%). Significant differences were found for the means for age (6.1 vs 9.0 years), abscess height (0.8 vs. 1.6 cm.), abscess width (0.3 vs. 1.4 cm), abscess length (1.1 vs 1.8 cm), and length of stay (4.3 vs. 6.1 days). Persistent morbidities occurred in no patients managed medically and in 2/25 (8%) managed surgically. **CONCLUSIONS:** Children with small medial orbital abscesses secondary to acute sinusitis may be managed medically with favorable outcomes.

9:30 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Aerodynamics of the Human Larynx During Vocal Fold Vibration
Randall L. Plant, MD MS*, Anchorage, AK

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation the participant should understand the manner in which air pressure, vocal intensity, and fundamental frequency interact to produce vocal fold vibration.

OBJECTIVE: The production of voiced speech requires three basic components: 1) a power source to generate flow of air; 2) conversion of this airflow into sound waves; and 3) a signal modifier that selectively amplifies these sound waves to produce the signals that our brain can interpret as speech. The larynx serves as the primary source of sound waves for human speech. The goal of this thesis is to comprehensively study the influence of aerodynamics on laryngeal function. Three specific aspects will be considered: 1) a multidimensional comparison of the interaction of subglottic pressure, sound intensity, and fundamental frequency during speech; 2) examination of instantaneous changes in subglottic pressure during each glottic cycle; and 3) determination of the threshold subglottic pressure for vocal fold vibration and its dependence on other aerodynamic factors. **STUDY DESIGN:** Six healthy individuals without history of voice disorders were recruited as volunteers, under guidelines established by the institutional review board. **METHODS:** The subjects vocalized the vowel sound /i/ with a variety of different intensities, pitch, and sound intensity. Subglottic air pressure, fundamental frequency, sound intensity, and the electroglottography (EGG) signal were simultaneously measured. **RESULTS:** Linear relationships were seen in all subjects between subglottic air pressure and sound intensity, though there were large variations in the slopes of these relationships. In most cases there was a linear relationship between fundamental frequency and subglottic air pressure, though the association was not as strong as seen with sound intensity. Rapid variations in subglottic pressure during each glottic cycle were detected, corresponding to the opening of the vocal folds with each individual vibration. The variation in this pressure was related to both the average subglottic pressure and the intensity of the sound signal. Threshold pressures for vocal fold vibration were dependent primarily on sound intensity and fundamental frequency. Threshold pressure for vocal fold onset tended to be higher than threshold pressures at offset, confirming the presence of a hysteresis effect. **CONCLUSIONS:** The larynx responded in a predictable pattern to general aerodynamic forces, but there was tremendous variability in its specific behavior. Fundamental frequency and sound intensity tended to increase with subglottic air pressure, but that relationship was not seen consistently in all subjects. The relationship between subglottic air pressure and sound intensity was usually linear, unlike the exponential relationship seen in previous studies. Subglottic pressure was noted to undergo rapid change with each glottic cycle in some, but not all subjects, and was found to be most strongly affected by average subglottic pressure. Phonation threshold air pressure was influenced by the sound intensity and, to a smaller extent, by the fundamental frequency of the voiced sound. The threshold pressure was usually greater for onset than for offset in five of the six subjects. In summary, the general behavior of the larynx was governed by basic factors such as the physical properties of air and the anatomy of the vocal tract. In addition, however, there was pronounced variability among human subjects that may have reflected the effects of subtle changes in neuromuscular control of this complex three-dimensional structure.

9:40 Audience Q&A

9:45 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
A ChemoSensory Questionnaire (CSQ) for Patients Treated for Cancer of the Head and Neck
Andrew N. Goldberg, MD MSCE*, San Francisco, CA

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation, the participants should be able to: 1) discuss the basic method of developing a questionnaire for assessment of smell and taste; 2) discuss the effects of treatment for head and neck cancer on smell and taste; 3) explain the quality of life effects of treatment for head and neck cancer on smell and taste; and 4) realize the characteristics of patients most associated with changes in smell and taste.

OBJECTIVE: To investigate the primary chemosensory issues that are present in patients who undergo treatment for cancer of the head and neck. To develop and validate a ChemoSensory Questionnaire (CSQ) useful in the understanding of the adverse chemosensory effects of head and neck cancers and their therapy and on patient quality of life. **STUDY DESIGN:** Literature review, expert opinion, and focus groups were used in a cross-section of patients treated for head and neck cancer to develop a draft survey instrument and assess quality of life effects. **METHODS:** A draft instrument was developed as above and was formally administered in addition to general and disease specific health related quality of life instruments to a cross section of 206 patients. The draft instrument item reduction and was correlated with responses to the other quality of life scales and demographic and clinical data. **RESULTS:** A survey instrument consisting of 4 questions on smell and 4 items on taste was developed. The smell scale demonstrated a Cronbach's alpha of 0.89 and the taste scale an alpha of 0.78. Good construct validity of the CSQ scores was demonstrated. **CONCLUSIONS:** A survey instrument was developed to evaluate chemosensory function that is simple to administer and brief. This instrument will be of value in identifying factors that contribute for chemosensory disturbance and may serve as a guide for planning treatment regimens that minimize such disturbance.

9:55 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
A Standardized Regimen of Antibiotics Prevents Infectious Complications in Skull Base Surgery
Dennis H. Kraus, MD*, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participant would be able to discuss the salient nature of broad spectrum antibiotic coverage for craniofacial resection. Moreover, the participant should be able to explain the reduced morbidity and mortality associated with broad spectrum antibiotics for patients undergoing craniofacial resection.

OBJECTIVE: The current study was designed to evaluate a prospectively designed antibiotic regimen in patients undergoing craniofacial resection and compare it to a group of historic controls. **STUDY DESIGN:** A single arm, prospective antibiotic regimen consisting of ceftazidime, flagyl (metronidazole), and vancomycin (CMV) was compared to a historic control of patients treated with non-standard antibiotic therapy (nonCMV), all of whom underwent craniofacial resection. **METHODS:** Demographics, prior therapy, anatomic site of origin and extent of disease, pathology, standard surgical data, and postoperative therapy were detailed. Outcome measures focused on incidence of infection, severity of infection, and operative mortality. **RESULTS:** A total of 211 patients underwent craniofacial resection from 1973-2003. The standardized antibiotic therapy (CMV) was employed in 90 patients and the non-standardized antibiotics (nonCMV) were used in 107 patients. Infectious wound complications were 11% within the CMV group versus 29% in the nonCMV regimen (p=0.002). Moreover, the severity of infections was greatly diminished in the CMV group (p=0.0001). Hospital stay and operative mortality were both adversely affected by the use of nonCMV antibiotic therapy. **CONCLUSIONS:** The data supports the hypothesis that the use of a 3 drug, broad spectrum antibiotic regimen in skull base surgery reduces the incidence of infectious complications and appears to reduce operative mortality.

10:05 **Does Severity of Disease Predict Uvulopalatopharyngoplasty Outcome?**
Michael Friedman, MD*, Chicago, IL
Ramakrishnan Vidyasagar, MD, Chicago, IL
Darius Bliznikas, MD, Chicago, IL
Ninos J. Joseph, BS, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to decide if OSAHS severity based on polysomnography can predict uvulopalatopharyngoplasty outcome.

OBJECTIVES: Uvulopalatopharyngoplasty (UP3) is the single most commonly performed surgical procedure for the treatment of OSAHS, but its success is limited. Our objective was to determine if severity of disease of OSAHS based on polysomnography (apnea hypopnea index—AHI) is a significant factor in predicting successful treatment by UP3. **STUDY DESIGN:** A retrospective chart review of 77 patients who underwent UP3 as an isolated procedure for the treatment of OSAHS in a tertiary university affiliated medical center. **METHODS:** Patients were grouped according to severity of disease based on preoperative PSG as mild (AHI <20), moderate (AHI = 20 30) and severe (AHI >30). The surgical success rate was defined as a 50% reduction in AHI and a postoperative AHI of < 20. **RESULTS:** Twenty-seven patients had mild disease and a surgical success rate of 35.1%. In 23 patients with moderate disease we found a surgical success rate of 23%. In 27 patients with severe disease, we found a surgical success rate of 35%. The same patients were analyzed by the Friedman staging system using anatomic findings without incorporating the severity of disease. Results indicated the following. Stage I had a success rate of 80.6%, Stage II patients had a success rate of 37.9%, and Stage III had a success rate of 8.1%. Assessment of severity within each stage did not affect outcome. **CONCLUSIONS:** Patients with mild disease based on PSG data do not have a better chance of successful treatment than patients with severe disease. Severity of disease should not be incorporated in the staging system.

10:15 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
The Role of ^{111}Indium Pentetreotide Scintigraphy in the Evaluation of Select Head and Neck Tumors
David Myssiorek, MD*, New Rochelle, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the basic science behind and application of ^{111}Indium pentetreotide scintigraphy as it pertains to select head and neck tumors.

OBJECTIVE: Peptide receptor imaging with ^{111}Indium pentetreotide is useful in the diagnosis of diffuse neuroendocrine system tumors (DNEST) of the head and neck. Uses of ^{111}Indium pentetreotide scintigraphy (IPS) include tumor and metastases detection, familial tumor screening, and surveillance for recurrence. Using target to background ratios (TBR) could generate a comparative scale for these tumors. **STUDY DESIGN:** A retrospective study evaluated the size, TBR, conventional imaging and outcomes of patients imaged with IPS for suspected head and neck DNEST. **METHODS:** Patients with head and neck tumors imaged by IPS over a nine year period were reviewed. Data analyzed were age, sex, scintigraphy, pathology and conventional radiology. Tumor data included dimension, multiplicity, metastases, tumor and brain counts. **RESULTS:** 53 patients underwent 58 scans. The sensitivity and specificity were 93% and 92%. Several different DNEST were successfully evaluated including familial paragangliomas and multiple paragangliomas. TBRs were variable depending on type of DNEST. **CONCLUSIONS:** IPS is accurate in determining the presence of paragangliomas, carcinoid tumors, esthesioneuroblastomas, small cell neuroendocrine tumors and metastases. It is an excellent surveillance tool. Screening patients for familial paragangliomas can be accomplished. No reliable comparative scale to distinguish amongst the various DNEST could be developed using TBR.

10:25 Audience Q&A

10:30 - BREAK
10:50

MONDAY, MAY 16, 2005
CONCURRENT SESSION II - GENERAL OTOLARYNGOLOGY
ESTATE BALLROOM

MODERATORS
HAROLD C. PILLSBURY, MD*, CHAPEL HILL, NC
C. PHILLIP DASPIT, MD*, PHOENIX, AZ

10:55 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Creation of a Disease-Specific Quality of Life Instrument for Nonmelanoma Skin Cancer

John S. Rhee, MD MPH*, Milwaukee, WI

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the relevant quality of life (QOL) issues for patients with nonmelanoma skin cancer and begin to understand the conceptual framework for creating a disease-specific QOL instrument for this population.

OBJECTIVE: To create a disease-specific quality of life (QOL) instrument - The Facial Skin Cancer Index (FSCI) - to measure QOL issues relevant to patients with nonmelanoma skin cancer (NMSC). **STUDY DESIGN:** Cross-sectional study of patients presenting to a dermatologic surgery clinic with NMSC of the head and neck. **METHODS:** For Stage I, item generation, a sample of 20 patients with cervicofacial NMSC and 6 health care providers specializing in the care of NMSC patients completed semi-structured interviews. For Stage II, item reduction, a second sample (N=52) of NMSC patients rated the items in terms of their importance for QOL among skin cancer patients. Domains of the FSCI were evaluated in terms of data quality, item variability, internal consistency, and range and skewness of scale score upon aggregation and floor and ceiling effects. **RESULTS:** A total of 71 distinct items were generated in Stage I. After utilizing the outlined item reduction techniques in Stage II, the FSCI was reduced from 71 to 36 items, representing 6 domains. With the exception of Physical Functioning (alpha = .63) that suggested adequate reliability, all subscale scores showed excellent reliability coefficients, with Cronbach's alpha ranging from .78 (Lifestyle) to .87 (Social/Family). **CONCLUSIONS:** A new disease-specific QOL instrument for patients with NMSC of the head and neck has been created. Validation studies are currently underway. Future directions will include sensitivity analysis to determine whether or not the FSCI is sensitive to change over time among patients undergoing treatment for NMSC.

11:05 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Carcinoma of the Oropharynx-Factors Affecting Outcome
Krishnamurthi Sundaram, MD*, Staten Island, NY

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation the participant should be able to discuss the value of both patient-related and tumor-related factors of oropharyngeal squamous cell carcinoma in predicting patient outcomes, with respect to the three primary subsites of the disease. Consequently, there will be a better understanding of strategies to improve patient outcome.

OBJECTIVE: To assess the value of both patient- and tumor-related factors of oropharyngeal squamous cell carcinoma (SCCA) in predicting patient outcome, with respect to the three primary subsites of the disease. We hypothesize that the subsite has a significant impact on outcome. **STUDY DESIGN:** Historical cohort study. **METHODS:** We conducted a comprehensive chart review of one hundred and twenty-six patients diagnosed with SCCA of the oropharynx over a 10 year period. The oropharynx was divided into three subsites: 1) base of tongue (BOT), 2) tonsil and pillars (TON), and 3) uvula, soft palate and posterior pharyngeal wall (OPX). Patient-related factors included age and gender. Tumor-related factors included AJCC stage, T stage, N stage, and grade. These factors were then compared using the end points of disease-free survival (DFS) and treatment response (CR: complete response; PR/NR: partial response/ no response). **RESULTS:** Tumor-related factors such as AJCC stage (p=0.016) and T stage (p= 0.008) had a significant impact on treatment response. The AJCC stage (p= 0.030) and the T stage (p= 0.005) were also significant predictors of disease-free survival. BOT lesions responded significantly worse to treatment than did TON or OPX lesions (p=0.014). The disease-free survival for BOT cancer was significantly worse than for TON and OPX cancer (p=0.010). **CONCLUSIONS:** Patient-related factors such as age and gender were not significant in predicting disease specific outcome. Important tumor-related factors were the AJCC stage and the T stage. Among the oropharyngeal subsites, SCCA of the base of tongue was associated with the worst outcome.

11:15 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Development and Immunophenotyping of Squamous Cell Carcinoma Xenografts: Tools for Translational Immunology
Scott E. Strome, MD*, Rochester, MN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the benefits and limitations of mouse models for human head and neck cancer.

OBJECTIVE: The objectives of this study were to delineate methods for the development of primary squamous cell carcinoma (SCCHN) xenografts and to define human leukocyte antigen, MAGE-A3, and HPV 16 antigenic expression in resultant cellular products. **STUDY DESIGN:** Prospective experimental model. **METHODS:** Freshly isolated SCCHN xenografts were established in NOD/SCID mice using a variety of methods. Resultant tumors were analyzed for expression patterns of HLA-A, MAGE-A3, and HPV 16. Appropriate controls were included to ensure the presence of human RNA. **RESULTS:** Three xenografts were successfully established and passaged in vivo. Characterization of the resultant products revealed that one was positive for HLA-A2 at both the DNA and protein levels. One of the tumor lines expressed MAGE-A3 while none expressed HPV 16. **CONCLUSIONS:** Freshly isolated SCCHN can be employed to generate primary xenografts. Characterization of select patterns of protein expression in established xenografts is a precursor to the development of a mouse model for SCCHN using tumor bearing animals reconstituted with autologous patient leukocytes.

11:25 **TRIOLOGICAL SOCIETY THESIS PRESENTATION**
Robotic Endoscopic Surgery in a Porcine Model of the Infant Neck
Russell A. Faust, MD PhD*, Detroit, MI

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the advantages, disadvantages, and technical challenges of using the surgical robot to perform endoscopic neck dissections in the infant neck.

OBJECTIVE: Minimally invasive surgery is rapidly becoming the desired surgical goal, especially for pediatric patients. However, infants and children present particular technical challenges due to the small caliber of target anatomic structures and small surgical workspace. Computer-assisted robotic-enhanced surgical telemanipulators may overcome these challenges by facilitating surgery in a small workspace. We studied the feasibility of performing robotic endoscopic neck surgery in a porcine model of the infant neck. **STUDY DESIGN:** Prospective, feasibility pilot study in small cohort for proof of concept. Survival model. **METHODS:** 8 piglets, aged 3-6 weeks old and weighing 4.0 - 9.1 kg, underwent survival thyroidectomy using the ZEUS surgical robot, which includes the AESOP endoscope holder, "Microwrist" microdissecting instruments, and a cervical endoscopic approach. **RESULTS:** We succeeded in performing endoscopic neck surgery in a piglet model as small as 4 kg, in an operative pocket as small as $2cm^3$. Total incision length for all 3 ports was $\leq$ 23 mm. There were no major complications, no robotic instrument malfunctions or breakages, and no procedures required conversion to open surgery. **CONCLUSIONS:** These results support the feasibility of computer-assisted, robotic-enhanced endoscopic neck surgery, in a neck the size of a human infant's.

11:35 **In Vivo Optical Coherence Tomography of the Human Larynx: Normative and Benign Pathology in 70 Patients**
Brian J. Wong, MD PhD, Irvine, CA
Ryan P. Jackson, MS, Stanford, CA
Shuguang Guo, PhD, Irvine, CA

James M. Ridgway, MD, Irvine, CA
William B. Armstrong, MD*, Orange, CA
Zhongping Chen, PhD, Irvine, CA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand how OCT can be used to image tissue microstructure during surgery and be used to guide therapy and diagnose disease.

OBJECTIVES: Optical coherence tomography (OCT) is an emerging imaging modality that combines low coherence light with interferometry to produce cross-sectional images of tissue with a pixel resolution approaching 10 microns. Over seventy patients undergoing surgical head and neck endoscopy were examined using a fiberoptic OCT imaging probe in order to study and characterize microstructural anatomy and features in vivo. **STUDY DESIGN:** Clinical trial of diagnostic imaging modality, prospective. **METHODS:** The OCT device employs a Michelson interferometer and a 1.3-micron broadband light source (FWHM, 80 nm). Conventional endoscopic images were obtained simultaneously to provide anatomic correlation with the OCT images and histology. **RESULTS:** In vivo systematic OCT imaging of laryngeal structures provided information on the thickness of the epithelium and basement membrane integrity in all laryngeal subsites and regional variations were identified. Supraglottic microstructural features identified included ducts, glands, blood vessels, and the transitions between pseudostratified columnar and stratified squamous epithelium. The variations in stromal tissue density were correlated with a priori data on collagen and elastin distributions. Normative true vocal cord (TVC) information included quantitative measurements of epithelial and basement membrane geometry in addition to characterization of the superficial, intermediate, and deep layers of the TVC. TVC pathology imaged included Reinke's edema, papillomatosis, polyps, mucous cysts, mature scar, granulation, and acute changes produced by collagen injection (edema) or laser ablation. Subglottic imaging identified boundaries between epithelium, lamina propria, perichondrium, and cartilage. **CONCLUSIONS:** The OCT images were compared with conventional histopathology when biopsies or excision was performed. The presentation will provide numerous representative in vivo images of both normal and pathologic structures in the larynx. This is the largest series of laryngeal OCT images obtained to date.

11:45 **Robotic Microlaryngeal Surgery: Results of Robotic Cadaver Dissections**
Neil G. Hockstein, MD, Philadelphia, PA
J. Paul Nolan, BA, Sunnyvale, CA
Bert W. O'Malley, Jr., MD*, Philadelphia, PA
Y. Joseph Woo, MD, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to explain potential applications of a surgical robot in microlaryngeal surgery and the means by which robotic technology can advance that which is technically feasible in the endolarynx.

OBJECTIVES: To demonstrate the use of a surgical robot for microlaryngeal surgery. **STUDY DESIGN:** Experimental dissections of the larynx and pharynx in a cadaver with a commercially available surgical robot. **METHODS:** Using the da Vinci® Surgical Robot (Intuitive Surgical, Inc., Sunnyvale, CA) several surgical procedures were performed on an edentulous, female cadaver. The procedures include: 1) true vocal cord stripping; 2) partial cordectomy; 3) arytenoidectomy; 4) partial epiglottectomy; 5) rotation of a mucosal flap from the epiglottis to the anterior commissure; and 6) partial resection of base of tongue with primary closure. All procedures were documented with still and video photography. **RESULTS:** The da Vinci® Surgical Robot, with currently available instruments, enabled performance of several laryngeal and pharyngeal surgical procedures on a cadaver. These procedures as well as endolaryngeal suturing of microflaps will be demonstrated with videographic and photographic images. **CONCLUSIONS:** The recent development of surgical robotics has a potential role in microlaryngeal surgery. Surgical robots offer the ability to manipulate instruments at their distal end with seven degrees of freedom, scaled movement, tremor buffering, and under stereoscopic 3-D visualization. Surgical robots may increase the precision with which we perform currently described procedures, additionally, surgical robots may push the envelope of laryngeal procedures that may be performed endoscopically.

11:55 Audience Q&A/ADJOURN

POSTERS

AESTHETIC AND RECONSTRUCTIVE

1. Peripheral Facial Nerve Regeneration Using Collagen Conduit Entubulation in a Cat Model
Harley S. Dresner, MD, Minneapolis, MN
Timothy A. King, MD, Dubuque, IA
Thomas E. Christenson, MD, Philadelphia, PA
Hamid R. Djalilian, MD, Los Angeles, CA
H. Brent Clark, MD, Minneapolis, MN
Samuel C. Levine, MD*, Minneapolis, MN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to: 1) recognize the challenges involved in the regeneration of the injured facial nerve; 2) describe the limitations of current methods of facial nerve repair; 3) understand the concept of conduit entubulation repair of injured peripheral nerves; 4) describe the results of prior attempts to regenerate the facial nerve via conduit entubulation; and 5) recognize the potentially superior results of collagen conduit entubulation repair of the injured facial nerve.

OBJECTIVES: Facial nerve (FN) injuries are functionally, psychologically, and financially debilitating. Autografts, the gold standard for FN gap repair, produce significant donor nerve morbidity and rarely result in functional recovery exceeding House-Brackmann grade III/VI. This study sought to enhance FN regeneration using conduit entubulation repair of transected FN stumps. **STUDY DESIGN:** Prospective, randomized study. Collagen conduits were specifically selected, as they occur naturally and are completely biodegradable. The semipermeable fibrillar structures provide scaffolds for Schwann cell migration and axonal elongation, concentrate endogenous neurotrophic factors, and permit escape of edema fluid. **METHODS:** Five control cats received right peripheral FN transection and immediate repair via direct microsurgical anastomosis. Five experimental cats underwent identical surgical procedures, followed by immediate implantation of collagen conduits over the anastomosis. **RESULTS:** Postoperative behavioral observation revealed gradual FN recovery in all ten cats, attaining adapted House grades II-III/VI after 6 weeks. Electromyographic (EMG) latency and amplitude data from the bilateral orbicularis oculi and orbicularis oris muscles indicated restoration of FN continuity in all 10 cats. Compared with controls, conduit presence positively and significantly enhanced amplitude recovery in the right orbicularis oculi muscles ($p = 0.037$) and latency recovery in the right orbicularis oris muscles ($p = 0.048$). Compared with latencies and amplitudes in the intact left FN, more statistically significant differences in right FN function were observed within control cats than in implanted cats, indicating that conduit presence facilitated a more complete return of electrophysiologic function. **CONCLUSIONS:** Overall, the results support a favorable effect of collagen conduit entubulation in the enhancement of peripheral FN regeneration.

2. The Utility of Routine Radiography in Postoperative Care Following Repair of Mandibular Fractures

Andrea M. Furr, MD, Jackson, MS
John M. Schweinfurth, MD, Jackson, MS

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the relative utility of clinical and radiologic information in the assessment of patients recovering from mandible fractures.

OBJECTIVES: The objective of this study is to assess the utility and effectiveness of clinical and radiologic examination in the detection and management of complications following the treatment of mandibular fractures. **STUDY DESIGN:** Retrospective case series. **METHODS:** A retrospective review of mandibular fractures treated in a tertiary care, level one trauma center over a five year period was undertaken. Three hundred seventy-four patients with mandibular fractures were included in this study, and each had been treated by either closed or open methods and received a minimum of a one month follow-up examination. Demographic information, cause of injury, type of fracture, and treatment used were recorded. Also noted were postoperative clinical and radiologic examination findings and the incidence of noninfectious complications. **RESULTS:** Of 374 patients with mandible fractures, there were 23 noninfectious, long-term complications for an incidence of 6%. All complications were detected clinically by history and physical examination. Pain at the fracture site was the most reliable indication of mal/nonunion, occurring in 8 of 8 patients, while subjective malocclusion occurred in 15 patients. No complications were detected by radiologic analysis by the treating surgeon. In 145 of 222 of the patients treated with mandibulo-maxillary fixation (MMF), clinical examination and history alone was used to determine the duration of MMF. **CONCLUSIONS:** Routine, postoperative radiologic examination contributes little to patient history and clinical examination in the detection of significant long-term complications of mandibular fracture. Patients lacking clinical signs or symptoms of post-treatment complications are unlikely to develop long-term sequelae regardless of radiologic findings.

3. Platelet Rich Plasma Decreases Ecchymosis Associated With Lower Lid Blepharoplasty
Todd A. Kupferman, MD, Shreveport, LA
Tim S. Lian, MD, Shreveport, LA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the advantage of using platelet rich plasma in the wound bed after blepharoplasty to shorten wound healing time.

OBJECTIVES: To determine if platelet rich plasma is useful for improving postoperative wound healing after lower lid blepharoplasty. **STUDY DESIGN:** A blinded prospective randomized controlled clinical trial was created. **METHODS:** Venous blood was collected just prior to incision by the anesthesiologist and a Medtronic multi speed centrifuge was used to create the platelet rich plasma (PRP). Since we were performing bilateral lower lid blepharoplasties for dermatochalasis with a skin muscle flap technique we were able to treat one side with PRP and the opposite side was able to act as a control. The side chosen to receive the PRP was done so at random just before each application. A blinded independent observer was used on postoperative day number seven to evaluate the appearance of the lower lid wounds with regard to edema and ecchymosis. **RESULTS:** There were 5 Caucasian males in the study with a mean age of 74 years. After randomization there were 3 right sides treated and 2 left sides. On postoperative day number 7 the side treated with PRP had noticeably less ecchymosis in all 5 cases as observed by the independent observer. With regard to edema all 5 patients had equal amounts of mild edema bilaterally. No postoperative hematoma was noted on either side in any patient. The patient was unable to distinguish which side was more painful through the healing process. **CONCLUSIONS:** PRP improves the ecchymosis associated with lower lid blepharoplasty using skin muscle flap technique.

4. Rectus Abdominus Microvascular Free Flap Reconstruction for Orbital Exenteration With or Without Total Maxillectomy
Shepherd G. Pryor, MD, Rochester, MN
Eric J. Moore, MD, Rochester, MN
Scott E. Strome, MD, Rochester, MN
Jan L. Kasperbauer, MD*, Rochester, MN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to have a greater understanding of the reconstructive method and discuss the advantages of placing rectus free flap tissue into the exenteration cavity. This surgical procedure holds significant information for reconstructive facial plastic surgeons.

OBJECTIVES: Orbital exenteration creates a large surgical defect with multiple challenges for the reconstructive surgeon. In contrast to procedures that use the temporalis or the pectoralis major muscles as pedicle flaps, the rectus abdominus free flap permits reconstruction with larger volumes of well-vascularized tissue and greater flexibility in placement without associated orientation problems. The long vascular pedicle provides the reconstructive surgeon freedom to utilize multiple donor vessels within the head and neck, an advantage in the previously radiated patient. **STUDY DESIGN:** Retrospective chart review of all patients who underwent rectus abdominus free tissue transfer for orbital exenteration with or without total maxillectomy at our institution. Flap outcomes were compared. **METHODS:** The charts of patients who underwent rectus abdominus free flap for orbital exenteration with/without total maxillectomy were retrospectively reviewed. The surgical technique was evaluated. The authors present the surgical technique for rectus abdominus free tissue transfer to the orbital cavity and discuss the advantages and disadvantages of this reconstructive method. **RESULTS:** Twenty patients underwent successful reconstruction after orbital exenteration with rectus abdominus free tissue transfer. Complications were minimal and cosmetic results were acceptable. Flap viability was 100%. **CONCLUSIONS:** Rectus abdominus microvascular free tissue transfer for the repair of the orbital exenteration defect is safe and reliable. The post-operative care and donor site defect is well tolerated. The flap allows reliable obturation of the oral maxillectomy defect, and it negates the need for cavity care in these patients.

5. Evaluation of Rhinoplasty in an Otolaryngology Training Program
Sandeep D. Sule, MD, Detroit, MI
Jeffrey J. Colton, MD, Detroit, MI

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to support the conclusion that rhinoplasty can be performed safely and effectively by otolaryngology residents with little morbidity and good patient satisfaction.

OBJECTIVES: Facial plastic surgery is one of the most difficult areas of otolaryngology to provide resident "hands on" experience. This study examines the experiences of rhinoplasty at the senior resident facial plastic surgery clinic at a tertiary care hospital. Through this clinic, rhinoplasties were performed by senior residents under the appropriate supervision of an attending surgeon. **STUDY DESIGN:** Retrospective chart review. **METHODS:** The charts of 46 consecutive patients who underwent either septoplasty/open reduction of nasal fracture or septoplasty/rhinoplasty were retrospectively reviewed. Thirty-two patients underwent septoplasty/rhinoplasty and 14 patients underwent septoplasty/open reduction of nasal fracture. The charts were reviewed for procedure used, complications, as well as satisfaction. **RESULTS:** Twenty-three males and twenty-three females were reviewed. The average age was 31. Follow-up time ranged from 1 month to 15 months. Of the 46 rhinoplasties reviewed, 41 were performed endonasally and 5 were open. In terms of complications, one patient (2%) had post-operative infections, 3 (6%) developed post-operative epistaxis requiring intervention, 2 (4%) developed septal perforations, and 1 (2%)

developed nasal valve abnormalities. Out of the 46 patients, 5 (11%) required/requested revision surgeries. In terms of patient satisfaction, 34 patients were completely satisfied with the results of their surgery. **CONCLUSIONS:** This data shows that, although rhinoplasty is a complicated procedure and often difficult to teach to residents, it can be done. The complication rates of the study compare favorably to published data. These data support the conclusion that rhinoplasty can be performed safely and effectively by otolaryngology residents with little morbidity and good patient satisfaction.

6. Microtia Surgical Positioner Fabrication and Use

William E. Walsh, MD CMI, Chicago, IL
David J. Reisberg, DDS, Chicago, IL
Daniel G. Danahey, MD PhD, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of the presentation, the participants should be able to explain the microtia surgical positioner fabrication process and demonstrate its use.

OBJECTIVES: To fabricate a three dimensional appliance to more accurately position and better sculpt the autologous rib cartilage graft during microtia reconstruction. **STUDY DESIGN:** New device design and surgical application. **METHODS:** Fabrication of the positioner begins by the medical artist making a cast of the patient's auricular defect. On this cast, the artist then creates an aesthetically pleasing wax sculpture of an ideal ear in appropriate position to mirror the patient's normal contralateral ear. The surface contour of the patient's auricular defect locks the wax sculpture in correct position. Then the artist makes a silicone mold, a perfect reverse copy of the wax ear, to produce the final clear acrylic surgical positioner. Finally, the artist drills a postauricular channel into the positioner. Intraoperatively, the positioner locks into the patient's auricular defect surface contour thus assuring accurate positioning of the cartilage graft. The surgeon marks the correct helix position through the postauricular channel. **RESULTS:** Our group successfully created and utilized a surgical positioner to guide accurate superior-inferior, anterior-posterior, and rotational placement of the helical portion of the cartilage graft. The surgical positioner also significantly contributed to detailed sculpting of the graft. **CONCLUSIONS:** Medical artists and surgeons can fabricate and use a microtia surgical positioner to guide accurate placement of the cartilage graft and assist with sculpting of the graft.

7. A Computerized Objective Analysis of Facial Synkinesis

Zhenqing B. Wu, MD, New York, NY
Maura K. Cosetti, MD, New York, NY
Belachew Tessema, MD, New York, NY
Carol A. Silverman, PhD, New York, NY
Christopher J. Linstrom, MD*, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to describe the use of the computerized analysis of facial synkinesis in comparison to the subjective evaluation.

OBJECTIVES: To objectively evaluate facial synkinesis using a video-computer system and to compare it with the subjective analysis. **STUDY DESIGN:** Prospective. **METHODS:** Thirty healthy adults with normal facial nerve function were enrolled in the study. Threshold values of synkinesis were established for eye closure and closed lip smile using the video-computer system. Thirty consecutive patients with facial dysfunction from various etiologies were analyzed for the presence or absence of synkinesis based on the threshold values. Test-retest reliability was evaluated with the paired t test. Subjective analyses of the same patients by two independent and blinded observers were compared with the computerized evaluation. **RESULTS:** In the computerized analysis, 18 (60%) patients demonstrated synkinesis during eye closure while 17 (57%) during closed lip smile. In either facial expression, 14 (47%) patients showed synkinesis on the presumed "normal" side. Interestingly, 5 (17%) patients developed synkinesis within 3 months from onset of the facial nerve injury. The repeatability of all test and re-test experiments were excellent. The independent subjective evaluation revealed 7 (23%) patients during eye closure and 18 (60%) patients during closed lip smile. **CONCLUSIONS:** Overall, the computerized analysis of facial synkinesis is more sensitive than the subjective evaluation. The computer-video system is a reliable tool in analyzing facial synkinesis. Its normative data and threshold values may prove useful for future endeavor.

8. Transverse Cervical Myofascial Flap in the Repair of Cervical Esophageal Perforations

Brent E. Yoder, MD, Washington, DC
Steven P. Davison, MD DDS, Washigton, DC
Sonya S. Malekzadeh, MD, Washington, DC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the rationale for use of this pedicled flap, especially for esophageal perforations. Additionally, the anatomy and performance of this flap will be discussed such that other surgeons should feel comfortable attempting this flap. Finally, a review of other available repair options should allow participants to compare this flap with alternative methods and appropriately select cases where this flap may be optimal.

OBJECTIVES: To describe the transverse cervical myofascial flap and elucidate this flap's utility in cervical esophageal perforation repair. **STUDY DESIGN:** Report on the use of the transverse cervical myofascial flap in two cases of esophageal perforation and review the relevant literature and anatomy. **METHODS:** Case report format with discussion of relevant anatomy, unique problems regarding cervical esophageal perforations, and comparison with other available repair methods. **RESULTS:** In one year, two esophageal perforations occurred following anterior spinal fusion. The first patient underwent a failed sternocleidomastoid muscle repair before successful closure with the aid of a transverse cervical myofascial flap. The second patient underwent an unsuccessful primary repair before successful closure with this pedicled flap. In both cases the flap served as an effective barrier between the cervical fusion and the esophageal repair. **CONCLUSIONS:** The transverse cervical myofascial flap is an effective and advantageous flap in the setting of a cervical esophageal perforation.

HEAD AND NECK

9. Intraoperative Recurrent Laryngeal Nerve Monitoring for Reoperative Thyroid Bed Surgery

Chetan Bettegowda, BA, Baltimore, MD
Nishant Agrawal, MD, Baltimore, MD *(Presenter)*
Ralph P. Tufano, MD, Baltimore, MD

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to 1) understand the role of intraoperative recurrent laryngeal nerve (RLN) monitoring in reoperative thyroid bed surgery; 2) characterize a subset of patients with recurrent papillary thyroid carcinoma at increased risk for recurrent laryngeal nerve injury after previous thyroid bed surgery; and 3) understand the anatomy of the previously operated thyroid bed for the surgical challenges it poses for preservation of recurrent laryngeal nerve function.

OBJECTIVES: To determine the role of intraoperative nerve integrity monitoring in preserving recurrent laryngeal nerve function during reoperative thyroid bed surgery. **STUDY DESIGN:** Retrospective analysis. **METHODS:** This is a retrospective analysis of twenty consecutive post-thyroidectomy patients who underwent thyroid bed reoperation for treatment of recurrent papillary thyroid cancer at our institution from 2002-2004. Intraoperative recurrent laryngeal nerve monitoring was performed with the Xomed Nerve Integrity Monitoring System (NIMS) endotracheal tube. Post-operative recurrent laryngeal nerve function was assessed by directly visualizing true vocal fold mobility using a fiberoptic laryngoscope in the post-extubation period. **RESULTS:** The mean age of patients in this study was 42.4 years of age with a 1:1 male:female ratio. The average number of surgeries prior to presentation was 1.6 and all patients had received prior I-131 radiotherapy. Of the 20 patients, 17 had bilateral dissections and 3 had unilateral dissections. All 37/37 RLN's were identified with confirmation by the NIMS. Two RLN's were electively resected en-bloc with recurrent tumor. Post-operatively, the 35 preserved nerves had intact function as determined by direct fiberoptic examination. **CONCLUSIONS:** While there is literature that suggests intraoperative nerve monitoring is useful in patients undergoing primary thyroid surgeries, there is no report of its utility in reoperative procedures. In fact, patients undergoing reoperative procedures for recurrent papillary thyroid cancer are at increased risk for injury to the RLN because of post-operative changes in the thyroid bed. This study demonstrates that intraoperative nerve integrity monitoring is useful in preservation of the RLN during reoperative thyroid bed surgery and should be strongly considered in this high risk patient population.

10. Lateral Thyrotomy for Excision of Laryngeal Paragangliomas

Seth M. Brown, MD MBA, Bronx, NY
David Myssiorek, MD, New Hyde Park, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to describe the workup and diagnosis of laryngeal paragangliomas as well as the lateral approach for their removal.

OBJECTIVES: Laryngeal paragangliomas, although rare, are lesions that warrant appropriate diagnosis and treatment secondary to their location and high risk of bleeding when violated. This paper will describe a method to work up patients with solid submucosal lesions of the larynx in order to diagnose a paraganglioma without a biopsy. When recognized preoperatively, a lateral approach to removal can be performed, decreasing the risk of significant bleeding and the need for tracheotomy or permanent laryngostoma. This paper will also add 2 more cases to the reported literature of 75. **STUDY DESIGN:** Case report and review of the literature. **METHODS:** We present 2 patients with laryngeal paragangliomas that were excised at our institution. **RESULTS:** One of the patients had a biopsy at an outside institution which resulted in significant bleeding requiring a tracheotomy and blood transfusions. As a result, she underwent a supraglottic laryngectomy for definitive treatment. The other patient was worked up without a biopsy and was able to undergo a lateral thyrotomy for removal, avoiding tracheotomy. Both patients are free of disease with a mean follow-up of 7 years. **CONCLUSIONS:** Lateral thyrotomy for laryngeal paragangliomas can be used as an alternative to the traditional approaches of laryngectomy or laryngofissure. Furthermore, biopsying these lesions should be avoided as this often causes significant bleeding. We recommend that all solid submucosal laryngeal lesions be worked up with either a CT or MRI and an octreotide scan when solid and vascular. Patients can then undergo lateral thyrotomy for definitive treatment of these lesions.

11. Previous Gastric Bypass as a Risk Factor for Severe Post-Thyroidectomy Hypocalcemia

Alan R. Burningham, MD, Washington, DC
Catherine A. Picken, MD, Washington, DC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to identify that a history of gastric bypass surgery may be a risk factor for severe hypocalcemia following thyroidectomy.

OBJECTIVES: The number of patients undergoing gastric bypass procedures for morbid obesity continues to increase, and many of these procedures involve bypassing large portions of the small intestine to induce weight loss. These patients frequently develop calcium and vitamin D deficiency secondary to surgically induced malabsorption and food intolerances. Decreased bone mass and metabolic bone disease have both been described in post-gastric bypass patients, both of which could predispose patients to post-thyroidectomy hypocalcemia. There have been no previous case reports of severe post-thyroidectomy hypocalcemia in gastric bypass patients. **STUDY DESIGN:** Case review of a gastric bypass patient who developed severe post-thyroidectomy hypocalcemia. **METHODS:** Clinical history and hospital course reviewed. **RESULTS:** A 30 year old female with a compressive multinodular goiter presented for a total thyroidectomy. She had a history of gastric bypass surgery one year prior with a 100 pound weight loss since the surgery. She underwent an uneventful total thyroidectomy without operative complications. Her calcium level was 8.4 mg/dL in the recovery room. The following morning, her calcium level dropped to 7.4 mg/dL and she developed a positive Chvostek's sign, but no other symptoms. She was stared on oral calcium supplementation and calcitriol. Her calcium level continued to decrease and she became symptomatic requiring intravenous calcium boluses. On post-operative day three, her calcium level dropped to 6.6 mg/dL despite oral and intravenous calcium, therefore, a continuous infusion of calcium gluconate was started. She required the continuous infusion for three days, the lowest serum calcium level measured was 5.8 mg/dL. She was transitioned to oral calcium supplementation on post-operative day nine and discharged to home. **CONCLUSIONS:** This patient developed severe post-thyroidectomy hypocalcemia which may have been secondary to pre-operative calcium and vitamin D deficiency induced by gastric bypass. Although additional studies are necessary to confirm if a history of gastric bypass is a risk factor for post-operative hypocalcemia, physicians should be aware of this possibility and follow serum calcium levels closely post-operatively.

12. Tissue Array Analysis of Young vs. Old Head and Neck Squamous Cancer Patients

Thomas H. Hammond, MD, Columbus, OH
Martha M. Yearsley, MD, Columbus, OH
Amit Agrawal, MD, Columbus, OH

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the issues regarding immunohistochemical and in situ hybridization microarrays and their application to head and neck cancer as well as the difference in the immunohistochemical profile between young and old cancer patients.

OBJECTIVES: To examine the hypothesis that young and old head and neck squamous cancer patients have a different immunohistochemical and in situ hybridization profile. **STUDY DESIGN:** Immunohistochemical and in situ hybridization tissue microarray comparison of banked tumor blocks from young and old head and neck squamous cancer patients. **METHODS:** 24 patients older than 40 (mean age = 61) at the time of diagnosis were compared with 24 stage matched patients that were younger than 40 (mean age = 32.6). Comparison was done using immunohistochemical and in situ hybridization microarray technology. Analysis of the immunohistochemical stains was done using image analysis software to obtain quantitative results. Immunohistochemical stains were done for p53, Ki-67, Cox-2, Cyclin-D1, EGFR and TGF-α. In situ hybridization stains were done for both high risk (types 16 and 18) and low risk (types 6 and 11) HPV. **RESULTS:** Significant differences were not noted with p53 or Ki-67. Young patients did have more Cyclin D1 staining and less TGF-alpha staining but these results did not reach significance ($p<0.131$ and $p<0.189$ respectively). Young patients did have significantly less Cox-2 staining ($p<0.011$), more EGFR staining ($p<0.032$) and a higher prevalence of high risk HPV ($p<0.0265$). **CONCLUSIONS:** Young patients with head and neck squamous cancer

have a different immunohistochemical and in situ hybridization profile when compared to similar patients who are older. This may explain why young patients get head and neck cancer despite their lack of typical risk factors and how their disease process may be different. It also may suggest different responses to treatments such as Cox-2 inhibitors or EGFR inhibitors.

13. Cranial Bone Regeneration Using Beta-TCP and Bone Putty With Fibrin Glue

Masanao Kishimoto, MD, Kyoto, Kinki Japan
Shin-ichi Kanemaru, MD PhD, Kyoto, Kinki Japan
Masaru Yamashita, MD, Kyoto, Kinki Japan
Akhmar A. Magrufov, MD, Kyoto, Kinki Japan
Yoshihiro Tamura, MD, Kyoto, Kinki Japan
Juichi Ito, MD PhD, Kyoto, Kinki Japan

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to learn about a practical technique of cranial bone regeneration after craniotomy. We suggest that the deformity after a craniotomy is avoidable.

OBJECTIVES: To regenerate the cranial bone defect by a tissue engineering technique. The cranial bone reconstructive surgery is usually performed after the craniotomy or post-traumatic repairing of skull. Recently, there have been many reports about the cranial bone reconstruction. However, the bone regeneration at the postoperative fissure/burr holes site or regeneration of the post-traumatic bone defect is still a challenging problem in cranial bone reconstructive surgery. **STUDY DESIGN:** Preliminary: an animal study. **METHODS:** Adult beagle dogs were used as the experimental animal. They were divided into 2 groups. In both groups, the parietal region of skull was exposed and a free bone flap with a diameter of 40 mm was created. In group I, the cranial bone defect was closed by placing back the free bone flap, where the remained fissure and burred holes were filled by the mixture of beta tricalcium phosphate (beta-TCP) and bone putty with fibrin glue. In group II, the same bone defect was closed only by putting back the free bone flap. As an assessment, pre- and post-operative imaging and histological examinations were also performed. **RESULTS:** New bone formation was observed at the defect site in group I. However, in group II, the bone defect was filled by fibrous tissue. **CONCLUSIONS:** The mixture of beta-TCP and bone putty with fibrin glue is a useful material for the postoperative or post-traumatic cranial bone defect reconstruction.

14. Examination of Routine Adult Tonsillectomy Specimens—Is There a Need for Histopathologic Analysis?

Michael P. McDowell, MD, Portsmouth, VA
Myron W. Yencha, MD, Portsmouth, VA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, participants should be able to discuss the current debate regarding routine pathologic analysis of adult tonsillectomy specimens and explain that histopathologic processing of these specimens without risk factors for cancer may not be cost effective or necessary.

OBJECTIVES: Recent publications have shown that routine pathologic analysis of tonsils in children is not universal and may not be cost effective. An ongoing debate exists as to whether routine adult tonsillectomy specimens should similarly undergo complete pathologic examination. The purpose of this study was to analyze the existing adult tonsillectomy data and methodology at our institution, calculate the cost effectiveness of pathologic examination, and present a synopsis of the literature when histopathology is indicated. **STUDY DESIGN:** Retrospective chart review and literature review. **METHODS:** All tonsillar histopathology reports were reviewed at our hospital from January 1997 through December 2003. Interviews with pathologists concerning the processing of tonsil specimens were also completed. Using applicable Medicare reimbursement rates, cost information was obtained for current procedural terminology (CPT) codes. **RESULTS:** At our institution, a total of 3866 tonsillectomy reports were reviewed. Of these, 1944 were excluded by age (less than 18) and 75 by suspicion of malignancy. No instances of occult malignancy were identified. An estimated 151 physician work hours were utilized to examine these 3694 specimens. The cost for pathologic analysis using averaged Medicare reimbursement rates amounted to $203,192 for microscopic examination versus $68,265 for gross examination. This implies a potential cost savings of $134,927 if only gross examination had been performed on these specimens without a concern for cancer. **CONCLUSIONS:** Our analysis suggests that routine histopathologic examination of adult tonsillectomy specimens without risk factors for malignancy may not be necessary or cost effective. Multi-institutional trials are needed to confirm this finding and should help to validate our results.

15. Head and Neck Manifestations of Extracranial Carotid Pseudoaneurysms

Shatul L. Parikh, MD, Atlanta, GA
Patricia A. Hudgins, MD, Atlanta, GA
John M. Delgaudio, MD, Atlanta, GA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the etiology and presentation symptoms of extracranial carotid pseudoaneurysms.

OBJECTIVES: Extracranial carotid pseudoaneurysm (ECPA) is a rare clinical entity that has been reported in the literature previously as case reports. We reviewed our experience of patients with ECPA to determine presenting symptoms to help diagnose this condition. Additionally, we identified disease processes that predispose patients to developing ECPA. **STUDY DESIGN:** Retrospective chart review of patients treated for ECPA from the period of 1999 through 2004 at a tertiary care academic medical center. **METHODS:** Charts were reviewed for data regarding the predisposing disease that resulted in ECPA, presenting symptoms, size of ECPA, treatment, and outcomes. **RESULTS:** Seven patients diagnosed with ECPA were identified. Predisposing factors to developing ECPA were as follows: 5 patients had metastatic cancer to the involved neck, with 2 of these patients having a neck abscess postoperatively. Two of these five patients also had previous trauma to the involved side. Of the remaining two patients, one patient had a previous carotid endarterectomy and the other had no identifiable predisposition to ECPA. Of the presenting symptoms, all patients (7) presented with cervical pain and a palpable mass. Other presenting symptoms included pulsatile mass (2/7), dysphagia (3/7), hoarseness (1/7), and bleeding (1/7). All patients with history of previous metastatic head and neck cancer (5/5) underwent a CT scan which failed to adequately diagnose the ECPA. **CONCLUSIONS:** Patients with ECPA present with symptoms including cervical pain and a palpable mass. Clinicians must have a high index of suspicion in patients with head and neck cancer and who present with cervical pain, a palpable mass, and unusual findings on CT scan.

16. Merkel Cell Carcinoma: Does Tumor Size or Depth of Invasion Correlate With Recurrence, Metastasis, or Patient Survival?

Henry D. Sandel, IV, MD, Washington, DC
Terry A. Day, MD, Charleston, SC
Mary S. Richardson, MD, Charleston, SC
Matthew Scarlett, MD, Charleston, SC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the malignant potential of Merkel cell carcinoma

and determine the best treatment options based on tumor size and depth of invasion. One should be able to explain basic tumor characteristics and relate them to prognostic factors that include local, regional, and distant recurrence. The participants should also be able to discuss the history of this disease, recognize tumor pathology, and debate the recent literature.

OBJECTIVES: To compare the clinical and histologic criteria with outcomes in patients with Merkel cell carcinoma. **STUDY DESIGN:** A retrospective study and literature review. **METHODS:** The state cancer registry provided patients (n=46) diagnosed with Merkel cell carcinoma from 1992 through 2002. Pathology slides were reviewed by the author for tumor size, depth of invasion, Clark level, and margin status. Further clinical information and survival data was gathered from patient records. Statistical analysis was performed using t-tests and Kaplan-Meier survival curves. Patients were excluded based on unavailability of pathology slides (n=9), those lost to follow up (n=6), or metastatic disease on presentation (n=2). **RESULTS:** Disease free survival (n=29) was 52%, 39% and 9% at 1, 2 and 5 years respectively. The average disease free interval was 18.4 months (1-80). No correlation was found between tumor size ($p>0.49$), depth ($p>0.41$), or Clark level ($p>0.82$) to overall survival. No correlation was found between tumor size or depth of invasion to local recurrence ($p>0.07$), regional recurrence ($p>0.93$ and $p>0.60$), or distant metastasis ($p>0.16$ and $p>0.24$). Overall recurrence was found in 60.7% of patients with local recurrence occurring in 18.1%, regional recurrence 40.9%, and distant recurrence 47.8%. Comparing patients with positive vs. negative margins at initial excision, local recurrence was found in 33.3% vs. 9.09% ($p>0.19$), regional recurrence 66.6% vs. 27.2% ($p>0.08$), and distant metastasis 66.6% vs. 45.4% ($p>0.36$) respectively. **CONCLUSIONS:** No correlation was found between tumor size or depth of invasion to patient survival, recurrence, or metastasis. These outcomes are consistent with those reported in recent literature and further characterizes the unpredictable nature of this disease. An aggressive approach should be taken including wide local excision with negative tumor margins and lymph node dissection, however larger multi-state reviews are needed for additional support.

17. Interferon-Alpha Protects Head and Neck Squamous Cells From Oncolytic Vesicular Stomatitis Virus in a Dose Dependent Manner

Edward J. Shin, MD, New York, NY
Jaime I. Chang, MD, New York, NY *(Presenter)*
Bryan Choi, MS, New York, NY
Oliver Ebert, MD, New York, NY
Eric M. Genden, MD, New York, NY
Savio Woo, PhD, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the role of interferon-alpha in VSV attenuation for head and neck squamous cancer cell lines.

OBJECTIVES: The prognosis of patients with recurrent head and neck squamous cell carcinoma (SCC) remains poor despite advances in multimodal therapies. Vesicular stomatitis virus (VSV) is a novel tumor targeted replicating virus that shows great promise for the treatment of cancer. It is a negative strand RNA virus with inherent specificity for replication in tumor cells due to their attenuated antiviral responses. Our objective is to determine if SCC cells retain the ability to respond to interferon-alpha to mount an antiviral response. **STUDY DESIGN:** In vitro testing of multiple human and murine SCC cell lines infected with VSV-GFP in the absence or presence of various concentrations of recombinant interferon-alpha. **METHODS:** Each cell line was tested in the presence of increasing concentrations of interferon-alpha at a single MOI of 0.01. Cell survival was tested by MTT assay at each concentration of interferon-alpha over 72 hours. Viral replication was tested by real time RT-PCR over 48 hours. **RESULTS:** SCC VII, UMSCC 9, UMSCC 28 are partially protected from VSV mediated cell apoptosis at 10 units/cc of interferon-alpha. Near complete protection is provided at 100 and 1000 units/cc of interferon-alpha. VSV replication is suppressed in a dose dependent manner in the presence of interferon-alpha. **CONCLUSIONS:** Human and murine SCC cells tested in the presence of interferon-alpha at 100 units/cc or higher retain the ability to protect themselves from VSV mediated apoptosis. Suppression of replication is one of the mechanisms through which VSV is attenuated in interferon-alpha treated SCC cells.

18. Genetically Modified Fibers in Recombinant Adenoviral Vectors Enhance Viral Transduction in Head and Neck Squamous Carcinoma Lines

Edward J. Shin, MD, New York, NY
Georges B. Wanna, MD, New York, NY *(Presenter)*
Bryan Choi, MS, New York, NY
Tian-Gui Huang, MD PhD, New York, NY
Eric M. Genden, MD, New York, NY
Savio Woo, PhD, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss how fiber modified adenovirus may improve the overall therapeutic potential of gene therapy in the treatment of head and neck cancers.

OBJECTIVES: To determine if fiber modifications of adenovirus will result in increased transduction. To determine if increased levels of transduction can be correlated with integrin or coxsackie adenovirus expression. **STUDY DESIGN:** Three separate fiber modifications (RGD, RTD, RGD/RTD) of adenovirus were developed to express GM-CSF and IL-12 and tested in several SCC cell lines. **METHODS:** Three human (SCC 09, SCC 25, SCC 38) and three murine (SCC VII, B4B8, B7E11) squamous cell carcinoma lines were tested at varying multiplicities of infection for levels of cytokine expression by ELISA for IL-12. This was correlated with coxsackie adenovirus receptor (CAR), $\pm v^2 3$, $\pm v^2 5$ and $\pm v^2 6$ integrin expression as determined by flow cytometry. **RESULTS:** Statistically significant increased rates of transduction were observed at most multiplicities of infection in the three human SCC cell lines tested for each of the new fiber modifications (1.0-3.5 fold increase). Transduction rates were cell line and MOI dependent in the murine SCC cell lines (1.0-137.0 fold increase). Flow cytometry revealed low CAR expression and increased levels of expression of $\pm v^2 6$ integrin expression in human squamous cancer cell lines. **CONCLUSIONS:** This study demonstrates that fiber modified adenoviruses transduce human and murine squamous cancer cell lines with enhanced efficiency and may correlate with increased expression of certain integrins. This increased gene transfer efficacy may allow lower vector doses and improve the overall therapeutic potential of gene therapy in patients with advanced or recurrent head and neck cancers.

19. Predicting Deep Neck Space Abscess Using Computed Tomography

Joseph L. Smith, II, MD, Syracuse, NY
Jack M. Hsu, MD, Syracuse, NY
Jakwei Chang, MD, Syracuse, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to explain the utility of computed tomography in diagnosing deep neck space infections. They should be able to discuss the strengths and weaknesses of this diagnostic modality as it pertains to differentiating phlegmons from abscesses. They should be able to compare clinical findings with radiologic findings and be able to discuss when these findings should direct surgical exploration for a suspected deep neck space abscess.

OBJECTIVES: To investigate objective measures which could increase the positive predictive value of computed tomography in diagnosing deep neck space

infections. **Study Design:** Retrospective analysis of patients surgically treated at a tertiary care hospital for deep neck space infections during the years 2002 and 2003. **Methods:** Charts were reviewed and only patients who had had computed tomography with contrast scanning suggestive of deep neck space abscess within 24 hours prior to surgery were included. The average Hounsfield units for each abscess were calculated. Based on the intraoperative finding of pus, the patients were divided into groups. Student t-tests compared the average Hounsfield units, white blood cell count, and maximum temperature between the groups. Outcomes were measured by comparing overall length of hospital stay, length of postoperative stay, and complications. **Results:** Of the 32 patients surgically drained, 24 (75%) had discreet collections of pus, while 12 (25%) did not. Hounsfield unit measurement was not reliable in distinguishing abscess from phlegmon. Of the other clinical variables studied to distinguish abscess from phlegmon, none were statistically different. Outcomes for the groups were statistically the same. **Conclusions:** Although computed tomography with contrast plays an important role in the diagnosis and management of deep neck space infections, the decision for surgical drainage of an abscess should be made clinically. A negative exploration rate of nearly 25% despite careful selection criteria should be expected.

20. Therapy with Gefitinib (Iressa®) in Patients With advanced Head and Neck Cancer

Georg M. Sprinzl, MD, Innsbruck, Tyrol Austria
Ilona M. Schwentner, MD, Innsbruck, Tyrol Austria
Gilbert Spizzo, MD, Innsbruck, Tyrol Austria
Wolfgang Hilbe, MD, Innsbruck, Tyrol Austria
Guenther Gastl, MD, Innsbruck, Tyrol Austria
Walter F. Thumfart, MD, Innsbruck, Tyrol Austria

Educational Objective: Patients with recurrent head and neck squamous cell carcinoma (HNSCC) are deemed in the majority incurable, but they may derive some benefit from systemic palliative chemotherapy. Recently, with the introduction of epidermal growth factor receptor (EGFR) antagonists such as gefitinib (Iressa), an effective and less toxic option is now available for the treatment of such patients. At the conclusion of this presentation, the participants should be able to discuss the therapeutic options for patients with advanced HNSCC.

Objectives: To evaluate the tolerability and activity of gefitinib, an epidermal growth factor receptor tyrosine kinase inhibitor, in patients with pretreated advanced HNSCC. **Study Design:** This paper reports retrospective the outcome of gefitinib treatment in patients who enrolled into the 'Iressa' Expanded Access Programme (EAP). We performed a retrospective, not blinded and open labeled study. **Methods:** From June 2003 to October 2004 we treated ten patients with metastatic previously treated HNSCC using gefitinib at a dose of 250 mg orally on a daily basis, within a compassionate protocol sponsored by AstraZeneca. Study end points included response rate, time to progression, median survival and amelioration of clinical findings. **Results:** The patients' median age was 55 years. All of them were male. 10 patients were enrolled with a median age of 55 years. All of them had local recurrent disease. The only grade 3 toxicity encountered was diarrhea in one patient, skin toxicity was found in two patients. We observed a response rate of 23% and a disease control rate of 6.5 month. Median time to progression and overall survival were 8 months, respectively. **Conclusions:** Gefitinib has single agent activity and is well tolerated in refractory HNSCC. Gefitinib is a new promising therapy option for patients with advanced HNSCC with few adverse events and significant response rates.

21. The Effect of the HGF Therapy on radiation Induced Salivary Gland Disorder in Mice

Hisanobu Tamaki, MD, Kyoto, Kinki Japan
Shin-ichi Kanemaru, MD PhD, Kyoto, Kinki Japan
Kasaru Yamashita, MD, Kyto, Kinki Japan
Akhmar A. Magrufov, MD, Kyoto, Kinki Japan
Yoshihiro Tamura, MD, Kyoto, Kinki Japan
Juichi Ito, MD PhD, Kyoto, Kinki Japan

Educational Objective: At the conclusion of this presentation, the participants should be able to know an ideal therapy for xerostomia, which is annoying for usual people in their old age.

Objectives: It is reported the number of the patient of xerostomia is now reached to about 8 millions in the reported country. For example, the causes of xerostomia are aging, Sjogren syndrome and sequela after radiation. In radiation induced xerostomia, an atrophic change of salivary gland cells is observed histologically and it reduces the salivary secretion in extremely. Treatment of radiation induced xerostomia is currently limited to administration of saliva substitutes and sialogogues. The effect of these medications is transient and limited. The final aim of our study is to develop the new therapy for radiation induced xerostomia. In this study, we investigated the protective effect of hepatocyte growth factor (HGF) with anti-fibrosing effect administered to salivary gland in mice immediately after radiation. **Study Design:** In vivo animal study with controls. **Methods:** Eight male C57BL/6 mice were divided into 2 groups: HGF administration group (n=4) and control group (n=4). Irradiation (12 Gy at one time) was performed in both groups. The weight of secreting saliva during five minutes after administration of 1% HCl pilocarpine: cholinergic drug were measured before, 1 day, 5 days and 12 days after irradiation in both groups. Histological examinations of salivary glands were performed at one day after irradiation. **Results:** The saliva's volume of control group was less than that of the HGF administration group. Histologically, damages of salivary gland in the HGF group were much less than those in the control group. **Conclusions:** HGF may have a protective effect on radiation induced salivary gland disorder in mice.

Laryngology and Bronchoesophagology

22. Aspirated Dentures Presenting as a Subglottic Mass

Gregory J. Artz, MD, Philadelphia, PA
Joesph M. Speigel, MD, Philadelphia, PA

Educational Objective: At the conclusion of this presentation, the participants should be able to recognize the importance of complete head and neck survey, including a dental history and examination in acute trauma patients.

Objectives: This is a case report of a 57 year old male presenting with a subglottic mass, stridor, hemoptysis and halitosis 11 months after a motor vehicle accident and closed head injury requiring tracheotomy and prolonged hospitalization. Aspirated foreign bodies are usually considered in the pediatric population; however they are occasionally seen in the adult population, usually in the edentulous population with dental prostheses. We discuss the relative rarity of laryngeal foreign bodies as compared to other sites in the tracheobronchial tree and their much higher associated risks and complications. **Study Design:** Retrospective chart review of a single patient chart. **Methods:** Case report and review of the literature. **Results:** This is the longest documented case of a retained foreign body in the adult population. This patient was found to have inhaled a portion of his dentures at the time of a motor vehicle accident. He presented to clinic after several asymptomatic months with progressive airway symptoms. **Conclusions:** This case underscores the need for a thorough history and dental exam early in the clinical course of patients presenting with head and neck trauma.

23. Long-Term Survival of Autologous Fat Injected Into Vocal Folds: A Clinical and Radiological Study

Giovanna Cantarella, MD, Milano, Italy
Riccardo F. Mazzola, MD, Milano, Italy
Barbara Maraschi, BSc, Milano, Italy
Biondetti Pietro, MD, Milano, Italy
Forzenigo L. Virginia, MD, Milano, Italy

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss advantages and limits of fat injection into vocal folds for the treatment of glottic incompetence.

OBJECTIVES: The aim of this study was to evaluate the long-term results of the lipostructure technique originally described for facial recontouring in the treatment of glottic incompetence. **STUDY DESIGN:** Prospective study. **METHODS:** Fifteen patients (age 18-74, mean 47.8) with breathy dysphonia secondary to laryngeal hemiplegia (8) or anatomical defects (7) underwent vocal fold lipoinjection. Four also reported difficulties in swallowing fluids and solids. Fat harvested by liposuction under moderate negative pressure was centrifuged at 3000 rpm for three minutes. Three layers were obtained, the middle of which (consisting of fat cells) was injected into the vocal muscle of the paralyzed or atrophic vocal folds under direct microlaryngoscopy. The patients underwent pre- and postoperative videolaryngostroboscopy, maximum phonation time (MPT) measurements, GRBAS perceptual evaluations, voice acoustic analysis and Voice Handicap Index (VHI) self-assessments. Between 10 and 28 months postoperatively, 10 patients underwent laryngeal CT and MRI studies. **RESULTS:** Voice quality improved soon after surgery in all cases and remained stable over 6-39 months (mean 23.3), as confirmed by MPT, GRBAS, and VHI evaluations and by acoustic analysis ($P<0.005$). The results were best in the eight patients with paralytic dysphonia. The four dysphagic patients reported the disappearance of their swallowing difficulties. CT and MRI studies equally well displayed the persistence of the fat implant in all 10 cases examined but only in 12/14 injected vocal folds. **CONCLUSIONS:** The clinical outcomes demonstrated that the lipostructure technique leads to lasting voice improvement in patients with glottic incompetence. Imaging studies confirmed that the stability of glottic competence was due to long-term fat survival.

24. Otolaryngologic Manifestations of Diffuse Idiopathic Skeletal Hyperostosis (DISH), A Report of a Case Series

Dominic M. Castellano, MD, Norfolk, VA
John T. Sinacori, MD, Norfolk, VA
Daniel W. Karakla, MD, Norfolk, VA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to explain the etiology of the otolaryngologic manifestations associated with DISH and the indications for surgery. The options for surgical treatment will also be explained.

OBJECTIVES: Present patient symptomatology associated with DISH and explain the etiology of ENT manifestations. The findings on physical exam and the options available for treatment will also be discussed. **STUDY DESIGN:** Retrospective review of 3 patients treated at our institution with symptoms of stridor and/or dysphagia. **METHODS:** Retrospective review of literature and discussion of management. A team approach consisting of otolaryngologists, orthopaedic surgeons and neurosurgeons. **RESULTS:** All patients had resolution of symptomatology with acceptable morbidity associated with their management. **CONCLUSIONS:** Stridor and dysphagia are common signs and symptoms encountered in an ENT practice. Uncommon etiologies of stridor and dysphagia must be considered given the increase in life expectancy. Intrinsic and extrinsic mechanisms must be determined prior to any intervention, but airway management is paramount. Treatment of DISH requires a team approach consisting of orthopaedic surgeons, neurosurgeons and otolaryngologists.

25. Development and Validation of Vocal Tremor Scoring System (VTSS)

Nicole Daamen, MD, Pittsburgh, PA
Clark A. Rosen, MD*, Pittsburgh, PA
Jackie L. Gartner-Schmidt, PhD, Pittsburgh, PA
Chen-Chi Wang, MD, Pittsburgh, PA
Lucian Sulica, MD, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to use a new classification system for assessing vocal tremor via flexible laryngoscopy.

OBJECTIVES: Essential tremor (ET) occurs in approximately 4% of the population and 25% of ET patients have vocal tract involvement. Treatment of vocal tremor has a variable success rate most likely due to inaccurate identification of the affected area(s). A vocal tremor assessment system was developed to standardize the evaluation and scaling of vocal tremor. **STUDY DESIGN:** Instrument development and validation. **METHODS:** A clinical consensus conference was conducted to develop an assessment tool for standardized rating of tremor location and severity. The assessment tool was then tested using video perceptual analysis from 10 reviewers scoring five patient examinations. **RESULTS:** The VTSS is based on severity scores for different anatomic sites within the vocal tract. A clinically applicable, standardized flexible nasopharyngoscopy assessment protocol was developed in conjunction with the VTSS. The sites in the VTSS are the palate, base of tongue, pharyngeal walls, larynx, supraglottis, and true vocal folds. Statistical analysis of the video perceptual analysis results showed that the anatomical sites with the best inter-rater agreement were the true vocal folds, palate, base of tongue, and supraglottis. Overall the VTSS demonstrated a good level of reliability. **CONCLUSIONS:** The VTSS represents the first standardized system for rating the anatomical site and severity of vocal tremor. This tool will allow improved communication between otolaryngologists, facilitate research on vocal tremor treatments and establish a descriptive system for assessing vocal tremor. Optimal patient selection and success rate for intra-laryngeal botulinum toxin treatment may be increased by using this assessment tool for patients with vocal tremor.

26. The Thyroid Foramen: A Case Report and Literature Review of a Largely Unrecognized Laryngeal Anomaly

Christine L. Gilliam, MD, Columbia, MO
Gregory J. Renner, MD, Columbia, MO

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to demonstrate a variant of laryngeal anatomy and how this anatomical anomaly can affect one's surgical planning, differential diagnosis, and treatment plan. The embryological origin of the thyroid foramen along with the associated laryngeal innervation and vascular supply will be explained. This presentation should promote discussion of the implications of misdiagnosis of laryngeal pathology including laryngeal fractures and juxtaposed laryngeal cancer to a laryngeal defect due to the lack of knowledge about this congenital anomaly, the thyroid foramen. Additionally, participants should be able to compare older technology with newer fine cut image studies to be aware of the presentation of previously non-visualized anatomy.

OBJECTIVES: The thyroid foramen is a congenital linear opening located in the posterosuperior portion of the thyroid cartilage lamina. Though the thyroid foramen's incidence is reported as high as 30%, few practitioners are aware of its existence. **STUDY DESIGN:** We report the case of a young man who was

misdiagnosed as having "bilateral thyroid cartilage fractures" on CT scan performed during his trauma workup from a motor vehicle accident. Additionally, the patient experienced transient left true vocal cord paresis. **METHODS:** This case prompted our review of the literature including studies of thyroid cartilage defects, laryngeal anatomy and anomalies, laryngeal innervation, and cadaver studies. **RESULTS:** The thyroid foramen's average size is 2.5mm and may be present unilaterally or bilaterally and orients in an oblique fashion through the thyroid cartilage. In 70% of cases there is an anastomotic brach connecting the external and internal braches of the superior laryngeal nerve. Embryologically it is thought to have a combined brachial and neurovascular origin. **CONCLUSIONS:** A detailed understanding of the laryngeal anatomy, with its variants and physiological implications, is vital to the head and neck surgeon as this determines eventual diagnosis, treatment planning, and surgical techniques. With advancements in imaging technology, this congenital anomaly will likely be detected with greater frequency. Physicians need to be aware of its presence and unique characteristics in order to avoid misdiagnosis, such as initially occurred with our patient. Though the actual significance of the thyroid foramen is still not well understood, we feel that awareness of this entity is important in the process of diagnosis and management of laryngeal pathologies.

27. Comparison of Nystatin to Fluconazole in the Prevention of Tracheoesophageal Voice Prosthesis Failure Due to Fungal Colonization

Parul Goyal, MD, Syracuse, NY
Richard T. Kelley, MD, Syracuse, NY
Lauren A. Paseman, MS, Syracuse, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to describe the causes of tracheoesophageal voice prosthesis failure and the role of antifungal therapy in patients with tracheoesophageal voice prosthesis.

OBJECTIVES: For many individuals who have undergone laryngectomy, tracheoesophageal puncture and placement of a voice prosthesis allows for excellent voice restoration. Several voice prostheses are available. Indwelling prostheses are felt to be advantageous because they do not require removal by patients. Because fungal colonization of these prostheses is a common cause of prosthesis failure, daily cleaning via in situ flushing and antifungal therapy is routinely used to extend the lifespan of indwelling prostheses. The goal of this study was to compare the efficacy, convenience, and cost of two antifungal regimens: daily nystatin and weekly fluconazole. **STUDY DESIGN:** Prospective cross-over study. **METHODS:** Patients with an indwelling voice prosthesis were placed on an antifungal maintenance regimen of either thrice daily nystatin or weekly fluconazole. Patients also flushed the prosthesis with water in situ. When the prosthesis began to leak, the prosthesis was changed and patients were then placed on the alternate antifungal regimen. The two regimens were compared in terms of convenience, cost, and prosthesis lifespan. **RESULTS:** Twelve patients were enrolled in the study. Patients reported that taking fluconazole was easier and more convenient than nystatin. Additionally, the overall cost of the fluconazole was less than that of nystatin. There was no significant difference in prosthesis lifespan based on the antifungal regimen. Patients also reported better compliance to fluconazole than nystatin. There were no adverse effects due to either antifungal agent. **CONCLUSIONS:** Antifungal therapy extends the lifespan of indwelling voice prostheses. Weekly fluconazole appears to be as effective, is less expensive, and is more convenient to take when compared to nystatin.

28. Injection Laryngoplasty for Glottic Incompetence in Patients on Oral Anticoagulant Therapy

Sumeer K. Gupta, MD, Winston Salem, NC
Stacey L. Halum, MD, Winston Salem, NC
Gregory N. Postma, MD, Winston Salem, NC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to compare the risks and benefits of various medialization procedures in patients who require anticoagulation.

OBJECTIVES: The objective of this study is to review a series of patients with glottic incompetence who had undergone injection laryngoplasty while on therapeutic oral anticoagulation. **STUDY DESIGN:** The study involved a retrospective chart review of all patients who were therapeutic on oral anticoagulation with Coumadin or Plavix and underwent injection laryngoplasty with acellular dermis or calcium hydroxyapatite. **METHODS:** Information recorded included patient age, injection material, injection technique, and results as determined by patient and physician perception. **RESULTS:** Nine patients were included in the study. Six were on therapeutic Coumadin and three were on Plavix at the time of the injection laryngoplasty. There were no procedural or postoperative complications. Eight of nine patients had subjective improvement in their voice as perceived by the physician and by patient self-rating. **CONCLUSIONS:** Injection laryngoplasty using acellular dermis or calcium hydroxyapatite can be performed safely and effectively on anticoagulated patients without need for anticoagulant reversal.

29. Robotic Microlaryngeal Surgery: A Technical Feasibility Study Using the da Vinci Surgical Robot and an Airway Mannequin

Neil G. Hockstein, MD, Philadelphia, PA
J. Paul Nolan, BA, Sunnyvale, CA
Bert W. O'Malley, Jr., MD*, Philadelphia, PA
Y. Joseph Woo, MD, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the principles of surgical robotics, how surgical robotics can be applied to microlaryngeal surgery, and different means of exposing the larynx to optimally allow introduction of the robotic arms.

OBJECTIVES: The trend toward minimally invasive surgery has lead to the development and mastery of endoscopic and laparoscopic surgery. These minimally invasive approaches, which only two decades ago were either novel or experimental, are now mainstream. More recently, robotically assisted surgery has evolved as an adjunct to open and endoscopic techniques. Surgical robots are now approved by the Food and Drug Administration for a variety of thoracic and abdominal/pelvic surgical procedures. The purpose of this study is to demonstrate the technical feasibility of robot assisted microlaryngeal surgery. **STUDY DESIGN:** Experimental surgical manipulation of the larynx in an airway mannequin with a surgical robot. **METHODS:** A variety of laryngoscopes and mouthgags, coupled with the da Vinci® Robot's (Intuitive Surgical, Inc., Sunnyvale, CA) 0 degree and 30 degree 3-D binocular endoscopes were utilized to optimize the visualization of the larynx in an airway mannequin. Five millimeter and 8 millimeter micro-instruments compatible with the da Vinci® robot were utilized to manipulate different elements of the larynx. Experiments were recorded with both still and video photography. **RESULTS:** The endoscope and robotic arms of the da Vinci® robot are well suited to airway surgery. Operating room setup, patient positioning, and laryngeal exposure and manipulation will be demonstrated with videographic and photographic images. **CONCLUSIONS:** Robot assisted laryngeal surgery can be performed with currently available technology. The potential for fine manipulation of tissues, increased freedom of instrument movement, and endolaryngeal suturing may increase the precision of endoscopic laryngeal microsurgery and offers the potential to increase the variety of laryngeal procedures which can be performed endoscopically.

30. Objective Quantitative Assessment of Upper Airway Stenosis: Experimental Validation and Clinical Application

Reza S.A. Nouraei, MA MBBChir, London, UK
David J. Howard, FRCS, London, UK
David C. McPartlin, FRCS, London, UK

Guri S. Sandhu, FRCS, London, UK

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to appreciate the principles of precise quantitative assessment of upper airway stenosis, contrast the proposed new technique with the existing, largely qualitative methodology, and incorporate this new technique in their clinical practice for assessing lesion severity and documenting the surgical outcome of reconstructive airway surgery.

OBJECTIVES: Assessment of the upper airways is paramount in diagnosis and classification of airway stenosis and documentation of surgical outcome. Current techniques are subjective; objective sizing, when attempted, has depended on CT scanning. We developed a methodology for quantitative assessment of the upper airways from endoscopic views. **STUDY DESIGN:** Experimental validation of optimal settings for quantitative endoscopy and preoperative assessment of acquired adult subglottic stenosis in ten patients undergoing surgery. **METHODS:** Rules for acquiring standardized endoscopic views in routine clinical practice were developed and mathematically validated. An airway calibrator was designed and passed to the level of stenosis. The cross-sectional area of the airway at the level of the stenosis was calculated with reference to the calibrator, and post-surgical airway improvement was quantitatively assessed. **RESULTS:** The combined error caused by measurement and fisheye distortion of images was <5% if the target occupied <70% of the field of view (FOV). Placing the calibrator at three radial levels and using weighted average achieved measurement accuracies >95%, independently of fisheye distortion or the endoscope-to-target distance. Maximum accuracy and minimal dispersion were calculated as a function of FOV. Cross-sections and lengths of normal and stenosed airway segments were intraoperatively calculated to the nearest mm2 in ten patients undergoing laser surgery using commercially available software, and success of reconstructive airway surgery was quantitatively determined and correlated against post-surgical changes in airway resistance. **CONCLUSIONS:** Exact endoscopic airway sizing is mathematically valid, technically feasible in routine clinical settings, and is clinically superior to qualitative classification or using ionizing radiation in patients with airway stenosis.

31. Is Twice a Day PPI Better Than Once a Day PPI for the Treatment of Laryngopharyngeal Reflux Symptoms?

Woosuk Park, MD, Cleveland, OH
Michael F. Vaezi, MD PhD, Cleveland, OH *(Presenter)*
Douglas Hicks, PhD, Cleveland, OH
Tom Abelson, MD, Cleveland, OH
Claudio Milstein, PhD, Cleveland, OH
Joel E. Richter, MD, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the efficacy of once daily versus twice daily proton pump inhibitor therapy for laryngopharyngeal reflux.

OBJECTIVES: To evaluate whether twice daily (BID) proton pump inhibitor (PPI) is more effective than once daily (QD) PPI for treatment of laryngopharyngeal reflux symptoms. **STUDY DESIGN:** Open label prospective cohort study. **METHODS:** Patients with ENT symptoms and laryngopharyngeal reflux on laryngoscopy were enrolled. Questionnaire assessed demographics, symptoms, symptom severity, and exposure to laryngeal irritants. Esophageal manometry and pH monitoring were performed. Patients were treated with PPI BID (lansoprazole 30 mg BID), PPI BID + H2RA (omeprazole 20 mg BID + ranitidine 300 mg QHS) or PPI QD (esomeprazole 40 mg QD). Treatment response was assessed at two months. Response to therapy defined as > 50% symptom improvement. Non-responders in the QD group were treated with BID PPI for additional two months. **RESULTS:** 85 patients enrolled (mean age 52.5 years; 68% female; 77% Caucasian): 60 patients in BID (30 patients PPI alone, 30 patients PPI + H2RA) and 25 patients in QD groups. Symptom prevalence: hoarseness (79%), throat clearing (79%), cough (66%), sore throat (60%), and globus (49%). Response to therapy: BID PPI = 15/30 (50%); BID PPI + H2RA = 15/30 (50%); QD PPI = 7/25 (28%), ($p < 0.03$). No significant difference between BID groups with and without H2RA ($p = 0.50$). 13 non-responders from the QD group were treated with BID PPI and 7/13 (54%) showed response to therapy at two months. **CONCLUSIONS:** Empiric therapy with twice daily PPI is more effective than once daily PPI in the treatment of laryngopharyngeal reflux symptoms. Until we better understand the placebo response rate, BID PPI dosing is recommended.

32. Injection Laryngoplasty With Calcium Hydroxylapatite for Glottic Insufficiency: CT Findings and Clinical Outcomes

Amy L. Reynders, MD, Syracuse, NY
Richard T. Kelley, MD, Syracuse, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to assess changes in CT localization and volume measures for injected calcium hydroxylapatite for the treatment of glottic insufficiency and determine if this correlates with clinical outcomes.

OBJECTIVES: Present 20 patients who have undergone calcium hydroxylapatite injection for glottic insufficiency. Compare CT findings and clinical outcome measures among patients with unilateral vocal cord paralysis, vocal cord scar and vocal cord atrophy. Demonstrate anatomic location and volumetric analysis differences using CT imaging obtained after initial injection. Determine if voice quality and airflow change over time correlates with CT findings. **STUDY DESIGN:** Non-randomized, prospective case series. **METHODS:** Twenty patients underwent injection laryngoplasty with calcium hydroxylapatite for glottic insufficiency - 12 with unilateral vocal cord paralysis, 4 with vocal cord scar and 4 with vocal cord atrophy. Post-injection CT scans of the larynx without contrast were obtained within one month and one year to assess for any anatomic location or volume changes of the injected calcium hydroxylapatite. Image analysis was performed using the GE Advantage Workstation AW4.1. Analysis allowed for 3-D reconstruction with both anatomic isolation of the injected implant as well as volume calculation. Hounsfield units of the injected material was also determined to assess the density of the implant in the surrounding tissues. Patients were followed with videolaryngostroboscopy and a voice questionnaire (VR-QOL). In addition, five patients underwent airflow analysis. **RESULTS:** Patients showed radiographic evidence of decreased volumes of the radiopaque calcium hydroxylapatite with follow-up CT scans. CT scan intervals for comparison ranged from six months to one year. Voice quality and airflow measures were correlated with volume changes evident with CT analysis. **CONCLUSIONS:** The ideal injectable material for laryngoplasty should have minimal tissue reaction and reabsorption so the effects of medialization are long lasting. Calcium hydroxylapatite shows radiographic evidence of diminished volume over time and in this study correlates with voice quality changes and airflow measures in a subset of five patients.

33. Management of Nonspecific Discrete Vocal Fold Lesions

Jeffrey H. Spiegel, MD, Boston, MA
Joshua D. Weissman, BA, Boston, MA *(Presenter)*
George L. Charpied, MS, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to optimize treatment for patients with nonspecific discrete lesions of the vocal folds.

OBJECTIVES: Vocal fold lesions can take many forms (e.g., cysts, polyps, granulomas, nodules, etc.). Differentiation between these lesions is facilitated by

fiberoptic laryngoscopy, stroboscopy, and voice evaluation. However, sometimes the true nature of the lesion is not completely evident until the patient has undergone suspension microlaryngoscopy under general anesthesia. Complicating this picture, many of the same factors which can contribute to vocal fold lesions (e.g., smoking, reflux) can create generalized inflammation with edema and erythema that can further obscure the nature of a discrete vocal fold lesion. As the nature of these lesions is uncertain, the necessary treatment is unclear. Further, some lesions are known to respond well to conservative treatment (e.g., medications, voice therapy) while other lesions tend to require surgical management. We sought to create a treatment algorithm for the initial management of the nonspecific discrete vocal fold lesion. **STUDY DESIGN:** Retrospective review. **METHODS:** Using the video database of nearly two thousand patients from the speech pathology section of the department of otolaryngology/head and neck surgery, 145 patients were identified by our speech pathologist as having discrete, but nonspecific vocal lesions. Of these, 37 had complete medical records that were available for evaluation. These charts were reviewed for treatment methods and outcomes, including voice quality and lesion resolution. **RESULTS:** 15 patients (Group 1) were treated with proton pump inhibitor medications (PPI) as sole treatment. Of these, all but one had improvement. An average of 104—170 days was required for lesion resolution. 8 patients (Group 2) began on PPI therapy and eventually required surgical excision of the discrete lesion. They typically had worsening or no improvement in their lesion and voice prior to surgical management, on average 166 days after beginning medical therapy. All were improved postoperatively. 14 patients (Group 3) went directly to surgery. All had significant improvement. **CONCLUSIONS:** Given that there is an approximate 2:1 ratio of patients who resolved on PPI alone versus those who failed PPI and required surgery, it is possible that of those patients who went directly to surgery, 2/3 of them may have responded to PPI therapy alone. Overall, approximately 40% of patients with discrete nonspecific lesions of the vocal cords responded to PPI therapy alone. For patients with discrete classifiable lesions, treat appropriately, however, when the discrete lesion is nonspecific, a trial of PPI may provide resolution of the lesion in > 40% of patients. A trial of conservative management is recommended prior to surgery.

34. West Nile Virus Induced Vocal Fold Paralysis

Natalie P. Steele, MD, New Hyde Park, NY
David Myssiorek, MD, New Hyde Park, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the viral etiologies of vocal cord paralysis and the unique clinical characteristics and diagnostic criteria of West Nile virus infection.

OBJECTIVES: West Nile virus has recently become a public health concern in the United States, after an outbreak in New York City in 1999. The virus may cause a spectrum of disease from flu-like symptoms to encephalopathy, muscle weakness, and, in some cases, death. We report a unique patient who developed a permanent vocal fold paralysis as a direct result of infection with the West Nile virus. **STUDY DESIGN:** Case report. **METHODS:** A 69 year old man presented in August 1999 with a one week history of severe, progressive muscle weakness. The patient's clinical course, diagnosis of West Nile virus and two year follow-up will be discussed. **RESULTS:** After admission to the intensive care unit, the patient developed hoarseness and was unable to maintain adequate respiratory volumes secondary to muscle weakness. Fiberoptic examination revealed bilateral vocal cord paralysis. The patient was intubated for ventilatory support due to his inability to maintain adequate tidal volumes secondary to a combination of respiratory muscle weakness and vocal fold paresis. Positive West Nile virus infection was documented on cerebrospinal fluid analysis. The patient subsequently required tracheotomy placement. After a prolonged hospital course, the patient was discharged to a nursing home with the tracheotomy tube in place. Two years later, the patient had recovered right vocal fold function, but the left vocal cord paralysis persisted. **CONCLUSIONS:** West Nile virus is now a nationally reportable disease and a major public health concern. Our case illustrates the importance of the inclusion of West Nile virus in the differential diagnosis of hoarseness, particularly in the background of flu-like symptoms and progressive muscle weakness. In addition, it underscores the need to examine the vocal folds if a tracheotomy is required in a patient with documented muscle weakness.

OTHER

35. Skull Base Regeneration by Polypropylene Mesh Coated With Collagen

Ryo Asato, Kyoto, Japan
Shin-ichi Kanemaru, Kyoto, Japan
Akhmar Magrufov, Kyoto, Japan
Masaru Yamashita, Kyoto, Japan
Tatsuo Nakamura, Kyoto, Japan
Juichi Ito, Kyoto, Japan

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss regeneration of head and neck lesion.

OBJECTIVES: Skull base surgery requires en-bloc resection and reconstruction of its defect, which is a very useful method to improve the survival rate. However, if a complication such as infection occurs after operation, patient would be fatal.
Though the large defect needs the bony reconstruction of the skull base to prevent brain herniation, it is very difficult to transplant autologous bone to the defect. In addition, no ideal materials to cure the defect have been found. We have reported success in the regenerations of trachea and larynx using artificial materials, specifically polypropylene mesh coated with collagen. This study aims to investigate whether polypropylene mesh coated with collagen can be utilized for skull base reconstruction. **STUDY DESIGN:** In vivo study on experimental animals. **METHODS:** Five guinea pigs and one beagle dog were used as experimental animals. A large part of the temporal bone was resected and its defect was reconstructed with this new artificial material. The guinea pigs were sacrificed 3-10 weeks later after operation and the beagle dog was sacrificed one year later. The specimens of reconstructed portion of all the experimental animals were collected and provided for histological examination. **RESULTS:** 1) The defects of the temporal bone were sufficiently regenerated macroscopically; 2) connective tissues invaded into the polypropylene mesh without the occurrence of foreign body reactions; and 3) neogenesis of capillaries and bones in reconstructed specimens were identified. **CONCLUSIONS:** Polypropylene mesh coated with collagen is a useful artificial material that fills up the defect in skull base surgery.

36. Diagnostic Clues Differentiating Intradural Trochlear Nerve Schwannoma From Other Meckel's Cave Region Tumors

Roberto A. Cueva, MD*, San Diego, CA
Bill Mastrodimos, MD, San Diego, CA
Mark A. Vanefsky, MD, Anaheim, CA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to differentiate between an intradural trochlear nerve tumor from other more common Meckel's cave region tumors.

OBJECTIVES: The objective of this report is to identify symptoms manifested by intradural trochlear nerve tumors that will help the clinician differentiate such a tumor from more common Meckel's cave region tumors. Trochlear nerve tumors are rare with approximately 25 (absent neurofibromatosis) reported and less than 20 of those surgically confirmed. There is only one previously reported case of a trochlear nerve schwannoma originating in the intradural course of the nerve. **STUDY DESIGN:** Retrospective review of cases. **METHODS:** The case histories of two patients with surgically documented intradural

trochlear nerve tumors were carefully reviewed and compared with reported typical symptoms for tumors arising in the region of Meckel's cave. **Results:** Diplopia with compensatory head tilt was the presenting symptom in both patients. Only one of the patients had a diminished corneal reflex and mild numbness of the first and second divisions of the ipsilateral trigeminal nerve. MRI demonstrated an ovoid, enhancing Meckel's cave region tumor in both cases. Pterional craniotomy was the approach of choice for these lesions and allowed complete tumor removal and provided excellent exposure. Nerve of origin was confirmed by direct visualization. Facial sensation returned to near normal by the first postoperative day in the patient with mild numbness. **Conclusions:** Different from trigeminal schwannomas or Meckel's cave meningiomas facial numbness or dysesthesias are less common in intradural trochlear nerve tumors. The presence of diplopia with compensatory head tilt in a patient with a Meckel's cave region tumor is highly suspicious for a trochlear nerve schwannoma.

37. Incisional Wound Healing in Swine After Electroporation of TGF-Beta 1 Plasmid DNA

J. Clayton Finley, MD, San Diego, CA
Timothy W. Haegen, MD, San Diego, CA
Lei Zhang, PhD, San Diego, CA
Craig L. Cupp, MD, San Diego, CA
Paul C. Shick, MD, San Diego, CA
Peter J. Killian, MD, San Diego, CA

Educational Objective: At the conclusion of this presentation, the participants should be able to describe importance of growth factors in the wound healing milieu and the potential benefits of genetic modification of this process using electroporation.

Objectives: Electroporation has been shown to be effective in transfecting mammalian cells with injected plasmids. We desired to evaluate incisional wound strength after using electroporation to transfect porcine skin with transforming growth factor-beta 1 (TGF-beta 1), a ubiquitous growth factor involved in wound healing. **Study Design:** Prospective, randomized, single blinded. **Methods:** Six Yorkshire swine were marked with 6 standardized linear incision sites along each flank. Each site was exposed to a randomized condition consisting of one of 5 control conditions or injection of plasmid DNA expressing TGF-beta 1 followed by electroporation. Incisions through the dermis were created, closed, and allowed to heal for 2 weeks. Tissue from each site then underwent tensiometry for measurement of breaking strength as well as light and electron microscopy. Data were analyzed using student's paired-t tests or ANOVA. In a second phase, 3 further swine underwent a similar regimen with several changes in technique as well as the addition of a strong promoter to the TGF-beta 1 cDNA. **Results:** In phase I, a non-statistically significant trend towards increased wound breaking strength was apparent with respect to the incision sites treated with TGF-beta 1 and electroporation. In phase II, even with the plasmid DNA under the strong promoter, no statistically significant findings were evident with respect to experimental conditions. However, the animals tolerated the regimen well. **Conclusions:** Transfection of porcine skin with TGF-beta 1 cDNA by electroporation does not improve incisional wound healing at 2 weeks under the initial conditions used in this study. Technical issues will be discussed along with microscopic findings.

38. Development of a Trigger Tool for Identification of Errors and Adverse Events on a Pediatric Otolaryngology Service

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Rahul K. Shah, MD, Boston, MA
Peter Forbes, MA, Boston, MA
Gerald B. Healy, MD*, Boston, MA
David W. Roberson, MD, Boston, MA

Educational Objective: At the conclusion of this presentation, the participants should be able to explain how the use of a trigger tool makes study of errors and adverse events more practical and cost effective.

Objectives: To develop a trigger tool to identify and quantify errors and adverse events (EAEs) on a pediatric otolaryngology service. **Study Design:** Retrospective chart review by two blinded observers using a novel trigger tool. **Methods:** Quantitative study of EAEs is hampered by the time and expense of detailed chart review for EAE detection. A "trigger tool" is a structured form that allows non-physician chart review, with defined "triggers" serving as indications that the chart requires physician review. We developed and piloted a trigger tool designed to detect EAEs in all phases of care on an academic pediatric otolaryngology service. Two blinded observers (one otolaryngologist and one non-clinician) reviewed 33 charts using the trigger tool. All charts then underwent detailed otolaryngologist review for EAEs. **Results:** The observers agreed in 29 of 33 charts (16 with one or more triggers, 13 with no triggers). In four cases, the observers disagreed (kappa = 0.76 +/- 0.22). There were a total of seven EAEs; the trigger tool identified six of these (sensitivity = 0.86, specificity = 0.58). **Conclusions:** An otolaryngology specific trigger tool is presented. Preliminary study shows a high inter-rater reliability, even when used by a non-physician. The trigger tool has high sensitivity and moderate specificity, the desired characteristics of a screening tool. This tool should allow more cost effective study of errors and adverse events in pediatric otolaryngology.

39. Identification of Risk Factors for Positive Airway Pressure Noncompliance

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James A. Rowley, MD, Detroit, MI
Gwendolyn C. Pan, BS, Burlington, VT
Ho-Sheng S. Lin, MD, Detroit, MI

Educational Objective: At the conclusion of this presentation, the participants should be able to identify risk factors that may predispose patients with obstructive sleep apnea to fail treatment with positive airway pressure due to noncompliance. Once identified, patients with these risk factors should be followed closely and early institution of other treatment recommendations may be necessary.

Objectives: Obstructive sleep apnea (OSA) has in recent years gained recognition as a prevalent and significant disease entity. Positive airway pressure (PAP) is the most commonly used modality for treatment of OSA. Although treatment with PAP is safe and effective, it suffers from poor compliance. The objective of this study is to identify factors that may predispose patients to fail PAP treatment due to noncompliance. **Study Design:** Case control study. **Methods:** Retrospective chart review of patients who underwent sleep study from May to December of 2003 in an academic medical center was conducted. Of the 188 charts reviewed, 63 patients with complete record documenting the diagnosis of OSA as well as PAP titration were identified. However, analysis of compliance was limited to only 31 patients. The other 32 patients were excluded because they either never follow-up following titration or never received the machine. Compliance was defined as usage of PAP more than 4 hours per night. Factors analyzed include sex, age, body mass index (BMI), neck circumference, Epworth Sleepiness Score, apnea-hypopnea index (AHI), and level of airway pressure required. **Results:** Analysis was performed using chi square and logistic regression. Both lower BMI ($p<0.0428$) and lower AHI ($p<0.0399$) were found to correlate with greater degree of PAP noncompliance. **Conclusions:** In this study, low BMI and low AHI were identified as risk factors for noncompliance with PAP treatment. Therefore, OSA patients with low BMI and low AHI may warrant closer follow-up to allow early identification of PAP treatment failure and institution of other treatment modalities.

40. A Practical Method for Predicting Obstructive Sleep Apnea (OSA) Based on Clinical Indicators

Jeffrey H. Spiegel, MD, Boston, MA
Tess F. Klaristenfeld, MPH, East Providence, RI *(Presenter)*
Raymond Nagem, HS, Medford, MA
Timothy C. Heeren, PhD, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to identify independent variables and understand their true predictive value for identifying obstructive sleep apnea and be able to explain a novel method for using constellations of clinical findings to obviate the need for some expensive diagnostic testing.

OBJECTIVES: To determine the positive predictive value (ppv) of a constellation of independent clinical findings for the accurate diagnosis of obstructive sleep apnea. Predictive values of OSA clinical indicators range widely in the literature. Thus, polysomnography (PSG), while costly and time intensive, remains the diagnostic gold standard. We hypothesized that the correct combination of clinical signs and symptoms can accurately predict OSA and potentially obviate the need for polysomnography. **STUDY DESIGN:** Meta analysis. **METHODS:** A comprehensive literature search was conducted to identify papers that correlated clinical patient characteristics with formal polysomnography. For inclusion the study needed to define OSA parameters, provide data for variables between OSA and non-OSA groups, and report sample size and variables with either incidence, means and standard deviations, or sensitivity and specificity. We calculated PPV for variables in each study, then pooled PPV (pPPV) for each variable. In some studies we first calculated incidence from weighted averages of reported means or from reported sensitivity and specificity. We consistently used the same cut-off values when OSA was reported as continuous PSG parameters. Finally, we calculated PPV for variable combinations and generated a multi-variable screen applicable to clinical use. **RESULTS:** 25 studies met our criteria. Independent variables selected included body mass index (BMI), tonsil size, Epworth Sleepiness Scale (ESS), and history. The pooled positive predictive value of these clinical characteristics are presented, along with PPV for combinations of these that can provide greater predictive value. **CONCLUSIONS:** We report on the pooled PPV for a number of clinically practical predictors of OSA. Additionally, we have identified a method of producing an OSA clinical diagnostic checklist. Independent variables of modest PPV when present as a constellation of findings can accurately identify patients with OSA. This method can be applied to other conditions that currently rely on costly diagnostic tests.

41. Regeneration of the Palatal Bone by In Situ Tissue Engineering

Yoshihiro Tamura, MD, Kyoto, Japan
Shin-ichi Kanemaru, MD PhD, Kyoto, Japan
Masaru Yamashita, MD, Kyoto, Japan
Akhmar A. Magrufov, MD, Kyoto, Japan
Hisanobu Tamaki, MD, Kyoto, Japan
Juichi Ito, MD PhD, Kyoto, Japan

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the scaffolds for regeneration of the palatal bone.

OBJECTIVES: To assess whether there are any differences in the influence of various scaffolds on the bone regeneration of the hard palate by in situ tissue engineering. **STUDY DESIGN:** In vivo animal study with controls. **METHODS:** Eight adult beagle dogs were used. Each dog was surgically made one fenestration bone defect (10×7mm) in the hard palate under the mucoperiosteum. All dogs were divided into four groups by what their bone defects were filled with: 1) only beta-tricalciumphosphate (b-TCP) implanted group (n=2); 2) b-TCP/collagen composite implanted group (n=3); 3) only collagen implanted group (n=1); and 4) nothing implanted group for control (n=2). B-TCP is biocompatible ceramic different from other artificial bone in respect that b-TCP is biodegradable bone substitute. Collagen is thought to be favorable to attachment of cells that serve as a seed. We developed collagen and b-TCP as a composite scaffold. Three months after the operation, all dogs were sacrificed and examined of their operated sites histologically. **RESULTS:** Bone regeneration of the hard palate was observed in only b-TCP implanted group and b-TCP/collagen composite implanted group, though bone defect was partially still remained in each group. In these groups, the process of bone regeneration and newly formed bone were observed around b-TCP. However, bone regeneration was not observed at all in only collagen implanted group and control group. **CONCLUSIONS:** Bone regeneration was observed only in b-TCP used groups. Therefore b-TCP is considered to be a useful material for the bone regeneration of the hard palate and might be clinically useful in future.

42. The Effect of Practice Complexity on Improvements in Precision Bone Drilling in Novice Surgeons

Cory S. Torgerson, MD PhD, Toronto, ON Canada
Joseph M. Chen, MD FRCSC, Toronto, ON Canada
Adam Dubrowski, PhD, Toronto, ON Canada

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to demonstrate that learning precision drilling skills is most effective when adjusted to the trainees' current performance level.

OBJECTIVES: In order to safely and efficiently train residents, surgical skills laboratories are increasingly being used to supplement operative experience and contribute to technical skill development. However, the most effective training strategies are not fully understood. According to the Learning Specificity Theory, the most functional learning occurs when the practiced task most closely resembles the task required to be performed in the real world. By contrast, the Optimal Challenge Point Model proposes that for most effective learning, the difficulty of practice should be adjusted to the trainees' current performance level. This study explored these divergent theories by examining whether drilling bone in novice surgeons was most effectively learned by first practicing on low or high fidelity models. **STUDY DESIGN:** Two groups of right handed medical students practiced precision bone drilling on either high or low fidelity models. **METHODS:** The low fidelity model consisted of drilling a 2D square in a sawbone block, and the high fidelity model consisted of drilling a 3D well to fit a cochlear implant. Practice duration in both groups was held constant. Before the practice and after 1 hour retention period all participants were tested on the complex shape. Outcome variables included expert assessment final product analyses and mass removed during drilling. **RESULTS:** Based on expert evaluations and final product analyses both experimental groups improved their performance to the same extent. **CONCLUSIONS:** Our findings support the Optimal Challenge Point Model and not the Learning Specificity Theory. Practicing on low fidelity models is beneficial for introductory training of precision bone drilling in novice surgeons.

43. A Study for Tracheal Regeneration After Partial Resection Using a Tissue Engineering Technique

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Koichi Omori, MD PhD, Fukushima, Japan
Akhmar A. Magrufov, MD, Kyoto, Japan
Masanao Kishimoto, MD, Kyoto, Japan

Juichi Ito, MD PhD, Kyoto, Japan

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to know about the tissue engineering concept and its application to the tracheal defect.

OBJECTIVES: The aim of this study is to investigate the efficacy of a tissue engineering approach to the tracheal reconstruction. The trachea must be resected in some cases with cancer or with trauma in head and neck regions. In general, these patients require staged operations for the tracheal defects. To minimize the cost and invasiveness to these patients, this experiment was designed. **STUDY DESIGN:** Preliminary: an animal experiment. **METHODS:** We used a tissue engineering technique, designed to regenerate organs by arrangements of three fundamental components, cells, scaffold, and regulation factors. Adult beagle dogs were used in this study. The operation was performed under general anesthesia. After making a longitudinal cervical skin incision, the trachea was exposed and a patch defect about 2cm in diameter was created. A scaffold made of polypropylene and collagen was preclotted with peripheral blood. Then, this implant was fixed to the defect site. The postoperative status of the site was evaluated both fiberscopically and histologically. **RESULTS:** The implanted scaffolds were completely covered with newly regenerated mucosa with capillaries in all the cases. The results of fiberscopic and histological assessments showed the efficacy of this regenerative approach. **CONCLUSIONS:** Good regeneration of the trachea was observed after a patch resection. As this tissue engineering technique is cost effective and has less invasiveness to the patients with cancer or with trauma, it may be suitable for the tracheal reconstruction.

OTOLOGY

44. Current Management of Otosyphilis

Christina B. Bales, MD, Philadelphia, PA
Stephen J. Gluckman, MD, Philadelphia, PA
Michael J. Ruckenstein, MD*, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss an updated approach to the diagnosis and treatment of acquired otosyphilis.

OBJECTIVES: This study aims to document the clinical presentation, evaluation, treatment, and course of patients with acquired otosyphilis. **STUDY DESIGN:** Prospective cohort. **METHODS:** During an 8 year period (1996-present), this study identified all patients presenting to an academic neurotology practice with progressive or fluctuating cochleovestibular dysfunction (N>300). Patients underwent a standardized diagnostic evaluation for various infectious and immune pathologies to yield a cohort of 8 adults who had studies exclusively consistent with otosyphilis. The clinical presentation and course of each patient was documented throughout treatment and long-term follow-up. **RESULTS:** All patients presented with progressive or fluctuating bilateral sensorineural hearing loss (SNHL). Audiologic deficits were variably associated with vertigo (3/8 patients), tinnitus (6/8 patients), and aural fullness (5/8 patients). Patients were uniformly treated with intravenous penicillin. One patient, who presented with severe-profound SNHL, underwent cochlear implantation. Symptom stabilization (6/8) or improvement (2/8) was achieved and sustained throughout follow-up (9-72 months) in all patients. **CONCLUSIONS:** Syphilis remains a treatable etiology of neurotologic disease. All patients with progressive cochleovestibular dysfunction, including symptoms of Meniere's disease, require serologic testing for syphilis. While intravenous penicillin remains the treatment of choice for otosyphilis, the use of corticosteroids is controversial. The advent of cochlear implantation offers an alternative treatment that may obviate the need for prolonged steroid use.

45. Expression of Surfactant Protein-A in Normal Rat Eustachian Tube

Anton Chen, MD, Nashville, TN
Kirk B. Lane, PhD, Nashville, TN
Virginia L. Shepherd, PhD, Nashville, TN
Robert F. Labadie, MD PhD, Nashville, TN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to demonstrate understanding of the role of surfactant protein-A in allergic disease and to discuss the significance of surfactant protein-A expression in rat eustachian tube.

OBJECTIVES: To determine whether Brown-Norway rat middle ear (ME) and eustachian tube (ET) mucosa express surfactant protein-A (SP-A), a mediator of allergic inflammatory processes. **STUDY DESIGN:** Analysis of SP-A expression in ME and ET mucosa of the Brown-Norway rat, an animal model for allergen induced otitis media with effusion (OME). **METHODS:** Normal rat ET and ME mucosa were harvested. Expression of SP-A was determined using reverse transcriptase-polymerase chain reaction (RT-PCR) and immunohistochemistry (IHC). **RESULTS:** Brown-Norway rat ME and ET mucosa express SP-A. RT-PCR demonstrated significantly more SP-A transcript in the ET than in ME ($p<0.01$). IHC showed SP-A expression within ME and ET epithelial cells as well as ET submucosal glands. **CONCLUSIONS:** SP-A is expressed in rat ME and ET mucosa. Greater SP-A expression in the ET suggests that SP-A may play a greater role in mediating allergic disease in the ET than in ME mucosa. Identification of SP-A expression in this animal model will facilitate further study in the pathogenesis of allergen-induced OME.

46. Changing Trends in Acoustic Neuroma Size Due to Routine MRI Screening of Asymmetric Sensorineural Hearing Loss

Roberto A. Cueva, MD*, San Diego, CA
Bill Mastrodimos, MD, San Diego, CA *(Presenter)*

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the effect that routine MRI screening of asymmetric sensorineural hearing loss has on tumor size at the time of surgery.

OBJECTIVES: Evaluate the effect of routine MRI screening of asymmetric sensorineural hearing loss (SNHL) on the number and size of acoustic tumors treated with surgery from 1993 through September 2004. **STUDY DESIGN:** Retrospective case review. **METHODS:** The charts of patients surgically treated for acoustic neuroma were reviewed. Year of treatment, tumor size, and surgical approach were recorded. **RESULTS:** Two hundred eighty-eight patients were treated surgically for acoustic neuroma. Initiation of routine screening of asymmetric sensorineural hearing loss with MRI was instituted in 1997. One hundred fifty-seven patients had translabyrinthine (TL) approach while 131 had retrosigmoid (RS) approach for tumor resection. In the years before routine MRI screening of asymmetric SNHL (1993—1996), the ratio of TL:RS was approximately 2:1. Subsequent to implementation of routine MRI screening (1997—2004) the TL:RS ratio was approximately 1:1. This change resulted due to a more than doubling in the number of smaller tumors diagnosed, suitable for attempted hearing preservation at the time of surgery. Overall average tumor size in each approach group did not change over time as would be expected since tumor size largely determines suitability for attempted hearing preservation. **CONCLUSIONS:** Routine screening of asymmetric SNHL with MRI has significantly increased the number of smaller acoustic neuromas diagnosed allowing a greater likelihood for hearing preservation at the time of surgical treatment.

47. Complication of Hydroxyapatite Reconstruction of Retrosigmoid Craniotomy

Hamid R. Djalilian, MD, Los Angeles, CA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to recognize and treat a complication of hydroxyapatite reconstruction of retrosigmoid craniotomy.

OBJECTIVES: To obtain a better understanding of the complications associated with hydroxyapatite bone cement in reconstruction of retrosigmoid craniotomy defects. **STUDY DESIGN:** Retrospective case review. **METHODS:** Two consecutive patients who had hydroxyapatite bone cement (HAC) reconstruction of their retrosigmoid craniotomy defects were evaluated for their post-operative complication and treatment. A control group of 15 consecutive retrosigmoid craniotomies reconstructed with methylmethacrylate were also evaluated. **RESULTS:** The two patients developed a delayed collection of subcutaneous fluid and disintegration of the HAC reconstruction, closely resembling a cerebrospinal fluid leakage several weeks post-operatively. Both patients had transcutaneous drainage of the fluid collection, with subsequent re-accumulation. One patient underwent a ventriculoperitoneal shunt placement for the treatment of a presumed cerebrospinal fluid leakage (CSF) and a communicating hydrocephalus. After failure of multiple treatment modalities, the wound was explored and the fragmented HAC was removed. Removal of the HAC showed inflammatory changes in the tissues. None of the patients with methylmethacrylate reconstruction had complications. **CONCLUSIONS:** The use of HAC for the reconstruction of retrosigmoid craniotomies may lead to an inflammatory seroma formation, which can mimic CSF leakage. Removal of the HAC will lead to the definitive resolution of the seroma. The use of HAC for reconstruction of retrosigmoid craniotomies has a high complication rate, as also supported by the literature.

48. Radiation Necrosis of the Temporal Lobe After Radiosurgery for a Vestibular Schwannoma

Hamid R. Djalilian, MD, Los Angeles, CA
Christopher A. Regala, MD, Los Angeles, CA *(Presenter)*
Kunal H. Thakkar, MD, Chicago, IL
Aaron G. Benson, MD, Chicago, IL
Mahmood F. Mafee, MD, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss presenting symptoms, signs, and radiological appearance of radiation necrosis of the brain after stereotactic radiation.

OBJECTIVES: To obtain a better understanding of radiation induced brain necrosis after stereotactic radiation therapy for a vestibular schwannoma. **STUDY DESIGN:** Retrospective case report. **METHODS:** We report a patient treated with stereotactic radiation who developed radiation induced necrosis of the ipsilateral temporal lobe. **RESULTS:** Patients who undergo stereotactic radiation therapy for vestibular schwannomas are at risk of radiation induced brain necrosis. Radiation necrosis of the brain generally occurs in a delayed manner. The most common symptoms are manifestations of increased intracranial pressure and loss of function associated with the area affected by the necrosis. **CONCLUSIONS:** The recognition of radiation induced brain necrosis is essential for neurotologists or otolaryngologists following vestibular schwannoma patients who have undergone stereotactic radiation. We support the development of a national database to track the long-term complications of stereotactic radiation therapy to help patients make a more informed decision for the treatment of their vestibular schwannomas.

49. Malignant Otitis Externa in the State of California From 1990 to 2000

Hamid R. Djalilian, MD, Los Angeles, CA
Mohsen S. Bazargan, PhD, Los Angeles, CA
Christopher N. Regala, MD, Los Angeles, CA
Deyu N. Pan, MS, Los Angeles, CA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the demographics of malignant otitis externa, comorbid conditions, and trends between 1990 and 2000.

OBJECTIVES: To obtain a better understanding of malignant otitis externa (MOE), its incidence, trends in co-morbid conditions, and length of hospitalization from 1990 to 2000 in California. **STUDY DESIGN:** Retrospective database review. **METHODS:** The California Hospital Discharge database was reviewed and 820 patients with a diagnosis of MOE were found over the 11 year period. Data on age, race, duration of hospitalization, the medical center, comorbid conditions, procedures performed, and total charges among others was extracted. **RESULTS:** The average incidence of MOE was 2.3 per 1,000,000 people. The median age of patients admitted with MOE was 58 years. Comorbid conditions included: diabetes mellitus (60%), acquired immunodeficiency syndrome (AIDS) (2%), chronic renal failure (1%), and solid organ transplant (1%). AIDS-related MOE did not increase in incidence during the study period. Median duration of hospitalization was 5 days (range, 1 to 79). Procedures performed during the hospitalization included debridement of external auditory canal (0.6%), mastoidectomy (1%), and petrosectomy (1.3%). Five hospitals in the state admitted 26% of the MOE patients. There was no significant difference between the duration of hospital stay at the five hospitals, from which 26% of the MOE patients were discharged, versus those that had fewer MOE discharges. **CONCLUSIONS:** The incidence of MOE in California has ranged from 1.8 to 3.1 per million over the last 11 years. Diabetic patients comprise the majority of MOE patients. Surgical procedures for treatment of MOE are rarely performed.

50. Is Word Recognition Correlated With the Number of Surviving Spiral Ganglion Cells and Electrode Insertion Depth in Human Subjects With Cochlear Implants?

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Ophir Handzel, MD, Boston, MA
Barbara J. Burgess, Boston, MA
Doris Damian, PhD, Waltham, MA
Donald K. Eddington, PhD, Boston, MA
Joseph B. Nadol, Jr., MD*, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to determine whether in cochlear implantees there exists a correlation between speech perception scores and 1) residual spiral ganglion cell counts; and 2) depth of insertion of the multichannel cochlear implant.

OBJECTIVES: Speech perception scores using cochlear implants range widely in all published series. The underlying determinants of success in word recognition are incompletely defined. Although it has been assumed that residual spiral ganglion cell population in the deaf ear may play a critical role, published data from temporal bone specimens from patients do not support this hypothesis. The depth of insertion of a multichannel cochlear implant has also been suggested as a clinical variable that may be correlated with word recognition. The current study evaluates these correlations in 15 human subjects. **STUDY DESIGN:** Temporal bones were fixed and prepared for histologic study by standard techniques. Specimens were then serially sectioned and reconstructed by

two dimensional methods. **METHODS:** The spiral ganglion cells were counted and the depth of insertion of the cochlear implant as measured from the round window was determined. Correlation analyses were then performed between the NU6 word scores and spiral ganglion cell counts and the depth of insertion. **RESULTS:** The segmental and total spiral ganglion cell counts were not significantly correlated (P>0.50) with NU6 word scores for the fifteen patients. Statistically significant correlations were not achieved by separate analysis of implant types. Similarly, no significant correlation between the depth of insertion of the electrode array and postoperative NU6 word score was identified for the group. **CONCLUSIONS:** While it is unlikely that the number of residual spiral ganglion cell counts is irrelevant to the determination of word recognition following cochlear implantation, there are clearly other clinical variables yet to be identified which play an important role in determining success with cochlear implantation.

51. Incudostapedial Joint Reconstruction Using Dahllite Bone Cement: Evaluation of Redundant Osteoneogenesis in a Chinchilla Model

Michael P. McDowell, MD, Portsmouth, VA
Jeffery J. Kuhn, MD, Portsmouth, VA
Barry Strasnick, MD, Norfolk, VA

EDUCATIONAL OBJECTIVE: At the end of this presentation, participants should be able to discuss the potential advantage of dahllite bone cement in the reconstruction of the ossicular chain and its application as a suitable alternative for current methods of ossiculoplasty in humans.

OBJECTIVES: The capacity of dahllite bone cement to mechanically bond ossicular bone has been shown previously in animal studies. Histopathologic evidence of redundant osteoneogenesis was observed, however, at the interface between bonded structures. The chinchilla model was used to determine the potential for redundant osteoneogenesis at the site of bone cement application as compared to a control ear. **STUDY DESIGN:** Prospective investigation in an animal model. **METHODS:** Bilateral epitympanotomy was performed on eighteen adult male chinchillas and the incudostapedial joint was separated. This joint was then reconnected using dahllite bone cement in the right ear, and the incus was repositioned onto the stapes without bone cement in the left ear. Bilateral middle ear exploration was then performed five months later to determine clinical evidence of inflammation, fibrosis, osteoneogenesis, and/or ossicular fixation. **RESULTS:** Of the 16 animals that completed the study protocol, there was no clinical evidence of redundant new bone growth in either the test or control ears ($p = 0.5$, Fisher Exact Test). Additionally, there was no significant difference between test and control ears when comparing incudomalleolar complex fixation ($p = 0.2$) or stapes fixation ($p = 0.12$). There was no fibrosis or inflammation involving the ossicular chain in any ear. Temporal bone specimens were obtained from two animals that died six weeks postoperatively. Histopathology of sections through the incudostapedial complex demonstrated fixation at the ossicle-bone cement interface. **CONCLUSIONS:** In a long-term follow-up animal model, dahllite bone cement mechanically bonded the incudostapedial joint without significant clinical evidence of redundant osteoneogenesis, fibrosis, or chronic inflammation.

52. In Vivo Verses In Vitro Measurements of Resistivities in the Gerbil Cochlea

Alan G. Micco, MD, Chicago, IL
Claus-Peter Richter, MD PhD, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to recognize that the hemicochlea model is useful in determining cochlear resistivities.

OBJECTIVES: The main objective is to quantify any measured differences in the measured resistivities between an in vitro verses an in vivo model. **STUDY DESIGN:** We have been using a gerbil hemicochlea model to determine the resistivities of the cochlear structures. The hemicochlea provides easy access to these structures. Since the hemicochlea is an in vitro model, there is a concern that there may be a difference between this and an in vivo cochlea. In this project, resistivities were determined for the basal turn of the cochlea in a gerbil. The results will be compared to our data for the hemicochlea. **METHODS:** The gerbil was anesthetized with intraperitoneal sodium pentobarbital, and one bulla was opened. Using a custom made electrode, the resistivities were determined using the four electrode reflection coefficient technique. The results of the in vivo study were compared to our existing data for the gerbil hemicochlea. **RESULTS:** The average resistivity for the hemicochlea preparation was 300 Ω cm with a standard error of 22. The in vivo model showed the average resistivity of 285 Ω cm with a standard error of 51. A paired t-test was used to compare the means obtained in vivo and in vitro. The differences were not significant ($p=0.4$). **CONCLUSIONS:** The hemicochlea provides a useful model to measure the impedances of cochlear structures. Future plans include measuring resistivities in hearing impaired animals to look for differences compared to normal hearing animals. This electroanatomic detail may help in future cochlear implant electrode designs aimed at improving performance.

53. Technical Aspects of Facial Nerve Monitoring During Mastoid and Middle Ear Surgery

Darryl T. Mueller, MD, Philadelphia, PA
Irina Skvirski, MD PhD, Philadelphia, PA
Wasyl Szeremeta, MD, Philadelphia, PA
Glenn C. Isaacson, MD*, Philadelphia, PA
Mathew B. Hanson, MD, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss patterns of facial nerve stimulation in mastoid and middle ear surgery and explain their value in preventing iatrogenic facial nerve injury.

OBJECTIVES: To determine the patterns of facial nerve stimulation in mastoid and middle ear surgery and assess their value in preventing iatrogenic facial nerve injury. **STUDY DESIGN:** Prospective observational study. **METHODS:** A consecutive series of patients undergoing mastoid and middle ear surgery were studied for their pattern of facial nerve activation noted during routine facial nerve monitoring using the Medtronic-Xomed NIM monitoring system. For each detection of nerve activation, the location of dissection was noted in relationship to the facial nerve. We also noted whether the activation involved the eye, the lip, or both. The nature of the activity that elicited the neural activation was noted, and a subjective assessment was made as to whether this activity truly represented a hazard to the facial nerve. **RESULTS:** 31 patients were studied. 22 were adults (age >18) and 9 were children. None had any pre- or post-operative facial dysfunction, and all had full completion of their procedure. A number of procedures were represented, including cochlear implantation (6), tympanoplasty without mastoidectomy (10), canaloplasty (2), tympanoplasty with intact canal wall mastoidectomy (6), and canal wall down procedures (6). During these procedures, neural activation was detected in 113 distinct instances. In only 39 of these instances was it felt that the initiating activity presented true risk to the facial nerve giving a 65% rate of false positives. Dissection of the mastoid segment of the nerve rarely elicited any activation and then only in the lower face. **CONCLUSIONS:** Facial nerve monitoring is useful in all mastoid and middle ear cases, but false positives and negatives remain a problem, indicating that nerve monitoring alone cannot protect against injury to the facial nerve.

54. Value of Multiplanar Reconstruction (MPR) Images for Cochlea Implant

Hiroshi Ogawa, MD, Fukushima, Japan
Yoko Baba, MD, Fukushima, Japan
Yukie Suzuki, MD, Fukushima, Japan

Teruhisa Suzuki, MD, Fukushima, Japan
Hisae Sato, MD, Fukushima, Japan
Koichi Omori, MD, Fukushima, Japan

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the clinical efficiency of MPR images for the evaluation of cochlea in the pre- or post-operation of cochlea implant.

OBJECTIVES: We studied visualization of minute configuration images for cochlea implant using multiplanar reconstruction images reconstructed by a multislice helical CT (MSCT) scan system. **STUDY DESIGN:** Focus group study. **METHODS:** All examinations were performed using a multislice helical CT scanner with four detector rows at 135 kV and 260 mA. The slice thickness was 0.5 mm, and the table speed was 1.25 mm/sec, resulting in a pitch of 2.5. The scans were obtained along a plane parallel to the Reid Base line. The multiplanar reconstruction (MPR) images were reconstructed with a slice thickness of 0.5 mm in the plane rotated 45 degrees or 30 degrees around the central axis of the cochlea. **RESULTS:** In the cases with pre-operative cochlea implant, the MPR image clearly visualized the scala vestibuli and scala tympani of the cochlea in the basal turn. In the case of ossified cochlea caused by meningitis, the ossification of the scala tympani in the basal turn was clearly visualized. In the case of post-operative cochlea implant, the electrode array was clearly visualized, and this could confirm that the tip of the electrode was next to the outside of scala tympani in the electrode insertion case. **CONCLUSIONS:** The detailed evaluation of cochlea can be done by the MPR image. The MPR image is very useful for the evaluation of cochlea in the pre- or post-operation of cochlea implant. The present system provides useful visualization of minute configurations, which can be used in planning surgical intervention.

55. Hearing Loss After Post-Dural Puncture Headache Treated With Epidural Blood Patch

Matthew S. Pogodzinski, MD, Rochester, MN
Jon K. Shallop, PhD, Rochester, MN
Juraj Sprung, MD PhD, Rochester, MN
Toby N. Weingarten, MD, Rochester, MN
Thomas J. McDonald, MD*, Rochester, MN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the relationship between cerebrospinal fluid pressure and sensorineural hearing loss and explain how an epidural blood patch may be expected to improve hearing in a patient with low cerebrospinal fluid pressure.

OBJECTIVES: Define the relationship between cerebrospinal fluid pressure and sensorineural hearing. **STUDY DESIGN:** Case study and review of the literature. **METHODS:** A patient was suffering from post-dural puncture headaches. This patient had a pre-epidural blood patch audiogram and transient otoacoustic emissions (TOAEs). He then underwent a standard epidural blood patch and had post-operative audiogram and TOAEs. **RESULTS:** Subjectively, the patient felt he was "hearing through a tunnel" initially. The pre-blood patch audiogram showed a moderate high frequency sensorineural hearing loss and a mild low frequency sensorineural hearing loss in both ears pre-treatment. Word recognition was 90% in the right ear and 50% in the left at 20 dB SL, pre-treatment. Post-treatment, there was a slight but significant change in the low frequency hearing in the right ear. There was a substantial increase in the word recognition in the left ear with an increase to 90% at 20 dB SL. There were significant changes in the TOAEs in both ears with the right ear amplitude rising from 7.7 dB to 12.1 dB and from 7.1 dB to 9.2 dB in the left ear. **CONCLUSIONS:** There has been considerable work in Europe on the relationship between low CSF pressure and sensorineural hearing loss. The link is thought to be either through the fundus of the IAC or an intact cochlear aqueduct to the perilymph, lowering its pressure and creating a relative endolymphatic hydrops. This is the first report of a patient having improved hearing due to an increase in CSF pressure.

56. Audiologic Follow-Up Evaluation of Children With Hyperbilirubinemia Using Auditory Brainstem Responses and Transiently Evoked Otoacoustic Emissions

Chung-Ku Rhee, MD*, Cheonan, Chungnam Korea
Sang-Jun Jeon, MD, Cheonan, Chungnam Korea
Yang-Hee Oh, MD, Jeju, Korea
Jae-Yoon Jung, MD, Cheonan, Chungnam Korea

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to changing audiologic findings of hyperbilirubinemic sensorineural hearing loss in children from neonate to pediatric ages.

OBJECTIVES: To investigate the changes of hearing level and the results of transient otoacoustic emissions (TEOAE) on neonates with hyperbilirubinemic sensorineural hearing losses at a long-term follow-up. **STUDY DESIGN:** Prospective study of 11 neonates with severe hyperbilirubinemia. **METHODS:** Auditory brainstem response (ABR) and TEOAE after exchange transfusion were carried out on 11 neonates with severe hyperbilirubinemia. After a four year follow-up, the same tests were carried out on the same 11 children. **RESULTS:** In initial ABR, 7 neonates had normal responses and 4 neonates had abnormal or no responses, however all 11 neonates passed TEOAE. In the four year follow-up tests, 7 children with normal initial ABR responses in neonatal period showed normal ABR and TEOAE. The four children with initial abnormal ABR responses in neonatal period showed improved hearing but still ABR thresholds remained 50 to 80dB nHL. In the TEOAE, 3 children demonstrated bilateral failure and 1 child showed unilateral failure. **CONCLUSIONS:** The results of this study indicate that the site of lesion in hyperbilirubinemic sensorineural hearing loss may be at the retrocochlear location. Their hearing level tends to improve. The follow-up failure of TEOAE may indicate deteriorating cochlea.

57. Financial Impediments to Hearing Aid Purchase Among Americans With Hearing Loss

Jatin Roper, MD, Boston, MA
Rebecca S. Stone, MD, Boston, MA *(Presenter)*
Jennifer G. Andrus, MD, Boston, MA
Kenneth M. Grundfast, MD*, Boston, MA
Elizabeth J. Mahoney, MD, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to describe the reasons why patients do not obtain hearing aids even though an otolaryngologist or audiologist has recommended purchase of a hearing aid.

OBJECTIVES: This study was designed to capture what factors, especially financial, are considered by patients who are deciding whether or not to follow through on a recommendation to purchase a hearing aid (HA). **STUDY DESIGN:** Prospective cohort study. **METHODS:** Study participants: Patients over age 18 visiting the audiology and/or otolaryngology clinics at an urban hospital that had been recommended a HA were enrolled in the study and completed a survey assessing their opinions regarding HA purchase and use. **RESULTS:** We found that cost and ability to pay was, as expected, a significant barrier to the pur-

chase of HAs. Among 94 responders who did not own a HA and who reported an income less than $50,000 per year, 80% said that they could not pay for a HA; 87% said that HAs cost too much. Of those patients not planning on obtaining a HA within 3 months, only 2 attributed their reluctance to non-financial factors. Vanity was not a significant impediment, as 91% and 80% of all responders, respectively, disagreed that HAs make one look weak or old. 65% expressed concern that a HA calls attention to their hearing loss, so reluctance to disclose a disability may be an impediment to using a HA. Still, 93% said if a HA were provided free of charge, they would use a HA. **CONCLUSIONS:** Cost is by far the biggest impediment to obtaining a HA, especially in economically disadvantaged Americans with hearing loss. The ability to afford HAs needs to be addressed in a reasonable way for this population.

58. Comparison of Two Types of Titanium Middle Ear Implants

James E. Saunders, MD, Oklahoma City, OK
Faiz A. Shakir, BS, Oklahoma, OK

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the effects of titanium middle ear implant design on hearing results.

OBJECTIVES: Several articles have demonstrated the efficacy of titanium middle ear prostheses. Two types of titanium implants are available that differ in design and weight. Our study compares the results of these two different titanium implants. **STUDY DESIGN:** Retrospective study at an academic center. **METHODS:** A chart review was conducted of the post-operative results, complications and audiometric data for 27 patients with titanium middle ear implants and at least 6 months follow-up. Pure tone averages were calculated and difference in air bone gap (ABG) compared between the groups. **RESULTS:** There was considerable variability in the post-operative results with both implants. Both types of prostheses demonstrated improved average ABG postoperatively (11.0 dB and 7.6 dB), however there was no significant difference between the groups. More patients had greater than 15 dB improvement with the lighter weight prosthesis than with the heavier design. There was a difference between the two prostheses types in the frequency specific ABG (500, 1000, 2000, and 4000 Hz), with the heavier prostheses yielding more improvement in the low frequencies compared with an improvement across all frequencies with the lighter weight design. The type of prosthesis (total or partial) did not seem to influence outcome. The extrusion rates (9% and 12%) were comparable between the groups. **CONCLUSIONS:** Factors other than the prosthesis design (e.g., fibrosis, retraction, and cholesteatoma) primarily determine hearing results after ossiculoplasty. The differences we noted in frequency specific hearing improvement are consistent with the stiffness-mass curve of acoustic transfer in the middle ear.

59. Modifications of MRI Sequences to Reduce Artifact Caused by the Internal Magnet of the Med-El C40+: An In Vitro Study

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Jason Edwards, MS, Raleigh, NC
Jean A. Tkach, PhD, Cleveland, OH
Michael Phillips, MD, Cleveland, OH
Peter C. Weber, MD*, Cleveland, OH

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be aware of the different options available to reduce magnet-induced MRI artifact during head and neck imaging in patients with a Med-El C40+ cochlear implant.

OBJECTIVES: MRI is particularly adept for soft tissue imaging but is sensitive to magnetic field inhomogeneities. The internal magnet of the Med-El C40+ cochlear implant system can cause artifacts during standard SE sequences ranging from 4cm at 1.5-T to 8cm at 0.2-T. The purpose of this study is to determine how the magnet-induced artifact can best be reduced during MRI of the head. **STUDY DESIGN:** This study is the first phase of a four phase study. For this phase, an in vitro examination of artifact was performed during MRI of cadaver heads that contained the Med-El C40+ cochlear implant device. **METHODS:** Cadaver heads underwent a standard battery of diagnostic brain and internal auditory canal imaging protocols at both 1.0-T and 1.5-T. The protocol that exhibited the most resiliency to artifact was examined and modified to further minimize its susceptibility to field inhomogeneities produced by the cochlear implant magnet. **RESULTS:** The 2D fast SE T2 protocol exhibited the least artifact. Modifications such as increasing bandwidth, reducing ESP, and reducing voxel size allowed a reduction in the artifact size by 20% of the artifact produced during a standard scan. Although a fast SE or conventional SE protocol technique as a 3D scan could reduce artifact as well, the scan time would be prohibitive. **CONCLUSIONS:** Most of the modifications to the MRI protocols were associated with a reduction in the signal to noise ratio and/or an increase in scan time. The clinical significance of these modifications remains to be determined.

60. Increasing Quality of Life and Safety in the Elderly Suffering from Dysequilibrium and Vertigo

Ronald L. Steenerson, MD, Atlanta, GA
Gaye W. Cronin, MS, Atlanta, GA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the importance and effectiveness of vestibular rehabilitation and balance retraining for fall prevention, decreasing vertigo, improving safety, increasing quality of life, and decreasing morbidity in the elderly.

OBJECTIVES: 1) Identify fall risks and morbidity in the elderly; 2) recognize the need for vestibular and balance therapy programs for the elderly; 3) identify appropriate interventions; and 4) present outcomes of the program. **STUDY DESIGN:** Prospective patient study in tertiary otology practice. **METHODS:** Medical examinations, audiograms, therapeutic assessments, fall risk and gait assessments, positional vertigo assessments, quality of life inventories, and assessments of mobility devices were done on 200 elderly patients (65 years and older) that presented in the clinic with dysequilibrium or vertigo. These assessments were administered pre- and post-treatment of the patients in vestibular rehabilitation and balance retraining to assess outcomes and effectiveness of these treatment interventions. **RESULTS:** Outcome assessments showed a 80% improvement in gait stability, 70% decrease in the use of mobility devices, 85% elimination of positional vertigo, 90% reduction of falls, and improvement in all subsections on the quality of life inventories. **CONCLUSIONS:** Vestibular rehabilitation and balance retraining can result in significant improvements in gait stability, fall reduction, decreasing vertigo, and increasing quality of life in the elderly.

PEDIATRIC

61. Short- and Long-Term Complications in Pediatric Tracheotomy

Douglas J. Colson, MD, Syracuse, NY
Timothy J. Minton, MD, Syracuse, NY
Anthony J. Mortelliti, MD, Syracuse, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the complications associated with pediatric tracheotomy and see the difficulties associated with managing chronic tracheotomies in children.

OBJECTIVES: Indications for pediatric tracheotomy have trended away from short-term protection of infected airways and toward long-term maintenance of obstructed or diseased airways. A significant task for the pediatric otolaryngologist has become the management of the chronic tracheotomy. The objective of this study is to look at the short-term complications associated with tracheotomy placement, as well as the problems associated with long-term tracheotomies in children. **STUDY DESIGN:** Retrospective review. **METHODS:** We reviewed the charts of all patients under the age of 12 years that received a tracheotomy at a university hospital from 1998 through 2004. The review included an analysis of peri- and post-operative complication, long-term management, surveillance bronchoscopy video recordings, and decannulation outcomes. **RESULTS:** Thirty-five patients underwent a tracheotomy in the 6 year study period. All procedures involved the classic vertical midline tracheal incision. Indications for tracheotomy were predominantly prolonged ventilation in premature infants with pulmonary disease and children with craniofacial abnormalities. Short-term complications were similar to those published in the otolaryngology literature. Long-term complications included subglottic stenosis, supratomal polyps, tracheal stomal overgrowth, peristomal skin breakdown, and distal tracheal granulation tissue growth. These complications frequently required multiple interventions and prevented or delayed decannulation. There was 1 tracheotomy related death. **CONCLUSIONS:** The pediatric tracheotomies performed at this institution exhibited few short-term complications. However, complications associated with the chronic tracheotomy frequently led to multiple interventions and delays in decannulation. Further studies into pediatric tracheotomy surgical technique and long-term management may provide insight into minimizing this challenging problem.

62. Rapid Cycle Real Time PCR Versus Standard Culture Detection of Group A Beta-Hemolytic Streptococci at Various Anatomical Sites in Tonsillectomy Patients

Jonathan H. Lee, MD, Rochester, MN
Laura J. Orvidas, MD, Rochester, MN
James R. Uhl, Rochester, MN
Franklin R. Cockerill, MD, Rochester, MN
Amy L. Weaver, MS, Rochester, MN

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, participants should be able to compare and contrast the use of rapid cycle real time polymerase chain reaction (rcPCR) and standard culture (SCx) in the detection of Group A Beta-Hemolytic Streptococci (GABHS) in tonsillectomy patients.

OBJECTIVES: Using standard swabbing techniques, rcPCR has been shown to detect GABHS at rates equal to SCx and requires only a few hours for results. This study compares the rates of GABHS detection by rcPCR and SCx at different anatomical sites. **STUDY DESIGN:** Prospective study of 130 patients undergoing tonsillectomy with or without adenoidectomy. **METHODS:** At tonsillectomy, swabs were taken of the pharyngeal tonsil surface, the pharyngeal tonsillar core, the inferior gingivobuccal sulcus, and the retromolar trigone. Tissue samples were also taken from the tonsil core and adenoid (if adenoidectomy was performed). Each sample was analyzed for GABHS by rcPCR and SCx. **RESULTS:** GABHS was detected at one or more of the sampled sites in 41 cases (32%), and 29 of those positives were detected at the tonsil surface. SCx and rcPCR were both positive in 28 of those 29 cases (97%). Of these 29 cases, rcPCR and SCx were both positive at the gingivobuccal site in 4, rcPCR only in 3, and SCx only in 3. Of the 7 tonsil surface positive cases with retromolar trigone swabs, rcPCR only was positive in 1, and SCx only in 2. Rapid cycle PCR detected GABHS in 11 tonsil core specimens and 10 adenoid tissue specimens where SCx did not. **CONCLUSIONS:** Using either rcPCR or SCx, swabs of the gingivobuccal sulcus and retromolar trigone do not provide an accurate reflection of GABHS populations present at the tonsil surface. Rapid cycle PCR is superior to SCx in the detection of GABHS from tonsil core and adenoid tissue samples.

63. Radiologic Evaluation of Abscesses of the Deep Spaces of the Neck: Lack of Association of CT Characteristics and the Need for Surgical Drainage

Kelly M. Malloy, MD, Wilmington, DE
James S. Meyer, MD, Wilmington, DE
Stephen J. Tai, MS, Philadelphia, PA
Richard J. Schmidt, MD, Wilmington, DE
Ellen S. Deutsch, MD, Wilmington, DE
Robert C. O'Reilly, MD, Wilmington, DE

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand the use and limitations of computed tomography (CT) in evaluation and management of pediatric patients with infections of the deep spaces of the neck.

OBJECTIVES: To evaluate the significance of abscess characteristics on CT scan and the need for surgical drainage. **STUDY DESIGN:** Retrospective chart and radiograph review. **METHODS:** On review of records between January 2000 and April 2003, 45 patients were evaluated with CT imaging for abscesses of the deep spaces of the neck. A total of 45 CT scans performed on these patients were graded by a blinded radiologist for maximal thickness of the prevertebral soft tissue, location, dimension, and degree of enhancement of the abscess. Data on age, steroid and antibiotic use, and surgical intervention were recorded for each patient. **RESULTS:** Surgical drainage was required in 35 of 45 patients (78%). We found no significant correlation between prevertebral soft tissue thickness and abscess dimensions on CT scan and the need for surgical drainage although there was a trend towards significance. There was no significant association between the need for surgical drainage and abscess enhancement on CT scan, patient age, administration of steroids, or pre-hospitalization antibiotic use. **CONCLUSIONS:** Deep neck infection abscess appearance on CT scan cannot be used as a predictor of the need for surgical drainage although prevertebral soft tissue thickness and abscess dimensions may be important features. Abscess enhancement, patient age, and the use of steroids and pre-hospitalization antibiotics were not found to correlate in this study with the need for surgical drainage.

64. Pediatric Deaths Due to Otolaryngologic Causes: A Population Based Study in Massachusetts, 1990-2002

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Katrina Chesnulovitch, BS, Boston, MA
Dwight T. Jones, MD, Boston, MA
David W. Roberson, MD, Boston, MA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to: 1) discuss the most common otolaryngologic causes of mortality in the pediatric age group in Massachusetts; and 2) understand the pediatric otolaryngologic mortality rate in Massachusetts.

OBJECTIVES: To identify the most common otolaryngologic causes of mortality in the 0-19 age group in the state of Massachusetts and to estimate the pediatric otolaryngologic mortality rate based on population data. **STUDY DESIGN:** Population based retrospective cohort study. **METHODS:** The Massachusetts State Registry of Vital Records and Statistics electronic database was searched for all otolaryngology related causes of death from 1990 to 2002 for children aged 0-19. The actual death certificates were then reviewed and a database of otolaryngology related pediatric deaths was created. **RESULTS:** A total of 59 otolaryngology related deaths were identified in the pediatric population from 1990 to 2002. 81% of deaths occurred from airway compromise due to infec-

tion, anatomic obstruction, or congenital anomaly. The remaining 19% of deaths occurred due to aspiration, non-airway infections, and malignant neoplasms. 95% of deaths in the children under age 10 were due to airway compromise. 6 out of 7 deaths (86%) in the age 15-19 group occurred due to malignant neoplasms. Conspicuously absent were any deaths due to epiglottitis, deep neck infections and otologic disease. The overall mortality rate due to otolaryngologic causes was estimated to be 0.28 per 100,000 population. **CONCLUSIONS:** The overall mortality rate for otolaryngology related deaths is low in the pediatric population. The vast majority of deaths are due to airway compromise, primarily due to laryngotracheobronchitis or other upper airway obstruction. In older children (age 15-19), malignant head and neck neoplasms are the leading cause of otolaryngology related deaths.

65. Post-Tonsillectomy Analgesic Use and Dietary Intake in Children: Electrocautery vs. Coblation

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David J. Kay, MD MPH, Boynton Beach, FL
Jessica F. Johnson, ARNP, Boynton Beach, FL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to appreciate the increase in early return to a normal diet using coblation rather that electrocautery for pediatric tonsillectomies.

OBJECTIVES: To quantify the differences between coblation and electrocautery tonsillectomy on return to normal diet and pain medication usage. **STUDY DESIGN:** Unsponsored prospective cohort clinical trial. **METHODS:** All pediatric patients undergoing outpatient tonsillectomy with or without concurrent adenoidectomy from January 2003 until September 2004 were enrolled. The patients were blinded as to the technique used. All procedures were performed by the same surgeon at one of two outpatient sites: in one site tonsillectomies were performed using coblation; in the other standard electrocautery was used. All dissections were extracapsular, with curettage adenoidectomy. The patients' primary caregivers were contacted by an experienced pediatric nurse practitioner daily for 10 consecutive days post-operatively and answered questions regarding diet and pain medication. **RESULTS:** 66 children ages 2-16 were enrolled. 27 underwent coblation tonsillectomy, and 39 had electrocautery dissections, without significant age differences between them. After 10 days, 89% (24/27) of the coblation patients and 70% (27/39) of the electrocautery ones had returned to normal diets (Pearson chi-square p=0.061). No significant differences in the amounts of narcotic, non-narcotic, or total pain medication usage were detected (two-sample t-tests with equal variances). There were no significant differences in post-operative hemorrhages or hospital admissions for dehydration (Fisher's exact test). **CONCLUSIONS:** The study demonstrates a 19% absolute rate difference between coblation and electrocautery tonsillectomy in children with respect to return to a normal diet. Given the small sample size of this study (47% power), the near significant statistical difference suggests a clinically meaningful effect. Continuing recruitment of additional patients will provide further information.

SINONASAL

66. Invasive Fungal Sinusitis Due to Pseudallescheria Boydii: A Case Report and Review of the Literature

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J. Whitman Mims, MD, Winston-Salem, NC

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the prognosis and treatment of patients with invasive fungal sinusitis due to Pseudallescheria boydii.

OBJECTIVES: Pseudallescheria boydii is a ubiquitous fungus and an emerging pathogen found worldwide. This report describes a case of invasive fungal sinusitis due to P. boydii in a diabetic host and reviews the literature. **STUDY DESIGN:** Case report and review of the literature. **METHODS:** The hospital chart of the index case was reviewed. In addition, a Pubmed search was performed and pertinent articles reviewed. **RESULTS:** P. boydii has been reported as the cause of sinusitis in 26 cases. There were 17 females and 9 males and the mean age was 48.3 years. Structures involved have included all of the paranasal sinuses and the nasal cavity. Mucosal invasion was demonstrated or suggested in 12 and excluded or not suggested in 9. Invasion was unclear in 5. Of the 12 patients with invasive disease, 9 were immunocompromised. All 9 died of infection or related cause or had persistent infection at the time of report. Of the 3 with invasion but no immunosuppression, 2 had complete resolution and 1 died of infection. Five without invasion were immunocompetent and all had complete resolution. Four without invasion were immunocompromised. Two of these patients had full resolution. **CONCLUSIONS:** Fungal sinusitis due to P. boydii occurs in immunosuppressed patients as well as immunocompetent. Although P. boydii resembles aspergillus on pathologic examination, it is typically resistant to amphotericin B. In general, sinusitis due to P. boydii should be treated with combination surgery and antifungal therapy, particularly in those with immunosuppression and invasion. Immunocompetent patients have a better prognosis, even if invasion is seen.

67. Outcomes in Minimally Invasive Pituitary Surgery

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Michael P. Platt, MD, Albany, NY
A. J. Popp, MD, Albany, NY
Steven M. Parnes, MD*, Albany, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the technique and outcomes in minimally invasive pituitary surgery via an endoscopic transnasal transsphenoidal approach.

OBJECTIVES: The objectives of this study are to present our technique in minimally invasive pituitary surgery via an endoscopic transnasal transsphenoidal approach, review the outcomes of this technique, and review the literature. **STUDY DESIGN:** Retrospective chart review and literature review. **METHODS:** 1) Describe the surgical technique developed by the senior author; and 2) chart review of patients undergoing minimally invasive pituitary surgery via and endoscopic transnasal transsphenoidal approach by the senior author and compare these outcomes with the literature. **RESULTS:** No deaths or intracerebral hemorrhage were reported in our review. Intraoperative/postoperative CSF leaks, need for lumbar drain, days with lumbar drain, meningitis, postoperative epistaxis, and postoperative visual complications compare favorably when evaluated against the results quoted in the literature. **CONCLUSIONS:** This novel technique in minimally invasive pituitary surgery via an endoscopic transnasal transsphenoidal approach produces results which compare favorably to the literature.

68. Examining the Differences in CT Staging of Disease Among Smokers and Nonsmokers Diagnosed With Chronic Rhinosinusitis

Michael A. Carron, MD, Detroit, MI
John H. Krouse, MD PhD*, Detroit, MI

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the scope of chronic rhinosinusitis (CRS) as a healthcare issue in the United States, define and discuss the role of the Lund-Mackay staging system of sinus disease on CT scan, explain the role of CT scan in defining the severity of sinus disease and to discuss the effects of smoking on nasal and sinus physiology.

OBJECTIVES: To evaluate whether smokers with chronic rhinosinusitis (CRS) had more severe CT stage of sinus disease compared to nonsmokers. To evaluate whether number of pack years influenced severity of CT stage. **STUDY DESIGN:** Retrospective review of 100 patients diagnosed with CRS from 1998-2003 (ICD-9 Code 473.9) **METHODS:** One hundred persons diagnosed with CRS were contacted via telephone and detailed smoking histories were obtained. Fifty smokers and fifty nonsmokers were identified. All nonsmokers had zero pack year histories. All patients had CT scans of the sinuses during the initial evaluation. Patients with immunodeficiency, sinonasal cancer or fungal sinusitis were excluded. A single list comprised of smokers and nonsmokers was created. The identity of smokers was concealed. CT scans were scored using Lund-Mackay staging system by an examiner blinded to the patients' smoking status. The two sided T-test was used to contrast the mean CT staging scores between the two groups. Pearson Product Moment Correlation was used to analyze the relationship between number of pack years and CT stage. **RESULTS:** The group mean Lund-Mackay score for smokers was 8.38 (SD 5.97) and for nonsmokers was 7.81 (SD 6.26) with p=0.65. The Pearson Product Moment Correlation value between pack years and CT stage was r=0.04 with p=0.70. **CONCLUSIONS:** Smoking did not affect the CT stage of sinus disease. There was no significant correlation between number of pack years smoked and CT stage of sinus disease.

69. Entomopathogenic Beauvaria Species: A New Entity Causing Sinusitis

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William Lawson, MD DDS*, New York, NY

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the impact of entomopathogenic fungi, specifically Beauvaria species, as an opportunistic infectious agent in immunocompromised patients.

OBJECTIVES: To report the first case of Beauvaria species fungal sinusitis. To determine the occurrence of infections in humans caused by Beauvaria species and other entomopathogenic fungi. To define the morphological and growth characteristics of Beauvaria species to facilitate diagnosis. **STUDY DESIGN:** Case report and literature review. **METHODS:** Literature review in MEDLINE for cases of Beauvaria species and other entomopathogenic fungal infections in humans. **RESULTS:** Beauvaria species fungal sinusitis with subsequent development of Rhizopus sinusitis developed in a heart transplant patient on immunosuppressive therapy. Originally discovered, in 1835, as the cause of muscardine (a disease in silkworms), Beauvaria bassiana is currently used as a biopesticide. This entomopathogen is an ubiquitous soil fungus that can be found to colonize nasal mucosa as early as the 5th day of life; however, it rarely causes infections in humans. MEDLINE literature search found a total of only 6 reported cases of Beauvaria species infections in humans: keratitis (4), systemic fungal infection with lung, liver, and spleen infections (1), and osteomyelitis (1). Our case is the first reported case of sinus infection caused by Beauvaria species. Out of the 12 fungal biopesticides under regulation by the US EPA, only 3 are entomopathogenic. Only Beauvaria bassiana and Metarhizium anisopliae (1 case) have been reported to cause infections in humans. **CONCLUSIONS:** Although entomopathogenic fungi rarely cause infections in humans, they can result in serious opportunistic infections in immunocompromised patients. Complete avoidance of fungi such as Beauvaria bassiana is not possible, but immunocompromised patients should not be exposed directly to such biopesticides.

70. Sinonasal Mucoepidermoid Arising From Inverting Papilloma

Jason G. Cundiff, MD, Chicago, IL
Robert C. Kern, MD*, Chicago, IL

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the presentation, management, and pathology of sinonasal mucoepidermoid arising from inverting papilloma.

OBJECTIVES: The objective of this poster is to report and discuss the management of a rare case of sinonasal mucoepidermoid arising from inverting papilloma. **STUDY DESIGN:** This is a case report and literature review of sinonasal mucoepidermoid arising from inverting papilloma. **METHODS:** A Medline search of the published literature from 1966-2004 was performed using "sinus+mucoepidermoid+papilloma". **RESULTS:** We report a case of a 61 year old male with sinonasal mucoepidermoid arising from inverting papilloma. The patient presented to the otolaryngology service with recurrent progressive right sided epistaxis and nasal obstruction. Nasal endoscopy revealed large vascular lesion involving the entire right nasal cavity. A CT scan and MRI were performed which revealed a highly vascular tumor involving the right nasal cavity, maxillary sinus, and ethmoid sinuses. There was no intraorbital or intracranial involvement. The patient underwent a pre-operative angiogram and embolization of the right nasal mass and 48 hours later the mass was completely excised via a medial maxillectomy through a lateral rhinotomy. Pathology revealed an intermediate grade mucoepidermoid arising from inverting papilloma. The patient underwent post-operative radiation and has remained disease free for 2 years. The literature review revealed this is the third reported case of sinonasal mucoepidermoid arising from inverting papilloma; however, neither of the previous cases had long-term follow-up. **CONCLUSIONS:** Mucoepidermoid is a rare malignancy that can develop from inverting papilloma, which can be successfully managed with surgical resection and post-operative radiation. This case reaffirms the malignant degenerative potential of inverting papilloma.

71. Physiologic Sequelae of Biofilm and Non-Biofilm Forming Pseudomonas Aeruginosa Sinusitis

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Akiva S. Cohen, PhD, Philadelphia, PA
Noam A. Cohen, MD PhD, Philadelphia, PA

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to understand that in an experimental model of pseudomonas aeruginosa sinusitis biofilm formation correlates with condemned ciliary function.

OBJECTIVES: Investigate the effect of biofilm forming and non-biofilm forming pseudomonas aeruginosa on sinonasal ciliary function. **STUDY DESIGN:** Animal study. **METHODS:** Unilateral sinusitis was induced in rabbits through obstruction of the maxillary ostium followed by inoculation of the sinus with wild type P. aeruginosa or one of two non-biofilm forming mutants. The flagella mutant is unable to transition from the planktonic form to a surface adherent phenotype, while the type IV pili mutant can attach to a surface but is unable to organize into a microcolony, both essential steps in biofilm formation. Mucosa from the infected sinus, the contralateral sinus and trachea were harvested two weeks following inoculation. The ciliary beat frequency (CBF) was analyzed using high speed digital video imaging with complementary scanning electron microscopy (SEM). **RESULTS:** The wild type P. aeruginosa infected mucosa demonstrated massive ciliary damage and concomitant absence of beating cilia by video microscopy. The flagella mutant infected mucosa demonstrated normal appearing cilia and no change in ciliary beat frequency. The type IV pili mutant infected mucosa demonstrated normal cilia with areas of patchy disruption but with a doubling of the CBF ciliary beat frequency as compared to the contralateral sinus or tracheal mucosa. **CONCLUSIONS:** Dynamic modulation of sinonasal ciliary beat frequency by environmental factors is well documented. Our study correlates structural evidence of infection by SEM with a functional assay (CBF) of mucosal function. This data suggests that biofilm formation in experimental sinusitis correlates with decreased sinonasal function.

72. Does Nasal Septal Surgery Improve Quality of Life?

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Klemens Dejakum, MD, Innsbruck, Tirol Austria
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Walter F. Thumfart, MD, Innsbruck, Tirol Austria
Georg M. Sprinzl, MD, Innsbruck, Tirol Austria

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss advantage of nasal septal surgery.

OBJECTIVES: Surgery of the nasal septum is a common procedure because of the high incidence of nasal disease caused by septal deviation. A number of studies tend to objectify the severity of nasal obstruction by using objective methods. In the majority of cases these measures do not correlate with patients` subjective perception of obstruction. This discrepancy between objective result and subjective perception demands for a new measuring instrument. **STUDY DESIGN:** The study was performed in a retrospective manner at our institution including 650 patients (468 men, 182 women) who had undergone septoplasty over the last three years. The mean age at the day of surgical intervention was 39.1 years. All subjects were evaluated after surgery. 285 of 600 patients (47.5%) have replied and answered the questionnaire. **METHODS:** Two standardized Health Related Quality of Life (HRQoL) questionnaires, the Glasgow Benefit Inventory (GBI) and the Health-Related Quality of Life Questionnaire Rhino surgery (HRQL) were the basis for our questionnaire for nasal septal surgery. Descriptive analysis of the data was carried out by computation of mean, standard deviation and frequency. **RESULTS:** A particular amelioration was found in the following disease specific subgroups: overall medical state, practical problems, sleep and nasal symptoms. Furthermore a remedy for practical problems could be achieved. A strong amelioration of nasal obstruction appears after nasal septal surgery. The septoplasty does not only influence the functional situation but also the subjective sensations and subsequently the patient's quality of life. **CONCLUSIONS:** The nasal septal surgery does not only influence the functional situation but also the subjective sensations and subsequently the patient's quality of life.

73. Histologic Patterns of Chronic Rhinosinusitis With and Without Nasal Polyposis

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Kenneth G. Haines, MD, Chicago, IL
Leslie C. Grammer, MD, Chicago, IL
Robert Schleimer, MD, Chicago, IL
Robert C. Kern, MD*, Chicago, IL

EDUCATIONAL OBJECTIVE: To discuss and compare the different histopathologic findings in chronic rhinosinusitis with and without nasal polyps.

OBJECTIVES: The surgical pathology of chronic rhinosinusitis (CRS) has limited clinical significance at present in the majority of cases. The current study will compare the mucosal tissue changes seen in surgical CRS with and without nasal polyposis (CRS/NP). Results will be interpreted in light of recent theories on the pathophysiology of sinus disease. **STUDY DESIGN:** Prospective study of 73 patients undergoing rhinologic surgery for inflammatory and non-inflammatory disease. **METHODS:** Tissue specimens from 34 patients with CRS/NP and 33 patients with CRS and no polyps were obtained. Specimens from 6 patients with non-inflammatory disease served as normal controls. The diagnosis of CRS was based on the Sinus and Allergy Health Partnership definition with CT scan confirmation. The diagnosis of polyps was confirmed by endoscopic visualization. All CRS patients failed aggressive medical therapy including 4-6 weeks of antibiotics. Histological specimens were evaluated by a single, blinded pathologist for extent of glandular hypertrophy and tissue edema as well as tissue eosinophil counts. CT scans were scored by one radiologist and scored according to the Lund-Mackay scale. **RESULTS:** Two primary histopathologic features were demonstrated to varying degrees in all 67 patients with CRS in comparison with the 6 controls: edematous stroma and glandular hyperplasia. Specimens were graded on degree of each of these two changes present. Of the 34 patients with CRS/NP, 29 (85%) had predominantly edematous changes while 4 (12%) had predominantly glandular pathology. Of the 33 CRS patients without polyps, 18 (54%) had predominantly edematous changes while 13 (40%) had predominantly glandular pathology. 3% of the CRS/NP and 6% of the CRS had unclassifiable changes in the specimen. Patients with CRS/NP had a significantly higher average Lund Mackay score (16.3 vs. 8.5, $p < 0.0001$) and higher eosinophil counts (21.1 vs. 7.6, $p < 0.0001$) than non-polypoid (CRS). Furthermore, the eosinophilic infiltration tended to be clustered in the areas of tissue edema rather than glandular hyperplasia. The two groups did not differ in age, gender, race or atopy. The control group had an average Lund score, eosinophil count of 1.8 and 2.3 respectively. **CONCLUSIONS:** This study demonstrates that glandular hypertrophy and edema with eosinophilia are common to most forms of inflammatory sinus disease. Tissue edema and eosinophilia was significantly more common in CRS/NP, however. These studies support the hypothesis that at least two distinct but overlapping pathologic processes occur in CRS: one that attracts eosinophils and results in tissue edema and a second separate process that triggers glandular hyperplasia.

74. Nitrous Oxide for Applying Local Anesthesia in Nasal Operations: A Randomized Placebo Controlled Single Blinded Study

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Antti A. Makitie, MD PhD, Helsinki, Finland
Jukka Ylikoski, MD PhD, Helsinki, Finland
Leif J.J. Back, MD PhD, Helsinki, Finland

EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to discuss the use of nitrous oxide inhalation as an alternative technique for anesthesia in outpatient sinonasal surgery.

OBJECTIVES: Nitrous oxide (N2O) inhalation has been proposed to reduce the discomfort experienced in various medical procedures. The aim of this study was to assess the suitability of N2O inhalation prior to application of local anesthesia for nasal procedures in outpatient surgery. **STUDY DESIGN:** Prospective, randomized, single blinded, placebo controlled study. **METHODS:** Ninety patients were randomized into three groups. Group A inhaled 10 deep breaths of 50% N2O/50% O2 through a nasal mask with Porter 2000 MXR scavenging system prior to application of local nasal anesthesia. Group B inhaled room air through the same mask prior to application of local anesthesia and group C received only local anesthesia. Visual Analogue Scale (VAS) was used to assess pain, nausea and discomfort related to the application of nasal anesthesia. Non-repeated, non-parametric data were compared using the Mann-Whitney U. **RESULTS:** The N2O inhalation was easy to perform and well tolerated by all patients. The three groups were similar regarding to the clinical parameters of interest. The N2O inhalation prior to applying local anesthesia for nasal operations did not show any significant additional benefit in reducing pain or discomfort. **CONCLUSIONS:** The N2O inhalation technique is a promising and well tolerated alternative for anesthesia in outpatient surgery. In our experimental setting N2O did not show any clinical benefit when used before applying local anesthesia for nasal operations. Further studies with longer inhalation times together with end-tidal concentration measurements are needed.

75. Noninvasive In Vivo Measurement of Ciliary Activity Using Endomicroscopy

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EDUCATIONAL OBJECTIVE: At the conclusion of this presentation, the participants should be able to compare how a new, rigid ultra-microscopic nasal endoscope (magnification: 400 times) enables ciliary activity to be measured optically and noninvasively in vivo as easily as conventional clinical examination and enables the recovery of ciliary activity after endoscopic sinus surgery (ESS) to be evaluated.

OBJECTIVES: The recovery of ciliary activity, a potential index of ESS prognosis, is too time consuming and invasive for clinical use with conventional measurement such as Saccharin/RI and pathological examination. We present noninvasive, real time optical observation of ciliary activity in vivo that is as easy as conventional endoscopic examination. **STUDY DESIGN:** Image sequences (60 Hz) of ciliary clearance and mucous waves, i.e., reflection on the mucous fluid surface caused by ciliary beats, were captured in vivo and the relationship between mucous waves and ciliary activity was analyzed. **METHODS:** Equipment: The endomicroscopy (magnification: 400 times) we propose consists of a nasal endoscope and a CCD camera with a newly developed zoom lens in between. Procedure: Mucous wave image sequences of the guinea pig trachea were recorded with the endomicroscope under 3 conditions: 1) normal, 2) with a nicotine solution inhibiting ciliary beats, and 3) with Chinese ink (controls). Entire fields of sequences were analyzed by FFT over the temporal domain. **RESULTS:** Spectrum power of 15 Hz significantly decreased only under condition (2). Under condition (3), the mucociliary clearance of Chinese ink was observed in real time. **CONCLUSIONS:** Mucous waves are caused by ciliary beats, reflecting ciliary activity. Results show that changes in mucous wave frequency reflect underlying ciliary activity inhibited by a nicotine solution. We concluded that ciliary activity can be optically measured with the endomicroscope, and its noninvasiveness is promising in clinical evaluation of the recovery of ciliary activity after ESS.