

**AMERICAN LARYNGOLOGICAL ASSOCIATION
ONE HUNDRED AND THIRTY-FIRST ANNUAL MEETING**

**FIRST DAY, WEDNESDAY, APRIL 28, 2010
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

Marvin P. Fried, MD

Bronx, NY

The ALA as a Microcosm of Medicine

Presidential Citations

Hugh Biller, MD, *Wells, ME*

Daniel Brasnu, MD, *Paris, France*

Mrs. Jaimie Fried Dockray, *New York, NY*

Mrs. Rita Fried, *New York, NY*

Mrs. Karen Fried Jacob, *Sudbury, MA*

Matina Horner, PhD *Cambridge, MA*

New York Laryngological Society

(Mark Persky, MD will accept on behalf of the Society)

Presentation: Marvin P. Fried, MD, *New York, NY*

8:20 a.m. Guest of Honor Remarks

Frank E. Lucente, MD, *Brooklyn*

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

8:27 a.m. Recognition of Program Committee

Clarence Sasaki, MD, *New Haven, CT*

Dana Thompson, MD, *Rochester, MN*

Gady Har El, MD, *New York, NY*

Daniel Brasnu, MD, *Paris, FRANCE*

Blake Simpson, MD, *San Antonio, TX*

SCIENTIFIC SESSION I

Moderators:

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

Gerald B. Healy, MD, *Boston, MA*

8:30 a.m. Prevalence of Laryngeal and Pharyngeal Symptoms in Patients with Environmental Allergy

Avani P. Ingley, MD*

Sarah K. Wise, MD*

Melissa Rotella, NP-C*

Michael M. Johns II, MD

Atlanta, GA

INTRODUCTION: While allergic patients typically present with nasal and ocular symptoms, environmental allergies may be responsible for laryngeal and pharyngeal complaints.

METHODS: Retrospective review of patients undergoing allergy skin testing from November 2006 to October 2009. Patients with positive tests to 5 or fewer antigens were classified as “mild reactors”; those with positive tests to 11 or more antigens were classified as “extensive reactors”.

RESULTS: Fifty patients were included. Laryngeal and pharyngeal symptoms were present in 10 of 22 (45.5%) mild allergy reactors, and in 11 of 28 (39.3%) extensive reactors. There was no significant difference between the mild and extensive reactor groups for laryngeal and pharyngeal symptoms ($p = 0.78$). Cough was the most common complaint, seen in 20% of patients. No patient complained of dysphonia or hoarseness.

CONCLUSION: Laryngeal and pharyngeal symptoms are not delineated by allergy severity. Dysphonia is a rare complaint in the allergic patient.

8:37 a.m. Acidic Contents of Laryngopharyngeal Reflux Weaken Vocal Fold Epithelial Barrier Function

Elizabeth Erickson, MS, CF-SLP*

Mahalakshmi Sivasankar, PhD, CCC-SLP*

West Lafayette, IN

Over 50% of patients with voice problems are posited to have laryngopharyngeal reflux (LPR). In LPR, gastric contents contact the vocal fold epithelium and potentially weaken epithelial barrier function. This study investigated the differential effects of common gastric contents (acid and pepsin) on vocal fold epithelial barrier function using both electrophysiology and light microscopy techniques. Porcine vocal fold epithelia (N = 56) were exposed to one of three challenges: (i) Luminal Pepsin (pH7); (ii) Luminal Pepsin + Acid (pH3); and (iii) Luminal Acid (pH3). Low pH (pH3) but not neutral pH (pH7) significantly increased vocal fold permeability. Follow-up investigations revealed that the increased permeability was solely due to acid exposure. Challenges at acidic pH deteriorate vocal fold epithelial barrier function and may increase vocal fold susceptibility to mechanical damage and inhaled pathogens and pollutants. The application of these findings to developing optimal treatments for LPR will be presented.

8:44 a.m. 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 of 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.

**8:51 a.m. Inter-Versus Intra-Rater Reliability of the Reflux Finding Score in
The Paediatric Larynx**

Shiraz Ahmed, MD*

Mike W. Saunders, MD*

David D. Pothier, MSc*

Bristol, UNITED KINGDOM

Laryngopharyngeal reflux (LPR) has been associated with many otolaryngological disorders. The gold standard of pH monitoring is not commonly undertaken, but physical signs of LPR have been described and collated as a reflux finding score (RFS). This has not been validated in children. ENT surgeons were shown a series of twenty digital video clips of paediatric rigid laryngoscopies. The first ten were unique clips, but the second series of ten were repeats of the original ten clips that had been rotated on two planes. The participants were asked score each clip. Inter rater reliability was poor (Krippendorff's alpha ranged from $r=0.06$ to $r=0.32$). Intra-rater reliability was better, (ranging from $r=0.19$ to $r=0.46$, but less than the level required for a reliable staging system ($r=0.8$). Domains within the scoring system were subject to substantial variability. These data suggest that the RFS cannot be applied to children in a consistent way.

8:58 a.m. RESIDENT RESEARCH AWARD

Reevaluation of Gastroesophageal Reflux as a Risk Factor for Laryngeal Cancer

David O. Francis, MD*
Bevan Yueh, MD, MHP*
Albert L. Merati, MD
Ernest A. Weymuller Jr., MD
Charles Maynard, PhD*
Gayle Reiber, MPH, PhD*
Seattle, WA/Minneapolis, MN

Presentation: Marvin P. Fried, MD
Bronx, NY

INTRODUCTION: The relationship between gastroesophageal reflux disease (GERD) and cancer of the larynx is not fully elucidated. This case-control study aimed to determine whether GERD increases odds of developing this malignancy.

METHODS: Rates of GERD among cases with laryngeal cancer identified in the Veteran's Administration database (2000-2006) were compared to controls; multivariate logistic regression measured the association between GERD and cancer.

RESULTS: 14,449 cases were matched 1:1 with controls. After adjusting for tobacco and/or alcohol use, no relationship was seen between GERD and laryngeal cancer in general (AOR 1.01, 0.92 – 1.12, p=0.780). However, in subsite analysis, GERD was associated with 42% increased odds of developing glottic cancer (AOR 1.42, 1.12 – 1.80, p=0.003).

CONCLUSIONS: GERD did not increase the overall risk of laryngeal cancer, but in subsite analysis, did specifically increase the risk of developing glottic cancer. These results challenge the previously reported strength of association between GERD and laryngeal cancer.

9:07 a.m. Discussion

9:17 a.m. PANEL DISCUSSION

Topic: *International Perspective on Common Laryngeal Problems*

Moderator: Daniel Brasnu, MD, *Paris, FRANCE*

Panelists:

Jéan Abitbol, MD, PhD, *Paris, FRANCE*

Steffen Maune, MBBS, *Koln, GERMANY*

Tadashi Nakashima, MD, *Kurume, JAPAN*

Wolfgang Steiner, MD, *Goettingen, GERMANY*

9:45 a.m. Intermission/Visit Exhibits

SCIENTIFIC SESSION II

Moderators:

Kenneth Altman, MD, PhD, *New York, NY*

Charles N. Ford, MD, *Madison, WI*

10:15 a.m. Transoral Laser Microsurgery for T1a Glottic Cancer – A Review of 404 Cases

Alexios Martin, MD*

Carsten E. Palme, MD*

Petra Ambrosch, MD*

Ralph M. W. Roedel, MD*

Martina Kron, PhD*

Wolfgang Steiner, MD

*Goettingen, GERMANY/Sydney, AUSTRALIA/Kiel, GERMANY/
Ulm, GERMANY*

INTRODUCTION: A variety of therapeutic options with good oncological results exist for treatment of T1a glottic cancer. Traditionally external beam radiotherapy has been favored over surgical excision given the non-invasive nature of this approach. This notion has been challenged by the emergence of transoral laser microsurgery (TLM).

PROCEDURES: A retrospective chart review was carried out. All patients with untreated T1a glottic SCC were eligible. Voice quality was analyzed. End points for statistical analysis were locoregional recurrence, patients dying as a result of glottic SCC, overall survival and larynx preservation.

RESULTS: Four hundred and four patients were eligible for inclusion. Five-year Kaplan-Meier estimates: local control 86.8%, overall survival 87.8%, disease specific survival 100%, larynx preservation 98%. Low complication rate (1%), the majority of patients had either normal or mildly dysphonic voices.

CONCLUSIONS: TLM for T1a glottic SCC is a treatment modality with excellent oncological and functional results.

10:22 a.m. Pharyngeal Closure with Endoscopic Stapler after Total Laryngectomy

Chih-Kwang Sung, MD*
Ramon A. Franco Jr., MD*
Boston, MA

OBJECTIVES: Total laryngectomies (TL) are performed as primary or salvage therapy for laryngeal carcinoma. Pharyngotomy closure is typically performed using manual sutures. Previously described closed stapling techniques do not allow direct evaluation of surgical margins and are limited to endolaryngeal disease. We describe an open technique for pharyngotomy closure using a mechanical stapling device.

METHODS: A retrospective review of seven TL from May 2008 to September 2009 utilizing an Ethicon GIA 45 endostapler.

RESULTS: Seven patients (6 male, 1 female), mean age 68, received TL (6 salvage, 1 primary) with endostapler closure and primary tracheoesophageal puncture (TEP). Average time to swallowing was 11.9 days (range 2-27) and mean hospital stay 6.6 days (range 3-9). Fistula incidence was 29% (2/7).

CONCLUSIONS: Mechanical stapling is a simple method for post-laryngectomy open pharyngotomy closure. This technique allows evaluation of margins, easy primary TEP, and the opportunity for early swallowing and shorter hospital stays.

10:29 a.m. YOUNG FACULTY/PRACTITIONER AWARD

3D Arytenoid Movement Induced by Vocal Fold Injections

I-Fan Theodore Mau, MD, PhD

Kent Weinheimer, BS*

Dallas, TX

Presentation: Marvin P. Fried, MD

Bronx, NY

INTRODUCTION/OBJECTIVES: 1. To create a high-resolution, 3D reconstruction of cricoarytenoid subluxation to understand its anatomy and functional consequence. 2. To examine the role of cricoarytenoid ligament in prevention of anterior arytenoid subluxation.

STUDY DESIGN/METHODS: Development of image processing algorithms and case study. Axial CT images of a larynx with a subluxed arytenoid were processed with custom MATLAB routines to create a versatile 3D reconstruction. Geometries of the subluxed and non-subluxed arytenoids were quantitatively compared. Position of the cricoarytenoid ligament from historical histologic sections was also examined with 3D reconstruction.

RESULTS: The anteromedially subluxed arytenoid has an inferoposteriorly displaced vocal process, resulting in an elongated vocal fold. Posterior displacement of vocal process has not been described previously. Comparison with 3D position of the cricoarytenoid ligament suggests the ligament does not prevent anterior subluxation as commonly believed.

CONCLUSIONS: Selective 3D reconstruction is a powerful tool for advancing understanding of cricoarytenoid joint mechanics.

10:38 a.m. Organ Preservation Surgery for Laryngeal Squamous Cell Carcinoma: Low Incidence of Thyroid Cartilage Invasion

Dana Hartl, MD, PhD*

Guillaume Landry, MD*

Stephane Hans, MD, PhD*

Patrick Marandas, MD*

Daniel F. Brasnu, MD

Paris, FRANCE/Villejuif, FRANCE

OBJECTIVE: Determine the incidence and risk factors for thyroid cartilage invasion in early- and mid-stage laryngeal cancer.

PATIENTS AND METHODS: Retrospective review (1992-2008) of endolaryngeal tumors treated by open partial laryngectomy with at least partial resection of the thyroid cartilage. Preoperative laser, radiation therapy or chemotherapy were excluded. Tumor stage, subsites, vocal fold (VF) mobility, CT scan and histopathological cartilage status were recorded.

RESULTS: 360 patients were treated for tumors staged T1 (33%), T2 (52%) or T3 (15%) by vertical (26%), supracricoid (62%) or supraglottic partial laryngectomy (12%). The thyroid cartilage was invaded in 8.9% of cases. Abnormal VF mobility was significantly related to thyroid cartilage invasion (Fischer's exact, $p < .0001$). Neither anterior commissure involvement nor CT scan were related to cartilage invasion.

CONCLUSIONS: Thyroid cartilage invasion was rare but more frequent if VF mobility was impaired. This has implications for transoral resection which avoids unnecessary cartilage resection, unlike open surgery.

10:45 a.m. Discussion

SCIENTIFIC SESSION III

Moderators:

Roger L. Crumley, MD, MBA, *Irvine, CA*
Robert T. Sataloff, MD, DMA, *Philadelphia, PA*

10:50 a.m. The Effects of Trophic Factor Combinations on Regenerating Vagal Motoneurons in Vitro

Bryan R. McRae, MD*
Stacey L. Halum, MD*
Geoffrey P. Aaron, BS*
Indianapolis, IN

OBJECTIVES: While vagus nerve (VN) injury is a common cause of dysphonia and dysphagia, direct study of brainstem-derived VN motoneurons in culture has been limited. In this study, our recently-developed technique for obtaining dissociated VN motoneuron cultures was used to assess the growth responses of regenerating VN motoneurons to combinations of different neurotrophic factors. Study design: In vitro experiment, mammalian cells.

METHODS: Primary VN motoneurons were obtained from the nucleus ambiguus of adult rats. Dissociated motoneurons were then incubated in combinations of trophic factors (GDNF, BDNF, and CNTF). Neurite outgrowth and branching patterns were determined for each pair.

RESULTS: Optimal combinations of trophic factors with regards to neurite branching and outgrowth were identified and compared with the individual factors' growth effects.

CONCLUSION: This study demonstrates that VN motoneurons can be derived and maintained in culture. The model facilitates the study of VN regeneration in response to various trophic factor combinations.

**10:57 a.m. Phoniatic Results (PR) of Bilateral Vocal Cord Palsy (bVCP)
Treated by Endoscopic Arytenoid Lateropexy (EAL)**

Gyorgy Smehak, MD*
Laszlo Szakacs, MD*
Alice Szamoskozi, MD*
Laszlo Rovo, MD, PhD*
Szeged, HUNGARY

OBJECTIVES: bVCP can be treated with different methods, which usually do not provide good voice quality. EAL is a reversible technique based on the arytenoid abduction with a suture. Preservation of laryngeal structures ensures the reversibility and good PR afterwards.

METHODS: We assessed the PR (acoustics, perception, videostroboscopy and self-evaluation) of EAL in terms of reversibility and the postoperative phonation on 32 consecutive bVCP patients with one year follow up.

RESULTS: Thirteen patients experienced complete motion recovery of at least one of their vocal cords with PR comparable to normal parameters. Eight patients had incomplete vocal cord recovery, with slightly impaired voice quality. Six patients had socially acceptable voice, but false vocal cord phonation. Five patients had complete palsy with poor phoniatic outcome.

CONCLUSION: EAL ensures voice quality preservation in case of temporary paralysis and it may provide good voicing in cases of partial recovery of the vocal cords.

**11:04 a.m. Non-Invasive Determination of Laryngeal Sensory Nerve Conduction:
Findings in Normals and Neuropathic Patients**

Jonathan M. Bock, MD

Safwan Jaradeh, MD*

Thomas Prieto, PhD*

Albert L. Merati, MD

Robert J. Toohill, MD

Joel H. Blumin, MD

Milwaukee, WI/Seattle, WA

INTRODUCTION: We report a new surface technique for studying sensory conduction in the superior laryngeal nerve (SLN).

METHODS: Surface stimulation of the vagus nerve 7-10 cm proximal to a surface electrode placed over the cricothyroid muscle was performed in controls and in subjects with needle electromyographic-confirmed laryngeal neuropathy. Cathodal stimulation was applied beneath the mastoid process, behind the posterior edge of the sternocleidomastoid muscle; conduction parameters were determined.

RESULTS: Non-invasive SLN conduction nerve studies were performed on healthy volunteers (n=28) as well neuropathic subjects (n=27). Age and gender were not significantly different between groups. Compared to controls, the neuropathic subjects had statistically significant differences in baseline-to-peak amplitude, conduction velocity, and intra-subject side-to-side amplitude ratio ($p<0.05$) of the SLN as determined by the surface conduction technique.

CONCLUSIONS: Laryngeal sensory nerve conduction can be determined non-invasively. This study provides a reproducible method for electrophysiological evaluation of a sensory branch of the superior laryngeal nerve.

11:11 a.m. Reanimation of the Bilaterally Paralyzed Canine Larynx with an Implantable Stimulator

Kenichiro Nomura, MD*

Isamu Kunibe, MD*

Akihiro Katada, MD*

Rajshri Nainthia, BS*

Yike Li, MD*

Cheryl Billante, PhD*

Yasuaki Harabuchi, MD*

David L. Zealear, PhD*

Nashville, TN/Asahikawa, JAPAN

The aim of this study was to examine the efficacy and the safety of bilateral stimulation of paralyzed posterior cricoarytenoid (PCA) muscle to restore vocal fold abduction over the long term (8-20 months). Four canines were implanted and paralyzed by recurrent laryngeal nerve neurotomy. Stimulated and spontaneous glottal area was measured endoscopically in anesthetized animal. Exercise tolerance was measured on a treadmill in awake animal. Swallowing study was performed endoscopically and radiographically. During the denervation phase, ventilatory compromise and stimulated response were minimal. During the reinnervation phase, paradoxical inspiratory closure obstructed the airway resulting in severe ventilatory compromise and exercise tolerance of less than 1 minute. Bilateral stimulation restored glottal area and exercise tolerance to normal. There was no evidence of aspiration. Lead integrity was improved by prevention of device migration. In conclusion, ventilation and activity level could be restored to normal without aspiration by a bilateral nonsynchronized stimulator.

11:18 a.m. Quantitative Laryngeal Electromyography (LEMG): Turns Analysis in Healthy Adults and Patients with Recurrent Laryngeal (RLN) Neuropathy

Melissa McCarty Statham, MD*

Clark A. Rosen, MD

Sanjeev D. Nandedkar, PhD*

Michael C. Munin, MD*

Cincinnati, OH/Pittsburgh, PA

The objective of this study was to develop normative data in controls for turns to amplitude analysis of the thyroarytenoid-lateral cricoarytenoid muscle complex (TA-LCA) and to compare results to patients with subacute recurrent laryngeal nerve (RLN) mononeuropathy. In this retrospective case-control study, we performed concentric needle LEMG of the TA-LCA in 21 controls and 16 patients with unilateral VFP. Quantified turns and mean amplitude/turn were measured for ≥ 10 epochs/individual. A linear-scale cloud was constructed for both controls and patients. The median age of controls and patients was similar (50.7 vs 48.5 years). In controls, regression analysis comparing mean amplitude per turn to the root-mean-square amplitude demonstrated high correlation ($R=0.82$). In controls, a normal cloud for the TA-LCA was delineated with mean amplitude 334 μV and 450 turns/second. Turns analysis from patients showed mean amplitude 299 μV and 290 turns/second. Very few data points in patients showed > 400 turns/second, and mean turns were statistically different from controls ($p=0.002$). Our study is the first to describe interference pattern analysis in the TA-LCA in healthy adults and patients with unilateral VFP. In patients with unilateral vocal fold paralysis, we found a decreased number of turns during a range of phonatory effort compared to controls.

11:25 a.m. Discussion

11:30 a.m. DANIEL C. BAKER, JR. LECTURE

“The Health Care Conundrum”

Michael M. E. Johns, MD

Atlanta, GA

Introduction: Marvin P. Fried, MD

Bronx, NY

12:05 p.m. Adjournment

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

Location: Grand Salon

SECOND DAY, THURSDAY, APRIL 29, 2010
Afternoon Session

12:30 p.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 IV

Moderators:

Gayle E. Woodson, MD, *Springfield, IL*
Jerry Goldstein, MD, *Lake Worth, FL*

1:00 p.m. Medialization vs. Reinnervation for Unilateral Vocal Fold Paralysis: A Multicenter Randomized Clinical Trial

Randal C. Paniello, MD
Julia D. Edgar, PhD*
Dorina Kallogieri, MD, MPH*
Jay F. Piccirillo, MD*
St. Louis, MO

PURPOSE: Medialization laryngoplasty (ML) and laryngeal reinnervation (LR) as treatments for unilateral vocal fold paralysis (UVFP) were compared in a multicenter, randomized clinical trial.

METHODS: Qualified, consenting patients underwent either ML or LR. Voice results were compared pre-treatment and at 6 and 12 months post-treatment using untrained listener ratings (ULR), GRBAS scores, and voice-related quality of life (VRQOL) scores.

RESULTS: 24 patients from 9 sites completed the study, 12 in each group. There were no significant intergroup differences in pre-treatment variables. At 12 months, the study groups showed no significant differences in RUL, GRBAS or VRQOL scores. However, patient age significantly affected the LR, but not the ML, group results. The age<52 LR subgroup had significantly ($p<0.05$) better scores than the age>52 LR subgroup, and trended better than the age<52 ML subgroup. The age>52 ML subgroup results were significantly better than the age>52 LR subgroup.

CONCLUSION: ML and LR are both effective surgical options for patients with UVFP. Reinnervation should be considered in younger patients, while medialization should be favored in older patients.

1:07 p.m. CASSELBERRY AWARD

The Effect of Decorin in Vitro and Ex Vivo in a Porcine Model of Vocal Fold Scarring

Priya Krishna, MD

Michael Regner, MS*

Joel Palko, MS*

Fang Liu, BS*

Steve Abramowitch, PhD*

Jack Jiang, MD, PhD*

Alan Wells, MD, DMSc*

Pittsburgh, PA/Madison, WI/Columbus, OH

Award Presentation: Marvin P. Fried, MD

Bronx, NY

Vocal fold scar eludes optimal treatment. We studied effects of decorin on pig vocal fold lamina propria fibroblasts in vitro and on rheology and biomechanics of excised larynges and vocal folds. Fibroblast monolayers were scratched and treated with decorin 20ug/ml, TGF-b1 10ng/ml, and HGF 200ng/ml. Image analysis and western blot was performed. Eleven pigs underwent vocal fold stripping and vocal fold injection with decorin, saline or HGF primed fibroblasts. Larynges were harvested day 30 and underwent rheometry or ex vivo measurements. Monolayer wound closure was decreased in decorin versus TGF-b1 treated fibroblasts ($p < 0.0005$). Blots showed decreased collagen production after 24 hours decorin exposure. Tan delta (0.20) for decorin and fibroblast treated samples trended towards normal values. Biomechanical testing demonstrated phonation threshold pressure as statistically different between decorin and HGF primed fibroblast groups ($p < 0.05$). Decorin decreases wound contraction and may improve laryngeal biomechanics in a porcine vocal fold scar model.

1:16 p.m. ALA/ALVRE 2008 RESEARCH GRANT AWARD

Effects of Thyroarytenoid and Cricothyroid Muscle Activation Levels on Phonation Onset Pressure, Vocal Fold Length, and Fundamental Frequency

Dinesh K. Chhetri, MD*

David Berry, PhD*

Juergen Neubauer, PhD*

Los Angeles, CA

The complex interactions between the cricothyroid (CT) and thyroarytenoid (TA) muscles in phonation were studied using an in vivo canine model. Each CT and TA muscle pairs were stimulated at eleven levels of graded stimulation from threshold to maximal contraction for a total of 121 unique CT/TA activation level conditions. Phonation threshold pressure (Pth), vocal fold length (Lvf), and fundamental frequency (Fo) were measured at each condition. TA activation (aTA) increased Pth at all CT activation (aCT) levels. However, aCT increased Pth at low aTA but decreased Pth at higher aTA levels. TA and CT were antagonistic in control of Lvf, and Lvf changed linearly with aCT and aTA levels. aCT was responsible for increasing Fo, while aTA decreased Fo at all aCT. These results demonstrate the complex antagonistic roles of the CT and TA muscles in control of Fo and phonatory effort.

1:24 p.m. Quantitative Analysis of Videokymography (VKG) in Normal and Pathologic Voice Folds: A Prospective Study

Giorgio Peretti, MD
Cesare Piazza, MD*
Francesca Del Bon, MD*
Stefano Mangili, MD*
Giovanna Cantarella, MD*
Marcello Calisti *
Claudia Manfredi*

Brescia, ITALY/Florence, ITALY/Milan, ITALY

VKG captures high speed images of the vocal folds independently from the periodicity of the acoustic signal. Aim of this study is to introduce a software to objectively measure specific parameters of vocal fold vibration. We evaluated 24 subjects (10 normal, 7 with benign lesions, and 7 after cordectomies) using a VKG camera with a 70° telescope during phonation. Images were analyzed by a software developed by us. Different parameters were considered, including the ratio between the duration of open and closed phase within the glottal cycle (Roc), and the ratio between the amplitude of the vibration of one vocal fold with respect to the contralateral (Ramp). Mean values for Roc and Ramp in normal subjects were 1.33 and 1.07, for benign lesions 2.42 and 1.38, and after cordectomies 1.65 and 1.18. Quantitative analysis of VKG is useful for objective evaluation of vibratory patterns in normal and pathologic vocal folds.

1:31 p.m. Discussion

SCIENTIFIC SESSION V

Moderators:

Michael S. Benninger, MD, *Cleveland, OH*
Robert H. Ossoff, DMD, MD, CHC, *Nashville, TN*

1:36 p.m. Treatment Success of Age-Related Voice Fold Atrophy

Jackie Gartner-Schmidt, PhD*
VyVy Young, MD*
Clark A. Rosen, MD
Pittsburgh, PA

Age-related dysphonia has been estimated to occur in 12%-35% of the population. Treatment success for voice therapy/surgery is unclear. Review of treatment outcomes related to voice therapy and surgery for all patients with vocal fold atrophy over the age of 55 during a 2-year period was performed. The pre/post VHI-10 served as the primary metric. Treatment improvement was defined as a pre/post delta VHI-10 of 5 or more. Two hundred and fifty-six patients fit the inclusion/exclusion criteria and were divided into the following groups: no treatment desired; surgery alone; voice therapy alone; voice therapy/surgery. Over two thirds desired no treatment (198/256). Thirty-seven percent of the voice therapy only group showed improvement and 14% of those went on to have surgery. Twenty-nine percent improved after surgery. Most elderly patients with vocal fold atrophy opted for no treatment. Thirty-eight percent responded to either voice therapy or surgery following voice therapy.

1:43 p.m. 532-Nanometer Potassium Titanyl Phosphates (KTP) Laser-Induced Expression of Selective Matrix Metalloproteinases (MM) in the Rat Larynx

Pavan S. Mallur, MD*
Milan R. Amin, MD*
Ryan C. Branski, PhD*
New York, NY

Though the 532nm KTP laser is utilized for vocal fold pathology, little is known about the mechanism of action. Previously, we described a model for KTP-induced injury in the rat larynx. This study uses the model to determine the KTP-induced histological changes and expression of MMP subtypes in the rat larynx. Endoscopic injury of rat vocal folds with the KTP laser was followed by gross and histological analyses, and mRNA quantification of MMP subtypes and inflammatory markers. Our study revealed healing of the vocal fold mucosa by seven days, and an immediate inflammatory infiltrate with no subsequent ultrastructural changes. MMP-3 expression increased transiently. No changes were seen in the expression of MMP-9, an MMP involved in extracellular matrix (ECM) remodeling, or TGF- β , a profibrotic cytokine. These data suggest that the KTP laser induces a modest inflammatory response, selective MMP expression, and no long-term fibrotic processes in a clinically relevant simulation.

1:50 p.m. Role of Tumor Necrosis Factor-Alpha (TNF-ALPHA) in Wound Repair in Human Vocal Fold Fibroblasts

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

Normal wound repair in the vocal fold depends on interaction between secreted cytokines and local cells. TNF-alpha is a pleiotropic cytokine and apoptotic molecule that appears to be a mediator in inflammation and fibrosis. The purpose of this study was to evaluate the response of human vocal fold fibroblasts in three dimensional (3D) cell culture to provide insight as (hVFF) to TNF-alpha to whether TNF-alpha may be a therapeutic target to improve vocal fold wound healing. In 3D, TNF-alpha (0.5-100ng/ml) was shown to down-regulate hVFF ECM related mRNA transcript levels -- Collagen I, Collagen III, fibronectin and TIMP3. At low dosages (0.5-10ng/ml) TNF-alpha up-regulated TGF-beta1 mRNA it down-regulated expression, however, at high dosages (100ng/ml) of TNF-alpha TGF-beta1 levels. TNF-alpha inhibited hVFF proliferation in a dose-dependent manner. These data reveal that TNF-alpha neutralization may be a potential therapeutic target for the study of the amelioration of fibrosis related vocal fold scarring.

1:57 p.m. Discussion

2:02 p.m. AWARD PRESENTATION

American Laryngological Association Award

Clarence T. Sasaki, MD, *New Haven, CT*

Presentation: Andrew Blitzer, MD, DDS

New York, NY

2:08 p.m. AWARD PRESENTATION

Gabriel Tucker Award

Charles M. Myer III, MD*, *Cincinnati, OH*

Presentation: John A. Tucker, MD

Philadelphia, PA

2:15 p.m. Intermission/Visit Exhibits

SCIENTIFIC SESSION VI

Moderators:

Marshall Strome, MD, MS, *New York, NY*
H. Bryan Neel III, MD, PhD, *Rochester, MN*

2:45 p.m. Inflammatory Signaling in Human Vocal Fold Fibroblasts

Ryan C. Branski, PhD*
Hang Zhou, MD*
Diane Felsen, PhD*
Dennis H. Kraus, MD
New York, NY

Investigation regarding pathways associated with the acute inflammatory response in mesenchymal cells is critical to the development of novel, physiologically-based therapies for vocal fold injury and fibrosis. We investigated the in vitro effects of pro-inflammatory mediators on cyclo-oxygenase (COX)-2, its upstream regulatory proteins and its downstream product, prostaglandin (PGE)2 in our immortalized human vocal fold fibroblast cell line (HVOX). In HVOX, interleukin (IL)-1 β regulated NF- κ B mRNA expression, activation, and nuclear translocation as well as both transcription and translation of COX-2. IL-1 β increased PGE2 synthesis, but also increased basal expression of membrane-bound prostaglandin receptors, suggestive of both autocrine and paracrine control of prostaglandin signaling in HVOX. The COX-2/PGE2 signaling pathway is particularly relevant given that it is upregulated in vocal fold lesions in contrast to the lower airway where decreased PGE2 is associated with fibrosis. In addition, this pathway is amenable to pharmacological inhibition.

2:52 p.m. Long-Term Outcomes of Injection Laryngoplasty in Patients with Potentially Recoverable Vocal Fold Paralysis

Lindsey Arviso, MD*
Adam M. Klein, MD
Clyde C. Mathison, MD*
Michael M. Johns II, MD
Atlanta, GA

INTRODUCTION: Injection laryngoplasty (IL) is commonly used as a temporary intervention for vocal fold paralysis (VFP) while awaiting spontaneous recovery, compensation, or definitive intervention. This study seeks to define the long-term outcomes of patients with potentially recoverable RLN injury treated with IL.

METHODS: A single institution retrospective review performed from January 2004 to July 2008 for patients with potentially recoverable VFP who had IL.

RESULTS: Of 81 total injections for this situation in 71 patients, 45 patients had greater than 6-month follow-up after IL (9 month overall mean follow up). Eleven patients (24%) had full recovery of their paralysis within an average of 7 months. Three partially recovered (2%) and 17 (38%) compensated well, obviating further intervention. Only fourteen (31%) required further definitive intervention. The majority (69%) of patients required no further intervention after IL.

CONCLUSION: This study demonstrates significant long-term improvement after IL performed using temporary materials.

2:59 p.m. The Prevalence, Diagnosis, and Management of Voice Disorders in a National Ambulatory Medical Care Survey (NAMCS) Cohort

Simon R. A. Best, MD*
Carole Fakhry, MD, MPH*
Baltimore, MD

PURPOSE: Describe prevalence, presentation and management of voice complaints (VC) in a national cohort of ambulatory patients.

METHODS: Retrospective analysis of 2006 NAMCS database.

FINDINGS: Of 29,392 outpatient encounters, 0.23% and 2.9% of total and otolaryngology visits, respectively, were for VC. In comparison to patients without VC, those with VC were similar in age (49.4% vs. 45.4%, $p=0.18$), more likely female (73.1% vs. 59.0%, $p=0.02$), Caucasian (88.0% vs. 82.4%, $p=0.02$), current smoker (16.4% vs. 10.6%, $p=0.02$) and acute onset (57.3% vs. 31.1%, $p=0.003$). The most common diagnostic procedure was fiberoptic laryngoscopy (24%). Primary laryngeal pathology (27%) was more commonly diagnosed than infectious (19%), or gastrointestinal pathology (10%). 19% and 12%, respectively were prescribed antibiotics or anti-reflux medication, and 9% referred to another specialist or voice therapy (12%).

CONCLUSION: Nationwide, VC are uncommon, however this study contributes to an understanding of their prevalence, outpatient presentation and management before otolaryngology encounter.

3:06 p.m. Cross-Sectional Imaging of Vocal Fold Mucosal Wave Dynamics with Triggered High-Speed Optical Coherence Tomography

James B. Kobler, PhD*

Ernest W. Chang, BS*

Steven M. Zeitels, MD

Seok-Hyun Yun, PhD*

Boston, MA

Functional laryngeal video imaging is very useful clinically, but is limited to surface views and can be difficult to quantify. We therefore adapted optical coherence tomography (OCT) for capturing calibrated cross-sectional movies of vibrating vocal folds, with high temporal, spatial and depth resolution. Novel technology was developed for triggering high-speed optical-frequency-domain-OCT on phonatory fundamental frequency, as in video-laryngeal-stroboscopy. Excised calf hemi-larynges were imaged during phonation. Phonatory and imaging parameters were varied to examine mucosal motion and characterize factors affecting motion-capture quality. We obtained unique high-resolution, coronal, cross-sectional movies with 100-200 frames/cycle. Mucosal wave deformations, including motion of epithelium and lamina propria were observable and quantifiable. Oscillatory stability and tissue velocity were identified as key factors influencing movie quality. Motion OCT is feasible and provides new opportunities for relating dynamic vocal fold biomechanics to epithelial and sub-epithelial anatomy. This non-contact technology has potential for incorporation into endoscopes for office-based clinical applications.

3:13 p.m. Does It Really Exist – the Post Thyroidectomy Syndrome Following Thyroidectomy?: Prospective Comparative Analysis of Open vs. Endoscopic Thyroidectomy

Seung Won Lee, MD*

Jae Wook Kim, MD*

Jae Yong Lee, MD*

Yoon Woo Koh, MD*

Bucheon, KOREA

INTRODUCTION: The purpose of this study was to prospectively evaluate and confirm the post thyroidectomy syndrome (PTS) through the subjective and objective analyses of conventional open thyroidectomy vs. endoscopic thyroidectomy

METHODS: Prospective nonrandomized clinical trials, From Jan 2008 to Jun 2009, 210 consecutive conventional open thyroidectomies (OPEN group) and endoscopic thyroidectomies (ENDO group) were performed. Of the 210 patients, 75 patients completed the subjective and objective evaluation prior to surgery, 1 and 6 months after surgery, respectively. Subjective parameters included perceptual analysis (GRBAS scale), stroboscopic or flexible fiberscopic analysis, voice handicap index, and five point visual analog scales for vocal fatigue, singing difficulty, high pitch phonation difficulty, swallowing difficulty, neck discomfort and hypesthesia. Objective parameters included acoustic & aerodynamic analysis (MPT, Jitter, shimmer, HNR, Max F0, Min F0) and contact quotient of EGG

RESULTS: For the ENDO group (n = 36), the operating time and recovery time of PTS duration were significantly longer than the OPEN group (n = 39) (P <.01). However, presence of PTS was not related to the size of tumor, operating time, T stage, RAI therapy, and operative techniques (P >.05). For the OPEN group, two objective and five subjective parameters get worse at postoperative one month, among them two subjective parameters persisted until postoperative six months (P <.05). For the ENDO group, three objective and six subjective parameters get worse at postoperative one month, among them three subjective parameters persisted until postoperative six months (P <.05)

CONCLUSION: PTS really exists following simple thyroidectomy and it is very common for both OPEN and ENDO group. Most of parameters gradually improved over the time. However, some subjective parameters especially for singing and high pitched voice persisted until postoperative 6 months

3:20 p.m. Discussion

3:30 p.m. State of the Art Panel

“Robotic Laryngeal Surgery”

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

Panelists: Richard Smith, MD, *Bronx, NY*

Bert O’Malley Jr., MD, *Philadelphia, PA*

Daniel Brasnu, MD, *Paris, FRANCE*

SCIENTIFIC SESSION VII

Moderators:

Clarence Sasaki, MD, *New Haven, CT*

Eugene N. Myers, MD, *Pittsburgh, PA*

4:00 p.m. Development of Artificial Tracheal Prosthesis: Semicircular Shape Polyurethane Scaffold

Han Su Kim, MD*

Hyun Hee Cho, MD*

Ja-Hyun Lee, MD*

Hwal Suh, DDS, PhD*

Sung Min Chung, MD, PhD*

Jae-Yol Lim, MD*

Hong-Shik Choi, MD, PhD*

Seoul, KOREA/Nam-gu Incheon/Korea

The purpose of this study was to develop an artificial prosthesis for use in the reconstruction of a partial tracheal defect. Semicircular shape porous scaffold was made from polyurethane (PU). Polyethylene glycol was grafted onto the inner surface of the PU scaffold to act as a surfactant. The variable sizes of scaffolds were transplanted into nine beagles. Endoscopic and histology examinations were performed monthly (From 1 month to 6 month after transplantation). The scanning electron microscopy was performed to evaluate the ultra-structure. Six of nine beagles studied survived to the expected date. The histological examination showed that a large amount of fibrous tissue had grown through the pores of the porous scaffold. Ciliated respiratory mucosa was restored on the surface of PU scaffold. Normal ciliary movement was notes on the high speed digital videocamera. The semicircular shape PU scaffold could be ready-made type prosthesis for tracheal reconstruction.

4:07 p.m. Effect of Cricopharyngeal Surgery on the Pharynx

Jacqui E. Allen, MBChB*
Cheryl J. White, MA, SLP-CCC*
Rebecca Leonard, MS, PhD*
Peter C. Belafsky, MD, PhD*
Sacramento, CA

Cricopharyngeal dysfunction (CPD) ranges from asymptomatic CP bar to Zenker's diverticulum. Consequences of CPD include dilation of the pharynx and reduced pharyngeal constriction. Relief of obstruction helps symptoms but effects on dilation and constriction are unknown. The purpose of this study was to evaluate pharyngeal measures before and after CP intervention. Methods Forty seven patients with CPD on videofluoroscopy underwent CP intervention followed by repeat fluoroscopic study. Objective measures of pharyngeal area and constriction were obtained. Paired t-tests and ANOVA were employed. Results Pharyngeal constriction and pharyngoesophageal segment (PES) opening improved significantly post-intervention ($p < 0.002$); pharyngeal dilation was unchanged. PES opening improved more with CP myotomy than with dilation and botulinum toxin. Conclusions Relief of CP obstruction by surgery or dilation improves pharyngeal constriction and PES opening. Dilation of the pharynx due to prolonged outlet obstruction does not improve. CP myotomy appears more effective than dilation or botulinum toxin in relieving obstruction.

4:14 p.m. The Effect of Office-Based Laryngeal Surgery on Hemodynamic Stability

Katherine C. Yung, MD
Mark S. Courey, MD
San Francisco, CA

Office based laryngeal surgery is a relatively new innovation and is becoming widespread in practice. One advantage is the avoidance of general anesthesia. However, changes in hemodynamic stability during office procedures have not been studied. This is a retrospective review of 31 patients who underwent unsedated laryngeal, esophageal, or tracheal procedures. Medical records were reviewed for demographics, baseline vital signs including heart rate(HR), blood pressure(SBP and DBP), and oxygen saturation(O₂), and vital signs during the procedure. The mean change in HR was 14.6(p<.0001), mean change in DBP was 18.5(p<.0001), mean change in SBP was 33.1(p<.0001), and mean change in O₂ was 0.8(p<.01). Older age groups had significantly higher baseline DBP (p=.02) and SBP (p=.0006), as well as procedural SBP (p=.0007). Change in DBP and SBP was not correlated with age. Significant changes in hemodynamic stability occur during office laryngeal procedures. Clinicians should be aware of this risk and consider monitoring during procedures.

4:21 p.m. CO2 Laser-Assisted Microsurgery for Intracordal Cysts: Technique and Results on 49 Patients

Marc Remacle, MD
Kassira Amoussa, MD*
Jacques Jamart, MD*
Georges Lawson, MD*
Yvoir, BELGIUM

Microsurgery for intracordal cysts is challenging because of the closeness with the vocal ligament and the risk of inducing a scar. In this retrospective study, our experience with the CO2-laser scanning system (Acublade®) is reported on 49 patients. There were 40.8% epidermoid cysts and 59.2% mucous retention cysts. A quarter of the patients had bilateral cystic lesions. Fifty-nine percent had a contralateral lesion, other than a cyst. The mean follow up time was 160 days. We noted a statistically significant improvement in the grade of the dysphonia according to the Hirano's perceptual scale (G pre=2, G post=1, p=0.02); the vocal handicap index (VHI pre= 51, VHI post=28, p=0.001) and the maximal phonation time in all the patients (MPT pre=11, MPT post=12.7, p=0.033). In the professional voice subgroup (20/49patients), there was a significant improvement in the frequency range. The CO2-laser scanning system is reliable in the treatment of intracordal cysts

4:28 p.m. Long-term Results of Calcium Hydroxylapatite (CaHA) Vocal Fold Injection for Glottal Incompetence

Thomas L. Carroll, MD

Clark A. Rosen, MD

Boston, MA/Pittsburgh, PA

Twelve month post-injection augmentation data with CaHA for glottal incompetence demonstrated excellent results. This paper provides long term follow-up data (24 – 60 months) on a new cohort of patients. A retrospective review was performed from a single institution. Subjects were included if they received a CaHA injection at least 24 months prior and had no further laryngeal surgery during follow up. The VHI-10 scores were used as the primary outcome metric. Twenty subjects amassed 26 post-24 month data points. At an average follow up of 37 months, a statistically significant deterioration from best post-injection VHI-10 score to the post-24 month score was observed ($P < .001$). 4/7 subjects at 24 months and 5/7 subjects at 36 months showed deterioration to near pre-injection or worse than pre-injection VHI-10 scores. CaHA can provide effective VF augmentation for up to 24 months. Most subjects lost the benefit of the material between 24-36 months post-injection.

4:35 p.m. Analysis of Laryngeal Framework Surgery: 10-Year Follow-up to a National Survey

VyVy Young, MD*
Thomas G. Zullo, PhD*
Clark A. Rosen, MD
Pittsburgh, PA

Laryngeal framework surgery (ML/AA) is common treatments for vocal fold paralysis and glottal incompetence. Little information is known about incidence of ML/AA surgery nationwide, especially success and complication rates. A 25-item questionnaire was mailed to 6644 otolaryngologists. The response rate was 22.5% (n=1492). 62% perform ML/AA, representing 26,321 procedures. The complication rate was 0.97%; granulation tissue comprised 38% and infection 36.6% of all complications. Years of practice were equivalent between those with complication rate <0.10 versus >0.10 (p=0.33). 0.8% implant extrusion and 5.4% revision rates were found. The most common revision was placement of a larger implant (14.4% of all revisions). Revision rate was lower for those with more experience but unaffected by number of procedures done. Comparisons made to the 1998 study demonstrate an increased use of ML/AA (average 26 ML/surgeon in the last decade compared to 12ML/surgeon seen previously). The complication rate is decreased, while revision rate is unchanged.

4:42 p.m. Discussion

4:53 p.m. **Introduction of 2011 President,**
Andrew Blitzer, MD, DDS, *New York, NY*

Announcements

Adjournment

5:00 p.m. **Neurolaryngology Study Group**

Topic: ***Vocal Fold Dysfunction: What Are We Talking About?***

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

Panelists: Tom Murry, PhD, *New York, NY*

Albert Merati, MD, *Seattle, WA*

Jackie Gartner-Schmidt, PhD, CCC-SLP*, *Pittsburgh, PA*

Christopher Hartnick, MD*, *Boston, MA*

Joint Poster Session
Wednesday, April 28 – Thursday, April 29, 2010

ALA POSTERS

3D Analysis of Cricoarytenoid Subluxation

I-Fan Theodore Mau, MD, PhD
Dallas, TX

Introduction/Objectives: 1. To create a high-resolution, 3D reconstruction of cricoarytenoid subluxation to understand its anatomy and functional consequence. 2. To examine the role of cricoarytenoid ligament in prevention of anterior arytenoid subluxation.

Study Design/Methods: Development of image processing algorithms and case study. Axial CT images of a larynx with a subluxed arytenoid were processed with custom MATLAB routines to create a versatile 3D reconstruction. Geometries of the subluxed and non-subluxed arytenoids were quantitatively compared. Position of the cricoarytenoid ligament from historical histologic sections was also examined with 3D reconstruction.

Results: The anteromedially subluxed arytenoid has an inferoposteriorly displaced vocal process, resulting in an elongated vocal fold. Posterior displacement of vocal process has not been described previously. Comparison with 3D position of the cricoarytenoid ligament suggests the ligament does not prevent anterior subluxation as commonly believed.

Conclusions: Selective 3D reconstruction is a powerful tool for advancing understanding of cricoarytenoid joint mechanics

A Murine Model of Subglottic Granulation

Ankona Ghosh, MD*
Kevin Leahy, MD, PhD*
Sunil Singhal, MD*
Eugene Einhorn, MD*
Paul Howlett, MD*
Noam Cohen, MD, PhD*
Natasha Mirza, MD
Philadelphia, PA

To develop a functional model of laryngotracheal granulation tissue by inducing direct airway irritation in transplanted mouse laryngotracheal complexes (LTCs). LTCs from C57BL mice were harvested and divided into 3 groups: (i) uninjured (ii) mechanical injury and (iii) chemical injury. Donor LTCs from each group were placed in dorsal subcutaneous pockets of recipient mice. Each week, the transplanted LTCs were harvested, tissues were fixed, sectioned and counter-stained. Representative slides were reviewed by a blinded pathologist to grade the formation and degree of granulation. Transplantation of LTC into a recipient subcutaneous pocket results in a viable airway able to undergo wound remodeling. Direct airway irritation induces the formation of granulation tissue under the disrupted epithelium of airway mucosa, seen as early as 2 weeks, most noticeably after chemical injury. Preliminary results indicate that the murine model may serve as a replicable and reliable model for airway granulation tissue.

A New Endolaryngeal Suture Technique Using a Silicon Piece: A Simple and Convenient Method

Tack-Kyun Kwon, MD, PhD*
Ji-Hun Mo, MD*
Myung-Whun Sung, MD*
Kwang Hyun Kim, MD
Seoul, KOREA

Endolaryngeal suture of the vocal fold mucosa is always challenging for most laryngologists. The authors introduce a new endolaryngeal suture technique using silicon piece. A sliced silicon piece was grasped with a curved forceps, than a needle holder with a 6-0 vicryl suture needle on the tip was introduced, stick the needle into the silicon through the mucosa. The silicon piece can hold the needle as it was placed and we can simply take the needle off the mucosa without any inadvertent mucosal injury. To evaluate the efficacy of this new technique we had 5 doctors perform 3 different endolaryngeal tasks, and compare with conventional suture technique. The time took performing these tasks significantly reduced with a new technique. The participants reported the easiness in handling needle with their non-dominant hand and in changing the direction of a needle. The author concluded that this technique is a simple and convenient option for endolaryngeal suture.

A New Endolaryngeal Thread Guide Instrument (ETGI) for Arytenoid Lateropexy (AL)

Laszlo Rovo, MD, PhD*
Shahram Madani, MD*
Gyorgy Smehak, MD*
Balazs Sztano, MD*
Valeria Majoros, MD*
Jozsef Jori, MD, PhD*
Szeged, HUNGARY

OBJECTIVES: In our study, we assessed the ETGI designed for a simple minimally invasive, endoscopic management of bilateral vocal cord immobility (bVCI)

METHODS: Prospective study of consecutive 34 bVCI patients (22 paralyses, 12 ankyloses). The ETGI utilizes a built-in, movable curved blade allowing a suture thread to be guided in-and-out between the internal laryngeal cavity and the exterior surface of the neck. The endoscopic creation of a double loop around the mobilized arytenoid cartilage causes abduction, thereby providing airway restoration.

RESULTS: 32 patients showed remarkably improved breathing ability. Twelve cases experienced complete and 13 cases incomplete recovery of at least one of their vocal cords with socially acceptable phonation. Seven patients had complete paresis with aphonia.

CONCLUSIONS: The AL is an effective, immediate and long term dynamic solution for various types of bVCI. The ETGI facilitates this method with the rapid and safe creation of fixating suture loops at specific laryngeal locations.

Abductor Paralysis after Botox Injection for Adductor Spasmodic Dysphonia

Naren Venkatesan, MD*
Michael M. Johns II, MD
Edie R. Hapner, PhD*
Atlanta, GA

Botox injections into the thyroarytenoid muscles are the current standard of care for Adductor Spasmodic Dysphonia. Reported adverse effects include a period of breathiness, throat pain, and difficulty with swallowing liquids. We report a novel complication, bilateral abductor paralysis following Botox injections for ADSD. An analysis of 452 patients receiving Botox injections for SD between 2000 and 2009 revealed 352 patients treated for ADSD. Demographics and treatment history were noted for all patients. Eight patients suffered bilateral abductor paralysis, manifesting as dyspnea upon exertion. Seven patients recovered after a brief period of activity restrictions while one underwent a tracheotomy. Most patients resumed Botox injections subsequently. Bilateral abductor paralysis has an incidence of 0.29% with Botox injections for ADSD. Extravasation of Botox around the muscular process of the arytenoid to the posterior cricoarytenoid muscles is the probable cause. The resulting temporary paralysis is best managed through watchful waiting and activity restrictions.

Actinomycosis of Post-Glottic Rib Graft

Jennifer Y. Lee, MD*
Kevin P. Leahy, MD, PhD*
Philadelphia, PA

PURPOSE: Actinomycosis of the larynx is an uncommon infection. We report actinomycosis of a post-glottic rib graft as a cause of subglottic narrowing, which has not been previously reported. We describe the diagnosis and treatment of actinomycosis of the larynx.

PROCEDURE: This is a case report of a patient with pathology-proven, actinomycosis of a posterior rib graft from a laryngotracheal reconstruction for subglottic stenosis.

RESULTS: Actinomycosis is successfully treated with a course of antibiotics. The subglottic narrowing resolved with complete regeneration of the mucosa.

CONCLUSION: Actinomycosis of a post-glottic rib graft is a rare cause of subglottic narrowing that should be considered in stenosis despite treatment. It can be successfully diagnosed and managed.

Acute Healing of Vocal Fold Microflap Defects in a Rabbit Model

Atsushi Suehiro, MD*
Jonathan Bock, MD
Erik R. Swanson, MD*
Bernard Rousseau, PhD*
Nashville, TN

The purpose of the current study was to establish a rabbit vocal fold microflap wound model. Sixteen New Zealand white rabbits were used. Transoral direct suspension laryngoscopy was performed using a pediatric laryngoscope. For the microflap procedure, eight rabbits received an incision into the epithelium of one vocal fold using a sickle knife. Mucosal elevation was then performed through this incision using a curved flap elevator. The contralateral vocal fold was left intact to serve as control. A separate group of eight rabbits underwent minimal removal of mucosa via superficial biopsy to serve as a comparison group. Acute healing of microflap and biopsy defects was evaluated histologically. Results revealed less overall thickness of the epithelium and contraction of the lamina propria on post-procedure day 3 and 7 in the microflap group versus biopsy comparison group. Future studies are planned to examine the effects of experimentally induced phonation on microflap healing.

An Evidence Based Approach to the Diagnosis and Treatment of Arytenoid Joint Dislocation

Sanjay Morzaria, MD*
Edward J. Damrose, MD
Stanford, CA

The diagnosis and treatment of arytenoid joint dislocation is controversial. The purpose of this study is to develop a clear clinical pathway for evidence-based diagnosis and management of arytenoid joint dislocation. A systematic literature review was performed using the terms arytenoid cartilage and dislocations or subluxations. 141 cases were reported in the literature. The most common etiologies included intubation and external laryngeal trauma. Physical exam findings alone lacked specificity for the diagnosis of dislocation. The combination of physical exam findings, laryngeal EMG and fine-cut CT imaging showed high specificity. Direct laryngoscopy was the diagnostic gold-standard. Improved voice outcomes were achieved with closed reduction. There was no correlation between the timing of intervention and voice quality. In conclusion, arytenoid dislocation is rare. There is no single diagnostic test. Closed reduction provides improved voice outcome compared to speech therapy. The voice outcome does not correlate with the timing of intervention.

An Unusual Complication of Vocal Fold Lipoinjection: Case Report and Review of the Literature

VyVy N. Young, MD*
Clark A. Rosen, MD
Pittsburgh, PA

Vocal fold lipoinjection has been used to address various laryngeal pathologies, with few reported complications. We present an unusual case of neck abscess following lipoinjection and review literature describing complications of this procedure. The patient presented with lifelong hoarseness secondary to vocal fold paralysis after PDA ligation. She underwent an unremarkable bilateral lipoinjection. Three weeks later, she presented with neck swelling, erythema, and pain. Imaging confirmed a superficial anterior neck abscess; incision-and-drainage was performed. She has recovered well and appears to have suffered no adverse effect on her voice. Vocal fold lipoinjection is a generally safe procedure, with few associated complications. We describe the first reported case of a neck abscess following lipoinjection, likely a result of fat traversing the cricothyroid membrane and serving as a nidus for infection. Contributing factors include anatomic features versus overinjection. The otolaryngologist is advised to remain conscious of this potential complication when performing lipoinjection.

Androgen Treatment and Recovery of Function Following Recurrent Laryngeal Nerve (RLN) Injury in the Rat

Amy L. Pittman, MD*
Todd J. Brown, PhD*
Gina N. Monaco, BSE*
Eileen M. Foecking, PhD*
Lee M. Akst, MD
Kathryn J. Jones, PhD, PT*
Maywood, IL

BACKGROUND: Androgen therapy demonstrates promise in other nerve injury models but has never been applied to RLN injury.

OBJECTIVE: Establish a crush injury model studying therapeutic potentials of androgens in RLN injury. **Methods:** Adult rats underwent standardized crush injury of left RLNs and received androgen or sham therapy. Direct laryngoscopic assessment of vocal cord mobility was performed before, immediately following, and 1, 2, 3, or 4 weeks after injury. Tissue harvest was performed at sacrifice for planned histologic analysis of nerve recovery

RESULTS: Of 20 rats examined, all exhibited paralysis following injury with gradual recovery complete by 4 weeks. Behavioral data analysis indicates the benefit of androgen treatment relative to controls. Additional cases and histological analyses are ongoing.

CONCLUSIONS: This crush injury model creates reproducible and standardized vocal cord paralysis allowing for study of possible therapies. Androgens speed RLN recovery and are potentially exciting for further translational research.

Anosmia Following Intranasal Cidofovir Injection for Recurrent Respiratory Papillomatosis: A Case Study

Brent Feldt, MD*
Robert L. Eller, MD
Lackland AFB, TX

REPORT OF A CASE: Recurrent respiratory papillomatosis (RRP) is a benign disease of the upper aerodigestive tract that affects patients of all ages. Recent investigations have shown cidofovir to be a promising adjunctive treatment for RRP. We present a case of a woman with RRP who suffered anosmia following intranasal injection of cidofovir. This is the only known case report of intranasal injection of cidofovir temporally associated with anosmia. Further investigations into the use of cidofovir need to be conducted to better understand short and long-term effects.

Benign Lesion Regression as a Function of Parameter Selection with the 532-Nanometer Potassium Titanyl Phosphate (KTP) Laser

Pavan S. Mallur, MD*
Milan R. Amin, MD*
Bobby Tajudeen, BS*
New York, NY

The 532nm KTP laser is a clinically versatile laser. However, variability exists in the selection of laser parameters for benign laryngeal pathology. This study examines the effect of altering wattage and pulse width on benign lesion regression with the KTP laser. We reviewed all patients treated with KTP laser for laryngeal pathology in a single institution. Laser parameters and pathology were recorded. Disease regression was recorded as a change in percent length of the true vocal fold of the lesion. For hemorrhagic polyps or leukoplakia, wattage of 20 to 30 with pulse width of 20-30 milliseconds induced greater than 50% of disease regression in all patients. Granuloma or papilloma showed decreased lesion regression with similar parameters, and typically required larger wattage and pulse width as part of additional procedures. These data suggest that established parameters for specific entities may help predict the degree of lesion regression in vocal fold pathology.

Bilateral Paraglottic Abscesses after Collagen Injection

Joseph Goodman, MD*
Nitin Patel, BSc*
Matthew Clary, MD*
Steven Bielasowicz, MD
Washington, DC/Philadelphia, PA

OBJECTIVES: 1. Review laryngeal anatomy and indications for injection laryngoplasty. 2. Review the medical literature regarding complications of injection laryngoplasty.

METHODS: Case report and review of the literature.

RESULTS: We present a case report of a 33 year old woman with lupus who presented with hoarseness, fever and worsening dyspnea six months after bilateral injection laryngoplasty with glutaraldehyde cross-linked bovine collagen for vocal cord paresis. A CT scan revealed bilateral paraglottic abscesses. She was admitted and treated with a protracted course of intravenous antibiotics, which provided improvement of her symptoms; however, after switching to oral antibiotics, she again became increasingly hoarse and dyspneic. Repeat CT scan showed persistence of the bilateral paraglottic abscesses. She was taken urgently to the operating room for suspension microlaryngoscopy and drainage of the abscesses.

CONCLUSIONS: Glutaraldehyde cross-linked bovine collagen has been used safely for injection laryngoplasty for many years. While hypersensitivity reactions to bovine collagen are known to occur, the cross-linked form is thought to have less immunogenicity. Increased reactions to exogenous collagen have been reported in patients with connective tissue diseases. Hypersensitivity testing has been advocated, but recent reports argue that this may be unnecessary. Our experience lends weight to the argument that testing may be indicated in patients with underlying collagen-vascular disease, such as lupus.

Bilateral Vallecular Cysts as a Cause of Dysphagia: Case Report and Literature Review

Steven Michael Olsen, MD*
Jonathan Romak, MD*
Dale Ekbohm, MD*
Rochester, MN/Farmington, CT

Cysts of the Vallecula are rare, accounting for 10.5-20.1% of all laryngeal cysts. Most reported cases in the literature address vallecular cysts as a cause of upper airway obstruction in infants or difficult intubation in adults. Vallecular cysts may present with diverse symptoms pertaining to voice, airway and swallowing. While authors have alluded to the occurrence of multiple vallecular cysts, to our knowledge, no specific cases have been reported. We review the existing literature and report a rare and illustrative case of a 70-year-old woman who presented with dysphagia from massive bilateral vallecular cysts. The patient underwent direct laryngoscopy and cyst excision with CO₂ laser. Follow up revealed complete resolution of her dysphagia. Vallecular cysts, although rare, should be considered in the differential diagnosis of globus, dysphonia, dysphagia, odynophagia and dyspnea. Surgical removal is frequently curative.

Botulinum Neurotoxin Treatment of Spasmodic Dysphonia – Quality of Life Outcomes

Daniel Novakovic, MBBS, MPH, BSc*
Joanna D’Elia, MD*
Andrew Blitzer, MD, DDS
New York, NY

Laryngeal Botulinum Toxin (BONT) injection is a well-established symptomatic treatment for Adductor Spasmodic Dysphonia (ADSD). Injections may produce a period of breathiness, voice weakness and dysphagia for liquids. A recent study using VR-QOL outcomes questions the overall benefit of BONT describing limited functional improvement with “good voice” for only 1/3 of the period between successive injections
AIM: To examine longitudinal effects of BONT for ADSD upon quality of life

STUDY DESIGN: Prospective cohort study

METHODS: ADSD patients completed qualitative evaluation of voice function after each BONT injection using the percentage of normal function (PNF) scale. Other parameters measured included VHI, duration of effect, PNF scores for best/current function & complications.

RESULTS: 100 patients treated continuously between Jan 2006 and Dec 2008 with an individuated regime (dose, pattern & schedule) were selected from our database. We present our findings with respect to botox dosage, functional outcomes, duration of effect and complications.

Delayed Aponia with Vocal Fold Immobility Secondary to Muscle Fibrosis after Blunt Laryngeal Trauma

Aric Park, MD*
Mika Sumiyoshi, BS*
Thomas L. Carroll, MD
Boston, MA

Blunt laryngeal trauma is most frequently associated with motor vehicle accidents, sports related trauma, pugilistic insult or strangulation. We present the unique case of a 23 year old male with delayed onset aponia two weeks after blunt neck trauma. A flexible laryngoscopy revealed a right true vocal fold (TVF) immobility and transglottic gap. CT scanning demonstrated a fractured, subluxed right inferior cornu of the thyroid cartilage, positioned between the posterior thyroid cartilage ala and the PCA and LCA muscles. Laryngeal EMG demonstrated normal ipsilateral nerve conduction. Intraoperatively, the fractured cornu was excised from the fibrotic intrinsic muscles. Endolaryngeal palpation demonstrated improved lateral excursion of the right arytenoid. Carboxymethylcellulose was injected into the immobile side for symptomatic relief of dysphonia early in the recovery period. A three-month postoperative examination showed essentially normal TVF mobility and a subjectively normal voice. A brief review on blunt laryngeal trauma and its management is presented.

Endoscopic Arytenoid Adduction with Calcium Phosphate Cement

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Previously, we reported the feasibility of injection laryngoplasty with calcium phosphate cement (CPC) for unilateral laryngeal paralysis. CPC is a self-hardening, injectable paste, which recrystallizes to calcium hydroxylapatite after injection. Here, we present an improved procedure for arytenoid adduction. Under general anesthesia, with an intubation tube of a small diameter, the entire larynx, including the bilateral vocal folds and arytenoid cartilages, was exposed with a Weerda distending operating laryngoscope or FK-laryngopharyngoscope. A rigid videolaryngoscope connected to a CCD camera was used for wide-field visualization. The arytenoid cartilage on the paralyzed side was palpated to determine the degree of adduction; thereafter, CPC was injected onto the lateral side of the vocal process, and the arytenoid cartilage was fixed in the adducted position by crystallized CPC. With this procedure, endoscopic arytenoid adduction was successfully performed in 10 cases, and injection laryngoplasty may be indicated for patients with a wide posterior glottal gap.

Expression of Fibronectin (FN) Splice Variants, Interleukin -1 β (IL-1 β), and Collagens in Vocal Fold Mucosa (VFM) During Subglottic Injury in Rabbits

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BACKGROUND: FN is a family of 20 isoforms generated by variant gene splicing. Age-dependent expression of FN-EDA splice variant may help differentiate regenerative fetal healing from scarring.

PURPOSE: To delineate correlations between splice-variant-FNs and inflammatory and scarring-associated molecules in injured VFM.

METHOD: Adult rabbits underwent cricothyroidotomy and CO₂-laser-induced subglottic injury, which also extended into adjacent VFM. At 12, 24, 48, and 72hrs VFM mRNA was measured for total FN, FN-splice variants EDA and V, collagens I and III, and IL-1 β .

RESULTS: Dose-dependent induction of FN-EDA was detected at 48 and 72hrs after 5-watts injury and at 72hrs after 2-watts injury. IL-1 β was induced at 24hrs and remained elevated at 72hrs in 5-watts injuries versus 2-watts injuries. At 72 hrs, collagen-I was up-regulated whereas collagen-III was suppressed.

CONCLUSION: Expression of the FN-EDA domain correlates with induction of IL-1 β and increased collagen I/III ratios, suggesting that FN-EDA may contribute to VFM scarring.

Factory Contributing to Laryngeal Injury from Prolonged Intubation

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The factors leading to laryngeal injury due to intubation are poorly understood. This study seeks to determine if duration of intubation, size of endotracheal tube, and/or type of endotracheal tube impact the degree of vocal fold immobility and other laryngeal injury upon extubation. 61 adult patients intubated for more than 48 hours were examined by fiberoptic nasolaryngoscopy shortly after extubation. 41% of patients had some degree of vocal fold immobility. However, neither the duration of intubation, the size of endotracheal tube, nor the type of endotracheal tube significantly affected the degree of laryngeal injury including vocal fold immobility. Additionally, none of the collected demographic information (age, race, gender, height, weight) significantly affected the degree of laryngeal injury. The duration of intubation, type of endotracheal tube, and size of endotracheal tube do not significantly correlate to the incidence of vocal fold mobility and degree of laryngeal injury noted after prolonged intubation.

How Do We Produce a Loud Voice?: Evidence for a New Mechanism

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INTRODUCTION: It is known that increasing vocal fold closing speed (VFCS) will increase voice intensity, and that increasing subglottal pressure (SP) will increase VFCS. The current hypothesis is that increasing SP increases maximum lateral displacement (MLD) which increases VFCS; however, this relationship has not been experimentally demonstrated. This work measures the relationship between VFCS, MLD and the negative pressures produced by the intraglottal vortices (NPPIV).

METHODS: Using methodology previously published by our group, the MLD, VFCS, and NPPIV were determined for different subglottal pressures during phonation for 4 excised canine larynges.

RESULTS: The Pearson correlation coefficients (PCC) between VFCS and NPPIV were 0.98 with a p value of 0.001, while the PCC between VFCS and MLD were 0.65 with a p value of 0.156.

CONCLUSION: This work does not support the current hypothesis but does support the theory that intraglottal vortices are important for determining voice intensity.

Idiopathic Ulcerative Laryngitis

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Ulcerative laryngitis, initially described by Rakel, et al is a distinct clinical entity that presents after a prolonged upper respiratory infection with cough and is characterized by bilateral ulcerations of the mid-membranous vocal folds. The purpose of this paper is to characterize this disorder over the entire disease course. The study is a multi-institutional retrospective review from eight clinical sites over a 5-year period. Fourteen cases were identified that had adequate videostroboscopic data from the initial presentation to the resolution of the vocal fold ulcerations. All patients were female with a median age of 47.4. The average time from initial presentation to the otolaryngologist to resolution of the disease was 3.2 months. In the majority of the patients (64%) there were persistent vibratory abnormalities after resolution of the ulcerations. This is the first multi-institutional study to define the complete disease course of this rare entity.

Injection Laryngoplasty with Micronized Dermis: A Ten Year Experience with 515 Injections in 465 Patients

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INTRODUCTION: It has been 10 years since micronized dermis has been used for correction of glottic insufficiency. This report reviews its role and lessons learned.

METHOD: Retrospective review from a single clinician.

RESULTS: The indications were for vocal fold paralysis, atrophy, scar and degenerative diseases. The material is best when placed into the membranous vocal fold just lateral to the vocal ligament. With the exception of premature absorption, complication was less than 0.1%. If injection was limited to augmentation to the mid-line and when less than 0.4 cc was used, premature absorption was noted. Over injection was needed and prompted the development of a trans-cervical approach to prevent implant extrusion. Bilateral injection was often necessary in patients with atrophy. The median injected material has increased from 0.6 cc to 1.4 cc over the decade. Re-injection and additional procedures can be expected in 10%. In 25 patients followed for greater than 1 year, gradual absorption was noted about 2.5 years after the initial injection.

CONCLUSION: Despite the problems of inconsistency in preparation, slow absorption over time and need for over-injection, micronized dermis is a safe augmentation allograft material that has long-term (>1 year) stability. It can be used for temporary or permanent vocal fold augmentation.

Intubation vs. Unspecified Laryngeal Granulomas: 49 Cases of Retrospective Analysis

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Intubation Laryngeal Granuloma (ILG) is known to be one of the common complications of endotracheal intubation. On the other hand, patients with no obvious cause of LG can be categorized as unspecified LG (ULG). We compared the results of our treatment for these two types of LG; 15 cases of ILG versus 34 cases of ULG, which occurred and treated between 1998 and 2008. Clinical course, especially the treatment outcome, treatment period and the presence of black spot were retrospectively reviewed and compared between these two groups. Resolution rate was much better in ILG (14/15 vs 22/34). Average of treatment period was significantly shorter in ILG (129 days vs. 276 days, $P < 0.05$). There was no significant difference in the presence of black spot after LG resolved (5/15 vs. 9/34). This retrospective study suggested that ILG can be categorized apart from ULG in terms of formulating the treatment plan.

Laryngopharyngeal Stenosis Status Post Chemoradiation Therapy

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INTRODUCTION: Laryngopharyngeal stenosis is a rare complication of chemoradiation. The stenosis may occur cephalad to the hypopharynx at the level of the base of tongue (BOT). Patients may present with a combination of dysphagia and/or respiratory distress. Our study seeks to present this severe complication and review treatment success.

PROCEDURE: Four patients were identified with laryngopharyngeal stenosis and subsequently underwent laryngoscopy with CO2 laser excision of stenosis. Each patient was then followed for at least 9 months.

RESULTS: All patients had a history of BOT carcinoma treated with chemoradiation. A total of 8 laser excisions were performed during the series. Despite treatment, 1 patient remained tracheostomy dependent and one required laryngectomy.

CONCLUSIONS: Laryngopharyngeal stenosis with dysphagia and/or respiratory distress is a severe complication of the treatment of BOT carcinoma. New therapies and techniques will need to be developed and applied to help prevent and treat this difficult complication.

Long-Term Functional Outcome of Patients with Glottic Carcinoma Treated with Unilateral Laser Cordectomy and Postoperative Voice Treatment

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Preservation of function is still an ongoing debate between different treatment modalities for laryngeal cancer. In a prospective longitudinal trial 17 patients treated with laser surgery for Tcis, T1 or T2-tumour of the vocal cords received voice therapy and were examined 1, 2, 3, 4 1/2, 6 and 12 months postoperatively. Besides videolaryngostroboscopy each examination included history, phonetogram of the speaking and the singing voice, a language specific hoarseness diagram and a questionnaire (Voice Handicap Index; VHI 12 in German). While stroboscopic and acoustic parameters improved gradually over time, this was initially also true for the VHI, however there was a deterioration noted after 3-6 months for subjective assessment while objective parameters improved. This discrepancy between objective findings and patient satisfaction over time has to be considered.

Maturing of Human Vocal Fold Scar after Cordectomy

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OBJECTIVE: The features of human scarred vocal folds have rarely been reported and how the scar changes with time is not well known. The present study aims to investigate maturing process of human scarred vocal folds caused by cordectomy in terms of vibratory and aerodynamic functions.

MATERIALS AND METHODS: 10 patients who underwent cordectomy in Kyoto University Hospital are enrolled in this study. Acoustic and aerodynamic analyses and videostroboscopic examination were used to evaluate the temporal changes of scarred vocal folds.

RESULTS: NMWA, NGG, MPT, MFR and APQ appear to stabilize about 6 months after the procedure in the majority of cases, however, PPQ and NHR varied individually.

CONCLUSIONS: There were individual variations in temporal changes of vocal functions of scarred vocal folds after cordectomy. In terms of vibratory and aerodynamic functions, it is suggested that it takes at least half a year for maturation of vocal fold scarring.

Management of Cancer Metastatic to the Paranasal Sinuses: A Case Report

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Cancer metastatic to the paranasal sinuses often presents with ophthalmologic and facial deformities, as well as insomnia, anosmia and aguesia. These diminutive tumors are difficult to effectively treat often leading to poor quality of life and ultimately patient demise. Although breast cancer is a common cancer affecting over 150,000 women each year, rarely is metastatic breast cancer found within the sinuses. We report a case history of a 40-year-old patient with breast cancer metastatic to the paranasal sinuses. Because her tumor demonstrated resistance to radiation therapy, an endonasal approach with debulking of the tumor was performed with post-operative chemotherapy. Four months post-operatively, our patient has decreased proptosis, is without facial pain, and has no sinonasal or visual complaints. While providing a better understanding of this tumor metastasis through a review of the literature, our report provides an alternative plan of care for suspected metastases to the paranasal sinuses.

Modification and Testing of a Pneumatic Dispensing Device for Controlled Delivery of Injectable Materials

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INTRODUCTION: Vocal fold (VF) injections of viscous materials are typically performed using hand-operated syringes; however, this method can be imprecise due to accumulation of back-pressure and effort-related tremor.

METHODS: A non-medical, foot-pedal-triggered device for dispensing viscous materials was modified by adding a volume-tracking linear transducer and a digital readout. In bench tests, bovine VFs were injected with fluids/materials of different viscosities (saline, glycerol, hydrogel and liposuctioned fat) through narrow-bore needles using a range of driving pressures and air-pulse durations. The device was further evaluated in 50+ in-vivo VF injection experiments.

RESULTS: Device function was precise and repeatable, with high correlations (typically R -squared $> .95$) between the readout and direct measures of volume, even at small outputs (5 μ l/pulse). Foot-pedal control enabled surgeons to make steady, accurate injections into ferret and dog VFs during phonosurgery.

CONCLUSIONS: This VF injection system shows promise for development to enhance human phonosurgery by increasing injection control and precision.

Novel Robotic Controller for Carbon-Dioxide (CO₂) Laser Micromanipulator Outperforms Expert Human Manual Control

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OBJECTIVES: To introduce a novel method of combining robotics and the CO₂ laser micromanipulator to provide excellent accuracy and precision that outperforms human manual control.

METHODS: We developed a portable robotic controller that appends to a standard CO₂ laser micromanipulator. Accuracy, laser beam path reproducibility, and consistency of ablation depth were compared between automated robotic control and manual micromanipulator control driven by up to six expert users. Both CO₂ laser live fire and Helium-Neon laser beam video tracking techniques were employed.

RESULTS: Automation demonstrated superiority over manual control in accuracy (path error greater than 1 mm, 2.56% versus 14.89%), laser beam path reproducibility (divergence, 21.42 versus 65.84 mm²), and consistency of ablation depth (variance, 0.206 versus 2.63 mm²). All results statistically significant ($p < 0.05$).

CONCLUSIONS: Robotic micromanipulator control enhances accuracy and repeatability for specific laser tasks. Computerized control opens opportunity for alternative control interfaces, safety features, and image-guided ablation.

Pediatric Laryngeal Tuberculosis: A Case with Difficult Diagnostic Challenges

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Laryngeal tuberculosis (LTB) is rare in the pediatric population. Most cases present clinically as sequelae of pulmonary tuberculosis (PTB). We present a case of a 12-year-old girl with Trisomy 21, hoarseness, cough and papillomatous lesions of the larynx. Histopathologically, suppurative non-caseating granulomas were noted. She had no history of PTB. AFB stain, cultures, chest x-ray and PPD were negative. She was treated empirically with antibiotics and antacids with symptomatic improvement. Nearly 1 year later, her symptoms worsened. Repeat debridement and studies were negative for TB. The patient subsequently required tracheotomy. An enlarged pretracheal lymph node was sampled and bronchial washings were obtained. AFB was noted in the lymph node, and the cultures were ultimately positive for Mycobacteria Tuberculosis. This patient underwent RIPE therapy and was subsequently decanulated. This case highlights the insidious nature of LTB and importance of diligence in obtaining a diagnosis

Post Cricoid Mucosal Advancement Flap – An Effective Treatment for Posterior Glottic Pathology

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Surgical management of posterior larynx pathology, particularly with vocal fold hypomobility, presents a challenging reconstructive problem for the laryngologist. The posterior glottis can be approached either endoscopically or via laryngofissure. Combined with the postcricoid mucosal advancement (PCMA) flap, scar and neolasms in this region can be successfully resected, preserving and improving glottic function. Four patients underwent posterior glottic reconstruction, two open and two endoscopic approaches, three for vocal fold immobility and airway compromise secondary to scar, one for an extensive granular cell tumor. In all cases, the posterior glottic pathology was successfully resected and flaps proved viable. All patients were successfully decannulated postoperatively, and all resumed normal oral alimentation. Voice quality was stable or improved in all. There were no perioperative or postoperative complications. Conclusion: Surgical reconstruction with the PCMA flap is a viable treatment for posterior laryngeal pathology and can be performed effectively by either traditional laryngofissure, or endoscopy.

Postcricoid Hemangioma in an Adult: First Reported Case

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INTRODUCTION: A hemangioma of the postcricoid region is a lesion that, to date, has been reported only in infants and young children. Reported here is a case of a postcricoid hemangioma in an adult patient.

CASE: A 38 year-old female presented with progressive dysphagia and weight loss over several months. Physical examination and imaging demonstrated a mass suspicious for a vascular lesion in the postcricoid area. The patient underwent transoral carbon dioxide laser microsurgery, and final pathological examination showed a hemangioma. She is doing well four months after surgery, with an excellent voice, resolution of dysphagia, and no evidence of recurrence.

RESULTS: To our knowledge, there have been no reports of adult patients diagnosed with a postcricoid hemangioma. We report the presentation and treatment of this entity.

CONCLUSION: Postcricoid hemangiomas are rare lesions that occur mostly in pediatric patients. We present a case of an adult with a postcricoid hemangioma treated effectively with transoral laser microsurgery.

Prospective Study of Patient Tolerance and Outcomes in Awake Percutaneous Injection Laryngoplasty

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INTRODUCTION: Percutaneous injection laryngoplasty in the awake patient(IL) is a treatment option for glottal insufficiency. Outcomes and patient tolerance of IL has not been widely studied in a prospective manner.

METHODS: Twenty-three subjects enrolled; 20 had complete data. Their self-reported injection experience, voice handicap index(VHI), CAPE-V, and GRBAS were evaluated prior to and 2 months post-IL.

RESULTS: The subjects' mean VHI improved from 62 to 43($p < 0.05$, paired t-test) following IL with bovine collagen. CAPE-V demonstrated a beneficial trend (40.6 pre-IL, 31.4 post-IL), as did the overall GRBAS(1.92 pre-IL, 1.65 post-IL); but neither were statistically significant($p > 0.05$, paired t-test). As measured by visual analog scales, patient perceptions about IL revealed moderate apprehension; afterwards, subjects noted that IL was not as uncomfortable as anticipated.

CONCLUSIONS: IL continues to be an effective method of treating glottal insufficiency, although self-report of improvement was greater than that noted by perceptual assessment. Post-IL VHI is still notably impaired in many patients.

Residual Motor Function in Bilateral Laryngeal Paralysis

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Patients with neurogenic bilateral vocal fold motion impairment have varying degrees of airway obstruction and variable response to surgical procedures to enlarge the glottis. Variations in residual or recurrent muscle activity could account for much of these differences. To assess patterns of muscle action, videolaryngoscopy recordings of thirty patients were reviewed, assessing phonatory adduction, inspiratory abduction, and active adduction during inspiration. 18 patients had some phonatory adduction of both vocal folds, and 11 had phonatory adduction of one vocal fold. Only one patient had no observable adduction with phonation, and that patient had paradoxical inspiratory adduction of the left vocal fold. Active adduction during inspiration was observed in 13 patients, and was bilateral in 2. Active abduction with sniff was only observed in 6 patients. **CONCLUSION:** The predominant residual activity in bilateral paresis is adductor, and paradoxical inspiratory adductor activity is common. These adductor forces could counteract surgical efforts to widen the glottis.

Risk Factors for Injection into the Superficial Lamina Propria Layer During Injection Laryngoplasty

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Injection of the augmentation material into the superficial lamina propria (SLP) layer is a major complication of injection laryngoplasty (IL). We performed a retrospective review of a case series to identify risk factors associated with this complication. 113 consecutive patients undergoing in-office IL with crosslinked bovine collagen using percutaneous technique were identified. Before and after laryngeal videostroboscopy and clinician's perceptual ratings of patient's voice were reviewed. Improvement in vocal function and quality was noted in 109/113 patients. Four patients (2.6%) had poor outcome due to SLP injection. All four were female and had low body mass index. No other major complications or hypersensitivity reactions were noted. Results show that superficial injection is a rare complication of IL and that the female larynx is particularly susceptible, likely due to its smaller dimensions. Higher incidence of SLP injection reported in the literature may be due to variable injection techniques and augmentation materials.

Sleep-related Deglutition in Patients with Sleep Apnea-Hypopnea Syndrome Under CPAP Therapy

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Deglutition is a vital function, and a clearance of the pharynx by swallowing is important to protect the airway. Sleep-related deglutition and respiratory phase patterns in patients with obstructive sleep apnea-hypopnea syndrome (OSAHS) under CPAP (continuous positive airway pressure) therapy were investigated. Sleep-related deglutition under CPAP therapy was examined in ten severe adult OSAHS patients using time-matched recordings of polysomnography and electromyography of the thyrohyoid and suprahyoid muscles and compared with deglutition before CPAP therapy. Under CPAP therapy, swallowing was infrequent during sleep. The deeper the sleep stage, the lower the mean deglutition frequency. Most deglutition occurred in association with spontaneous electroencephalographic arousal. And swallows followed by inspiration were markedly reduced (11.8%). Sleep-related deglutition and respiratory phase patterns had normalized. CPAP therapy improved not only apnea-hypopnea during sleep and sleep structure but also sleep-related deglutition, especially respiratory phase patterns associated with deglutition.

Slow-Release Nanoparticle Encapsulated Delivery System for Laryngeal Therapeutics

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Injectable encapsulated polylactide-co-glycolide (PLGA) nanoparticles offer a potential slow release delivery system for therapeutics in the larynx. PLGA nanoparticles were loaded with Texas Red-Dextran (NPTR) and Hepatocyte growth factor (NPHGF). In vitro release was determined for each over time. In vivo release of NPTR was assessed in the murine vocal fold. NPHGF bioactivity was measured in vitro. In-vitro release kinetics show slow release of NPTR, and NPHGF over 12 to 14 days. In vitro NPTR release correlated with in vivo results. In vivo presence of NPTR occurred up to 7 days compared to 1 day for TR control. NPHGF demonstrated slow release over an extended period and was shown to be bioactive by reducing procollagen transcription in vitro. PLGA encapsulated agents show promise as an effective tool for providing sustained release of biologically active therapeutics in the larynx.

Squamous Cell Carcinoma Arising from Teflon Granuloma

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INTRODUCTION: Teflon® granulomata following injection medialization are known to occur over a long period of time. Progression to invasive carcinoma has not previously been described.

METHODS: A case of a squamous cell carcinoma arising from the true vocal cord of a patient who had previously undergone a Teflon® medialization procedure over thirty years ago is described. This patient presented with the complaint of several years worsening dysphonia and dyspnea. Exam was consistent with granuloma formation; however intraoperative examination demonstrated a more extensive lesion. Biopsies subsequently revealed squamous cell carcinoma coexistent with a foreign body, giant-cell reaction consistent with Teflon® granuloma.

RESULTS: Review of literature demonstrates no previous evidence of squamous cell carcinoma arising from Teflon® related giant cell reaction. Discussion Pathologic findings in this case represent evidence of malignant transformation of a Teflon® granuloma.

CONCLUSION: The chronic inflammation associated with Teflon granuloma may give rise to invasive carcinoma.

The Role of Conservation Surgery in Laryngeal Chondrosarcoma

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INTRODUCTION: Laryngeal chondrosarcoma (LC) is rare. Traditional treatment involves aggressive surgery often requiring total laryngectomy (TL). The purpose of this study is to develop treatment algorithms focusing on laryngeal preservation.

PROCEDURES: A retrospective examination of all patients treated for LC in the last ten years at the Vanderbilt University Department of Otolaryngology was performed. All patients were treated surgically. If deemed appropriate from a disease-control standpoint, patients were offered conservation laryngeal surgery (CLS). Pre- and post- operative laryngeal exam photodocumentation and videostroboscopic evaluation were obtained.

RESULTS: Nine patients were identified. The two patients with aggressive grade chondrosarcoma as well as the oldest patient in the series were treated with TL. The remaining six patients underwent CLS. All patients were treated successfully. All patients treated with CLS maintained their nasopharyngeal airway, voice, and swallowing.

CONCLUSIONS: Based on our experience, CLS is an appropriate treatment option for LC patients who meet criteria.

To Present a Novel Pathway for Resident Education in Laryngology

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PURPOSE: To present a novel pathway for resident education in laryngology

METHODS: Canine larynges were dissected by otolaryngology residents in a temporal bone lab using the laryngeal dissection station. Endoscopic procedures such as subepithelial infusion, creation of a microflap, and epithelial resection were performed with use of the microscope and microinstruments. Using the same specimen, participants then dissected a hemilarynx from outside-in, identifying important structures and anatomical relationships. Participants performed procedures on the remaining hemi-larynx including variations of laryngoplasty and hemilaryngectomy.

RESULTS: Canine larynges strongly resemble human larynges and are easily employed in a teaching model. They are more easily acquired and are less expensive than human larynges.

CONCLUSION: A laryngeal dissection course utilizing a canine larynx and laryngeal dissection station was successful in teaching residents anatomy as well as endoscopic and open procedures via an ex-vivo model.

Tracheotomy Technique and Complications: A Single Institution Comparison between Otolaryngologist and Non-Otolaryngologist Surgeons

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BACKGROUND: Tracheotomy technique and management can differ between otolaryngologist and non-otolaryngologist surgeons. This study aims to determine at one institution if there are technical differences between otolaryngologist and non-otolaryngologist surgeons, and if these differences impact patient outcomes.

METHODS: All tracheotomies performed at our institution from 2003-2008 were reviewed. Indication, operating surgeon, technique, complications, and time to decannulation and hospital discharge were recorded.

RESULTS: A total of 894 tracheotomies were performed, 394 by otolaryngologists and 500 by non-otolaryngologists. The commonest indication for tracheotomy was ventilator dependence. The overall complication rate was 1.9% (1.7% for otolaryngologists and 2.0% for non-otolaryngologists). The rate of complications requiring operative reintervention was 0.76% for otolaryngologists and 1.2% for non-otolaryngologists.

CONCLUSION: There was a non-significant trend towards lower complication rates in tracheotomies performed by otolaryngologists. Further studies are warranted to determine if these patterns are similar nationwide, and if guidelines could be implemented to improve to tracheotomy technique and management

Utility of Injection Laryngoplasty in the Management of Post Thyroidectomy Vocal Cord Paralysis

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OBJECTIVES: This prospective study investigated the safety and efficacy of injection laryngoplasty in the management of post-thyroidectomy vocal cord paralysis (VCP).

STUDY DESIGN: Prospective clinical study. **Methods:** From Mar. 2005 to Dec. 2008, 174 consecutive injection laryngoplasties were performed in patients with unilateral glottic insufficiency. This included 34 patients with post-thyroidectomy vocal cord paralysis (VCP): 15 with transient VCP (TVCP) and 19 with permanent VCP (PVCP). Percutaneous injection was performed under local anesthesia into the vocalis muscle, using disposable 25G long needles through the cricothyroid membrane or directly through the thyroid cartilage. Patients completed acoustic aerodynamic, perceptual, stroboscopic, and voice handicap index (VHI) evaluations before and 3 and 6 months after the injection.

RESULTS: Injection laryngoplasty can be performed under local anesthesia without morbidity. Acoustic and perceptual parameters (GRBAS (grade, roughness, breathiness, asthenia, and strain), maximum phonation time, jitter, and shimmer), the voice handicap index (VHI), and grades of mucosal waves and glottic closure were significantly improved after the injection and they remained stable over 6 months in both the TVCP and PVCP groups ($P < 0.05$).

CONCLUSIONS: Based on these preliminary results, injection laryngoplasty improved the voice, and voice-related quality of life in patients with post-thyroidectomy VCP. It is a simple, safe, and useful method for rehabilitating post-thyroidectomy VCP patients.

Viscoelastic Data on Currently Used and Promising Injectable Biomaterials

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INTRODUCTION: Viscoelastic properties are important in determining the potential of injectable biomaterials to augment and repair impaired vocal folds. We aim to analyze the current viscoelastic data on these materials.

METHODS: A MEDLINE search was performed, identifying 15 articles that addressed the viscoelastic properties of currently used and developing biomaterials.

RESULTS: Teflon, Gelfoam, Cymetra, and calcium hydroxyapatite achieved elastic moduli (G') and dynamic viscosities (η) several orders of magnitude higher than that of normal vocal fold mucosa; bovine collagen and autologous fat had lesser G' and η values. Derivatives of hyaluronic acid (HA) achieved viscoelastic properties that most resembled that of vocal fold mucosa.

CONCLUSIONS: Many currently used biomaterials are well suited for injection into deeper layers of the vocal cords to treat glottic insufficiency. Whereas these materials are overly stiff and viscous for treating damaged vocal fold mucosa, chemically modified HA derivatives are potential agents for this purpose.

Vocal Fold Augmentation with a New Gel Implant – Four Month Outcomes

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There are several substances available for vocal fold (VF) augmentation. The purpose of this investigation was to report 4-month follow-up on a new FDA approval gel for VF augmentation.

METHODS: Forty-four patients prospectively recruited for VF injection augmentation were evaluated. Voice Handicap Index (VHI) and stroboscopy findings were documented at enrollment, one, three, and four month follow-up. Paired t-test was used for comparison of pre- and post-operative results.

RESULTS: Forty-two patients underwent 48 injections. The mean VHI at entry, 1, 3, and 4-months was 28 (+/-8), 18 (+/-9), 20 (+/-11), and 18 (+/-10) ($p < 0.0003$). Stroboscopy revealed improved glottal closure, however, delayed stiffness was apparent at 3 months in 11/48 (23%). Average follow up was 4.4 months.

CONCLUSIONS: VF augmentation with Novielle Voice Gel has demonstrated significant improvements in VHI-10 at five months. The delayed onset of vibratory stiffness in 23% is concerning.

Vocal Fold Wound Healing Outcomes in Drug Resistant Protein Knockout Mice

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Stem cells are known to overexpress drug resistant proteins as part of a self-protective nuclear dye efflux phenotype. The purpose of this study was to examine differences in vocal fold mucosal wound healing outcomes in drug resistant protein knockout mice compared to wildtype control mice. Mice were subjected to unilateral vocal fold injury under endoscopic guidance. Laryngeal tissue was harvested one month post-injury and immunohistochemistry was performed against the extracellular matrix proteins procollagen type I, collagen types I, III and IV, fibronectin, decorin, elastin, and hyaluronic acid binding protein 2. Drug resistant protein knockout mice demonstrated significantly altered extracellular matrix protein abundance compared to wildtype control. Drug resistant protein knockout models may hold a key role in improved understanding of vocal fold tissue repair processes.

Voice Outcomes in Early Glottic Cancer Treatment: Comparison of Surgery and Radiation

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PURPOSE: The objective of this systematic review is to compare voice outcomes for T1 glottic carcinomas treated with endoscopic excision to those treated with radiation therapy.

METHODS: Eligible studies were identified through PubMed searches spanning 1966 – 2009. Hand-searches through references from selected papers as well as searches through other databases are ongoing. Outcome data, including acoustic parameters, perceptual ratings, and functional and quality of life questionnaires, are collected.

RESULTS: Of the 72 studies identified initially, a large fraction presented voice outcomes in aggregate across different T stages of disease. Preliminary results from the focused review of T1 glottic carcinoma treatment indicate that voice outcomes are similar but not identical between treatment with endoscopic surgery and radiation therapy.

CONCLUSIONS: A more nuanced understanding of the effects of endoscopic surgery and radiotherapy on voice outcomes after treatment for T1 glottic carcinoma will allow improved counseling for newly diagnosed patients.