

**AMERICAN LARYNGOLOGICAL ASSOCIATION
ONE HUNDRED AND THIRIETH ANNUAL MEETING**

**FIRST DAY, THURSDAY, MAY 28, 2009
Morning Session**

- 7:30 a. m. Business Meeting (Fellows Only)**
- By-Laws Amendment
- Election of Active, Associate, and Emeritus Fellows
- Election of Post-Graduate Members
- Introduction of Newly Elected Fellows and Members
- Election of Nominating Committee
- 8:00 a. m. Presidential Address**
Roger L. Crumley, MD, MBA, *Irvine, CA*
- “Honoring Our Past; Valuing Our Future”***
- 8:15 a.m. Introduction of Guest of Honor**
Gayle E. Woodson, MD, *Springfield, IL*
Introduction: Roger L. Crumley, MD, MBA, *Irvine, CA*
- 8:20 a.m. Presidential Citations**
Geza Jako, MD, *Melrose, MA*
W. Frederick McGuirt, MD, *Winston-Salem, NC*
Clarence Sasaki, MD, *New Haven, CT*
H. Bryan Neel III, MD, *Rochester, MN*
Presentation: Roger L. Crumley, MD, MBA, *Irvine, CA*
- 8:25 a.m. Recognition of Program Committee**
Andrew Blitzer, MD Chair, *New York, NY*
Steve Bielasowicz, MD, *Washington, DC*
Natasha Mirza, MD, *New York, NY*
Clarence Sasaki, MD, *New Haven, CT*
David Terris, MD, *Augusta, GA*
Steven Zeitels MD, *Boston, MA*
- 8:30 a.m. Recognition and Acknowledge of ALA Emeriti**
Roger L. Crumley, MD, MBA, *Irvine, CA*

SCIENTIFIC SESSION I
Unilateral Vocal Fold Motion Impairment

Moderators:

Michael S. Benninger, MD, *Cleveland, OH*
Robert T. Sataloff, MD, DMA, *Philadelphia, PA*

8:35 a.m. Electromyographic Laryngeal Synkinesis Screening: Implications for Prognosis and Treatment of Unilateral Vocal Fold Immobility (UVFI)

Melissa McCarty Statham, MD*
Clark A. Rosen, MD
Libby J. Smith, DO
Michael C. Munin, MD*
Pittsburgh, PA

Synkinesis is often a confounder when predicting return of function of immobile vocal fold. Currently, no information exists on the incidence of synkinesis in UVFI or its effect on prognosis and treatment. Our objective was to develop a vocal fold adductor synkinesis screening protocol using laryngeal electromyography. A standardized protocol involving testing for vocal fold adductory synkinesis was performed in 114 consecutive laryngeal electromyographic exams. Synkinesis testing was positive in 11/114 patients (9.6%). Post hoc quantitative analysis of electromyographic tracings revealed a significant difference in motor unit potential amplitude ratios for negative synkinesis testing (41%) and positive exams (128%) ($p < 0.001$). A higher rate of recovered vocal fold motion was noted in the negative synkinesis patients (58%) when compared with the positive synkinesis patients (27%). We propose this screening protocol as an adjunct to diagnostic laryngeal electromyography as further understanding of synkinesis will alter prognosis for return of vocal fold motion.

**8:43 a.m. Utility of Awake Injection Laryngoplasty: A Case-control Study
Comparing Clinical Outcomes in Patients Undergoing Injection
Laryngoplasty (IL) Under Local Versus General Anesthesia**

Clyde C. Mathison, MD*
Michael M. Johns III, MD
Adam M. Klein, MD
Craig R. Villari, BA*
Atlanta, GA

Charts of 141 consecutive patients undergoing IL were reviewed. Subjects who underwent IL with local anesthesia were grouped as experimental cases. Subjects who underwent IL with general anesthesia were grouped as controls. One hundred sixty-six IL were performed in 141 patients (82 males, mean age = 61.3). Unilateral vocal fold immobility was diagnosed in 60.3%. The remainder had glottal insufficiency with bilateral mobile vocal folds. One hundred and five (63.3%) IL were performed in awake patients and 61 were performed in asleep patients. For 78 IL, pre- and post-injection VRQOL data was available. Average VRQOL in the awake patient improved by 25.05 points, while average VRQOL in the asleep patient improved by 20.8% points ($p=0.42$). There were 24 complications (14.5% of all injections), which included 19.1% of awake IL and 6.6% of asleep IL. All complications were self-limited. Both awake and asleep IL offer comparable results. Awake IL has a higher complication rate.

8:51 a.m. Surgical Principles of Revision Medialization Laryngoplasty

Matthew O. Old, MD*
C. Gaelyn Garrett, MD
Scott Kaszuba, MD
Leslie F. Childs, MD*
Jennifer Muckala, MS, CCC-SLP*
Cheryl R. Billante, PhD*
Donald T. Weed, MD*
James L. Netterville, MD

Nashville, TN/Napierville, IL/Miami, FL

Medialization laryngoplasty by open laryngeal framework surgery remains the standard of care for unilateral vocal cord paralysis. This study seeks to evaluate failure etiology for patients requiring a secondary medialization and outline important technical aspects in primary and revision procedures. We reviewed our experience over an 18 year period and identified 866 cases of open medialization laryngoplasty that included 149 revision procedures with or without arytenoid adduction. Voice quality and glottic closure improved in most patients except for those with thyroarytenoid muscle atrophy at the time of revision surgery. Improperly placed windows, instability of the implant, and under-medialization were the most common etiologies of failure. We developed key surgical principles that we use to approach both revision and nonrevision cases. These technical aspects coupled with the principles fundamental to achieving satisfactory results in primary medializations can successfully revise patients with poor outcomes from an initial procedure.

8:59 a.m. CASSELBERRY AWARD

Improved Recovery of Adductor Function by Early Injection of the Posterior Cricoarytenoid Muscle: A New Paradigm Vocal Fold for Paralysis

Randal C. Paniello, MD
St. Louis, MO

Presentation by: *Roger L. Crumley, M.D., M.B.A.*
Irvine, CA

Most patients with unilateral vocal fold paralysis undergo some degree of nerve recovery, which commonly includes some degree of cross-innervation with adductor nerve fibers reinnervating the abductor muscle (synkinesis). In this series of canine experiments, a new approach to treating acute vocal fold paralysis was proposed. Laryngeal adductor function was measured in seven models of recurrent laryngeal nerve injury and microneural repair (total n=72). For the intervention groups (total n=26), attempts were made to affect the ultimate recovery of laryngeal motor function by use of an intramuscular injection of nerve growth factor (for improved adductor recovery) or vincristine (to block synkinetic reinnervation of the abductor muscle). It was found that the vincristine blockade was highly effective at improving adductor functional recovery. This finding suggests a new paradigm for early treatment of vocal fold paralysis, which could improve functional adductor recovery and avoid the need for medialization procedures in many patients.

9:07 a.m. Laryngeal Complications after Lipoinjection for Vocal Fold Augmentation

J. Drew Sanderson, MD*
C. Blake Simpson, MD
San Antonio, TX

Vocal fold augmentation (VFA) with autologous fat has been widely used for the past 20 years with varying success, however, to our knowledge no studies have looked at the complication rate of lipoinjection for VFA. A retrospective chart review from 1997 to 2008 was carried out, identifying ninety-eight cases of autologous lipoinjections for VFA. Eighty-nine patients met the criteria for review with an average follow up of 20.2 months (range 0-126 months). Overall, four laryngeal complications were identified (4.5%) including three overinjections (3.4%) leading to poor voice quality and one granuloma formation (1.1%). The overinjections were managed using a CO₂ laser lateral cordotomy with fat removal, resulting in improved voice in all cases. Lipoinjection of VFA can lead to overinjection with dysphonia in a small number of patients. The complications can be managed with CO₂ laser lateral cordotomy and fat removal.

9:15 a.m. Discussion

SCIENTIFIC SESSION II
Laryngeal Papillomatosis

9:27 a.m. Microlaryngoscopic and Office-Based Injection of Bevacizumab (Avastin) to Enhance Pulsed-KTP Laser Treatment of Glottal Papillomatosis

Steven M. Zeitels, MD
James A. Burns, MD*
Robert E. Hillman, PhD
Boston, MA

Photoangiolytic lasers effectively treat glottal papillomatosis by involuting the disease while preserving superficial-lamina-propria. However, this approach does not reliably prevent recurrence. Therefore, sublesional injections of the anti-angiogenic agent Bevacizumab (Avastin) were done to determine the effect on disease recurrence and phonatory mucosal pliability/function.

A prospective nonrandomized investigation was done in a pilot group of 5 patients who had prior angiolytic laser treatment with established patterns of recurrence. They underwent Avastin injections (~5-7mg) into diseased vocal folds along with pulsed-KTP laser photoangiolysis. When compared with laser treatment alone, all patients maintained mucosal pliability and had >50% reduction in recurrence. Presently, one patient, is clinically disease-free despite having been treated for >30 years.

There is preliminary evidence that Avastin enhanced photoangiolytic laser treatment of glottal papillomatosis while maintaining pliability of phonatory mucosa. Coupling an anti-angiogenesis agent with pulsed-KTP laser photoangiolysis is conceptually attractive and promising since the mechanisms of action are complimentary.

9:35 a.m. Gardasil Immunization Effects on Laryngeal Papillomas: A Preliminary Study

Herbert H. Dedo, MD
K. Izdebski, PhD, CCC-SLP*
San Francisco, CA

Fourteen (14) adult patients (9 males and 5 females) with laryngeal papillomas (HPV) have received three Gardasil vaccine immunizations. Each patient was used as his own control. All patients were treated for years with meticulous CO₂ laser removal under microdirect laryngoscopy every two months until clear, and then followed-up by laryngovideoscopy at doubling intervals, 4 months, 8 months, and yearly as long as clear. No definitive improvement was observed in their clinical studies.

9:43 a.m. Discussion

9:47 a.m. Intermission/Visit Exhibits

SCIENTIFIC SESSION III

Moderators:

Marvin P. Fried, MD, *Bronx, NY*

Mark S. Courey, MD, *San Francisco, CA*

10:15 a.m. RESIDENT RESEARCH AWARD

Impact of Surveillance on Survival in Laryngeal Cancer Patients

David O. Francis, MD*

Albert L. Merati, MD

Ernest A. Weymuller Jr., MD

Bevan Yueh, MD, MPH*

Seattle, WA/Minneapolis, MN

Presentation: Roger L. Crumley, MD, MBA

Irvine, CA

Objectives: Routine surveillance is advocated to detect recurrent disease after treatment for laryngeal cancer. We aimed to evaluate whether more intensive surveillance improved survival.

Methods: Patients with recurrent cancers (1992 -1999) were identified in a national cancer database and merged with Medicare to track surveillance. Multivariate analysis evaluated the effect of surveillance on post-recurrence survival.

Results: Of 2121 recurrent cancers identified, 931 were laryngeal. Patients with laryngeal cancer recurrence had 27% ($p=0.001$) and 21% ($p=0.007$) better odds of 1- and 5-year survival than other sites. Multivariate regression revealed that surveillance intensity had no independent impact on their survival ($p>0.05$).

Conclusions: First, more frequent surveillance visits was not associated with a survival advantage. This challenges the notion that more frequent visits detect earlier tumors with better odds of survival. Second, laryngeal cancer patients had better post-recurrence survival than other sites presumably because effective salvage is available.

10:25 a.m. YOUNG FACULTY/PRACTITIONER AWARD

Regeneration of Aged Rat Vocal Folds Using Hepatocyte Growth Factor Therapy

Tsunehisa Ohno, MD*

Mi Jin Yoo*

Erik R. Swanson, MD*

Shigeru Hirano, MD, PhD*

Robert H. Ossoff, DMD, MD

Bernard Rousseau, PhD*

Nashville, TN/Kyoto, JAPAN

Presentation: Roger L. Crumley, MD, MBA
Irvine, CA

Voice changes associated with aging result from histological and physiological alterations to the vocal fold extracellular matrix. Previous studies have revealed dense collagen deposition and decreased levels of hyaluronan in the aged vocal fold. Techniques for reducing collagen deposition and restoring hyaluronan may lead to novel treatments for regeneration of the aged vocal fold. Our previous studies have revealed that hepatocyte growth factor (HGF) reduces collagen and increases hyaluronan in injured vocal folds. The purpose of the current study was to investigate, molecular and histological changes from aged vocal folds treated with HGF. Fifteen, 18-month-old, Sprague-Dawley rats received serial sham- or HGF-treatment over 2 weeks and were subsequently sacrificed. Results revealed significantly increased levels of matrix metalloproteinase-2, -9, and hyaluronan synthase-3 expression, and significant reduction of collagen deposition in HGF-treated vocal folds, compared to sham-treated vocal folds. This study demonstrates the regenerative effects of HGF in aged rat vocal folds.

10:35 a.m. The Relationship of Restech Ph Probe Results With Laryngopharyngeal Reflux (LPR) Symptomatology And Examination Findings

Lauren C. Anderson, MD*
Stacey L. Halum, MD*
Samuel L. Oyer, BA*
Indianapolis, IN

Objectives: To determine the utility of the new Restech pH-probe in diagnosis of laryngopharyngeal reflux (LPR) by showing that patients with higher Reflux Symptom Indices (RSI) and Reflux Finding Scores (RFS) will have positive Restech studies.

Study Design: Retrospective study.

Methods: Twenty patient charts were reviewed retrospectively. Patients had already been seen and examined by the primary investigator. As is standard practice in the primary investigator's office, all new patients presenting in clinic complete a RSI, and the primary investigator assigned an initial RFS based on videostroboscopy examination. In patients with suspected LPR, Restech studies were obtained. Patients were excluded if they had any underlying neurologic disorders causing throat-related symptoms, dysphagia related to previous head and neck chemoradiation, and a RSI with a score less than 5, which indicates an incomplete survey.

Results: Thirteen patients (65%) had positive pH events during Restech evaluation. Sixteen patients (80%) of patients had RSI of 10 or greater. Eighteen patients (90%) had RFS of 7 or greater. Thirteen patients (65%) had RFS and RSI results that correlated with a positive Restech study.

Conclusions: The Restech pH-probe is an additional tool to diagnose patients with LPR in correlation with symptoms and examination findings.

10:43 a.m. New Clinical Trial Initiatives and Funding Opportunities at NIDCH

Gordon B. Hughes, MD*
Bethesda, MD

10:51 a.m. Assessment of the Variability of Vocal Fold Dynamics within and between Recordings with High Speed Imaging (HSI) by Phonovibrogram (PVG)

Melda Kunduk, PhD*
Jörg Lochscheller, PhD*
Andrew J. McWhorter, MD*
Michael Döllinger, PhD*
Baton Rouge, LA

High-speed imaging captures vocal fold vibration in real time. Normative data and analysis tools for these large data sets are limited. The consistency and reproducibility of HSV parameters is critical for objective comparison of normal and pathologic voices. The PVG is a novel quantitative analysis methodology which analyzes multiple variables of vocal fold vibration and represents the dynamic data of both vocal folds within a single image.

PVG analysis was used to investigate the normal variability in vocal fold dynamics in 14 female, normal voices within and between recordings captured over three days. The glottal closure efficiency, open and speed quotient, speed amplitude ratio of the bilateral vocal folds, frequency, phase difference, maximum glottal area, and asymmetry parameters evaluated revealed that the PVG analysis was consistent and reproducible between and within the recordings. These findings support the investigation of HSI with PVG for further characterization of vocal fold vibratory behavior.

10:59 a.m. Discussion

11:07 a.m. Bilateral Thyroarytenoid Botulinum Toxin Injections for Bilateral Vocal Fold Motion Impairment

Dale C. Ekbom, MD*
Mark S. Courey, MD
David Zealear, PhD*
Felicia Ragland, MD*
C. Gaelyn Garrett, MD

Rochester, MN/San Francisco, CA/Little Rock, AR/Nashville, TN

We present our experience with botulinum toxin type A in the management of respiratory compromise due to bilateral vocal fold motion impairment. This is a retrospective case series. The records of 10 patients with respiratory compromise due to motion impairment were reviewed. Age, gender, etiology of respiratory distress, number of Botox treatments with usual dosage amounts, numbers achieving symptomatic improvement, and complications were reviewed. 9 of 10 patients reported symptomatic improvement. Patients received injections of 2.5 units into each thyroarytenoid muscle at an average interval of 4 months. One patient without relief had bilateral cricoarytenoid joint fixation. Complications were limited to mild dysphagia with liquids. In conclusion, botulinum toxin type A is a viable treatment option for selected patients with bilateral vocal fold motion impairment due to neurological injury and should be considered part of the treatment paradigm for patients who wish to avoid surgery.

11:15 a.m. Further Refinements of the Singing Voice Handicap Index

Seth M. Cohen, MD, MPH

Clark A. Rosen, MD

Thomas Zullo, PhD*

Melissa Statham, MD*

Durham, NC/Pittsburgh, PA

Introduction: The objective is to develop a shortened version of the validated health status instrument for singers, the Singing Voice Handicap Index (SVHI).

Methods: Principal component analysis of the SVHI was performed based on the responses of 313 patients who prospectively completed the SVHI. Individual item to total correlations were conducted in a reliability analysis, and individual items were also evaluated for bipolar response patterns. Finally, a clinical consensus conference prioritized each individual item. Items were then eliminated and the internal consistency evaluated.

Results: The principal component analysis demonstrated that the SVHI is measuring a single factor. Four items showed item/total correlation coefficients < 0.5 , and one item had a bipolar response. Additional items were eliminated based on the clinical consensus conference to retain the coefficient alpha at ≥ 0.96 .

Conclusions: The reduced SVHI is a valuable instrument to assess self-perceived handicap associated with singing problems with reduced patient burden.

11:23 a.m. Polysomnographically Monitored CO₂ Laser Surgery in Laryngomalacia

Jochen A. Werner, MD
Annette P. Zimmermann, MD*
Michael Bernard, MD*
Andreas M. Sesterhenn, MD*
Marburg, GERMANY

Background: Laryngomalacia is the most common cause of stridor in newborns and infants. The aim of this paper is to present the concept of diagnostic and transoral endoscopic therapy which is followed at our institution as a one-step procedure.

Patients and methods: 33 newborns and infants were treated. In case of pathologic findings during initial flexible endoscopy a rigid laryngoscopy followed. If there was evidence for laryngomalacia a transoral CO₂ laser surgical intervention and/or epiglottopexy was performed pre- and post-interventionally.

Results: 21/33 patients required invasive treatment for laryngomalacia (laser incision of the ary-epiglottic folds: n=13; epiglottopexy: m=5; combined procedure: n=3). In 20/21 cases breathing improved clearly after one single intervention

Conclusion: The presented concept describes a reliable approach for diagnosis and therapy for severe laryngomalacia as a one-step procedure. Thus, further interventions and a prolonged stay in hospital can often be avoided.

11:31 a.m. Discussion

11:38 a.m. DANIEL C. BAKER, JR. LECTURE

“DaVinci, Netter, Rockwell, ENT...and me”

Lawrence Krames, MD*

San Francisco, CA

Introduction: Roger L. Crumley, MD, MBA

Irvine, CA

12:05 p.m. Adjournment

12:10 p.m. Group Photograph (*Members only*)

Location: TBD

SECOND DAY, FRIDAY, MAY 29, 2009
Afternoon Session

12:30p.m. Business Meeting (Fellows Only)

Report of the Nominating Committee

**Report of the Secretary and
Announcements**

C. Gaelyn Garrett, MD, *Nashville, TN*

Report of the Treasurer

Michael S. Benninger, MD, *Cleveland, OH*

Report of the Historian-Editor

Mark S. Courey, MD, *San Francisco, CA*

Special Committee Reports

Other Business

**Election of the Council and
Organization of New Officers**

SCIENTIFIC SESSION III

Vocal Fold Scar, Laryngeal Bioengineering, New Technologies

Moderators:

Andrew Blitzer, MD, DDS, *New York, NY*

C. Gaelyn Garrett, MD, *Nashville, TN*

1:00 p.m. Epithelial Differentiation of Adipose-Derived Stem Cells for Laryngeal Tissue Engineering

Jennifer Long, MD, PhD*

Patricia Zuk, PhD*

Gerald S. Berke, MD

Dinesh Chhetri, MD

Los Angeles, CA

One potential treatment option for severe vocal fold scarring is to replace the vocal fold cover layer with a tissue-engineered structure containing autologous cells. As a first step towards that goal, we sought to develop a three-dimensional cell-populated matrix resembling the vocal fold layers of lamina propria and epithelium. Adipose-derived stem cells were cultured in fibrin hydrogels with various growth factors. At the end of the culture period, matrices were sectioned and labeled with immunomarkers to identify cell phenotype. Adipose-derived stem cells survived, attached, and populated three-dimensional fibrin matrices. Under selected conditions, a superficial layer of cells expressing epithelial marker proteins was produced. In conclusion, a three-dimensional structure of fibrin and adipose-derived stem cells was created as a prototype vocal fold replacement. A bilayered geometry resembling epithelium over lamina propria was achieved. This preliminary work demonstrates the feasibility of tissue engineering to produce structures for vocal fold replacement.

1:08 p.m. Autofluorescence Video Endoscopy for the Diagnosis of Vocal Fold Scar

Ichiro Tateya, MD, PhD*
Shigeru Hirano, MD, PhD
Yo Kishimoto, MD*
Atsushi Suehiro, MD*
Kyoto, JAPAN

Although stroboscopy is generally used for the diagnosis of vocal fold (VF) scarring, it is sometimes hard to estimate the location and the depth of the scar accurately. Autofluorescence is a method that takes advantage of a natural characteristic of tissue to enhance reflected green light when illuminated with blue light. Abnormal tissue such as carcinoma-in-situ lacks this characteristic and appears darker. We hypothesized that the disrupted tissue in the scarred VF may alter signals visualized by the autofluorescence endoscope. In this preliminary study, the VFs of four normal subjects and four patients with VF scar were evaluated using the autofluorescence video endoscopy. The scarred VF lesion in three cases appeared darker than the background whereas one case with severe scar in all layers of the VF showed increased signal. The results indicated the potential of the autofluorescence endoscopy for estimating the location and the depth of the VF scar.

1:16 p.m. Evaluation of Porcine Liver Stroma for Treatment of vocal Fold Injury

Thomas W. Gilbert, PhD*
Mark Gilbert, MD*
Katherine M. Povirk *
Vineet Agrawal, BS*
Stephen F. Badylak, DVM, PhD, MD*
Clark A. Rosen, MD
Pittsburgh, PA

The purpose of the study was to evaluate liver stroma extracellular matrix (LS-ECM) scaffold for vocal fold (VF) repair. ECM scaffolds promote tissue repair in other body areas and the LS-ECM was selected because it contains hepatocyte growth factor (HGF), which has been shown to be important in lamina propria rehabilitation. The lamina propria of six canines was removed bilaterally with an immediate unilateral repair with a porcine LS-ECM scaffold. The other vocal fold was left untreated. Detailed histological, geometric and collagen alignment testing was done to characterize the remodeling response. After three months, the LS-ECM treated VF showed increased collagen density, especially in the superficial aspect of the lamina propria. The LS-ECM treated VF also showed an increased ratio of collagen type III to I. This suggests that LS-ECM leads to formation of connective tissue that is more pliable as compared to the no treatment side.

1:24 p.m. A Model for 532nm Pulsed KTP Laser-Induced Injury in the Rat Larynx

Pavan S. Mallur, MD*
Benjamin Saltman, MD*
Ryan C. Branski, PhD, CCC-SLP*
Milan R. Amin, MD
New York, NY

The 532nm KTP laser is emerging as a treatment for various vocal fold pathologies. To date, no studies have examined the biochemical effects of this wavelength on the vocal fold mucosa. To address this issue, we developed an *in vivo* model for videolaryngoscopic surgery in the SD rat. Unilateral vocal fold injury was induced with the KTP laser at 10W and 20mS in 18 adult rats. Animals were euthanized one, four, and twelve weeks post treatment, and the larynges were subjected to histological and molecular analyses. The KTP altered matrix metalloproteinase (MMP) mRNA expression in a time and dose-dependent manner, consistent with data from the dermatology literature. MMP expression also corresponded with histological alterations to the vocal fold mucosa. We propose that use of this model will allow us to further characterize effects of KTP and assess therapeutic potential for KTP laser in the treatment of vocal fold scar.

1:32 p.m. Discussion

1:40 p.m. Trans-oral Resection of Short Segment Zenkers Diverticulum and Cricopharyngeal Myotomy: An Alternative, Minimally Invasive Approach

Madeline R. Schaberg, MD, MPH*
Peak Woo, MD
Nithin Adappa, MD*
Melissa M. Mortensen, MD
New York, NY

Treatment of cricopharyngeal bar and small Zenkers' diverticula (<2cm) remains a challenge. We propose a new, trans-oral approach for cricopharyngeal myotomy (TOCPM) for patients with cricopharyngeal bar, and trans-oral resection of diverticula followed by cricopharyngeal myotomy (TOCPM+TORD) in the patient with small (<2cm) Zenkers' diverticula. The key difference is the use of scissors and sutures for the resection of the muscle under direct vision followed by meticulous suture repair of the pharyngeal defect. We performed a retrospective review of 46 patients with cricopharyngeal spasm (21) and Zenkers diverticula (25) treated from 1998-2008. Thirteen patients were treated by the TOCPM(6) or the TOCPM+TORD(6) approach. All were discharged within 48 hours, none were converted to open, and follow-up barium swallow showed resolution of the bar and diverticulum. This technique combines the advantages of a minimally invasive approach with complete resection of the diverticulum, complete myotomy and direct repair of the pharyngeal defect.

**1:48 p.m. Laser Myoneurectomy of Bilateral Ventricular Folds and
Thyroarytenoid Muscles for Adductor Spasmodic Dysphonia – Long-
Term Results**

Chih Ying Su, MD*
Kaohsiung City, TAIWAN

Background: During the past decades, botulinum toxin has emerged as the treatment of choice for adductor spasmodic dysphonia (ASD). Although effective, it also has significant disadvantages including temporary effect and an unpredictable dosage-response relationship. The aim of this study is to investigate the long-term effect of transoral approach to laser ventricular and thyroarytenoid myoneurectomies for treatment of ASD.

Method: Forty-one patients with ADS underwent transoral surgery. Under an operating microscope and CO₂ laser, the posterior half ventricular folds were resected followed by myoneurectomy of bilateral thyroarytenoid muscles. All patients underwent pre-and postoperative videolaryngostroboscopy and voice assessments.

Results: Thirty of the 41 patients have been followed up for more than 1 year (1-5 ys, mean 2 ys). Spasmodic symptoms were improved with persistent long-term effect in 29 of 30 (96.7%) patients.

Conclusion: Transoral laser myoneurectomy of bilateral ventricular folds and thyroarytenoid muscles is a simple and effective technique for ASD. The long-term outcome is encouraging.

1:56 p.m. Decoy NF-kB Fortified Immature Dendritic Cells Prevent Laryngeal Allograft Rejection and Provide Enhancement of Regulatory T-Cells

David G. Lott, MD*
Olivia Dan, BS*
Lina Lu, MD*
Marshall Strome, MD, MS
Durham, NC/New York, NY

Introduction: To examine the responsiveness of the previously validated Singing Voice Handicap Index (SVHI) to treatment related changes in patients' singing voice.

Methods: 19 singing patients at a tertiary voice clinic prospectively completed the Voice Handicap Index (VHI) and SVHI at their initial presentation, prior to voice therapy, and at treatment completion.

Results: Patients had lower SVHI scores post-therapy compared to the initial and pre-therapy SVHI scores and no difference between the initial and pre-therapy SVHI scores (ANOVA on Ranks, $p = 0.004$; Dunn's method for multiple comparison, $p < 0.05$ for initial versus post-therapy SVHI and pre- versus post-therapy SVHI, $p > 0.05$ for initial versus pre-therapy SVHI). The Spearman correlation of the VHI difference with the SVHI difference before and after treatment was 0.66 ($p = 0.004$).

Conclusion: The SVHI measures changes in patients' singing vocal health status resulting from treatment and correlates with other validated instruments.

2:04 p.m. Discussion

2:12 p.m. AWARD PRESENTATION

American Laryngological Association Award

Stanley M. Shapshay, MD, *Albany, NY*

Presentation: Clarence Sasaki, MD
New Haven, CT

2:14 p.m. AWARD PRESENTATION

Gabriel Tucker Award

William Crysdale, MD, *Toronto, Ontario, CN*

Presentation: John A. Tucker, MD
Philadelphia, PA

2:16 p.m. Vocal Process Granuloma and Glottal Insufficiency: An Overlooked Etiology for Disease Resolution?

Thomas L. Carroll, MD*
Melissa M. Statham, MD*
Clark A. Rosen, MD
Pittsburgh, PA

Vocal process granuloma (VPG) has been attributed to intubation, laryngopharyngeal reflux and hyperfunctional vocal behaviors. VPG has recurrence rates following surgical excision approaching 92%. We hypothesize that a portion of persistent or idiopathic cases of VPG result from underlying glottal insufficiency (GI) caused by paresis, scar or atrophy. Our goal was to examine our VPG population and determine the incidence of GI, treatment interventions and outcomes.

A retrospective review revealed 36 patients with VPG. Blinded video perceptual analysis confirmed the diagnoses of GI.

18/34 patients (53%) carried an underlying diagnosis of GI, 13/34 were treated surgically, and 9/13 surgical patients had underlying GI. 25% of the surgically augmented patients recurred while 46% who were not augmented recurred. VHI and RSI scores significantly improved after VPG resolution ($p < 0.05$).

In idiopathic or persistent VPG it is worthwhile to consider glottal insufficiency as an important co-morbidity, especially when formulating a treatment plan.

2:24 p.m. Wendler Glottoplasty for Voice Feminization in Case of Male-to-Female Gender Reassignment

Marc Remacle, MD, PhD
Dominique Morsomme, PhD*
Georges Lawson, MD*
Yvoir, BELGIUM

A retrospective study was conducted to assess the effectiveness of glottoplasty for voice feminization

The procedure consists in creating a controlled glottic web encompassing the anterior 1/3 of the vocal folds.

The assessment was based on the fundamental frequency (Fo) the frequency range, G(rade) of the GRABS scale, the Voice Handicap Index (VHI), the jitter, the maximum phonation time (MPT), the Phonation quotient (PQ) and the estimated sub-glottic pressure (ESGP)

Sixteen patients with a mean age of 42.5 years were included. The mean follow-up is of 7.5 months.

Fo was improved from 150 to 194 Hz ($p < 0.01$); the frequency range, VHI, the jitter, MPT and QP were not modified significantly but ESGP increased from 8.1 to 12 Hp ($p < 0.01$).

This technique is a good alternative but at the cost of an increased voice effort

2:32 p.m. Real-Time Tracking of Vocal Fold Injections with Optical Coherence Tomography

James A. Burns, MD*
Ki-Hean Kim, PhD*
Steven M. Zeitels, MD
R. Rox Anderson, MD*
Johannes F. deBoer, PhD*
James B. Kobler, PhD*

Boston, MA/Amsterdam, NETHERLANDS

Optical coherence tomography (OCT) is a promising new imaging modality that can help discern the layered microstructure of vocal folds. In the future, subepithelial injections of biomaterials will improve vocal-fold pliability where there is stiffness of phonatory mucosa. Using OCT to delineate the depth of subepithelial injections real-time would be valuable and has not been previously demonstrated.

An investigation was done employing real-time OCT imaging of subepithelial injections into phonatory mucosa (4 excised calf larynges) and to track the presence of subepithelial biomaterials in phonatory mucosa over time in 3 canines. In the cadaver-calf larynges, the biomaterials were easily identified in the proper layer and could be visualized as the tissue dissection occurred. In the canine subjects, repeat imaging confirmed the presence of the biomaterial in the appropriate layer over the ensuing month. OCT appears to be a useful imaging modality for real-time placement and tracking of phonatory mucosal injections.

2:40 p.m. Discussion

2:45 p.m. Intermission/Visit Exhibits

SCIENTIFIC SESSION IV
Bilateral VF Paralysis and Immobility

Moderators:

Gayle E. Woodson, MD, *Springfield, IL*
Clarence Sasaki, MD, *New Haven, CT*

3:15 p.m. Rehabilitation of the Bilaterally Paralyzed Canine Larynx with an Implantable Stimulator

David L. Zealear, PhD*
Isamu Kunibe, MD, PhD*
Kenichiro Nomura, MD, PhD*
Cheryl Billante, PhD*
Vikas Singh, MD*
Shan Huang, MD*
James Bekeny, BS*
Yash Choski, BS*
Akihiro Katada, MD, PhD*
Nashville, TN/Asahikawa, JAPAN

The aim of the study was to determine whether bilateral stimulation of paralyzed posterior cricoarytenoid (PCA) muscles could restore glottal opening, ventilation, and exercise tolerance. Three dogs were implanted, paralyzed by recurrent laryngeal nerve neurotomy and studied 12-18 months. In bimonthly sessions, stimulated and spontaneous vocal fold movement was measured endoscopically in the anesthetized animal. Exercise tolerance was measured on a treadmill using pulse oximetry. Swallowing function was examined by videofluoroscopy. Within 3 months, synkinetic reinnervation became significant with paradoxical closure of the glottis during inspiration. Animals were stridorous and could walk for only 1-2 minutes (2.5 mph). With device activated, paradoxical closure was overridden by PCA stimulation and normal glottal opening achieved. Stimulated animals showed normal exercise tolerance of 12 minutes (2.5-8 mph). Protective reflexes prevented aspiration during bilateral stimulation. In conclusion, ventilation and activity level could be restored to normal without aspiration using a bilateral nonsynchronized stimulator.

**3:23 p.m. Improvement of Respiratory Compromise Through Abductor
Reinnervation and Pacing in a Patient with Bilateral Vocal Fold
Impairment**

Michael Broniatowski, MD
Aaron J. Hadley, BE*
Nemath S. Shah, MS*
Sharon G. Broniatowski, MD*
Kingman P. Strohl, MD*
Harvey M. Tucker, MD
Dustin J. Tyler, PhD*
Cleveland, OH

Introduction/Purpose: To determine whether respiratory compromise from bilateral vocal fold impairment (paralysis) can be objectively alleviated by reinnervation and pacing.

Brief description of procedure employed: A patient with paramedian vocal folds and synkinesis had a tracheotomy for stridor after bilateral laryngeal nerve injury and Miller-Fisher syndrome. One posterior cricoarytenoideus received a nerve-muscle pedicle fitted with a perineural electrode for pacemaker stimulation. The airway was evaluated endoscopically and by spirometry for 6 months.

Summary of results: Bilateral vocal fold patency during quiet breathing was reversed to active vocal fold adduction during tracheal occlusion. Peak inspiratory flows (PIFs) were significantly higher ($p < 0.001$) after reinnervation. PIFs and glottic apertures increased further under stimulation (42 Hz, 1-4mA, 42-400 μ sec) although the differences were not significant.

Conclusions: Respiratory compromise after paradoxical adduction can be alleviated by reinnervation and pacing of the abductor antagonist.

3:31 p.m. The World's First Laryngeal Transplant at 10 Years: Mature Perspectives and Long-Term Outcomes

P. Daniel Knott, MD*

Douglas Hicks, PhD*

William Braun, MD*

Marshall Strome, MD, MS

Cleveland, OH/New York, NY

Purpose: To present a comprehensive ten-year evaluation of the world's first complete human laryngeal transplant.

Materials and Methods: Retrospective case study.

Results: Ten years following transplantation, the world's first complete composite human laryngeal transplant recipient continues to enjoy essentially normal lung powered speech with normal deglutition. His immunosuppressive regimen has been refined and minimized. There were two short episodes of rejection managed acutely with steroids. Malignancy has not developed and he has experienced no significant long term organ dysfunction from his immunosuppressive therapy.

Conclusion: In properly selected individuals with a full understanding of the risks, benefits, and alternatives of the procedure, human composite laryngeal transplantation is a viable procedure which offers significant improvements in quality of life with an acceptable level of morbidity over at least 10 years.

3:39 p.m. State of the Art Lecture

Human Bilateral Laryngeal Reinnervation: Implications for Transplantation

Jéan-Paul Marie, MD*
Rouen, FRANCE

Introduction: Roger L. Crumley, MD, MBA
Irvine, CA

4:03 p.m. Discussion

Management of Bilateral Vocal Fold Motion Impairment

SCIENTIFIC SESSION V

Moderators:

Marvin P. Fried, MD, *Bronx, NY*
Marshall Strome, MD, MS, *New York, NY*

4:20 p.m. Correlation of Endotracheal Tube Monitoring on Post-Operative Vocal Fold Function during Anterior Cervical Spine Surgery

Karen M. Bellapianta, MD*
Stanley M. Shapshay, MD
Robert Cheney, MD*
Daryl Diriso, MD*
David Anchel, MD*
Albany, NY/Port Jefferson, NY

The primary goal of the study is to determine if electromyography (EMG) linked endotracheal tube signals correlate with true vocal fold (TVF) injury during anterior cervical spine surgery (ACSS). Our study is the first to assess the correlation or utility of recurrent laryngeal nerve monitoring during ACSS. The vocal folds of 40 patients were prospectively evaluated with pre- and post- operative flexible fiberoptic nasopharyngoscopy. Intra-operative RLN monitoring was done with the NIM ET tube. Neurotonic discharges were characterized as either left, right or bilateral and quantified based on duration (<10;10-30;>30 seconds). Forty patients have been enrolled; 25 from a left sided approach and 15 from the right. The rate of TVF paresis was 5%, both from the right sided approach (2/2). We found no correlation between the EMG endotracheal tube signals and vocal fold injury, however the EMG ET tube fired more frequently with the right sided approach.

**4:28 p.m. Dysphonia in Performers and Nonperformers: Towards an
Epidemiology of the Performing Voice**

Joel Guss, MD*
Lucian Sulica, MD*
Brian Benson, MD*
New York, NY

Objectives: To identify diagnoses responsible for dysphonia in performers as well as aspects of clinical presentation and outcome, compared to those in non-performers.

Methods: Retrospective chart review of all new patients presenting with a chief complaint of dysphonia over a one year period.

Results: 372 new patients complaining of dysphonia presented over 12 months; 43 were professional vocalists. Performers were significantly more likely to be diagnosed with midfold phonotraumatic lesions and pseudocysts (p-values <0.001). Performers presented more promptly after onset of hoarseness than non-performers. Carcinoma and precancerous lesions, Reinke's edema, papilloma, neurological disorders (ex: spasmodic dysphonia), and granulomas were significantly more common in nonperformers (all p-values <0.05).

Conclusions: Phonotraumatic injury is responsible for the majority of dysphonia in vocal performers. Voice disorders in non-performers tend to be of neurologic, neoplastic, and infectious cause.

4:36 p.m. Current Practices in Injection Augmentation of the Vocal Folds

Lucian Sulica, MD*

Gregory Postma, MD

C. Blake Simpson, MD

Clark A. Rosen, MD

Albert L. Merati, MD

Milan Amin, MD

Mark S. Courey, MD

*New York, NY/Augusta, GA/ San Antonio, TX/Pittsburgh, PA/
Seattle, WA/San Francisco, CA*

Introduction: Although injection augmentation is commonly performed for rehabilitation of glottic insufficiency, information regarding contemporary indications, techniques, materials, complications, and success is not well detailed.

Methods: Retrospective, multi-institutional review over a one-year period.

Results: 430 injections were performed by 7 practitioners; indications included VF paralysis/immobility (52%), VF paresis (21%), atrophy (15%) and scar /sulcus (12%). 216 injections (50%) were performed in the office under local/topical anesthetic; 96% were technically successful. 214 (50%) were performed in the operating room; 99% of these were technically successful. The difference in success was not statistically significant ($p < 0.10$), Fisher's two-tailed t-test). The most common materials in the clinic setting were methylcellulose (37%), calcium hydroxylapatite (32%) and bovine collagen (29%); the most common materials used in the operating room were calcium hydroxylapatite (38%), methylcellulose (34%).

Conclusions: Injection augmentation is technically achievable in the extreme majority of patients regardless of method or setting. Otolaryngologist continue to use a broad array of injectable materials and anatomic approaches.

4:44 p.m. Discussion

4:51 p.m. **Introduction of 2009-10 President**
Marvin P. Fried, MD, *Bronx, NY*

4:55 p.m. **Neurolaryngology Study Group**

Topic: TBA

Moderator:
Lucian Sulica, MD*, *New York, NY*

6:00 p.m. **Adjournment**

Joint Poster Session
Thursday, May 27 – Friday, May 28, 2009

ALA POSTERS

Age-Related Differences in Gene Expression, Protein Abundance, and Cell Proliferation Following Vocal Fold Injury

Seong Hee Choi, PhD*
Masaru Yamashita, MD, PhD*
Diane M. Bless, PhD
Nathan V. Welham, PhD*
Madison, WI

Aging brings about cellular, extracellular, and morphological changes in the vocal fold lamina propria. These age-related changes often negatively influence vocal fold vibratory function and voice; however it is unknown whether they also negatively influence vocal fold tissue repair processes and outcomes. In this study, gene expression, protein abundance, and cell proliferation were investigated in the context of chronic wound repair, 2, 4, 8 and 12 weeks following vocal fold injury in young (6 mo) and old (30 mo) F344/BN strain rats. Significant differences in extracellular matrix gene expression, protein abundance and cell proliferation were observed between old and young rats across all time points. These findings are suggestive of altered cellular activity and regulation of vocal fold tissue repair with aging.

An Anatomical Study of the Compartments of the Larynx

Nwanmegha Young, MD*
Clarence Sasaki, MD
New Haven, CT

Compartmentalization of the larynx was first described by Hajek in 1891. He noted the cancer of the larynx tends to spread in a predictable way. Though many operations are based on this theory little is understood about the anatomy of these barriers. In this study a human larynx was harvested and injected with India ink submucosally in the supraglottis. The specimen was then examined grossly and histologically. Grossly, it demonstrated the compartmentalization described by Hajek. There was a lack of migration of the India ink below the ventricular folds. Whole-organ serial sectioning was then performed in the coronal plane. Slides were then stained with Orcein and Elastic van Gieson (EVG) stains in order to demonstrate potential fibroelastic barriers. Histological examination revealed a barrier outlining the ventricle. Further studies are needed to investigate the exact nature of this barrier.

An Underreported Complication of Laryngeal Microdebrider: Vocal Fold Web and Granuloma: A Case Report

Melissa Mortensen, MD*
Peak Woo, MD
New York, NY

Introduction: The microdebrider has become a valuable instrument for otolaryngologists. It is now used in the larynx for treatment of recurrent respiratory papillomatosis, laryngeal stenosis and debridement of large cancers for airway control. There are few reported complications associated with the use of the microdebrider in the larynx.

Materials and Methods: A case report. A patient with a vocal fold polyp underwent removal of the polyp with a microdebrider at an outside institution. He presented to our clinic 2 months after the excision with a severely strained near aphonic voice. On rigid stroboscopic examination we saw a large anterior commissure laryngeal web with a granuloma.

Conclusions: The microdebrider is an extremely valuable tool for the otolaryngologist. Violation of the epithelium and the lamina propria with muscle exposure can result in serious damage to the vocal folds. When using powered instrumentation the surgeon should use the upmost caution in the larynx to avoid causing debilitating injury and scar with subsequent dysphonia.

Calcium Hydroxylapatite Injection Laryngoplasty for Presbylaryngis: Personal Experiences

Tack-Kyun Kwon, MD, PhD*
Jeong Hun Jang, MD*
Myung-Whun Sung, MD, PhD*
Kwang Hyun Kim, MD, PhD
Seoul, SOUTH KOREA

Presbylaryngis is a part of the normal aging process, but many people visit hospital with communication difficulties. We evaluated the efficacy of calcium hydroxylapatite (CaHA) injection laryngoplasty (IL) for the patients with presbylaryngis.

We performed CaHA injection for 27 patients who were diagnosed as presbylaryngis without other laryngeal pathology. Among these patients, those who followed up over 3 months were included for analysis. All patients were male with mean age of 65. All injections were done through cricothyroid membrane under local anesthesia in the clinic.

Voice handicap indices, subjective ratings and closed quotients have significantly improved after injection, although perturbation parameters and noise harmonic ratio changes showed no statistical significance. There were no major complication except for transient hematoma, pain and foreign body sensation.

We concluded that CaHA IL is beneficial for the patients with presbylaryngis. We need more patients and longer-term observation to establish the long-term efficacy of this procedure.

Characterization of Discrete Phonation Qualities in an Evoked Rabbit Phonation Model

Erik R. Swanson, MD*
Davood Abhollahian, BS*
Tsunehisa Ohno, MD*
David L. Zealear, PhD*
Robert H. Ossoff, DMD, MD
Bernard Rousseau, PhD*
Nashville, TN

Our laboratory has previously described a model of evoked rabbit phonation to investigate the role of mechanical forces on messenger RNA expression of the vocal fold. As vocal fold impact will be an important variable in future biochemical studies, the purpose of the current study was to assess the feasibility of eliciting discrete phonation qualities in the in-vivo rabbit model. Five New Zealand White rabbits were phonated using an in-vivo rabbit preparation. Alternations in the frequency and current of electrical stimulation, as well as rate of airflow, resulted in predictable changes in phonation output. Acoustic data from three distinct phonation qualities were qualitatively and quantitatively analyzed. The current study describes the effects of manipulating stimulation and airflow on elicited phonation output. Future experiments are now planned to investigate the effects of these manipulations on phonation-dependent tissue alterations.

Cigarette Smoke and Reactive Oxygen Species (ROS) Metabolism: Implications for the Pathophysiology of Reinke's Edema

Benjamin Saltman, MD*
Lucian Sulica, MD*
Hazel Szeto, MD, PhD*
Dennis H. Kraus, MD
Dix P. Poppas, MD*
Diane Felsen, PhD*
New York, NY

Reinke's edema (RE) is highly associated with prolonged cigarette smoke (CS) exposure. Phenotypically, this chronic inflammatory tissue response is starkly different from the fibrotic response to CS in the lower airway. In further contrast, it rarely progresses to malignancy in spite of the established link between inflammation and cancer. We present preliminary data regarding ROS metabolism as a potential mechanism for this unique response. Hemoxygenase (HO)-1 gene expression was significantly higher in human RE tissue samples versus samples from other benign pathologies. CS condensate stimulated intracellular ROS as well as a significant antioxidant response in vitro in our immortalized human vocal fold fibroblast cell line (HVOX). In addition, CS condensate had a dose-dependent effect on HVOX proliferation, migration, and viability. These preliminary data may implicate the oxidant/antioxidant balance as a potential mechanism underlying RE. Further studies will focus on the putative chemoprotective role of HO-1 in the larynx.

Contribution of High-speed Imaging in Comparison with Stroboscopy in Daily Clinical Practice

Marc Remacle, MD, PhD
Dominique Morsomme, PhD*
Georges Lawson, MD*
Yvoir, BELGIUM

The objective was the evaluation of the information presently provided by high speed imaging in comparison with stroboscopy for the management of benign vocal fold pathology

35 patients were checked during the same consultation with stroboscopy and with the Wolf® high speed imaging unit.

Quality of imaging, contribution to the diagnosis and the management were evaluated

The high speed imaging unit was short of pixels in comparison with stroboscopy. High speed imaging didn't modify the diagnosis. Vocal fold vibration was better observed with high speed imaging. The information provided by high speed imaging was superior in case of glottis gap. The therapeutic decision was modified in 4 cases presenting a glottic gap. The subjective selection of a segment of recording for analysis might induce a bias. The Wolf® high speed imaging unit cannot presently replace stroboscopy.

Defining a Surgical Approach to Selective Reinnervation of the Posterior Cricoaeroid Muscle: An Anatomical Study

Paul E. Kwak, MSc, MM*
Aaron Friedman, MD*
Eric Lamarre, MD*
Robert R. Lorenz, MD
Cleveland, OH

Selective reinnervation for bilateral vocal cord paralysis has been successful in animal models and shows promise in humans, but detailed, surgically relevant measurements for performing this in the human larynx are not readily available. After dissecting twenty human cadaveric larynges, we describe the anatomy and gender differences of the recurrent laryngeal nerve (RLN), with specific attention to the distance between posterior cricoarytenoid (PCA) branch and the interarytenoid (IA) branch. This data was also used to predict the need for drilling a window into the thyroid cartilage for access. The average distance between the PCA and IA branches was 6.00 mm in males and 5.23 mm in females. A thyroid cartilage window was twice as likely to be required in females versus male specimens for access in performing the neurotomy. This study provides new insight into laryngeal anatomy and further data for developing a reliable surgical approach.

Deglutition and Respiratory Patterns During Sleep in Adults

Kiminori Sato, MD
Hirohito Umeno, MD*
Shun-ichi Chitose, MD*
Tadashi Nakashima, MD
Kurume, JAPAN

Clearance of the pharynx by swallowing is important to protect the airway. The deglutition and respiratory phase patterns during sleep in younger adults were investigated. Sleep-related deglutition was examined in ten younger adults (25 ±4 years old) using time-matched recordings of polysomnography, and electromyography of the thyrohyoid and geniohyoid muscles.

During sleep, swallowing was infrequent, and was absent for long periods. The mean number of swallows per hour during the total sleep time was 2.4±1.0. The mean period of the longest absence of deglutition was 68.8±24.8 minutes. Most deglutition occurred in association with spontaneous electroencephalographic arousal. Deglutition was related to sleep stage. The deeper the sleep stage, the lower the mean deglutition frequency and the lower the ration of deglutition to arousal frequency. Approximately 60% of swallows were followed by apnea and approximately 25% by expiration. Deglutition was infrequent and displayed unique patterns during sleep in younger adults.

Evaluation and Management of Laryngeal Symptoms of Parkinson's Disease

Brian Benson, MD*
Joel Guss, MD*
Andrew Blitzer, MD, DDS
Hackensack, NJ/New York, NY

Parkinson's disease (PD) is a neurological syndrome characterized by bradykinesia, postural instability, rigidity, tremor, and motor blocks. Laryngeal symptoms include hypophonia, dysphonia, and tremor. The clinical assessment often reveals vocal fold bowing and poor respiratory effort. As otolaryngologists care for an aging populace, it is important to be familiar with the pathophysiology, evaluation, and appropriate application of surgical and non-surgical treatment to patients with laryngeal manifestations of Parkinson's disease. We evaluated thirty patients with PD. Twenty-nine patients had a voice disorder, and all had severe respiratory abnormalities. One had paradoxical vocal fold motion, one had dysphagia, five had laryngeal dyscoordination, three had obstructive sleep apnea, and 10 had vocal fold bowing. Eight patients underwent vocal fold augmentation or medialization thyroplasty, with improvement in their loudness. The current classifications of PD and Multi System Atrophy are discussed. Laryngeal manifestations of PD are common. Although a minority of patients require surgery, the otolaryngologist must be able to understand the disabilities and surgical indications, since this group may have great benefit.

Hoarseness Misattributed to Reflux: Sources and Patterns of Error

Lucian Sulica, MD*

New York, NY

The ubiquity of signs of laryngopharyngeal reflux signs can lead to misattribution symptoms to this disorder. Twenty-six patients carrying a diagnosis of reflux alone presenting for second-opinion evaluation were identified from among 381 new patients presenting with a chief complaint of hoarseness over a 6 month period. Patients specifically referred for further workup were excluded. Average duration of reflux treatment was 10.6±9.0 weeks. In no case was reflux alone the cause of hoarseness. Eleven (42%) had phonotraumatic lesions, nine (34%) had neurologic disorders, 5 (19%) had age-related changes, and one (4%) was infectious. Twenty-two (85%) abnormalities were diagnosed by dynamic laryngeal examination with improved optics, including stroboscopy. Only four (15%) represent disorders routinely diagnosed with flexible fiberoptic laryngoscopy. Hoarse patients with no apparent cause for dysphonia other than reflux after flexible laryngoscopy, or who fail to improve with appropriate treatment, should undergo further investigation rather than continued treatment.

Laryngeal Tremor: Association with Other Movement Disorders

David Wolraich, MD*

Cristina Marchis-Crisan, MD*

Sami Khella, MD*

Natasha Mirza, MD

Philadelphia, PA

Tremor is the involuntary skeletal muscle contraction that leads to an oscillatory movement. It can affect a single muscle (thyroarytenoid) or groups of muscles. Laryngeal Tremor (LT) has been associated with benign essential tremors, but to date, there is limited epidemiologic information regarding LT and its association with other movement disorders. We performed a retrospective chart review of 24 patients with the diagnosis of LT seen in a voice disorders clinic over a 3 year period. Of the patients who presented with LT, almost 80% had an associated movement disorder. Of these patients, 25 % had generalized tremor, and 33% had head and neck tremors including orofacial dystonias. Otolaryngologists may be the first to evaluate a patient for tremors. It is important to consider other movement disorders when examining patients with LT as a full neurologic assessment and treatment of other tremors may be beneficial.

Laryngoscopic Findings in Vocal Fold Paralysis: An Assessment of Inter-rater Reliability

David E. Rosow, MD*
Lucian Sulica, MD*
New York, NY

Terms commonly used to describe vocal fold paralysis (VFP) clinically and in the professional literature vary and are not standardized. We therefore assessed inter-and intra-rater reliability of twelve commonly used laryngoscopic criteria. Excerpts from exams of 22 patients were presented to fellowship-trained laryngologists. Raters were blinded to clinical history, each other's ratings, and their own previous ratings. Inter-rater agreement was calculated using Fleiss kappa. Twenty reviewers replied, for a response rate of 91%. Intra-rater reliability ranged from 66 to 100%. Three criteria showed moderate agreement ($k < 0.4$) among reviewers: glottic insufficiency, vocal fold bowing, and salivary pooling. Arytenoid stability, arytenoid position, and height mismatch showed poor agreement ($k < 0.2$). Other stroboscopic criteria showed fair to slight agreement. These findings suggest a need for a standardized descriptive scheme for laryngoscopic findings in vocal fold paralysis.

Lentigo of the Larynx with Melanoma of the Temple: Report of a Case

Stella Lee, MD*
Nwanmegha Young, MD*
New Haven, CT

Benign lentigo or melanosis of the larynx is a rare entity characterized by melanocytes lining the laryngeal epithelium. A case is presented of an African American male with a previous history of malignant melanoma of the temple presenting with lentigo in the larynx and the buccal mucosa of the oral cavity. Lentigo in this case was noted to be associated with extensive hyperkeratosis and may indicate a precursor to malignant transformation. This is the first case of an African American male with a history of malignant melanoma presenting with lentigo of the larynx. An overview of current theories regarding melanin deposition in the larynx as well as the possible relation of lentigo to melanoma and perhaps squamous cell carcinoma are evaluated.

Measurement of the Elastic Modulus of Vocal Folds by: Influence of Indenter Size, Indentation Depth, And Boundary Conditions

Daekeun Joo, MD*
Juergen Neubauer, PhD*
Zhaoyan Zhang, PhD*
Dinesh K. Chhetri, MD
Los Angeles, CA

The indentation method for stiffness measurement of the multi-layered vocal fold and the sensitivity of this method to experimental parameters was investigated. Indentation tests were performed on silicon rubber models of the vocal folds with known geometric and material properties. Using a range of cylindrical indenters the tests were repeated for different indentation depths and boundary conditions. The results showed that indentation on single-layer models yielded Young's modulus with acceptable accuracy. As expected from theory, on two-layer models the stiffness estimation was determined by the ratio of indenter diameter to layer thickness: the measured stiffness was a weighted average of the stiffness of the two layers. Measurements with different indenter diameters and indentation depths were performed on excised human vocal fold tissue to determine the elastic moduli of the thyroarytenoid muscle, the lamina propria, and the intact vocal fold.

Multiple Laryngeal Lesions of Plasma Cell Granuloma in a Young Patient

Courtney Shires, MD*
Roy Rajan, MD*
Sandeep Samant, MD*
Memphis, TN

Plasma cell granuloma of the larynx is a rare benign lesion of unknown etiology with only 21 reported cases. We report one additional case of plasma cell granuloma in which a 26 year old male experienced a 1.5x3.4 cm severely obstructing subglottic lesion and subsequent partially obstructing glottis lesion four months later. Due to his young age, history of hemoptysis and bleeding from his tracheostomy, and the rarity of plasma cell granulomas, the patient was assumed to have hemangioma until proven otherwise. Endoscopic excision was used to excise the subglottic and arytenoid lesions. Multiple modalities have been utilized to treat plasma cell granulomas, including radiation, endoscopic CO₂ laser ablation, high dose prednisone, and open excision. In our case, steroids were given in the interim between two excisions with subsequent emergence of glottic lesion. This is the first demonstration of a patient with two laryngeal lesions of plasma cell granuloma.

Quantitative Analysis of Cell Density and Distribution in Rat Vocal Fold Lamina Propria Following Injury

Changying Ling, PhD*
Emily Waselchuk *
Jennifer Raasch*
Masaru Yamashita, MD, PhD*
Nathan V. Welham, PhD*
Madison, WI

The vocal fold lamina propria (LP) plays an important role in voice production. Its cell composition and density frequently change under various pathological conditions, often contributing to altered extracellular matrix production, altered tissue viscoelasticity, and dysphonia. In this study, cellular density and distribution in the LP following unilateral stripping injury were investigated quantitatively. Cell density significantly increased in the LP following injury, and reached its peak level at 5 days post injury. Newly recruited cells were distributed throughout the LP, but were preferentially located in the sub-epithelial region. The emergence of a reactive cell population following injury suggests its involvement in scar formation and repair processes in the LP.

Risk Factors for Adult-Onset Recurrent Respiratory Papillomatosis

Yuk Yee Yau, BS*
Duane Sewell, MD*
Natasha Mirza, MD
Philadelphia, PA

Introduction: Modes of disease transmission for the adult-onset version of Recurrent Respiration Papillomatosis (AORRP) have not been well established. We studied demographic and personal history data to identify risk factors.

Design: A retrospective review of patients with a histologically confirmed diagnosis of AORRP over a 2 year period (n = 24) was conducted. Patient medical records were reviewed and a questionnaire was designed to identify risk factors under an approved IRP protocol.

Results: Most patients had fewer than 15 lifetime sexual partners and all patients and their partners had no history of sexually transmitted diseases. Males predominated and less than 50% were smokers.

Conclusion: This study did not identify a sexual history or other behavior related risk factors for acquiring AORRP, suggesting a greater likelihood of a latent infection becoming active for unknown reasons.

Survival Characteristics of Injected Human Cartilage Slurry in a Nude Mice Model

Bounmany Kyle Keojampa, MD*
Jacob Pieter Noordzij, MD*
Vartan Mardirossian, MD*
Bohdana Burke, MD*
Joseph Alroy, MD*
Zhi Wang, MD*
Boston, MA

Our aim was to examine the viability and volume retention characteristics of drilled human cartilage slurry when injected into a nude mice model. The goal is to develop a long-term injectable cartilage implant for vocal fold augmentation. We injected 0.2ml of human septal cartilage slurry into the hind limb of nude mice. These mice were sequentially sacrificed over the period of 1 year. Histological reviews of the hind limbs were performed to determine viability of injected chondrocytes and volume retention. Specimens were obtained at 1 day, 1 month, 3 months, 6 months, and 1 year. Volume retention was approximated using the serial section technique. Viable cartilage and volume retention was seen at 1 day, 1 month, and at 3 months. Data at 6 months and 1 year are pending. We propose that an injected human cartilage slurry can be considered as a possible long-term injectable vocal fold implant.

0.2cc injected	Day 1	1 month	3 months
Avg Total Volume (cc)	0.188 cc	0.142 cc	0.146 cc

The Atypical and Disparate Presentations of Laryngeal Sarcoidosis

Michael Pitman, MD*
Ross Mayerhoff, BS*
New York, NY/Stoney Brook, NY

Early diagnosis and proper management of laryngeal sarcoidosis is essential as the symptoms are debilitating and possibly life threatening. Our aim is to highlight the disparate presentations of laryngeal sarcoidosis as well as the treatment options.

Although sarcoidosis typically presents with dyspnea in patients 20-40 years old and most frequently involves the supraglottis, it may present with atypical signs and symptoms and in children.

We present a retrospective review of four patients with previously undiagnosed sarcoidosis presenting with atypical signs and symptoms of laryngeal sarcoidosis. Case 1 – pediatric sarcoidosis; Case 2- severe bilateral vocal fold paresis and dysphagia; Case 3- cough and globus pharyngeus; Case 4- dysphonia with isolated vocal fold involvement.

A high degree of suspicion is necessary for a correct and expeditious diagnosis in patients with an atypical presentation of laryngeal sarcoidosis. Treatment may consist of local and systemic chemotherapy as well as adjunctive procedures.

The Effect of Tgf β -1, Il-6, and Anti- Tgf β -1 on Vocal Fold Fibroblast-Myofibroblast Differentiation

Keiko Ishikawa, MA*
Bimal Vyas, MS*
Susan Thibeault, PhD
Madison, WI

Myofibroblasts play a role in wound repair and are differentiated from fibroblasts in the presence of transforming growth factor β -1 (TGF β -1) as measured by alpha-smooth muscle actin (α -SMA) expression. To determine if differentiation can be influenced vocal fold fibroblasts were treated with varying doses of IL-6, hepatocyte growth factor (HGF) and TGF β -1. The effect of TGF- β 1 on α -SMA expression, as measured by western immunoblotting, was attenuated when combined with either IL-6 or HGF. Extent of differentiation appears to be attenuated by HGF suggesting a potential mechanism to support prior work indicating that HGF plays a role in scar formation in vocal fold injuries. Paradoxically, IL-6 which has been shown to play a pro-fibrotic role in dermal studies also attenuated the TGF- β 1 response. The myofibroblast model characterized in this study will be useful in future studies that seek to elucidate the mechanisms of potential therapeutics targeting the reduction vocal fold fibrosis.

The Establishment of a Scarring Model in Mouse Vocal Fold Lamina Propria

Masaru Yamashita, MD, PhD*
Diane M. Bless, PhD
Nathan V. Welham, PhD*
Madison, WI

Vocal fold scarring is an intractable condition often resulting in severe dysphonia and voice handicap. Mouse experimental models have had limited use in vocal fold research to date, primarily due to size limitation, however, these models offer a powerful opportunity to study disease mechanisms via gene knockout. Our previous work reported an endoscopic surgical methodology for creating vocal fold injuries in FVB strain mice. In this study, we evaluated unilateral injury outcomes and scar formation over time using histological and immunohistochemical techniques. We observed significant alteration in vocal fold morphology, extracellular matrix (ECM) organization, and ECM protein abundance, in injured vocal folds compared with control. We confirmed the presence of scarring in the lamina propria by 8 weeks post-injury. This mouse model shows promise as a tool to study vocal fold disease mechanisms and pathophysiology (both scarring and other) in conjunction with the eventual use of selective gene knockout.

The Safety and Effectiveness of HA Hydrogel in Immortalized Vocal Fold Fibroblast Cell Lines

Xia Chen, MD, PhD*
Susan Thibeault, PhD
Madison, WI

In order to promote wound repair and induce tissue regeneration, an engineered hyaluronan (HA) hydrogel has been developed exclusively for extracellular matrix defects of the superficial and middle layers of the lamina propria. The purpose of this study was to evaluate the safety and effectiveness of the HA hydrogel on an immortalized human vocal fold fibroblast (hVFF) cell line prior to clinical trials. Immortalized hVFF proliferation, viability, apoptosis and transcript analysis of both ECM constituents and inflammation were measured for both 2D and 3D conditions. There were no significant differences in viability and apoptosis of IVFF cultured with HA hydrogel compared with Matrigel. Gene expression levels for collagen I, fibronectin, fibromodulin, hyaluronic acid synthase, hyaluronidase, TGF- β 1, COX2, IL6, IL8 and TNF α were similar between the HA hydrogel and Matrigel. This study demonstrates the safety and effectiveness of the engineered HA hydrogel with a human vocal fold fibroblast model.

Treatment of Adult Recurrent Respiratory Papillomatosis with the Flexible CO₂ Waveguide Fiber

Karen M. Bellapianta, MD*
Chris Brook, MD*
Stanley M. Shapshay, MD
Albany, NY

We present a case of a 58 year old male who has suffered from recurrent respiratory papillomatosis (RRP) for over fifty years and has undergone multiple endoscopic procedures. As technology advances, so does the ability to treat this disease. This remains a difficult and unpredictable disease to handle, however with the advent of the flexible CO₂ laser, we are able to treat the disease in a way that wasn't achievable in the past. This patient represents a difficult case whose disease is manageable only secondary to the advancing technology of the flexible CO₂ waveguide laser.

Treatment of Vocal Fold Scar with Local Injection of Basic Fibroblast Growth Factor: A Canine Study

Atsushi Suehiro, MD*
Shigeru Hirano, MD, PhD*
Yo Kishimoto, MD*
Ichiro Tateya, MD, PhD*
Shin-ichi Kanemaru, MD, PhD*
Tatsuo Nakamura, MD, PhD*
Juichi Ito, MD, PhD*
Kyoto, JAPAN

Treatment of vocal fold scarring has not been established. We have examined several types of regenerative therapies, such as stem cell implant or growth factor therapy. In this study the effect of Basic Fibroblast Growth Factor (bFGF) for regeneration of scarred vocal fold was examined using canine model. Canine vocal folds were unilaterally scarred by stripping of the mucosa under direct laryngoscopy. Local injections of bFGF into the scarred vocal folds were performed at 1 month after the initial injury with an interval of revealed improvements of PTP (Phonation Threshold Pressure) and mucosa amplitude in the treated group as compared to sham, which suggested that bFGF injection therapy may have a potential to restore vocal fold scarring.

Vocal Fold Impairment Following Calcium Hydroxylapatite (HA) Injection

Jonathan Y. Ting, MD*
Keith E. Early*
Stacy L. Halum, MD*
Indianapolis, IN

While HA is a popular material used in vocal fold augmentation (VFA), HA injections may rarely result in voice impairment. We performed a retrospective review of patients with impaired phonation following HA injection for VFA. Four patients were identified. Two patients had videostroboscopy demonstrating adynamic vocal folds with HA visible superficially in Reinke's space, while two had significant asymmetry of mucosal waveform propagation despite HA not being superficially visible. One patient underwent microflap excision of the HA material, with pathology demonstrating foreign body reaction. We conclude HA may result in impaired rather than improved voice quality in certain cases. Appropriate injection technique and preoperative recognition of patients at risk can help minimize poor outcomes.