THE PROGRAM
OF
THE NINETY NINTH ANNUAL MEETING
OF
The American Broncho-Esophagological Association

Wednesday, Thursday, and Friday
May 1-3, 2019
JW Marriott Austin
Austin, Texas
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The Laryngoscope is the official journal of ABEA

The Laryngoscope has been the leading source of information on advances in the diagnosis and treatment of head and neck disorders for nearly 120 years. The Laryngoscope is the first choice among otolaryngologists for publication of their important findings and techniques. Each monthly issue of The Laryngoscope features peer-reviewed medical, clinical, and research contributions in general otolaryngology, allergy/rhinology, otology/neurotology, laryngology/bronchoesophagology, head and neck surgery, sleep medicine, pediatric otolaryngology, facial plastics and reconstructive surgery, oncology, and communicative disorders. Contributions include papers and posters presented at the Annual and Section Meetings of the Triological Society, as well as independent papers, "How I Do It", "Triological Best Practice" articles, and contemporary reviews. Theses authored by the Triological Society’s new Fellows as well as papers presented at meetings of the American Laryngological Association and American Broncho-Esophaesophageal Association are published in The Laryngoscope.
Purpose

The purpose of this program is to provide Otolaryngologists-Head and Neck Surgeons, Pulmonologists, Gastroenterologists and other interested physicians, clinicians and scientists with an opportunity to update their knowledge of diseases involving the upper aerodigestive tract.

Educational Objectives

The aim of these scientific sessions is to provide physicians with up-to-date information pertinent to the clinical evaluation and endoscopic management of laryngeal, tracheobronchial, and esophageal disorders.

This scientific program will provide attendees with an advanced understanding of current issues regarding the diagnosis and management of complex swallowing disorders, voice disorders, airway disorders and operative procedures used in the management of disorders of the upper aerodigestive tract.

Special focus will be placed on issues relevant to laryngology.

Attendees will also receive advanced knowledge and techniques enabling them to compare and refine their medical and surgical skills to include best practice performance and optimize patient outcomes. These outcomes will also introduce them to deficits in current knowledge and future research needs.

Disclosure

In compliance with the ACCME Accreditation Criteria, the American College of Surgeons, as the accredited provider of this activity, must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. All reported conflicts are managed by a designated official to ensure a bias-free presentation. Please see the insert to this program for the complete disclosure list.
CONTINUING MEDICAL EDUCATION
CREDIT INFORMATION

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This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of the American College of Surgeons and American Broncho-Esophagological Association. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™
The American College of Surgeons designates this live activity for a maximum of 8.25 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the AMA PRA Category 1 Credits™ listed above, a maximum of 4.25 credits meet the requirements for Self-Assessment.
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Your support goes toward building resources for resident scholarships as well as research and educational programs for members.
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**Wednesday, May 1, 2019**  
**Agenda At A Glance**

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Introduction of Guests  
Presidential Citations |
| 1:45 PM - 2:18 PM| Presidential Keynote Address                                         |
| 2:20 PM - 2:50 PM| Session I: Airway I                                                  |
| 2:50 PM - 3:20 PM| Break with Exhibitors  
*Exhibit Hall*                                                       |
| 3:20 PM - 4:05 PM| Panel 1: Dysphagia Management in the Elderly  
(In collaboration with ASGO)                                        |
| 4:07 PM - 4:37 PM| Session II: Cancer                                                  |
| 4:39 PM – 4:59 PM| Ellen M. Friedman  
Foreign Body Session                                                   |
| 4:59 PM – 5:00 PM| Adjourn                                                               |
Presidential Welcome

Milan R. Amin, MD
Presidential Citations

Peter Belafsky, MD, PhD
Ellen Deutsch, MD
Richard Hayden, MD
Glenn Isaacson, MD
Albert Merati, MD
Guests of Honor

Jamie Koufman, MD
Chandrika Tandon
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1951–2018

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1959 Louis Clerf, MD – Saint Petersburg, FL
1961 W. Likely Simpson, MD – Memphis, TN
1962 Edwin N. Broyles, MD – Baltimore, MD
1963 Sam E. Roberts, MD – Kansas City, MO
1964 Lyman Richards, MD – Wellesley Hills, MA
1965 Berling K. Hart, MD – Charlotte, NC
1966 Julius W. McCall, MD – Cleveland, OH
1967 Francis W. Davidson, MD – Danville, PA
1968 Dean M. Lierle, MD – Iowa City, IA
1969 Leroy A. Schall, MD – Barnstable, MA
1970 Herman J. Moersch, MD – Rochester, MD
1971 Louis Clerf, MD – Saint Petersburg, FL
1972 Joseph P. Atkins, MD – Philadelphia, PA
1973 Ricardo T. Acuna – Mexico City, Mexico
1974 Paul H. Holinger, MD – Chicago, IL
1975 Arthur M. Olsen, MD – Rochester, MN
1976 Francis LeJeune, MD – New Orleans, LA
1977 Alden H. Miller, MD – Los Angeles, CA
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1979 Charles F. Ferguson, MD – Osterville, OH
1980 Emily Lois Van Loon, MD – Philadelphia, PA
1981 Donald Proctor, MD – Baltimore, MD
1982 Frank D. Lathrop, MD – Pittsford, VT
1983 John E. Bordley, MD – Baltimore, MD
1984 Gabriel F. Tucker, MD – Chicago, IL
1985 Stanton A. Friedburg, MD – Chicago, IL
1986 F. Johnson Putney, MD – Charleston, SC
1987 Howard A. Anderson, MD – Rochester, MN
1988 John Paul Frazer, MD – Rochester, MN
1989 Paul H. Ward, MD – Los Angeles, CA
1990 D. Thane R. Cody, MD – Jacksonville, FL
1991 M. Stuart Strong, MD – Boston, MA
1992 Bruce Benjamin, MD – Sydney, Australia
1993 David R. Sanderson, MD – Scottsdale, AZ
1994 Michael E. Johns, MD – Baltimore, MD
1995 John A. Kirchner, MD – Woodbridge, CT
1996 Robert W. Cantrell, MD – Charlottesville, VA
1997 Eiji Yanagisawa, MD – New Haven, CT
1998 Lauren Holinger, MD – Chicago, IL
1999 William R. Hudson, MD – Durham, NC
2000 Robert H. Ossoff, DMD, MD – Nashville, TN
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2013 Steven M. Parnes, MD – Albany, NY
2013 Jerry C. Goldstein, MD – Wellington, FL
2013 Leora Loy – Salt Lake City, UT
2014 Ellen Friedman, MD, FACS - Houston, TX
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2015 Stuart Strong, MD - Boston, MA
2016 Diane Bless, PhD - Madison, WI
2017 Robin Cotton, MD – Cincinnati, OH
2017 Kerry Olsen, MD – Rochester, MN
2018 Steven Zeitels, MD – Boston, MA
Presidential Keynote Address

Rethinking Success

Chandrika Tandon
Session I:
Airway I

Moderators
Laura Matrka, MD
Marshall Smith, MD
Examining the Swiss Cheese: Multidisciplinary Perspectives on Patient and Caregiver Tracheostomy Care Education and Its Pitfalls

Presenter: Victoria Yu

Authors: Victoria Yu, Apoorva Ramaswamy, Michael Pitman

Disclosures: V. Yu: None. A. Ramaswamy: None. M. Pitman: None.

Institution: Columbia University Medical Center

Objective: Previous studies have evaluated protocols for patient and caregiver tracheostomy care education, showing improvements in caregiver skill and confidence and reduced complication rates. Less explored is the optimal implementation of these protocols. We present a synthesis of stakeholder interviews related to our institution’s tracheostomy care education practices, with the goal of identifying and ultimately addressing impediments to its execution.

Method: Qualitative, semi-structured interviews were conducted with 5 stakeholder groups: patients/family caregivers, physicians, nurses, respiratory therapists (RTs), and speech-language pathologists (SLPs). For patients/caregivers, questions explored tracheostomy-related concerns, information they obtained regarding tracheostomy care, and satisfaction with this information. For providers, questions examined their roles in patient education, current educational practices, and best practices.

Results: Analysis was conducted using interviews collected to date with 7 patient/caregivers, 6 physicians, 9 nurses, 4 RTs, and 4 SLPs. We found that patients/caregivers received variable teaching, with most receiving none. Providers largely agreed on the set of tasks that patients/caregivers should know how to perform, with discrepancies in recommended execution. Providers also conveyed varying levels of urgency regarding the need to ensure patients/caregivers’ ability to care for tracheostomies independently. They gave differing responses about who is responsible for teaching. Patient/caregiver factors that affect education delivery include medically complicated states, advanced age, and attitude toward tracheostomy care.

Conclusion: Though studies show that tracheostomy care education is beneficial, factors associated with both the providers and patients/caregivers impede the execution of these educational protocols. These factors must be considered when developing and executing an effective tracheostomy education protocol.
Implementation of the European Laryngological Society Classification for Adult Benign Laryngotracheal Stenosis: A Multicentric Study

Presenter: Christian Sittel

Authors: Christian Sittel¹, Ivana Fiz¹, Philippe Monnier², Jan Constantin Koelmel¹, Diana Di Dio¹, Francesco Fiz³, Francesco Missale⁴, Cesare Piazza⁵, Giorgio Peretti⁶


Institution: ¹Katharinenhospital Stuttgart; ²Lausanne University Hospital; ³University of Tuebingen - Germany; ⁴University of Genoa - Italy; ⁵University of Milan - Italy

Objective: Introduction of cricotracheal resection as routine treatment for high-grade benign laryngotracheal stenosis (LTS) rose a need for new classification system that would accurately predict surgical outcomes integrating crucial stenosis and patients’ information. ELS published in 2015 a classification proposal for benign LTS, based on its grade, extension, and patients’ comorbidities. We retrospectively tested this classification in adults treated in 3 referral centers, to assess its reliability in predicting surgical outcomes.

Method: We included 166 adults treated by open surgery, restaged according to the degree of stenosis (I to IV according to Myer-Cotton grading), number of subsites involved (a to d for 1 to 4 subsites: supraglottis, glottis, subglottis and trachea) and presence of systemic comorbidity (+ sign). We correlated these parameters with decannulation, number of re-treatments and complication rate.

Results: Final decannulation was predicted by the proposed ELS score, resection length and the occurrence of surgical complications (p<0.001, p<0.001, and p<0.05, respectively). Decannulation was achieved in 99% of patients without and in 88% of patients with surgical complications (p<0.001). Incidence of surgical complications was related to the proposed ELS score (p<0.05); ELS score <IIIb showed a lower complication rate compared to patients with ?IIIb (32.8% vs. 57.7%, p<0.001). Additional treatment was required in 73 patients (44%), on average 2.7±2.2, range 1-11. ELS score and presence of surgical complications predicted the number of such treatments (p<0.05).

Conclusion: ELS classification of benign LTS represents an important predictor of success in airway surgery that enables correct therapy choice and patients’ counseling.
Determining the Minimal Clinically Important Difference of the Dyspnea Index in the Management of Laryngotraheal Stenosis

Presenter: Alan Gray

Authors: Alan J Gray, Molly L Naunheim, Devin Didericksen, Tanya K Meyer, Albert L Merati, Simon Brisebois


Institution: University of Washington

Objective: The Dyspnea Index (DI) is a validated quality of life (QoL) instrument, scored 0-40, used in the management of laryngotraheal stenosis (LTS). Although statistical difference before and after treatment may be reported in some studies using the DI, it is not known what change in the DI is of clinical significance. The minimal clinically important difference (MCID) is an established concept to help determine the change in a QoL instrument that reflects meaningful change for the patient. This study aims to determine the MCID for the DI in patients undergoing endoscopic surgical treatment for LTS.

Methods: This is a prospective cohort study in which fifteen patients with LTS completed the DI before and 6-8 weeks postoperatively, in addition to a Global Ratings Change Questionnaire (GRCQ), scored from 7 to +7, at the postoperative interval. A hypothesis test was carried out to test the association between GRCQ and change in DI. The MCID for change in DI was determined using anchor-based analysis.

Results: Overall mean change in DI was -10.2 and the mean change in GRCQ was +4.4. Change in DI scores were significantly different among the improvement and no improvement groups (p-value=0.0015). Area under the ROC curve was 0.86, demonstrating high discriminatory ability of the change in DI score. A change of -4 was determined to be the threshold that discriminated between moderate improvement and no improvement.

Conclusion: A decrease of 4 in the DI can be considered as the MCID for patients with LTS after endoscopic surgical treatment.
Predictors of Tracheostomy Decannulation in Adult Laryngotracheal Stenosis

Presenter: Grace Snow

Authors: Grace Snow, Elizabeth Guardiani

Disclosures: G. Snow: None. E. Guardiani: None.

Institution: University of Maryland

Objective: The aim was to identify predictors of tracheostomy decannulation in tracheostomy-dependent adult patients with acquired stenosis of the larynx and/or trachea.

Method: Tracheostomy-dependent patients with laryngotracheal stenosis who were seen between January 1, 2013 and August 2, 2018 were identified by retrospective chart review. Patient characteristics, characteristics of the stenosis, and treatment approach were reviewed. The presence of tracheostomy at last follow-up was recorded. Exclusion criteria included age younger than 18, history of laryngeal cancer or head and neck radiation, or history of laryngeal fracture.

Results: One hundred and three patients met inclusion criteria; 68% of patients were women and the average age was 54. Sixty-four patients (62%) were successfully decannulated. Patients underwent an average of 1.7 surgeries (range 0 to 13) with the goal of tracheostomy decannulation. Patients who were successfully decannulated presented to Otolaryngology clinic earlier than patients who were not decannulated (48 days after tracheostomy versus 225 days, p <0.05). Those who were decannulated were more likely to have been intubated due to trauma and were less likely to have cardiac disease, diabetes, or gastroesophageal reflux compared to those who remained tracheostomy-dependent (p <0.05). There were no statistically significant differences in patient gender, age, number of surgeries, site of stenosis, characteristics of stenosis (granulation tissue versus scar), or treatment methods between the two groups.

Conclusion: Early evaluation by an otolaryngologist may increase the likelihood of tracheostomy decannulation in patients with laryngotracheal stenosis. Patient comorbidities may assist in predicting which patients will be successfully decannulated.
Autoimmune Related Subcordal Stenosis as a Variant of Subglottic Stenosis; A Case Control Study.

Presenter: Keven Motz

Authors: Kevin Motz, Bridget D Burgess, Simon Best, Lee Akst, Alexander Hillel


Institution: Johns Hopkins

Objective: Idiopathic subglottic stenosis (iSGS) and granulomatosis with polyangitis related subglottic stenosis (GPA SGS) are both well-established clinical entities at the level of the cricoid cartilage below the inferior edge of the thyroarytenoid muscle. Here we present six cases of a proposed variant of autoimmune SGS that involves stenosis of the inferior aspect of the vocal folds at the level of the conus elasticus, and extending inferiorly into the subglottis. This autoimmune related “subcordal stenosis” has been seen at this institution in patients who are C-ANCA negative, but responsive to systemic steroids or other immunosuppressants.

Method: A review of the electronic medical record revealed six cases of stenosis at the level of the inferior vocal folds in C-ANCA negative patients who responded to systemic immunosuppressants. These patients were matched to C-ANCA positive subglottic stenosis patients. Their systemic medication regimens and surgical procedure histories were compared in order to determine how this clinically distinct entity should be managed in contrast to classic GPA SGS patients.

Results: The subcordal stenosis patients and GPA SGS patient had similar immunosuppressive regimens. The subcordal stenosis patients responded better to systemic medical therapy alone however, with patients requiring a median of only 2 procedures versus 7 in the GPA SGS group. Additionally, the interval between procedures was longer in the subcordal stenosis group.

Conclusion: Subcordal autoimmune stenosis is a variant of autoimmune SGS and distinct from iSGS or GPA SGS. Therefore treatment should be geared towards medical therapy as the primary intervention rather than surgical intervention.
Discussion
Break with Exhibitors
Panel I:
Dysphagia Management in the Elderly

With the American Society of Geriatric Otolaryngology (ASGO)

Moderator
Ozelm Tulunay-Ugur, MD

Panelists
Brianna Crawley, MD
Naushee Jamal, MD
Karen Kost, MD
Session II:
Cancer

Moderators
Karuna Dewan, MD
David Rosow, MD
Volumetric Changes in Pharyngeal Structures Following Head & Neck Cancer Chemoradiation Therapy

Presenter: Ashley Hinther

Authors: Ashley V Hinther1, Nina Samson1, T. Wayne Matthews2, Harold Lau1, Harvey Quon1, Robyn Banerjee1, John Lysack1, Petra Grendarova1, Eduardo Villarreal1, Derrick Randall1


Institutions: 1Cumming School of Medicine University of Calgary; 2Dr. T. Wayne Matthews

Objective: To determine the volumetric changes in pharyngeal structures in patients treated with curative chemoradiation therapy (CRT) for head and neck squamous cell carcinoma (HNSCC). Patients treated with CRT for esophageal carcinoma (EC), where pharyngeal structures were outside the radiation treatment fields, controlled for potential dysphagia-associated weight loss. We hypothesize tissue volume loss is a contributing factor of post-CRT dysphagia.

Method: This retrospective cohort study measured pre- and one-year post-treatment soft tissue volumes of the base of tongue (BOT), parapharyngeal spaces (PPS), posterior pharyngeal wall (PPW), and retropharyngeal space (RPS) in patients undergoing CRT for HNSCC or EC treated January 1, 2012 - December 31, 2015. All HNSSC patients were treated to doses of 66-70 Gray in 30-33 fractions using Intensity Modulated Radiotherapy techniques.

Results: Our cohort included 50 HNSCC and 11 EC patients. Within the HNSSC cohort, PPW volume increased 1.55 cm$^3$ (95% CI = 0.77-2.34 cm$^3$, p=0.0002), RPS increased 1.22 cm$^3$ (95% CI = 0.67-1.77 cm$^3$, p<0.0001), and BOT decreased 2.29 cm$^3$ (95% CI = -0.20-4.79 cm$^3$, p=0.070). The EC cohort showed no significant volumetric changes for any anatomic space, with combined PPW and RPS volume changes statistically less than the HNSSC cohort (p=0.031). There was no difference in mean BMI reduction between groups (p=0.10).

Conclusion: Volumetric changes following CRT may play a role in post-treatment dysphagia. Our findings support loss of physiologic function from posterior pharynx tissue thickening and reduced pharyngeal constriction capacity due to BOT atrophy secondary to radiation effects.
Endoscopic Laryngo-pharyngeal Surgery for Hypopharyngeal Lesions

Presenter: Yo Kashimoto

Authors: Yo Kishimoto, Ichiro Tateya, Morimasa Kitamura, Koichi Omori


Institution: Kyoto University

Objective: Transoral approaches for laryngeal / pharyngeal malignancies have been widely accepted as less invasive treatment option, however hypopharyngeal lesions treated by transoral surgery have rarely been reported because of the difficult exposure of the hypopharynx. Since 2010, we have treated the hypopharyngeal lesions with endoscopic laryngopharyngeal surgery (ELPS) so far as the conditions allow, and herein report the outcomes of this transoral procedure.

Method: One hundred and sixteen patients with hypopharyngeal lesions were treated by ELPS from February 2010 to February 2017, and the clinical courses of the patients were reviewed.

Results: Four females and 112 males were included in this study, and their ages ranged from 41 to 85 years (average: 65.5 years). One hundred and thirty seven hypopharyngeal lesions (dysplasia: 22, Tis: 44, T1: 43, T2: 22, T3: 6) were resected in total. Five patients presented nodal metastases and ten patients had simultaneous oropharyngeal lesions. Post-operative bleeding and aspiration pneumonia were observed in 9 and 11 cases, respectively. These complications were safely managed and no percutaneous endoscopic gastrostomy (PEG) dependency was needed. As for oncological outcomes of 106 patients with malignant lesions, the 3-year overall survival rate was 93.4% and the 3-year disease specific survival rate was 100%.

Conclusion: In ELPS, the hypopharynx was well visualized providing the enough working space for the resection. The procedure was safe and feasible for hypopharyngeal lesions and exhibited very good oncological outcomes. ELPS are thought to be a very effective alternative for hypopharyngeal lesions.
Swallowing Impairment is Influenced by Free Flap Choice in Oral Cavity Reconstruction

Presenter: Steven Hoshal

Authors: Steven G Hoshal, Brianna N Harris, Lisa M Evangelista, Maggie A Kuhn

Disclosures: S.G. Hoshal: None. B.N. Harris: None. L.M. Evangelista: None. M.A. Kuhn: None.

Institution: University of California - Davis

Objective: Determine impact of free flap type on swallowing outcomes among patients undergoing oral cavity reconstruction.

Method: Retrospective review of adults presenting for evaluation of dysphagia who had undergone surgical resection and free flap reconstruction. Demographics, tumor size and stage, treatment details as well as post-operative functional oral intake scale (FOIS) scores, penetration aspiration scale (PAS) scores, oral transit times (OTT) and EAT-10 scores were recorded. Swallowing outcomes among free flap types were compared using Chi-square and Kruskal-Wallis analyses.

Results: Thirty-six patients were included. Of these, 67% were male, and mean age was 62.4 (+/-11.7) years. Fourteen (39%) underwent anterolateral thigh (ALT), eight (22%) underwent radial forearm (RF), and fourteen (39%) underwent osteocutaneous (OC) reconstruction with either a fibula or scapula flap. The mean time to videofluoroscopic swallow study after surgery was 52 days (range 13-63 days). Patients undergoing ALT had the longest mean OTT of 6.8 +/- 2.7 seconds (p<0.001). Within the ALT group, twelve patients (86%) required feeding tubes (FOIS < 4), compared to 63% of RF and 43% of OC groups (p=0.061). There was no statistical difference in post-operative EAT-10 scores among groups.

Conclusion: Dysphagia is common among patients undergoing oral cavity cancer resection and free flap reconstruction. These data suggest that swallowing impairment may be worse in patients receiving ALT reconstruction. These findings may help to guide reconstructive decision-making, post-surgical expectations and post-treatment swallowing rehabilitation.
KTP Laser Treatment of Early Glottic Cancer: A Multi-institutional, Retrospective Study

Presenter: Noah Parker

Authors: Noah Parker\textsuperscript{1}, Mark Weidenbecher\textsuperscript{2}, Aaron Friedman\textsuperscript{3}, Brian Walker\textsuperscript{4}, David Lott\textsuperscript{4}


Institutions: \textsuperscript{1}The Voice Clinic of Indiana; \textsuperscript{2}Case Western Reserve University; \textsuperscript{3}Northshore University Health System; \textsuperscript{4}Mayo Clinic

Objectives: To report oncologic and functional outcomes following potassium-titanyl-phosphate (KTP) laser photoablation of early glottic cancer by independent surgeons.

Methods: A retrospective analysis of patients treated by 4 laryngologists at separate institutions was performed. Inclusion criteria were: (1) patients with T1 or T2 squamous cell carcinoma of the glottis treated with the KTP laser utilizing a photoablation technique with ultra-narrow margins, and (2) at least 2 years of follow up. Frozen and/or permanent section margins were not used to assess tumor control. Exclusion criteria included previous radiation or surgical failures. T2 tumors were differentiated by ‘a’ (unilateral) and ‘b’ (bilateral) designations. Primary outcomes included surgical failures requiring radiation or laryngectomy, disease-specific survival, and overall survival. Secondary outcomes included voice outcomes following treatment assessed pre-operatively and at 6-12 months post-treatment using the Voice Handicap Index-10 or the Voice-Related Quality of Life instruments.

Results: Eighty-seven patients met inclusion criteria. Mean follow up was 43.2 months (standard deviation 17.2). Staging included 54 T1a, 15 T1b, 12 T2a, and 6 T2b tumors. One patient required radiation therapy (radiation rate 1.1%). No patients required total laryngectomy. No patients died from laryngeal cancer. Disease specific survival and overall survival were 100% and 93.1%, respectively. Voices generally improved following treatment as assessed by validated patient-reported rating scales.

Conclusions: A multi-institutional, retrospective study analyzing outcomes following KTP laser photoablation for early glottic cancer demonstrated excellent tumor control and patient-assessed, subjective vocal improvement.
Is Depth of Cordectomy the Only Parameter Correlate with Voice Quality After Surgery?

Presenter: Jacob Cohen

Authors: Jacob T, Cohen, Eran Fridman, Yossi Keshet, Miki Paker


Institution: Rambam Health Care Campus

Objectives: To evaluate the different parameters affecting voice quality of patients suffering from T1 glottic carcinoma who underwent transoral laser cordectomy (TLC).

Methods: Twenty patients, who underwent TLC for T1 glottic carcinoma, were included in the study. Voice analysis was performed 36.7 ± 4.6 months after surgery. Acoustic analysis, perceptual GRABAS (Grade, Roughness, Breathiness, Astenia, Strain) scale, and subjective voice analysis using the Voice Handicap Index (VHI) were conducted. Patients' cordectomy specimens were re-evaluated using picrosirius red stain under polarized light microscopy to better define tumor depth of invasion and surgical depth of resection.

Results: Mean age was 61.5 ± 7.4 years. Average VHI was 36 ± 37.2. GRABS was 4.75 ± 4.4. Voice quality indices were inversely correlated with: Anterior commissure involvement, presence of glottic web, continuation of smoking after surgery and the presence of pre-operative vocal fold atrophy / paresis (VHI 4.75±1.5, GRABAS 7.75±3.8, Jitter 0.87±1%, shimmer 10.3±7%, Time to stability 0.09±0.08) compare to patients without any of the above mentioned parameters (VHI 7±8.7, GRABAS 1.75±2.36, Jitter 0.4±0.28%, shimmer 5.7±4.57%, Time to stability 0.06±0.02). Depth of resection didn't differ among the groups. We showed that picrosirius red stain with light polarization was the best tool to demonstrate the layers of lamina propria and the depth of surgical resection.

Conclusions: Depth of resection in TLC for T1 glottic cancer is only one of the many factors influence voice quality after surgery. Additionally, In order to truly appreciate depth of resection dedicated/additional stains are needed.
Discussion
Ellen M. Friedman
Foreign Body Session

Moderator
Mark Gerber, MD
Successful Retrieval of a Large Upper Esophageal Foreign Body Using Traction Suture

Presenter: Bharat A Panuganti

Authors: Bharat A Panuganti, Amanda Martin, John Pang, Matthew Lutch


Institution: Kaiser Permanent

Objective: Denture ingestion is a rare but potentially complicated phenomenon. We describe a novel technique using traction suture to retrieve a large partial denture from the cervical esophagus.

Method: Case report including imaging and photodocumentation.

Results: We present a 92-year old male who was hospitalized with acute respiratory failure secondary to influenza. Though his respiratory status improved with medical therapies, the patient then reported dysphagia. Video fluoroscopic swallow exam demonstrated a metallic object in the cervical esophagus, with a radiographic silhouette consistent with a partial denture. Otolaryngology was consulted for intraoperative removal after failed retrieval via flexible esophagoscopy by gastroenterology due to the denture’s size and immobility. To maximize exposure of the denture, a Weerda diverticuloscope was advanced distal to the upper esophageal sphincter. Initial attempts at retrieval with rigid instrumentation failed due to inadequate purchase. To facilitate retrieval, a vessel loop and 0-silk suture were looped around the denture with alligator forceps to form a traction sling. The surgeons successfully removed the bridge using an L hook and judicious retraction on the sling. Subsequent rigid esophagoscopy demonstrated esophageal abrasions but no transmural injury. He was discharged several days later without sequelae.

Conclusion: The size, shape, and orientation of a foreign body may preclude retrieval using flexible or even rigid esophagosopic techniques. The described method, using a traction suture to recover an ingested partial denture from the upper esophagus through a diverticuloscope, is a useful technique for bulky foreign bodies that resist rigid instrumentation.
A .50 Caliber Bullet as an Airway Foreign Body

Presenter:

Authors: Ashwin Ananth, John M. Carter

Disclosures: A. Ananth: None. J.M. Carter: None.

Institution: Ochsner Hospital for Children

Objective: To present the case of a 9 year-old male who presented with an unusual airway foreign body.

Method: Case report and video presentation.

Results: A 9 year-old male was brought to the emergency room after suspected ingestion of a foreign body while swimming. On initial examination, the patient was playful with normal vital signs but complained that he inhaled a “bullet” and could feel it on his right side. On lung exam he had diminished right-sided breath sounds. A chest X-ray identified a possible radiolucent foreign body without significant lung opacification. The patient was brought to the operating room for direct laryngoscopy and bronchoscopy. A foreign body was identified in the right mainstem bronchus and successfully removed endoscopically with optical forceps. An additional challenge presented is that when the slick metallic foreign body was dropped it would travel down the airway at high velocity. On examination of the removed foreign body, it was found to be a hollowed .50 caliber bullet. Images and video are available for presentation.

Conclusion: We present the case of a male child who presented with an unusual foreign body which was successfully managed with endoscopic retrieval.
Ellen M. Friedman Foreign Body Awardee
An Innovative Approach to Airway Foreign Body Management in an Extremely Premature Neonate

Presenter: Sarah E Hodge

Authors: Sarah E Hodge, Lauren Kilpatrick, Carlton Zdanski

Disclosures: S.E. Hodge: None. L. Kilpatrick: None. C. Zdanski: None.

Institution: University of North Carolina

Objective: To demonstrate a unique approach to airway foreign body removal in an extremely premature infant.

Method: This is a case report involving a retrospective review of a challenging though ultimately successful removal of an airway foreign body in an extremely premature neonate.

Results: A 2 day-old premature female born at 23 weeks and 4 days gestation, weight 530g, was intubated at birth. A 5 French surfactant catheter was advanced via the lumen of her indwelling 2.5 endotracheal tube (ETT) with accidental dislodgement of a 5cm segment of catheter in the distal airway. A chest X-ray revealed a right pneumothorax with airway foreign body within the right main stem bronchus extending into the right pleural space. A right chest tube was placed emergently, and the patient was subsequently transferred to the operating room for removal of the airway foreign body. Given the patient’s extreme prematurity, size, and tenuous respiratory status, both adequate visualization of the foreign body and maintaining ventilation were challenges. Ultimately, visualization was obtained using an 8mm sialoendoscope passed via the patient’s 2.5 ETT. With direct visualization of the surfactant catheter, sialoendoscopy forceps were then passed via the working channel of the sialoendoscope and used to successfully remove the foreign body while maintaining ventilation.

Conclusion: This case represents an innovative approach to complex airway foreign body management utilizing sialoendoscopy instruments to aid in visualization, maintain adequate ventilation, and successfully remove a foreign body from the airway of an extremely premature neonate.
Adjourn
### Thursday, May 2, 2019

**Agenda At A Glance**

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*Griffin Hall*
Presidential Welcome

Milan R. Amin, MD
Session III: Dysphagia I

Moderators
Jonathan Bock, MD
Mark Fritz, MD
Esophageal Transit Time is Influenced by Underlying Disease: A Videofluoroscopic Study

Presenter: Jacqui Allen

Authors: Jacqui E Allen, Kirany Bennett, Anna Miles

Disclosures: J.E. Allen: None. K. Bennett: None. A. Miles: None.

Institution: University of Auckland

Objective: Recently esophageal evaluation has been incorporated into videofluoroscopic study of swallowing (VFSS), however little is known about esophageal transit time (ETT) in different conditions.

Methods: Consecutive patients studied by VFSS with esophageal evaluation over 3 years were categorised by their primary referral diagnosis as stroke, other neurological condition, respiratory or gastroenterology and were included in this study then compared to 139 normal adults. All subjects underwent a standardized protocol including a 20ml fluid barium esophageal swallow. All videos were analyzed using objective digital measures of timing and displacement. Data was examined with Pearson correlations, ANOVA and pairwise comparisons.

Results: 756 patients (49% female, mean age 77y, SD 15y) and 139 healthy adults (50% female, mean age 52y, SD 22) were included in analyses. Patients were categorised as stroke (n=207), other neurological condition (n=207), respiratory (n=91) and gastroenterology (n=131). 24% of patients aspirated, no healthy adults aspirated. Gastroenterology patients were significantly younger than all other patient groups (p<.05). Age was significantly associated with ETT (p<.05). 20ml esophageal transit time (ETT) was significantly different across groups when controlling for age: healthy normal: 11s, stroke:17s, other neurological condition:15s, gastroenterology:14s, respiratory:9s (p<.001). Pairwise comparisons show significant differences in ETT between healthy and stroke (p<.05) and respiratory and stroke (p<.05).

Conclusions: Esophageal transit times vary between patients with different underlying comorbid conditions. This should be considered when assessing individuals and advising eating strategies. Prolonged esophageal transit may influence eating patterns, satiety, appetite, meal duration or pharyngeal parameters and warrants further investigation.
Evaluation of the Pharyngal Phase of Swallow Through High Density Surface Electromyography

Presenter: David Bracken

Authors: Gladys Ornelas, *co-first author, David J Bracken *co-first author, Thomas P Coleman, Philip A Weissbrod


Institution: University of California - San Diego

Objective: The pharyngeal phase of swallowing utilizes a complex series of anterior neck muscles. The coordination of suprahyoid and infrahyoid musculature occurs during this reflexive maneuver to achieve hyolaryngeal elevation, airway protection, and successful bolus migration. This study presents the use of high-density surface electromyography (HD sEMG) for the evaluation of swallow activity within the anterior neck.

Method: An HD sEMG grid of 20 channels was used to capture electromyographic data in ten adult subjects during salivary swallow tasking. Further, an HD sEMG grid of 64 channels was used to capture electromyographic data in three healthy adult subjects during extended swallow tasking of various consistencies such as; saliva alone, thin liquids, puree liquids, mixed consistency liquids, and solids. Two-dimensional coronally oriented energy maps were created to visualize anatomic position and activity of suprahyoid and infrahyoid musculature.

Results: Signal analysis techniques obtained a distinguishable wave morphology that varied between different bolus consistencies and between spatially oriented electrodes. Additionally, across all subjects, the temporal changes, such as duration of swallow task increased with increasing texture complexity. Energy maps offered a new means to identify muscle activity grossly amidst swallow tasking.

Conclusion: This pilot study in swallow evaluation suggests that noninvasive high-density sEMG has significant potential in monitoring and therapeutic biofeedback for swallow applications.
Objective Swallowing Abnormalities in Patients with Dysphagia Following Anterior Cervical Spine Surgery

Presenter: Shumon Dhar

Authors: Shumon I Dhar, Adam M Wegner, Pope Rodnoi, Omid Mehdizadeh, Shih C Shen, Yuval Nachalon, Nogah Nativ-Zeltzer, Peter C Belafsky, Eric O Klineberg


Institution: University of California - Davis

Objective: Determine quantitative fluoroscopic abnormalities in patients with dysphagia following anterior cervical spine surgery (ACS).

Methods: Dysphagic patients following ACS who presented from 01/01/12-12/31/17 were age and gender matched to normal individuals. Fluoroscopic parameters including lateral upper esophageal sphincter opening (UES-L), pharyngeal constriction ratio (PCR), and penetration aspiration scale (PAS) were measured. Number of spine levels fused, type of plates used, and primary versus revision cases were abstracted.

Results: 129 ACS patients presented with dysphagia. Mean age was 63 (+/- 11 years) and 54% were female. The mean voice handicap index was 13.3 (+/-10), mean eating assessment tool score (EAT10) was 18.5 (+/-10.1) and mean PAS was 1.9 (+/- 1.7). 7% of patients exhibited aspiration (PAS>5). 8% (10/129) had endoscopic vocal fold immobility. Mean number of levels fused was 2.2 (+/- 0.9). 11.6% (15/129) were revision surgeries. Mean time from ACS to swallow study was 58.3 months (+/-63.2). 72.9% had anterior cervical discectomy and fusion (ACDF) with a plate, 11.6% had a no profile implant, 2.3% had disc arthroplasty (DA) and 12.4% had hybrid surgery (ACDF + DA). Mean PCR for ACS patients was 0.12 (+/- 0.12) vs. 0.08 (+/- 0.08) (p=0.01), indicating significant pharyngeal weakness. Mean lateral UES opening was 0.84 (+/- 0.23) for ACS patients vs. 0.86 (+/- 0.22) (p=0.52).

Conclusion: Swallowing dysfunction in most patients after ACS is related to pharyngeal weakness and not vocal fold immobility, aspiration, or diminished UES opening. Preventive measures should focus on the relationship between surgical approach, plate morphology and pharyngeal dysfunction.
Development and Validation of the Laryngopharyngeal Universal Measure of Perceived Sensation (LUMP)

Presenter: C. Claire Melancon

Authors: C. Claire Melancon, Kathryn Ruckart, Stephen Carter Wright, Jr., Sarah Persia, Lyndsay L Madden

Disclosures: C. Melancon: None. K. Ruckart: None. S.C. Wright, Jr.: None. S. Persia: None. L.L. Madden: None.

Institution: Wake Forest Baptist Health

Objective: Globus pharyngeus (GP) is described as the subjective sensation of having a "lump" in the throat in the absence of correlating physical findings or dysphagia. Historically, despite the frequency of patient complaints, GP has been difficult to quantify with current outcome measures. This is in large part due to lack of a user friendly, modernized, objective patient-reported outcome measures (PROM) of symptom severity. The aim of this study is to develop a modernized, practical, validated PROM for evaluating GP symptom severity.

Methods: The Laryngopharyngeal Universal Measure of Perceived Sensation (LUMP) was created in 3 phases: 1) Item generation by an expert panel involving two laryngologists and two speech language pathologists developed from common patient-reported GP symptoms. 2) Line-item reduction based on internal consistency and reliability. 3) Instrument validity which was assessed by administering the questionnaire to patients with GP as well as patients without GP.

Results: A 19-item questionnaire was developed from an expert panel, then administered to 110 patients, 100 of which met inclusion criteria. After statistical analysis, less internally consistent or relevant questions were removed, leaving 8 items. Internal consistency (Cronbach alpha) of this 8-item questionnaire was 0.892. When administered to patients with GP versus patients without GP, the mean score was found to be higher in those with GP.

Conclusion: Preliminary results suggest the LUMP questionnaire is a valuable PROM for evaluating GP symptom severity.
Relationship of Vocal Fold Atrophy with Swallowing Safety and Cough Function in Parkinson’s Disease

**Presenter:** Yin Yiu

**Authors:** Yin Yiu, James A Curtis, Sarah E Perry, Michelle S Troche

**Disclosures:** Y. Yiu: None. J.A. Curtis: None. S.E. Perry: None. M.S. Troche: Grant support; Michael J Fox Foundation, CurePSP Foundation.

**Institution:** Teachers College, Columbia University

**Objective:** When swallowing function is compromised in patients with Parkinson’s Disease (PD), cough plays a crucial role in clearing the airway and preventing pulmonary complications. The aim of this study was to determine the influence of vocal fold atrophy severity as measured by bowing index (BI) on airway protection in PD.

**Method:** Thirty patients with PD completed measures of voluntary and reflex cough. Flexible laryngoscopy with endoscopic evaluation of swallowing (FEES) allowed for measurement of BI using ImageJ software and swallowing safety scored on the Penetration-Aspiration Scale (PAS). Regression analyses and ROC were performed to test our study aim.

**Results:** Twenty-four of 30 patients had some degree of vocal fold atrophy (BI > 0). When controlling for age, disease duration did not significantly influence BI. BI was not predictive of any sensory or motor measures of cough including measures of cough airflow, reflex cough threshold, or urge-to-cough. BI did significantly discriminate between patients with near-normal (PAS 1-3) and impaired (PAS 4-8) swallowing safety (p=0.01, sensitivity: 87%, specificity: 71.4%, cutoff value BI > 4.6).

**Conclusion:** Our results show that vocal fold atrophy is a potential factor contributing to poor swallowing safety. However, BI was not associated with cough function in this PD cohort, which was unexpected as prior studies have shown improved cough measures after vocal fold augmentation. Future studies should include measures of glottic closure during vocal fold adduction. Vocal fold atrophy in PD remains an important area of study as a targetable intervention for patients with airway protective dysfunction.
Discussion
Chevalier Q. Jackson Award

Recipient
Gregory Postma, MD
Chevalier Q. Jackson Lecture

Ryan C. Branski, PhD
Session IV: Airway II

Moderators
Priya Krishna, MD
Lauren Tracy, MD
STEVEN DEAN GRAY AWARD, 1st PLACE

Outcomes of Hypoglossal Nerve Stimulation Outside the U.S. Food and Drug Administration Recommendations

Presenter: Kathleen Sarber

Authors: Kathleen M Sarber¹, Katherine W Chang², Stacey L Ishman¹, Reena Dhanda Patil³


Institutions: ¹Cincinnati Children's Hospital Medical Center; ²University of Cincinnati; ³Cincinnati Veterans Affairs Hospital

Objective: The hypoglossal nerve stimulator (HGNS) is currently approved for treatment of obstructive sleep apnea (OSA) for patients with an apnea-hypopnea index (AHI) ≥15 to ≤65 events/hour with fewer than 25% central events (CAI), no complete concentric collapse on drug induced sleep endoscopy, and a recommendation for body mass index (BMI) ≤32 kg/m² or less. We present 18 patients implanted as a salvage procedure despite being outside these guidelines.

Study design: Retrospective chart review

Methods: We included all patients who underwent HGNS outside the current FDA guidelines. Demographic data, previous sleep surgery, polysomnographic parameters, Epworth sleepiness score (ESS), and BMI were compared before and after surgery.

Results: Eighteen patients were identified: 88% male, median age=63 years. Seven underwent previous sleep surgery. Four had an AHI<15 (mean 10.5 events/hour), 4 had an elevated AHI (mean 86.9 events/hour), 2 had elevated CAI (mean 49.5% of AHI), and 12 had elevated BMIs (range 32.1-39.1 kg/m²). Median AHI dropped from 25.2 to 3.75 events/hour (P=0.0006), oxygen saturation nadir increased from 82% to 88.5% (P=0.0001) and median ESS dropped from 11 to 7 (P=0.0016). Fifteen (78.9%) patients achieved surgical success (decrease in AHI>50% and AHI<20 events/hour) and 12 (63.2%) had an AHI<5 events/hour. Neither patient with elevated central events was successfully treated. Median device usage/week= 40 hours.

Conclusion: Our success rate for patients outside the FDA guidelines for HGNS was similar to the 1-year STAR trial results (66%). Future studies are necessary to consider expansion of these guidelines, with particular attention to BMI and AHI criteria.
Cricotracheal Resection for Adult Subglottic Stenosis: Clinicopathological Factors Predicting Decannulation Failure

Presenter: Ashok Jethwa

Authors: Ashok R Jethwa, Wael Hasan, Carsten E Palme, Antti A Makitie, Ralph W Gilbert, David P Goldstein, Andrew Pierre, Patrick J Gullane


Institution: University Health Network

Objective: Identify risk factors for decannulation failure after adult cricotracheal resection (CTR) and thyrotracheal anastomosis (TTA) in patients with subglottic stenosis (SGS).

Method: A retrospective review of adults undergoing CTR and TTA for SGS between 1988abstain017 was performed. All patients with a minimum of 6 months follow up were included in this review. Patient demographics, stenosis characteristics, treatment, and outcome data was collected. The endpoints for statistical analysis were development of restenosis and permanent tracheostomy.

Results: Seventy-five patients were included in this study. The etiology of subglottic stenosis was idiopathic or acquired in 27 and 58 patients, respectively. Postoperative airway patency was maintained via a T-tube in 54 (72%) and a tracheostomy in 14 cases (14%). A total of 7 patients (9%) were successfully extubated at the end of the procedure. The rate of restenosis and permanent tracheostomy was 13% (10/75) and 11% (8/75), respectively. The development of restenosis and presence of preexisting impaired vocal cord mobility were independent predictors for permanent tracheostomy (p = 0.02 and 0.03, respectively). Male gender, significant medical comorbidity, prolonged intubation, impaired vocal cord mobility and T-tube duration > 86 days were all associated with the development of restenosis (p < 0.05). The overall rate of successful decannulation was 89% (67/75).

Conclusion: CTR and TTA is an excellent surgical approach for adult patients with SGS with the majority of patients achieving successful decannulation. Preexisting impaired vocal cord mobility and development of restenosis after resection predicts treatment failure.
Tracheotomy Outcomes Based on Timing and Technique

Presenter: Mingyang Gray

Authors: Mingyang L. Gray, Ross O'Hagan, Christopher H. Park, Daria G. Ade, Kevin Wong, Adel Bassily-Marcus, Mark S. Courey


Institution: Icahn School of Medicine at Mount Sinai

Objective: To demonstrate differences in outcomes among early versus late and percutaneous versus non-percutaneous tracheotomy.

Method: A retrospective analysis of all patients who underwent tracheotomy at one tertiary-care teaching hospital in 2016 was performed. Patients were aggregated by early (<12 days intubation) or late (>12 days intubation) and percutaneous or non-percutaneous tracheotomy. Outcomes measured were intensive care unit (ICU) length of stay (LOS) and total hospital LOS.

Results: Of the 652 records reviewed, 513 had complete data with 411 early tracheotomies and 102 late tracheotomies. The average ICU LOS for early tracheotomy was 11.1 days (SD=12.6) and late tracheotomy was 12.3 days (SD=12.3), (p=0.3639). The average hospital LOS for early tracheotomy was 32.7 days (SD=149.5) and late tracheotomy was 32.2 days (SD=150.8), (p=0.2451). Early percutaneous tracheotomy had an average ICU LOS of 13.1 (SD=12.6) and average hospital LOS of 34.5 (SD=150.2) while early non-percutaneous tracheotomy had an average ICU LOS of 10.0 (SD=12.6) and average hospital LOS of 31.8 (SD=149.5), (ICU LOS p=0.00317, hospital LOS p=0.0119). Late percutaneous tracheotomy had an average ICU LOS of 18.7 (SD=12.4) and average hospital LOS of 34.8 (SD=152.0) while late non-percutaneous tracheotomy had an average ICU LOS of 9.0 (SD=12.3) and average hospital LOS of 30.8 (SD=150.8), (ICU LOS p=0.00298, hospital LOS p=0.0485).

Conclusion: There were no statistically significant difference in outcomes between early and late tracheotomies. Patients who underwent non-percutaneous tracheotomy had a significantly shorter length of ICU and hospital stays than those who underwent percutaneous tracheotomy regardless of timing.
**Frequency of Intervention with a Variety of Procedures for Idiopathic Subglottic Stenosis**

**Presenter:** Brandon Cardon

**Authors:** Brandon R Cardon, Ian Newberry, Matthew Miller, Marshall Smith

**Disclosures:** B.R. Cardon: None. I. Newberry: None. M. Miller: None. M. Smith: None.

**Institution:** University of Utah

**Objectives:** Idiopathic subglottic stenosis (iSGS) is a rare disease not explained by trauma or systemic disease that causes airway narrowing from relapsing scar and granulation tissue. Multiple treatments exist including cricotracheal resection (CTR), microlaryngoscopy bronchoscopy dilation (MLB), and in-office injection (IOI). Definitive management involves CTR for long term improvement when possible. However, treatment combinations remain highly variable across institutions. We present outcomes and experiences of a single surgeon at a high-volume tertiary care center.

**Methods:** Retrospective review from 1999 to 2018 of one surgeon’s experience with iSGS patients. Groups were divided into CTR, 1 or fewer MLB dilations and IOI (0-1 MLB+IOI), 2 or more MLB dilations with IOI (>1 MLB+IOI). Demographics, dyspnea index (DI), number of procedures, and time between procedures were recorded.

**Results:** Initial review revealed 69 iSGS patients, CTR (55): averaged 0.6 procedures per year (PPY) over 7.6 years of follow up vs >1 MLB+IOI (8): 1.6 PPY over 5.2 years vs 0-1 MLB+IOI (6): 2.7 PPY over 2.5 years. Procedures requiring general anesthesia: CTR: 0.6 PPY, >1 MLB+IOI: 1.2 per year, 0-1 MLB+IOI: 0.2 per year. Average DI at time of diagnosis and last follow 0-1 MLB+IOI: 22.7 to 19.3 vs >1MLB+IOI: 30.3 to 16.7.

**Conclusion:** CTR, MLB, and IOI may be used in combination to treat iSGS. IOI decreases the incidence of surgical intervention requiring general anesthesia while maintaining improvement in DI, a clinical indicator. Key Words: idiopathic, subglottic, stenosis, cricotracheal
BROYLES-MALONEY AWARD RECIPIENT

Efficacy and Safety of Biodegradable Stent for Tracheomalacia: Report on Animal Experiment

Presentation: Seong Keun Kwon

Authors: Seong Keun Kwon, Jungirl Seok, Minhyung Lee, Young Kang, Seulki Song


Institution: Seoul National University Hospital

Objective: Tracheomalacia or bronchomalacia can occur with a variety of congenital or acquired causes and can be fatal. Since non-absorbable stents presents with fatal complications, studies using various biodegradable stents have been conducted but the efficacy and safety are still inconclusive. The purpose of this study is to demonstrate the usefulness of biodegradable Polydioxanone (PDO) stent for tracheomalacia by using animal model.

Methods: Inflatable mesh type biodegradable stent was made with 8 mm diameter and 30 mm length using PDO. Endoscopic application system (EAS) which mounts the stent was developed. New Zealand White Rabbits were assigned to one of groups of normal, tracheomalacia with stent, and tracheomalacia without stent. Tracheomalacia model was developed by removing anterior portion of 10 consecutive tracheal cartilage rings without creating perforation on tracheal mucosa. Animals were observed with rigid endoscope for 12 weeks or until the animals die. Tracheas and lungs were harvested and histologic analysis were performed.

Results: All animals in normal group survived for 12 weeks. Stent was absorbed progressively without significant inflammation or any stenosis. All animals of tracheomalacia without stent died within 40 minutes. With stent, animals survived significantly longer than animals without stent. Cilia degeneration was observed in the trachea around 3 weeks, but normalization was observed at 12 weeks.

Conclusion: This study proved the efficacy and safety of biodegradable stents in the tracheomalacia model. Further study should be made to demonstrate safety and availability through fine-tuning of the stent mounting and more animal testing before clinical application.
Discussion
Break with Exhibitors
Panel II: Advances in Adult and Pediatric Posterior Glottic Stenosis

Moderator
Alexander Hillel, MD

Panelists
Alexander Gelbard, MD
Christopher Wootten, MD
Karen Zur, MD
Session V: Pediatrics

Moderators
Jennifer Lavin, MD
Scott Rickert, MD
Slide Tracheoplasty Outcome Predictors

Presenter: Aileen Wertz

Authors: Aileen Wertz, Stephanie Fuller, Christopher Mascio, Luv Javia

Disclosures: A. Wertz: None. S. Fuller: None. C. Mascio: None. L. Javia: None.

Institution: Children's Hospital of Philadelphia

Objective: Investigate if preoperative health status markers, comorbid conditions, or surgical parameters are associated with postoperative outcomes after slide tracheoplasty.

Method: Retrospective chart review of patients undergoing slide tracheoplasty at one institution from 01/01/2010 through 12/31/2017.

Results: 26 patients were included. Median age was 6 months and weight was 7.1kg at time of surgery. Median follow up was 24 months. Median time to extubation was 7 days. Median ICU and hospital stay were 27 and 30 days, respectively. Three (12%) patients required postoperative tracheostomy, 2 (8%) a single open revision, and 6 (23%) underwent endoscopic intervention postoperatively. There were no deaths due to persistent tracheal stenosis. No cardiac, pulmonary, or other captured comorbid conditions were associated with any measured outcomes. Concomitant cardiac surgery was associated with postoperative tracheostomy (p=0.04). Bypass time was associated with open revision (p=0.05). Age and weight at surgery were negatively correlated with time to extubation and length of hospital stay (p=0.03, 0.03, 0.001, 0.002, respectively). Hospital stay was 2.2 times longer if mechanical ventilation was required preoperatively (p=0.01) and 39% longer for every 1mm decrease in airway diameter at the stenosis (p=0.005).

Conclusion: Longer bypass time and need for concomitant cardiac surgery were associated with open revision and postoperative tracheostomy, respectively. Lower age and weight at surgery were correlated with increased time to extubation and length of hospital stay. Preoperative mechanical ventilation and smaller airway diameter at stenosis were associated with longer hospital stay. This information may be helpful in counseling families and planning postoperative care.
A Longitudinal Analysis of Tracheostomy Patients, Two Years Old and Younger

Presenter: Jordan Salley

Authors: Jordan Salley, Yann-Fuu Kou, Charles Sadeeh, Gopi B Shah, Ron B Mitchell, Romaine F Johnson


Institution: University of Texas Southwestern Medical Center

Objective: To estimate the probability of tracheostomy decannulation in infants based on time with tracheostomy and ventilator status upon initial discharge.

Method: We conducted a retrospective analysis of a single-institution longitudinal database of tracheostomy patients (age <3 years). Information was collected on demographics, indications for tracheostomy, and ventilator dependence. The endpoints were decannulation or death. The Kaplan-Meier method estimated five-year survival and decannulation rates. A Cox regression analysis controlled for associated comorbidities.

Results: This study included 305 infants. The indications for tracheotomy in patients were respiratory failure (70%), airway obstruction (48%), and pulmonary toilet (3.3%). 79% of patients were ventilator-dependent at discharge. At five years, 55% of patients were alive with tracheostomy, 30% of patients were decannulated (median time = 2.5 years), and 16% of patients were deceased (median time = 0.5 years). The log-rank test revealed that ventilator-dependent patients were more likely to be decannulated (X<sup>2</sup> = 6.2, p = 0.03) but equally likely to die compared to non-ventilated infants (X<sup>2</sup> = 0.15, p = .70). The Cox Proportional Hazards Regression model showed short gestation (HR 2.9, p <.001), bronchopulmonary dysplasia (HR 1.7, p = .02), and airway obstruction (HR 1.8, p = .01) were associated with higher chance of decannulation. Hispanic patients had a lower chance of decannulation (HR 0.58, p = .03).

Conclusion: Our single-institution database showed about one-third of our population was decannulated by five years (median time = 2.5 years). Further longitudinal studies are needed for better understanding of predictors for decannulation or death.
Spontaneous Respiration Using Intravenous Anesthesia and High-Flow Nasal Oxygen (STRIVE Hi) for Pediatric Airway Surgery

Presenter: Seong Keun Kwon

Authors: Seong Keun Kwon, Jeong-Yeon Ji

Disclosures: S. Kwon: None. J. Ji: None.

Institution: Seoul National University Hospital

Objective: The use of spontaneous respiration using total intravenous anesthesia and high-flow nasal oxygen (STRIVE Hi) technique in pediatric airway surgery has not been reported yet. We report our experience on endoscopic evaluations and surgeries of pediatric airway using STRIVE Hi.

Method: A retrospective review was performed. Among the fifty-six airway procedures held under STRIVE Hi by a single surgeon in a single institute during May 2017~September 2018, ten cases with pre-existing tracheostomy tube were excluded and remaining forty-six cases were included in the study. After induction of anesthesia, continuous infusion with propofol and remifentanil was titrated to an adequate level of anesthesia and humidified oxygen was supplied via nasal cannula. Transcutaneous CO2 sensor, pulse oximeter, oxygen reserve index, and bispectral index were monitored. Muscle relaxant was not administered.

Results: The median age was 16.0 (1abstain15) months and the median weight 10.1 (2.4-38.5) kg. The median duration of anesthesia was 47 (15-140) minutes. The airway procedures included suspension exam, tracheocutaneous fistula excision, balloon dilatation, supraglottoplasty, laryngeal cleft repair, injection laryngoplasty, papilloma excision, and subglottic cyst removal. During these procedures, STRIVE Hi facilitated the evaluation of dynamic obstruction of the airway and the immediate evaluation of surgical treatment, provided a good surgical view, and thus allowed us to avoid tracheostomy. Intubation and termination of spontaneous respiration were required only in five cases.

Conclusion: STRIVE Hi is an effective and feasible option of anesthesia for pediatric airway surgery. It provides unobstructed surgical access while avoiding tracheostomy and is applicable to various procedures.
Pediatric Ingestion of Household Cleaning Agents: A Population-Based Analysis

**Presenter:** Scott Schwartz

**Authors:** Scott J Schwartz, Eleanor P Kiell

**Disclosures:** S.J. Schwartz: None. E.P. Kiell: None.

**Institution:** Wake Forest School of Medicine

**Objective:** Our objectives were to identify and analyze household cleaning product ingestion trends in the pediatric population. We hope to potentially guide preventative measures of these products, and provide useful information to physicians.

**Method:** The Consumer Product Safety Commission's National Electronic Injury Surveillance System was queried for pediatric household cleaning products (including laundry detergents, soaps, bleaches, etc) poisoning and ingestion data for the most recent five-year span (2013-2017). Data was analyzed for product type and injury occurrence. Injury trends over the past 5 years were identified; patient demographics were analyzed; and patient disposition was reported.

**Results:** Emergency department visits for pediatric household cleaning product ingestion remained relatively stable over the time period analyzed. In all, an estimated 248,600 visits occurred during this time frame. The most common product ingested was laundry detergents (24.0%), followed closely by household bleaches (20.8%). Interestingly, the number of injuries secondary to laundry detergent ingestion decreased over the time period studied. From 2013 to 2017, children under 2 years of age accounted for 50.2% of all ingestion injuries.

**Conclusion:** Pediatric ingestion remains a frequent occurrence with potentially significant ramifications. A slight majority of this population is under 2 years of age, indicating that proper storage of these household cleaners is paramount. While laundry detergent injuries have recently risen in national prominence, our data showed that these ingestions appeared to be slowly declining over the past five years. Physicians, including otolaryngologists, can use this information to properly counsel patients and parents.
Surgical Outcomes of Children with Type IV Laryngotracheoesophageal Clefts

Presenter: Alessandro de Alarcon

Authors: Alessandro de Alarcon¹, David R Lee², Matthew M Smith¹, Michael J Rutter¹


Institutions: ¹Cincinnati Children's Hospital; ²University of Cincinnati

Objective: Laryngotracheoesophageal (LTE) clefts are an uncommon congenital airway abnormality that have historically been associated with high mortality. Our objective is to describe the outcomes of children with type IV LTE who underwent surgical repair of their clefts.

Methods: This is an IRB approved retrospective case series of children with type IV LTE clefts at a single institution who underwent repair from 2002abstain017. Clinical and demographic information was recorded. Children underwent either a transtracheal approach or cricotracheal separation repair.

Results: There were 11 children (5 female) who were diagnosed with a type IV LTE cleft, with 3 extending past the carina into a mainstem bronchi. The mean age at surgical repair was 55 days (10-111 days), mean weight was 4.14kg (2.5-6.42 kg). The most common comorbidities diagnosed were microgastria (n=5), cardiac anomalies (n=5), and syndromes (2 VACTERL, 1 CHARGE). Three patients underwent transtracheal repair and 7 were repaired via cricotracheal separation (1 child had withdrawal of care prior to surgery). Three patients required a sternotomy and ECMO inotraoperatively. There was a survival rate of 70% (n=7). Three patients died within 13 days of surgery, 2/3 deaths had cleft extension into the mainstem bronchi. Mean follow up was 31.5 months(7-85 months). Only two patients had residual LTE clefts, and two patients are completely PO fed.

Conclusion: We report the first successful repair of a type 4 LTE cleft extending past carina. Surgical repair of type IV LTEs via a cricotracheal separation or transtracheal approach provides a successful method of surgical intervention.
Adjourn

Member Photograph

5:30 PM - 7:00 PM
Poster Reception
Griffin Hall
Friday, May 3, 2019
Agenda At A Glance

7:55 AM - 8:00 AM  Presidential Welcome

8:00 AM - 8:30 AM  Session VI: Dysphagia II

8:32 AM – 9:17 AM  Comprehensive Approaches to the Contemporary Reflux Patient
Supported by the Jamie Koufman Lectureship

9:19 AM - 9:50 AM  Session VII: Voice

9:50 AM - 10:30 AM  Break with Exhibitors
Exhibit Hall

10:30 AM - 11:15 AM  Panel III: Innovation in Laryngology
Supported by the Voice Institute of Health Endowment

11:17 AM - 11:53 AM  Session VIII: Larynx

11:55 AM – 12:00 PM  Adjourn
Introduction of New President
Session VI:
Dysphagia II

Moderators
Gregory Dion, MD
Libby Smith, DO
Esophageal A-Rings Represent a Compensatory Mechanism in Gastroesophageal Reflux Disease

Presenter: Yuval Nachalon

Authors: Yuval Nachalon, Nogah Nativ-Zeltzer, Shumon I Dhar, Peter C Belafsky


Institution: University of California- Davis

Objective: The Esophageal A-ring (EAR) is an anatomic finding on swallowing fluoroscopy at the junction of tubular and vestibular esophagus. EARs are appreciated on 5% of video-fluoroscopic esophagrams (VFEs). The purpose of this investigation is to evaluate the association between EARs and GER.

Method: This is a Case Control Study. All persons having undergone ambulatory pH testing with an EAR identified on VFE between 11/1/14 and 6/30/18 were identified from an electronic dysphagia database. All cases were age and gender matched to control patients and by presence/absence of hiatal hernia. Demographic information, Eating Assessment Tool (EAT10), total percent time pH <4, and composite DeMeester pH score were compared.

Results: The mean (SD) age of the entire cohort (n=20) was 63 (+/- 7.7) years. 60% was female. There was no association between cases and controls in regards to age, gender or presence of hiatal hernia (p>0.05). The mean EAT10 for persons with and without an EAR was 10.2 (+/- 7.9) and 11.3 (+/- 4) respectively (p=0.7). The mean DeMeester score for persons with and without an EAR was 48.9 (+/- 39.6) and 15.4 (+/- 12.3) respectively (p=0.033) and the mean total % time that the pH<4 for persons with and without an EAR was 26.4 (+/- 18.1) and 7.7 (+/- 6.8) respectively (p=0.034). The prevalence of erosive esophagitis among persons with and without an EAR was 70% and 10% respectively (p=0.019).

Conclusion: There is a significant association between EAR and severity of acid reflux on ambulatory pH testing and erosive esophagitis on endoscopy. We hypothesize that the presence of EAR is either a compensatory mechanism to protect against gastroesophageal reflux and/or inflammatory consequence of peptic esophagitis.
The Real Costs of Swallowing Complaints in a Public Health System

**Presenter:** Jacqui Allen

**Authors:** Jacqui Allen¹, Matthew Stretton², Ismael Sabido¹, Anna Miles¹, Monique Greene²

**Disclosures:** J. Allen: None. M. Stretton: None. I. Sabido: None. A. Miles: None. M. Greene: None.

**Institutions:** ¹University of Auckland; ²Waitemata District Health Board

**Objective:** Difficulty swallowing may lead to aspiration pneumonia and death. In a hospital setting where patients are admitted for other causes, we hypothesised that the additional burden of a swallow problem would increase length of stay, rate of pneumonia, cost, readmissions and morbidity compared to those without dysphagia.

**Method:** Retrospective case control analysis of patients admitted to a public hospital over 3 years with hip fracture. Two groups were identified and compared - those with a coded diagnosis of dysphagia (n=165) and an age- and gender-matched group without (n=2455). The number of in-patient days, cost per patient, diagnosis of pneumonia, 30-day readmission and mortality rates were compared.

**Results:** For those in the hip fracture with dysphagia group (HF+D) the mean age was 85 y compared to 78 y (p<0.05) and length of stay was 32 days, more than twice that of the hip fracture without dysphagia (HF-D) group (14 days)(p<0.05). Mortality within 30 days of admission was significantly different (18% vs 4%) but 30-day readmission rate was similar (8% vs 11%). Rate of aspiration pneumonia was 10 times greater in HF+D (6.7%) vs HF-D (0.7%). Average admission cost was $36,698NZD (HF+D) vs $22,028NZD (HF-D)(p<0.05).

**Conclusion:** Our analysis demonstrates that complaint of dysphagia, in addition to hip fracture, lengthens inpatient stays and cost per patient. It is associated with increased aspiration pneumonia and greater mortality. Dysphagia screening at admission to hospital allows early identification of swallow compromise and may prevent complications and reduce costs.
Differences in Objective Swallowing Characteristics in Zenker’s-Like Traction Diverticulum Following Anterior Cervical Discectomy and Fusion

Presenter: Shumon Dhar

Authors: Shumon I Dhar¹, Adam M Wegner¹, Pope Rodnoi¹, Omid Mehdizadeh¹, Shih C Shen¹, Yuval Nachalon³, Nogah Nativ-Zeltzer¹, Gregory Postma², Eric O Klineberg¹, Peter C Belafsky¹


Institutions: ¹University of California - Davis; ²Medical College of Georgia

Objective: Compare fluoroscopic parameters of Zenker’s-like traction diverticulum (ZTD) after anterior cervical discectomy and fusion (ACDF) to those of typical Zenker’s diverticulum (ZD).

Method: Patients presenting with ZTD after ACDF from 01/01/14-10/01/18 were age-gender matched to controls with ZD without ACDF.

Results: 11 out of 151 patients (7%) who underwent ACDF and were referred for videofluoroscopic swallow study had ZTD. Mean age was 69.6 (+/- 9.6 years) and 45.5% were female. Mean number of levels fused was 2.6 (+/- 1.22) and mean highest level fused was 3.78 (+/-0.97). For ZTD vs ZD, mean pharyngeal constriction ratio (PCR), was significantly higher, 0.87 (+/- 0.07) vs. 0.17 (+/-0.08) (p=0.045), mean hyolaryngeal elevation was significantly less, 2.5 (+/-0.85 cm) vs. 3.5 (+/-0.69 cm) (p=0.035) and mean diverticulum size was significantly smaller, 1.31 (+/-1.0 cm) vs. 2.3 (+/-1.9 cm) (p= 0.045). No significant differences in VHI, EAT10, FOIS, PAS, pharyngeal wall thickness, or vocal fold mobility were identified. Of the ZTD patients, one underwent endoscopic laser diverticulectomy, 3 had endoscopic staple diverticulectomy and one had a balloon dilation. 5 ZTD patients had exposed hardware and infection necessitating removal. Postoperative EAT10 was significantly higher in ZTD, 17 (+/abstain) vs. 5.5 (+/-4.3) (p=0.043).

Conclusion: We report the largest cohort of ZTD after ACDF. ZTD are smaller than ZD, associated with more pharyngeal weakness, poorer laryngeal elevation, and worse post-treatment subjective dysphagia. Although these diverticula can be managed endoscopically, the high percentage of exposed cervical hardware (45%) necessitates a thorough preoperative assessment and high index of suspicion.
Surgical Management of Recurrent Zenker’s Diverticulum: A Multi-Institutional Cohort Study

Presenter: Michael Berger

Authors: Michael H. Berger¹, David Weiland¹, William S. Tierney², Paul C. Bryson³, Philip A. Weissbrod³, Parth V. Shah⁴, Rupali N. Shah⁴, Robert A. Buckmire⁴, Sunil P. Verma¹


Institutions: ¹University of California - Irvine; ²Cleveland Clinic Voice Center; ³University of California - San Diego; ⁴University of North Carolina

Objective: The management of a symptomatic Zenker’s diverticulum after surgery is controversial, with many advocating open trans-cervical management as the preferred method of treatment. This study identifies how recurrent Zenker’s diverticula are treated.

Methods: Four tertiary referral academic voice and swallowing centers participated in this study. A retrospective chart review was performed to identify individuals who underwent surgery for Zenker’s diverticulum. Individuals who had prior surgery for their Zenker’s diverticula were included. Demographic data, surgical modalities for primary and revision surgery, symptoms pre and post revision and complications were recorded.

Results: 56 individuals, made up of 35 males and 21 females, met inclusion criteria. The average age at initial surgery was 65.4 years and the average time between initial and revision surgery was 4.6 years. Primary surgery was open in 30.3% (n=17) and endoscopic in 69.6% (n=39). The average pouch size at time of revision surgery was 3.4 cm with no size difference between primary treatment modality groups. Revision surgery was performed via an open approach in 37.5% of cases (N=21) and via an endoscopic approach in 62.5% of cases (N=35). No serious complications occurred after revision surgery. Revision surgical technique was based on pouch size, patient age and co-morbidities, as well as patient and surgeon preference.

Conclusion: Zenker’s diverticulum symptoms can recur regardless of treatment modality. There are many ways to successfully treat recurrent Zenker’s Diverticula.
Risk Factors for Death In Persons With Dysphagia

Presenter: Peter Belafsky

Authors: Peter Belafsky, Mustafa Sahim, Nogah Nativ-Zeltzer, Matthew Kaufman


Institution: University of California - Davis

Objective: To determine risk factors for mortality in persons with dysphagia.

Methods: All individuals undergoing a video-fluoroscopic swallow study between 01/01/12 and 06/30/15 were identified from an electronic dysphagia database and followed historically for two years. Demographic information including age, gender, smoking status, medical comorbidity, primary cause of dysphagia, BMI, EAT-10, and objective fluoroscopic data was abstracted. The incidence of death up to 2 years after the swallow study was obtained from the medical records, patient and family telephone interview, and vital records.

Results: 14 percent of the cohort (N=776) was dead within two years of the swallow study. The mean (+/- SD) age for persons alive and deceased was 64 (+/-13) and 73 (+/11) years respectively (p < 0.001). Elevated BMI, ever smoking status, higher FOIS, history of head and neck cancer, lower UES opening, elevated EAT-10 at time of study, elevated PAS, and elevated PCR were significantly associated with the incidence of death in univariate analyses (p < 0.05). Logistic regression suggests that older age, ever smoking status, elevated BMI, and reduced UES opening are all significantly associated with incident mortality (p < 0.05).

Conclusion: Dysphagia poses a significant risk of death. The two-year death rate for all persons with dysphagia at a tertiary swallowing center undergoing a fluoroscopic swallow study is high (14%). Independent risk factors for death among persons with dysphagia include advancing age, elevated BMI at the time of the study, reduced UES opening, and ever smoking status.
Discussion
Jamie Koufman Lectureship

Comprehensive Approaches to the Contemporary Reflux Patient

Moderator
Peter Belafsky, MD PhD

Panelists
Thomas Carroll, MD
Jamie Koufman, MD
Gregory Postma, MD
Craig Zalvan, MD
Session VII: Voice

Moderators
Lesley Childs, MD
Brad DeSilva, MD
Long-term Vocal Fold Injection Augmentation using a Microporous Annealed Particle Hydrogel in a Rabbit Model

Presenter: Heather Koehn

Authors: James J Daniero, Heather Koehn, Donald Griffin


Institution: University of Virginia

Objective: The objective of this experiment was to demonstrate the feasibility of injection augmentation in the leporine model for the long-term treatment of glottal insufficiency with a synthetic microporous annealed particle (MAP) scaffold, providing both integration and be non-resorbable biomaterial characteristics.

Methods: 32 rabbits were stratified into three treatment arms including MAP gel, hyaluronic acid, and saline. Endoscopic injection augmentation of the left vocal fold was performed to treat glottal insufficiency. At intervals of 0, 6, 12, and 24 weeks post-injection the rabbits were phonated and larynges were harvested for histopathologic examination. All rabbits underwent stimulated in vivo phonation using a tracheotomy with retrograde humidified oxygen delivered with unilateral laryngeal electrical stimulation. High-speed videolaryngoscopy was recorded at 5000 frames per second and acoustic recordings were collected and analyzed for vocal fold vibratory amplitude, open quotient, pitch and loudness.

Results: Glottic insufficiency due to unilateral laryngeal stimulation demonstrated by increased open quotient and decreased loudness. This function was reversed with MAP gel injection augmentation of the non-stimulated left vocal fold and tissue permanence was noted out to 6 months. Harvested laryngeal specimens subsequently underwent histopathologic analysis demonstrating no increase in CD11b cellular infiltration and significant penetration of CD31 cells into the implant itself indicating a lack of immune response and vascular infiltration within the MAP scaffold respectively.

Conclusions: MAP gel is an injectable long-term laryngeal reconstruction biomaterial suitable for vocal fold augmentation in a leporine model of glottal insufficiency.
Vocal Fold Augmentation with Abdominal Fat for Atrophy, Scarring and Unilateral Paralysis: Long Term Outcomes

Presenter: Yonatan Lahav, MD

Authors: Yonatan Lahav\textsuperscript{1}, Yael Shapira-Galitz\textsuperscript{1}, Liron Yosef\textsuperscript{1}, Doron Halperin\textsuperscript{1}, Hagit Shoffel-Havakuk\textsuperscript{2}


Institutions: \textsuperscript{1}Kaplan Medical Center;\textsuperscript{2}Rabin Medical Center

Objectives: Vocal fold augmentation with autologous fat is traditionally considered a temporary solution, assuming the adipose graft is absorbed over time. Nevertheless, our experience and previous publications by other disciplines suggest fat implantation may deliver a long-lasting improvement. This study aims to present the long-term outcomes for autologous fat vocal fold augmentation using strict protocols of harvesting, preparing and implantation.

Method: A prospective trial conducted between 2014 and 2017. Enrolled patients had unilateral paralysis, scarring or atrophy. The harvested fat was injected unilaterally or bilaterally into multiple paraglottic sites. Outcome measurements included video-stroboscopy, GRBAS score, VHI and acoustic analysis, performed preoperatively, 3, 12, 24 and 36 months after surgery.

Results: 22 patients were assigned; 11 had unilateral paralysis, 11 had atrophy or scar. 10 augmentations were unilateral, 12 were bilateral. Between pre-operative analysis to 36 months post-operatively, average(SD) VHI score improved from 73.45(22.78) to 43.14(30.37), \textit{p}-value=0.018; average(SD) GRBAS decreased from 8.64(3.89) to 4.0(3.09), \textit{p}-value=0.023; and average(SD) fundamental frequency decreased from 163.88Hz(41.61) to 145.0Hz(62.06), \textit{p}-value=0.012. Average(SD) Phase closure also improved significantly, from normal in 10\%(30) preoperatively to normal in 89\%(33) after 3 years, \textit{p}-value=0.008. In selected cases, narrow band imaging and CT scans demonstrated long-term viability of the implanted adipose tissue.

Conclusions: Fat is an excellent source of autologous graft, easy to harvest and implant. In careful patient selection and proper surgical technique, fat is suitable for long term correction of glottic insufficiency caused by various etiologies. Fat augmentation should be considered as a long-lasting or even permanent solution, rather than temporary.
Intraoperative Phonation Testing of Individual Vocal Folds in the Dog Larynx

Presenter: James Heaton

Authors: James T Heaton, James B Kobler, Mark P Ottensmeyer, Robert H Petrillo, Monica A Tynan, Robert E Hillman, Steven M Zeitels


Institution: Massachusetts General Hospital

Objective: Phonation typically involves two interdependent vocal folds (VFs), yet vibrating each fold independently may reveal tissue properties that are otherwise obscured when the folds interact. We tested this hypothesis using a hand-held instrument called the aerodynamic vocal fold driver (AVFD), comparing single-fold vibration with conventional 2-fold vibration in anesthetized dogs.

Method: Thirteen dogs (19abstain9 kg) were tested during suspension laryngoscopy under general anesthesia. Two dogs had bilateral scar created >1 year prior to testing, and one dog had a unilateral sulcus. The AVFD was modeled in SolidWorks and 3D-printed with photopolymer in a range of sizes. A high-fidelity pressure sensor was embedded in the AVFD surface to capture VF contract pressures. Phonation was generated by 1) placing a 2.1mm cannula through the mouth and posterior glottis and passing heated/humidified air below the glottis while the VFs were manually closed, and 2) vibrating each VF individually using multiple AVFD versions. High-speed-video files were recorded for each condition (4000 fps).

Results: All 26 individual VFs were successfully phonated with the AVFD, even in instances where scar prevented conventional bilateral phonation. The 15mm-wide AVFD fit best within the A-P dimension of the musculomembranous VF, and VF contact pressure correlated with acoustic output, driving pressures, and visible modes of vibration.

Conclusion: The AVFD can reveal vibratory characteristics of individual VFs under general anesthesia that are not always apparent or available through conventional phonation, which might facilitate phonosurgical decision making.
Revision Medialization Laryngoplasty: Patterns of Failure and Management

Presenter: Paul Bryson

Authors: Paul C Bryson, Eulalia M Amador, Michael S Benninger

Disclosures: P.C. Bryson: None. E.M. Amador: None. M.S. Benninger: None.

Institution: Cleveland Clinic

Objective: To describe our experience with revision medialization laryngoplasty (ML) over an eight year period. We will report common patterns of failure and revision techniques employed. Relationships between etiology of vocal fold immobility, surgical failure, and revision technique will be reported.

Method: Retrospective cohort review of patients undergoing ML for glottic insufficiency (GI)

Results: 366 patients underwent ML for GI over an 8 year period. Of these, 65 patients underwent a total of 96 revision procedures. Fourteen of these patients had their initial medialization procedure at an outside facility. The most common patterns of failure included persistent glottic incompetence, overmedialization, and implant malposition/extrusion. Diminished mucosal pliability was also noted in many of these patients. Patients underwent either open revision medialization with or without arytenoid procedure, endoscopic revision via vocal fold injection, or some combination of each. 18 patients underwent only injection revision (mostly fat) while 47 patients had an open procedure. The overall revision rate was 17.75% for any revision procedure while the revision rate for patient ultimately undergoing an open procedure was 12.8%.

Conclusion: Medialization laryngoplasty is often successful for voice rehabilitation in patients with glottic insufficiency. Revision medialization can be difficult and outcomes have not been reported frequently in the literature. Patients may undergo injection or open revision procedures with or without arytenoid manipulation. In our cohort, most patients underwent unilateral implant modification without arytenoid manipulation.
Utility of Imaging Studies in Patients Diagnosed with Idiopathic Vocal Fold Paralysis

Presenter: Fernando Morell

Authors: Fernando J Morell

Disclosures: F.J. Morell: None.

Institution: Ohio State University

Objective: The goal of the study is to identify the incidence of positive findings on imaging studies that have affected the patient’s care and outcome.

Method: A retrospective review of patients presenting to a tertiary care subspecialty Laryngology clinic from 2000 - 2018 with vocal fold paralysis. The following parameters were obtained: etiology of paralysis, need for surgical intervention, imaging studies, and significant positive results from these studies.

Results: A total of 121 patients identified with idiopathic vocal fold paralysis met criteria. There were 52 neck CTs, 37 chest CTs, 9 head CTs, 4 PETs, 16 brain MRIs, 6 neck MRIs and 2 chest MRIs. Of these, 29 had positive findings that explained the vocal fold paralysis. 23.9% of the patients had a positive imaging study. 41 patients (33.8%) underwent vocal fold augmentation or medialization.

Conclusion: This is a retrospective study on the incidence of positive findings on imaging studies for idiopathic vocal fold paralysis. Our results showed a diagnostic yield that is on par or higher than previously stated in the literature, with 76.1% of the patients having negative results.
Discussion
Break with Exhibitors
Panel III: Innovation in Laryngology

Supported by the Voice Health Institute Endowment

Moderator
Michael Pitman, MD

Panelists
Ramon Franco, MD
Adam Klein, MD
Peter Santa Maria, MD PhD
Phillip Weissbrod, MD
Session VIII: Larynx

Moderators
Lee Akst, MD
Katherine Yung, MD
Glottic Keratosis - Any Guidance from Appearance?

Presenter: Mursalin Anis

Authors: Mursalin Anis, Jennylee Diaz, Adam Lloyd, David Rosow

Disclosures: M. Anis: None. J. Diaz: None. A. Lloyd: None. D. Rosow: None.

Institution: University of Miami

Objective: The laryngoscopic appearance of keratotic vocal fold lesions presents a difficult challenge to clinicians: Which lesions can safely be observed, and when is observation not prudent? The aim of this study is to determine if there is an association between laryngoscopic appearance of glottic keratosis and histopathology.

Method: This is a retrospective case-control study. Fifty-nine patients with glottic keratosis and normal vocal fold mobility met inclusion criteria. Cases were patients who had biopsy-proven carcinoma in situ or invasive carcinoma. Controls were patients who had either benign laryngeal pathology or mild to moderate dysplasia. Preoperative videostroboscopies done with distal chip laryngoscopes and 70-degree telescopes were reviewed by blinded reviewer. Patient demographics and pathology were reviewed. Multivariable logistic regression was used to examine the correlation between laryngoscopic appearance of laryngeal lesions and presence or absence of carcinoma on biopsies.

Results: Sixty-eight percent of keratotic glottic lesions were determined to be malignant by histopathology. Erythroplakia underlying keratosis was present in 40% of glottic lesions. Increased angiogenic activity, recognized as speckled non-uniform vascular patterns on or around keratosis was present in 60% of glottic lesions. On logistic regression, both erythroplakia and vascular speckling were significantly associated with carcinoma, $p = 0.002$ and $p = 0.03$, respectively.

Conclusion: The presence of erythroplakia or vascular speckling in glottic keratosis is significantly associated with presence of carcinoma. These findings should prompt clinicians to consider immediate diagnostic biopsy in these patients rather than maintaining close surveillance.
Multi-Institutional Epidemiologic Survey of Laryngeal Leukoplakia

Presenter: Brian Sanders

Authors: Brian C Sanders¹, Stratos Ahlatis¹, Binhuang Wang¹, Clark A Rosen², Gregory N Postma³, C Blake Simpson⁴, Craig R Villari⁵, Milan R Amin¹


Institutions: ¹New York University; ²University of California - San Francisco; ³Medical College of Georgia at Augusta University; ⁴University of Texas - San Antonio; ⁵Emory University

Objective: Patients with recurrent laryngeal leukoplakia are a significant challenge given the lack of clear etiology and repeated surgical treatment required. Little is known regarding risk factors that may lead to this disease. We therefore conducted a multi-institutional survey to further characterize risk factors and disease impact to guide future studies and enhance patient education.

Method: A case-control survey was performed across five institutional sites. Subjects with laryngeal leukoplakia (LL) were compared to controls (1) patients with T1-T2 laryngeal squamous cell carcinoma (SCC) and (2) those with no known vocal pathology (NKVP). Surveys with a maximum of 64 questions were completed anonymously online.

Results: A total of 201 surveys were completed: 66 subjects with LL, 45 controls with SCC, and 90 controls with NKVP. When comparing LL to KNVP, subjects with LL had a higher prevalence of LPR and RSI (p<0.0001), increased personal voice use (p=0.026), increased pre-diagnosis EtOH intake (p=0.025) and binge drinking (p<0.0001), higher prevalence of positive smoking history (p=0.0247) and increased years of smoking history (p=0.047), and rated overall health as worse (p=0.03). When comparing LL to SCC, subjects had increased positive smoking history (p=0.0664), higher rate of pre-diagnosis binge drinking (p<0.0001); no difference was appreciated for prevalence of GERD (p=0.69) or RSI score (p=0.48), or subjective evaluation of overall health (p=0.21).

Conclusion: We identified several risk factors for laryngeal leukoplakia as well as helped characterize disease burden. Our data suggests that reflux, alcohol intake, increased voice use, and smoking history may all contribute to laryngeal leukoplakia.
Infection at the Operative Site After Microlaryngeal and Open Phonosurgery: The Role of Peri-Operative Antibiotics

Presenter: Scott Roof

Authors: Scott Roof, Michael Amato, Dillan Villavisnis, Rocco Ferrandino, Benjamin Rubinstein, Mark Courey, Peak Woo


Institution: Mount Sinai Hospital

Objective: While it is known that the airway has bacterial contamination that seeds the surgical site during microlaryngeal surgery, literature on the use of post-operative antibiotics is lacking. We performed a retrospective analysis of phonosurgical cases at a single institution to assess whether use of post-operative antibiotics impacts the incidence of surgical site infections (SSI).

Method: In this retrospective cohort study, we reviewed 230 phonomicrosurgery and 53 open phonosurgery cases performed for benign laryngeal diseases. Surgeries were performed by two laryngologists between February 2016 and August 2018. The surgeons differ in their postoperative antibiotic regimens: no antibiotics versus a 5-7 day post-operative course. Data collected includes demographics, medical co-morbidities, type of benign laryngeal disease, surgical procedure, and healing/voice outcomes. The primary outcome measure was postoperative infection, defined as the patient requiring a new prescription for antibiotics, an extended course of antibiotics, or any mention of infection at follow-up/emergency visits within the first month postoperatively.

Results: The overall rate of infection was 3.9% and 1.9% for endoscopic and open cases, respectively. For endoscopic cases, there was no difference in the infection rate for patients who received or did not receive antibiotics perioperatively, 2.8% versus 4.9% (P = 0.64). Similarly, there was no difference in the infection rate for open cases, 3.2% and 0.0% for antibiotic use or not, respectively (P = 0.99).

Conclusions: Infection rates after endoscopic and open phonosurgery are low. In this study, we found no evidence to suggest a protective effect associated with the use of post-operative antibiotics.
Metabolic Activity of Cells in Macula Flava of Human Vocal Fold from the Aspect of Mitochondrial Microstructure

Presenter: Kiminori Sato

Authors: Kiminori Sato, Shun-ichi Chitose, Kiminobu Sato, Fumihiko Sato, Takashi Kurita, Hirohito Umeno


Institution: Kurume University

Objective: There is growing evidence to suggest that the cells in the maculae flavae of the vocal fold mucosa are tissue stem cells of the human vocal fold. This study investigated the metabolic activity of the cells in the maculae flavae of the human vocal fold from the aspect of mitochondrial microstructure.

Method: Five normal human adult vocal folds obtained from autopsy cases were investigated under transmission electron microscopy. Results: Mitochondria were randomly distributed in the cytoplasm of the cells. The morphological features of the mitochondria consisted of a double-membrane-bounded body containing matrices and a system of cristae. In each mitochondrion, the lamellar cristae were sparse. The intercristal space was occupied by a mitochondrial matrix which contained electron-dense matrix granules, mitochondrial DNA and ribonucleoprotein granules. A single mitochondrion spread out over or fused to the surface of a lipid droplet in the cytoplasm. In addition, both the mitochondrial outer and inner membranes and the membranes of the lipid droplets had disappeared. Close association between mitochondria and rough endoplasmic reticulum accompanied with cisternae was present. The features of the mitochondria suggested that the metabolic activity and oxidative phosphorylation was reduced and that they may have shifted to the utilization of lipids to some extent for their metabolic needs.

Conclusion: The results of this study are consistent with the hypothesis that the cells in the maculae flavae of the human vocal fold mucosa have the metabolic programs of stem cells maintaining their stemness and undifferentiated states.
STEVEN DEAN GRAY AWARD RECIPIENT, 2nd PLACE

Carbon Debris and Fiber Cleaving: Effects on KTP Laser Power Output and Chick Chorioallantoic Membrane Vessel Coagulation

Presenter: Lauren Tracy

Authors: Lauren F Tracy, James A Burns

Disclosures: L.F. Tracy: None. J.A. Burns: None.

Institution: Massachusetts General Hospital

Objective: Photoangiolytic precision afforded by the 532nm potassium-titanyl-phosphate (KTP) laser relies on accurate power, pulse width, and pulse rate parameters. Inadequate power output can cause rupture of vessels instead of coagulation during KTP laser-assisted microlaryngoscopy. The purpose of this study was to quantify the effect of carbon debris and fiber cleaving configurations on power output and demonstrate the effect on blood vessel coagulation using a chick chorioallantoic membrane (CAM) model.

Method: Laser fibers with carbon debris, optimal cleaving, and suboptimal cleaving were studied. The average power output from 5 consecutive pulses through each of fiber configuration was recorded. The effect on vessel coagulation was tested in the chorioallantoic membrane (CAM) model. Repeated measures ANOVA was used to compare results with p<0.05.

Results: Carbon debris and suboptimal cleaving resulted in significantly decreased power output in comparison to optimal cleaving [(-?244W, d=4.31, p<0.001) and (-?195W, d=6.04, p<0.001)]. Optimal cleaving resulted in immediate coagulation of each tested vessel. Suboptimal cleaving and carbon debris coating had unpredictable outcomes, requiring multiple pulses to effect coagulation or causing vessel rupture.

Conclusion: KTP laser fiber function is significantly affected by distal tip configuration. Carbon debris and suboptimal cleaving create significant decrease in power output which results in unpredictable angiolytic effect as demonstrated by increased rupture rate in the CAM model. Optimal re-cleaving of KTP laser fibers allows return of power output and predictable coagulation of blood vessels. Care should be taken to avoid buildup of carbon debris on laser-fiber tips and to cleave the fibers properly.
Does Antithrombotic Therapy Increase Bleeding Incidence When Performing Direct Microlaryngoscopy?

**Presenter:** Richard Heyes

**Authors:** Richard Heyes, David G. Lott

**Disclosures:** R. Heyes: None. D.G. Lott: None.

**Institution:** Mayo Clinic - Arizona

**Objective:** To evaluate whether antithrombotic status impacts the incidence of intraoperative or postoperative bleeding in direct microlaryngoscopy (DML).

**Method:** A retrospective chart review of patients receiving operating room surgery with CPT codes 31525, 31526, 31535, 31536, 31540, 31541, 31545, 31561, or 31571 in a single surgeon’s practice from September 2012 to September 2017 was performed. These codes include DML alone and DML with biopsy, microsurgery, laser ablation, or vocal fold injection. At least one postoperative visit with laryngoscopy needed to be documented. Included patients were stratified based on perioperative antithrombotic status. Patient age, gender, American Society of Anesthesiologists class, indication for surgery, antithrombotic status, procedure, use of laser(s), intraoperative bleeding, postoperative bleeding and other complications were recorded.

**Results:** 288 patients met inclusion criteria. 102 patients (35%) were receiving antithrombotic medications prior to surgery. Two-thirds (68%) of medicated patients were receiving single antiplatelet therapy. Perioperative continuation of some form of antiplatelet or anticoagulant occurred in 84 patients. Medicated patients were older (72 vs. 55 years), predominately male (77% vs. 51%), and increasingly morbid (ASA 2.5 vs. 2.0). Perioperative complications occurred in 11 patients (4%) with 1 episode of mild hemoptysis and hypoxemia in PACU following phonosurgery with perioperative aspirin continuation. There were no intraoperative bleeds requiring electrocautery. There were no episodes of bleeding following discharge. Documented vocal fold hemorrhage on follow-up laryngoscopy occurred in 5 medicated patients (5%) and 2 non-medicated patients (1%); all resolved with conservative management.

**Conclusion:** Perioperative continuation of antithrombotic medications is appropriate when performing routine DML.
Discussion
Adjourn

Introduction of the new president
The Broyles-Maloney Award was established to encourage advancement of the art and science of bronchoesophagology and closely related subjects. Competition for the award is limited to persons whose abstracts are submitted for inclusion in the Annual Scientific Program. The award is given for outstanding manuscript, thesis or accomplishments in bronchoesophagology, laryngology or related science.

### RECIPIENTS OF THE BROYLES-MALONEY AWARD:

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<tr>
<td>1988</td>
<td>Richard A. Kosarek, MD</td>
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| 1990 | Thomas F. Dowling, MD  
       | Jamie Koufman, MD |
| 1991 | (no award) |
| 1992 | (no award) |
| 1993 | Jos. van Overbeek, MD |
| 1994 | Steven D. Gray, MD |
| 1995 | Jonathan E. Aviv, MD  
       | John H. Martin, PhD  
       | Ralph Sacco, MD  
       | Beverly Diamond, PhD  
       | Andrew Blitzer, MD, DDS |
| 1996 | (no award) |
| 1997 | Ira Sanders, MD  
       | Liancai Mu, PhD |
| 1998 | Nancy M. Bauman, MD  
       | Degiang Wang, MD  
       | Eric S. Luschei, PhD  
       | Debra M. Jaffe, MD |
| 1999 | Robert Berkowitz, FRACS  
       | Qi-Jian Sun, PhD  
       | John Chalmers, PhD  
       | Paul Pilowsky, PhD |
| 2000 | Asif Amirali, MD  
       | Greg Tsai, MD  
       | Nicole Schrader, MD  
       | Donald Weisz, PhD  
       | Ira Sanders, MD  
       | (no award) |
| 2001 | Shin-ichi Kanemaru  
       | Hisayoshi Kojima, MD  
       | Akhmar Magrufov, MD  
       | Koichi Omori, MD  
       | Yasuyuki Hiratsuka, MD  
       | Shigeru Hirano, MD  
       | Juichi Ito, MD  
       | Yasuhiro Shimizu, MD  
       | Ira Sanders, MD |
| 2002 | (no award) |
| 2003 | Clarence T. Sasaki, MD  
       | Tomoko Tateya, MD  
       | Ichiro Tateya, MD, PhD  
       | Diane M. Bless, PhD*  
       | (No award) |
| 2004 | (no award) |
| 2005 | J. Scott McMurray, MD  
       | Charles N. Ford, MD  
       | Nadine P. Conner, MD  
       | Joseph E Kershner, MD  
<pre><code>   | Nikki Johnston, PhD |
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| 2008 | Tina L. Samuels, MS  
Ethan Handler*, BS  
Michael L Syring, BS  
Joel H Blumin, MD  
Joseph E Kershner, MD  
Nikki Johnston, PhD |
| 2009 | Nikkie Johnston, PhD  
Clive W. Wells  
Tina Samuels, MS  
Joel Blumin, MD |
| 2010 | Sandeep Karajanagi, PhD  
Gerardo Lopez-Guerra, MD  
Hyounghin Park, PhD  
James B. Kobler, PhD  
Daryush D. Mehta, SM  
Yoshikiko Kumai, MD, PhD  
James T. Heaton, PhD  
Victoria L. M. Herrera, MD  
Robert E. Hillman, PhD  
Steven M. Zeitzels, MD |
| 2011 | Mikhail Wadie, MD  
Juan Li, MD  
Clarence T. Sasaki, MD |
| 2012 | Satoshi Ohno, MD  
Shigeru Hirano, MD, PhD  
Shin-ichi Kanemaru, MD, PhD  
Masonobu Mizuta, MD |
| 2013 | Tina Samuels, PhD  
Nikki Johnston, MD  
Gary Stoner, MD |
| 2014 | Steven M. Zeitzels, MD  
James Burns, MD  
Stacey Halum, MD  
Khadijeh Bijang-Visehsaraei, PhD  
Hongji Zhang, MD  
John Sowinski, BS  
Marco Bottino, DDS, MSc, PhD |
| 2015 | Abie H. Mendelsohn, MD  
Zhaoyan Zhang, MD  
Georg Luegmaier, MD  
Michael Orestes, MDD  
Gerald S. Berke, MD |
| 2016 | Seong Keun Kwon, MD  
Hyun-Woo Shin, MD |
| 2017 | James Kobler, PhD  
Steven Zeitels, MD  
James Heaton, PhD  
Sandeep Karajanagi, MD  
Jamie Bothello  
Patrick Lombardo  
Robert Hillman, PhD |
| 2018 | Rachel Anfang, MD  
Kris Jatana, MD  
Rebecca Linn, MD  
Keith Rhoades, MD  
Jared Fry, MD  
Ian Jacobs, MD  
Seong Keun Kwon, MD  
Jungil Seok, MD  
Minhyung Lee, MD  
Young Kang, MD  
Seulki Song, MD |
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<td>Ellen Deutsch, MD</td>
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Chevalier Q. Jackson Lecturers

The ABEA established in 1964 the “Chevalier Q. Jackson Lecture” to honor the memory of the Doctors Jackson, father and son. These two physicians were uniquely gifted in the development of new information and techniques. The Doctors Jackson were dedicated and gifted in the teaching of bronchoesophagology.

1964 D. F.N. Harrison, MD  
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1968 Paul H. Holinger, MD  
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1981 Peter Stradling, MD  
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2017 Nicholas LaRusso, MD  
2018 Robert Hillman, PhD  
2019 Ryan Branski, MD
The Ellen M. Friedman Foreign Body Award is given to an accepted abstract in recognition of excellence in innovation, skill and education in the management of aero-digestive foreign bodies. It is intended to encourage continued leadership in the art of endoscopic foreign body management.

RECIPIENTS OF THE ELLEN M. FRIEDMAN FOREIGN BODY AWARD:

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<td>Carlton Zdanski, MD</td>
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The Seymour R. Cohen Award for Pediatric Laryngology and Bronchoesophagology is presented to any resident, fellow or practicing physician who submits the best original paper in either basic research or clinical investigation pertaining to pediatric laryngology and bronchoesophagology.

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Yasuaki Harabuchi, MD
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2017 Ravi W Sun, MD
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2018 Steven Coppess, JD, MBA
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Mahesh Shah, MD
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Matthew Mackinnon, MD
Kaalon Johnson, MD
Kris Jatana, MD
2021 (no award)
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2010 None
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2014 None
2015 Yuta Nakaegawa, MD
2016 Neel Bhatt, MD
2017 Neel Bhatt, MD
2018 Andrew Redmann, MD
2019 Kathleen Sarber, MD

Lauren Tracy, MD
Scientific Poster Reception –

All registrants and guests are invited. Scientific Posters will be attended by authors.

Abstracts of ABEA submissions to the Combined Scientific Poster Session appear on pages (106-185) of this program booklet.
A Mouse Model of Dysphagia After Facial Nerve Injury

Presenter: Ceisha Ukatu

Authors: Ceisha C Ukatu, Lauren Welby, Teresa E Lever

Institution: University of Missouri

Objective: Dysphagia is a common clinical complaint from patients with facial nerve paresis, but there is sparse research on the relationship between swallowing and facial nerve injury. In mouse models, previous studies have used eye blink and vibrissae movement as measures of facial nerve impairment and recovery.

The purpose of this study was to create a mouse model of facial nerve injury that results in dysphagia.

Methods: C57BL/6J mice underwent surgical transection of the main trunk (MT, n=10) or marginal mandibular branch (MMB, n=10) of the left facial nerve. Videofluoroscopic swallow study (VFSS) was performed at baseline and two weeks postoperatively to quantify outcome measures, including lick, mastication, and swallow rates. Eye blink and vibrissae movement were assessed daily.

Results: All VFSS outcome measures showed subtle alterations after MT or MMB transection. However, only lick rate was significantly impaired (p<0.05), and only after MT injury. As expected, eye blink and vibrissae movement were abolished on the left side after MT transection, whereas only vibrissae movement was affected after MMB transection.

Conclusion: Transection of the MT but not MMB of the facial nerve resulted in significantly slower lick rate. This finding suggests that jaw opening is impaired due to associated injury of the digastric branch of the facial nerve, which innervates the posterior digastric muscle. We are exploring this hypothesis using custom jaw tracking software, which may permit detection of more robust functional biomarkers of dysphagia. Future experiments will explore treatment modalities such as electrical stimulation and corticosteroids for enhanced recovery.
A Nationwide Epidemiologic Study of Pediatric Tracheotomy Using Japanese Claims Database

Presenter: Kayoko Mizuno

Authors: Kayoko Mizuno, Masato Takeuchi, Yo Kishimoto, Koji Kawakami, Koichi Omori

Institution: Kyoto University

Objective: Pediatric tracheotomy is a relative rare surgical procedure and the actual situation has not been thoroughly elucidated. We aimed to examine the incidence and indications of pediatric tracheotomy to clarify the actual situation.

Method: This descriptive study utilized a nationwide claims database in Japan constructed by JMDC Inc. (Tokyo, Japan). The database includes claims data for approximately 3.75 million insured persons (approximately 3.1% of the population) comprising mainly company employees and their family members. We identified children registered with tracheotomy from 2005 to 2017 among 1,221,431 children aged 0-15 years. We extracted the date of tracheotomy, age, gender, diagnosis-code related to the tracheotomy, duration of tracheostomy dependence.

Results: The study included 215 children (120 boys, 56%). The mean age at tracheotomy was 2.7 years. The most common age at the time of tracheotomy was less than 12 months (n=127, 59.1%). The most common indications for tracheotomy was neuromuscular disease (n=62, 28.9%), and followed by upper airway obstruction (n=43, 20.0%), heart disease (n=40, 18.6%), prematurity (n=17, 7.9%), chronic lung disease (n=16, 7.4%), trauma (n=16, 7.4%), prolonged ventilation (n=12, 5.6%), malignancy (n=9, 4.2%) in order. The median duration of tracheotomy dependence was 17.2 months, and 117 children (54.4%) discharged with cannulation. During the follow-up period, decannulation was achieved in 84 children (39.1%). Number of death was 31 (14.4%).

Conclusion: Most pediatric tracheotomies were performed due to chronic underlying diseases at the age of under 1 year, and more than half of the children discharged with cannulation.
Use of Spirometry and Dyspnea Index in Management of Subglottic Stenosis

Presenter: Kevin Tie

Authors: Kevin Tie, Robert A. Buckmire, Rupali N. Shah

Institution: University of North Carolina

Objective: There is currently no standardized approach to guide the timing of airway surgery in subglottic stenosis (SGS) patients. We aimed to assess the relationship between Dyspnea Index (DI) scores and expiratory disproportion index (EDI) values from pulmonary function tests (PFTs) as the first step of devising a novel severity assessment tool for subglottic stenosis.

Method: Twenty-six SGS patients were prospectively recruited. DI was administered and PFTs performed at serial clinic visits. Data was analyzed to determine relationship between DI and EDI for patients undergoing surgery and those who did not.

Results: Mean DI scores were significantly different for surgical patients, 30.64 (n = 11, SD = 6.45) and for non-surgical patients, 8.79 (n = 19, SD = 8.95), (p < 5×10^-8). Mean EDIs were also significantly different for surgical and non-surgical SGS patients, 86.66 (n = 11, SD = 14.43) and 64.23 (n = 19, SD = 22.55) respectively, (p < 0.005). Pearson’s correlation coefficients between DI and EDIs were -0.15 for patients requiring surgery, 0.40 for those who did not, and 0.54 for all patients.

Conclusion: DI scores and EDIs are significantly higher for patients with subglottic stenosis requiring surgery than those who do not. EDIs and DI scores are poorly correlated, perhaps because DI is a survey reflecting the subjective, variable impact of dyspnea, while EDI reflects an unbiased measure of airflow mechanics. A clearer understanding of the relationship between DI and EDIs may help clinicians better gauge SGS severity and guide the timing of airway surgery.
A Retrospective Review of Oropharyngeal Dysphagia in Pediatric Patients with DiGeorge Syndrome

Presenter: Nicole Wong

Authors: Nicole S Wong, Zipei Feng, Christina Rappazzo, Catherine Turk, Julina Ongkasuwan

Institution: Baylor College of Medicine

Objective: DiGeorge syndrome is a genetic condition that affects 1:3000 births. Besides cardiac anomalies and immunosuppression, those with 22q11 microdeletion can have feeding difficulties from birth resulting in failure to thrive and infections. This study aims to characterize the dysphagia seen in children with DiGeorge syndrome.

Method: This is a retrospective chart review of children with DiGeorge syndrome who underwent videofluoroscopic swallow studies (VFSS) from 6/2008 to 1/2018 at a tertiary children’s hospital. Demographic data and VFSS findings were collected.

Results: Forty-four patients were identified, 52% were males, and mean time to VFSS was 71 days. At the time of the VFSS, 31% of the patients had at least 1 prior episode of pneumonia, 66% had NG tube placement, and 41% required G-tube placement. Of the patients, 93% had oral-phase dysphagia, 65% had nasopharyngeal reflux, and 89% had pharyngeal-phase dysphagia. Twenty-two patients demonstrated evidence of penetration: 41% with thins, 14% with ½ nectar, and 18% with nectar thick liquids. Nineteen patients showed aspiration (84% silent): 74% with thins, 11% with ½ nectar, 47% with nectar thick liquids. Three patients had UES opening dysfunction. Diet modifications were recommended for 39% of patients.

Conclusion: Vast majority of the patients with DiGeorge referred for swallow studies demonstrated evidence of dysphagia in both oral and pharyngeal phases. Importantly, more than 1/3 of these children showed evidence of silent aspiration, which can lead to recurrent pneumonia and significant morbidity if overlooked. Prompt recognition is paramount in these children to intervene early and reduce long-term complications.
A Review of Pediatric Tracheostomy in last 13 Years in Singapore - What have we learned?

Presenter: Sok Yan Tay

Authors: Nina Eliza R Pernia, Woei Shyang Loh, Sok Yan Tay

Institution: National University Hospital Singapore

Objective: This study aims to review the demography, indications, outcomes and complications of pediatric tracheostomies done in a tertiary hospital in Singapore and to evaluate the role of direct laryngobronchoscopy (DLB) in these patients.

Method: The medical records of children who underwent tracheostomy from 2005 to 2018 were reviewed following IRB approval.

Results: There were 39 tracheostomies performed with 36 (92%) done after 2010. Twenty-two (56%) were female and 17 (44%) were male, 18 (46%) were Chinese. Ages range from 1 day to 17 years old, with majority (33.3%) >10 years old, followed by <6 months old (20.5%). Prolonged intubation and pulmonary toileting (43%) were the most common indications. Complication rate was 20% comprising mainly of stoma granulation. Mortality rate was 35% mostly unrelated to tracheostomy, 1 patient died due to tracheostomy tube dislodgment and 1 patient died because of suspected tube obstruction. DLB was done in 14 (35.9%) of patients. Majority (76.9%) were on regular follow up by Home Care or ENT.

Conclusion: Pediatric tracheostomy is a safe surgery. Following the two cases of tracheostomy associated mortality, we initiated a QI program on pediatric tracheostomy care. Our most common complication was stomal granulation, mostly managed conservatively. In our series, prolonged intubation and pulmonary toileting were most common indications. In this group, we do not recommend routine DLB, as surveillance can be done using flexible scope in clinic, avoiding anesthesia related complications. We do recommend DLB for patients with existing airway or craniofacial issues or are planning to decannulate.
Airway Management In Vocal Professionals

**Presenter:** Stephanie Teng

**Authors:** Stephanie E Teng, Mark A Fritz, Michael W Groves, Gregory N Postma

**Institution:** Augusta University

**Objectives:** To gain an understanding of airway management in vocal professionals undergoing surgery.

**Method:** A twenty-item survey was sent to practitioners that routinely treat vocal professionals including the American Broncho-Esophagological Association, European Laryngological Society, and Fall Voice Conference attendees (2017). It included questions regarding the respondents’ demographics, preferences for airway control in non-laryngeal (NLS) and laryngeal surgery (LS), and perioperative management.

**Results:** Total respondents (n=163): 82.8% were Laryngologists, 4.3% were General Otolaryngologists, 3.1% were Head & Neck Oncologists, and 6.8% were Speech Pathologists. One hundred twenty-five of the participants (76.7%) cited extensive experience with vocal professionals.

For NLS, there was a tendency towards laryngeal mask airway (55.35%) over endotracheal intubation (44.65%) with a strong preference for orotracheal intubation (97.5%) over nasotracheal intubation.

For professional singers, a smaller endotracheal tube (ETT) was recommended with size varying based on sex. In male non-singers 87% recommended a 7.0 or smaller ETT. In male singers, 97% recommended a 7.0 or smaller ETT. In female non-singers, 74% recommended an ETT 6.0 or smaller. Ninety-three percent (93%) recommended a size 6.0 or smaller in a female singer.

For LS, 13.3% of providers personally intubate them 91-100% of the time. Seventy-one percent (71%) did not allow resident intubation.

**Conclusion:** Objective data regarding necessary precautions in airway management of professional voice users is scarce. This is the largest survey to date on current practices. Survey results indicate that smaller ETTs are preferred for singers, and that more experienced practitioners are preferred for the intubation.
Analysis of Laryngeal Dimensions Using Computed Tomography - Implications for Thyroplasty

Presenter: Alexander Kovacs

Authors: Alexander Kovacs, Guri Sandhu, Sunil P Verma

Institution: University of California - Irvine

Objectives: Computed Tomography (CT) scans of the neck are increasingly being used to plan for medialization laryngoplasty. The purpose of this study was to evaluate if measured laryngeal dimensions differ when obtained from reformatted CT scans.

Methods: Normal CT scans of the neck with 1 mm slice thickness were reviewed. Axial images were used to determine vocal fold length and thyroid cartilage angle. The images were then reformatted to create new axial images parallel to the plane of the true vocal folds and measurements were reobtained. The angle between the original and reformatted images was measured.

Results: 105 CT scans were analyzed. The mean thyroid cartilage angle for males (n=50) was 78.2 degrees (95% CI, 74.8, 81.5) on the original and 92.3 degrees (89.1-95.5) on the reformatted images. The mean thyroid cartilage angle for females (n=55) was 90.4 degrees (86.7, 94.1) on the original and 100.6 degrees (97.8, 103.3) on the reformatted images. The mean vocal fold length for males was 29.2 mm (28.1, 30.2) on original and 24.7 mm (23.5, 26.0) on the reformatted images. The mean vocal fold length for females was 24.5 mm (23.4, 25.6) on the original and 21.7 mm (21.0, 22.5) on the reformatted images. Each measurement obtained on original images was significantly different than the measurement obtained on the reformatted images. The angle between the original and reformatted axial planes ranged from 9.6 to 45.8 degrees (mean 27.5).

Conclusion: Correcting the axial plane of CT scans resulted in significant differences in laryngeal dimensions.
Atypical Laryngeal Infections: Localized Lesions from Unusual Organisms May Simulate Malignancy

Presenter: Kenneth Yan

Authors: Kenneth Yan¹, Jerome B Taxy², Ajit Paintal², Aaron D Friedman²

Institutions: ¹University of Chicago Medicine, ²NorthShore University

Objective: The identification of rare sources of laryngeal infection in immunocompetent patients. Recovered organisms were Mycobacterium tuberculosis (laryngeal tuberculosis [LTB]), Mycobacterium fortuitum (laryngeal atypical mycobacteria [LAM]), and Blastomyces dermatiditis (laryngeal blastomycosis [LB]).

Methods: Single institution retrospective case series of three patients over a 2.5 year period and review of the literature on laryngeal infections by three atypical organisms.

Results: Three patients presented with hoarseness and cough, one additionally had throat pain (LTB). Indirect laryngoscopy demonstrated multifocal laryngeal ulcerations (LTB, LAM) and an exophytic, contiguous glottic mass (LB). Direct microlaryngoscopic biopsies and cultures established the diagnoses, including a frozen section in one case (LB), which prevented a simultaneously planned surgical resection. Appropriate antimicrobial therapy yielded dramatic endoscopic as well as vocal improvement.

Discussion: In the last 10 years, fewer than 500 cases of LTB have been reported in the English language medical literature, principally outside the United States. To date, there have been reports of only 34 LB and 4 LAM cases. Endoscopic laryngeal photo/audio documentation of treatment response is presented for all 3 patients, which is unique for LB and LAM infections.

Conclusion: Atypical infections of the larynx may be localized and mimic laryngeal cancer on endoscopy. Tissue examination as well as microbiologic samples are diagnostic and complementary.
Awake Endoscopic Management of Supraglottic Stenosis after Caustic Ingestion

Presenter: Ronak Dixit

Authors: Ronak Dixit, Libby Smith

Institution: University of Pittsburgh

Objective: To present a case with novel management of supraglottic stenosis after caustic ingestion using a sedated transnasal endoscopic technique.

Method: Using photo documentation and a review of the literature, we report the case of supraglottic stenosis in a 17-year-old female with depression who intentionally ingested a chemical drain cleaner. A few months after her injury, she presented to our Voice Center with dyspnea on exertion. She was found to have severe supraglottic stenosis consisting of circumferential scarring of the epiglottis and false vocal folds to the base of tongue and posterior pharyngeal wall, respectively.

Results: Over the course of nine months, she underwent serial sedated procedures consisting of transnasal flexible laryngoscopy, CO2 laser lysis and balloon dilation of supraglottic stenosis, as well as triamcinolone injection. At 14 months since initial injury and a total of four airway procedures, she now reports no problems with breathing, voice, or swallowing. Her supraglottic airway has remained stable and has not required further intervention.

Conclusion: Caustic ingestion leading to supraglottic stenosis is exceedingly rare, and sedated endoscopic management of this condition is unreported in the literature. Advantages of performing the procedure in this way include easy maintenance of structures in their natural anatomic position as well as the lack of an endotracheal tube that may otherwise impede surgical access. We highlight the utility and feasibility of this technique for these challenging situations.
Blunt Laryngeal Trauma Resulting in a Unique Arytenoid Injury

Presenter: Aileen Wertz

Authors: Aileen Wertz, Lisa Elden

Institution: Children’s Hospital of Philadelphia

Objective: Describe the presentation, injury, treatment and long-term outcome of a patient with arytenoid injury due to blunt trauma. Compare management and outcome with previously reported cases.

Method: Case report and literature review.

Results: As evidenced by photographs and video captured at initial injury, two operative cases and two outpatient appointments spanning 6 months, a 6-year-old boy presented with partial right arytenoid and glottic mucosal de-gloving and corniculate and cuneiform cartilage avulsion after hitting his right neck on an opening car trunk. This caused severe dysphonia only and was initially managed with anti-reflux medication after bronchoscopy and CT showed no laryngeal framework injury. Over the course of months, dysphonia resolved and dyspnea with exertion developed that correlated with obstructive scar formation in the area of previous degloving injury. Conservative laser ablation and steroid injection of scar relieved dyspnea and maintained normal voice. Operative management decisions were challenging given the rareness of such injuries and whether placement of a suture would be advantageous in reapproximating partially degloved mucosa, especially given the location of the injury within the glottis and supraglottis.

Conclusion: Conservative surgical management of a laryngeal mucosal degloving injury with judicious trimming of scar tissue resulted in good voice and breathing outcomes over a 6-month course despite not repairing the injury primarily. While rare, especially in young children, blunt laryngeal trauma injuries can be severe and challenging to repair due to their location and unique nature.
Bronchoesophageal Fistula from Occult Pistachio Aspiration- Management Challenges

Presenter: Sarah Gitomer

Authors: Sarah A Gitomer, Deepak K Mehta

Institution: Baylor College of Medicine

Objective: We present a unique case of bronchoesophageal fistula from an occult foreign body aspiration with an objective to discuss various challenges encountered and its successful management.

Method: A case of benign bronchoesophageal fistula was reviewed. The relevant literature was reviewed and is presented.

Results: We present a 2-year-old boy who presented to us with a six month history of retained pistachio shell leading to a bronchoesophageal fistula. With gastric contents pouring into his lungs the first step was to stabilize the patient with a Hood bronchial stent. Once the lungs were stable, formal repair was done with Thoracic, Pediatric and ENT surgeons. The patient had significant bronchial collapse, and therefore a bronchial stent was placed and secured for 6 weeks while the fistula healed. Six months later, the child is doing well with mild esophageal stenosis and near normal swallowing. The bronchial compression is improving but continues to need stenting. Benign airway obstruction is rare in children and there is no consensus on treatment. Airway stents are used most commonly for malignant stenosis in adults, and this technology was adapted for this child with improvement in symptoms.

Conclusion: Prompt recognition of airway foreign bodies prevents longterm complications. However, when complications arise, we present techniques utilized in adult malignancies in a novel setting to manage bronchial and esophageal stenosis in a young child. There is varying longterm success with airway stents in adults and children, but it is an option to consider in children with benign bronchial stenosis.
Cancer or Fungal Infection? A Case of Bilateral Vocal Fold Fixation and Laryngeal Blastomycosis Misdiagnosed as Squamous Cell Carcinoma

**Presenter:** Mark Fadel

**Authors:** Mark Fadel¹, Brad deSilva²

**Institutions:** ¹University of Toledo, ²The Ohio State University

**Objective:** We present a rare case of bilateral vocal fold lesions and vocal fold fixation, initially showing benign inflammatory changes, that later revealed squamous cell carcinoma (SCC) and a positive culture for Blastomyces dermatitidis.

**Method:** A 59-year old male presented for evaluation of worsening dysphonia for over a year. Flexible videolaryngostroboscopy revealed a left vocal fold papillomatous lesion and irregularity posteriorly along both medial arytenoids causing bilateral vocal fold fixation. Three biopsies over the course of a year revealed papillomatous mucosa with inflammation and pseudoepitheliomatous hyperplasia. PAS stains for fungi were negative. His fourth biopsy revealed invasive well-differentiated keratinizing SCC and fungal culture grew Blastomyces dermatitidis.

**Results:** After two months of itraconazole therapy, his voice dramatically improved. He no longer exhibits difficulty breathing or stridor. His voice handicap index (VHI) improved from 30 to 9. Videolaryngoscopy revealed full vocal fold mobility bilaterally and resolution of all mucosal irregularities after two months of itraconazole. Concern for SCC is no longer present and radiation therapy has been delayed given his dramatic improvement with itraconazole.

**Conclusion:** Blastomycosis has been described as imitating the cellular changes of SCC in a variety of head and neck structures. This confusion is rare but important to prevent unnecessary invasive procedures. Despite the paucity of Blastomycosis in the United States, laryngologists should consider fungal analyses when faced with lesions revealing nonspecific inflammatory changes and epithelial atypia.
Characterization and Management of Adult and Pediatric Airway Foreign Bodies in US Emergency Departments

Presenter: Elisa Berson

Authors: Elisa R Berson, Elliot Morse, Jonathan Hanna, Saral Mehra

Institution: Yale School of Medicine

Objective: Much research has been done on pediatric airway foreign bodies, but few studies have assessed the epidemiology of adult foreign bodies. This study aims to classify the incidence and characteristics of patients with airway foreign bodies who present to emergency departments (EDs) in the U.S. and explore trends over time.

Method: The Nationwide Emergency Department Sample was queried for ED encounters with a diagnosis of an airway foreign body (as determined via relevant ICD-9 codes) during 2007-2014. Weighted estimates for demographics and facility characteristics were extracted, and procedures, complications, and cost were assessed. Predictors of extended length of stay were determined by multivariable logistic regression.

Results: A total of 683,841 ED visits were identified. 533,254 (78.0%) involved adult patients while 150,416 (22.0%) involved pediatric patients. The average age of adult patients was 63.8, while the average age for pediatric patients was 3.36. In both adult and pediatric patients, airway foreign bodies were slightly more common in males, comprising 51.1% of all patients. Similarly, hospital characteristics showed common trends for adult and pediatric patients, with most encounters occurring in the South (39.2%). Over time the number of adult visits increased (p<0.001) whereas the number of pediatric visits decreased (p<0.001).

Conclusion: The incidence of adult cases involving airway foreign bodies is increasing while there is a downward trend for emergency care provided to children with an airway foreign body. Elderly patients are particularly vulnerable, and it is important to recognize the clinical manifestations of airway obstruction to avoid further life-threatening complications.
Characterizing the Distinction in the Etiology of Dysphagia Between the Early-Elderly and Late-Elderly

Presenter: Sina Mehraban-Far

Authors: Sina Mehraban-Far, James Alrassi, Melissa Mortensen

Institution: Stony Brook University Hospital

Objective: To understand the difference in the etiology of dysphagia between early-elderly (aged 60-75) and late-elderly (aged>75) patients.

Method: A retrospective chart review was undertaken of 1500 patients undergoing videofluoroscopic swallowing study (VFSS) for a chief compliant of dysphagia at a tertiary-care university hospital between January 2010-June 2018. All patients aged 60 and above were included in the study (n=206). Patients' diagnoses were compared between the early-elderly (n=95) and late-elderly (n=111).

Results: Patients in the early-elderly group were 9.7 times more likely to have a head and neck cancer (z-test, p<0.001), while patients in the late-elderly group were 9.3 times more likely to have dementia (z-test, p<0.001). Head and neck cancers represented 26.3% of early-elderly cases, whereas dementia represented 20% of late-elderly cases. The majority (45%) of the late-elderly patients did not have any cerebrovascular, neurodegenerative, or musculoskeletal diagnoses. The major cause of dysphagia in this group was presbyphagia—age-related sarcopenia in the swallowing muscles. Presbyphagia was 1.8 times more likely to be the cause of dysphagia in the late-elderly than in the early-elderly (Z-test, p=0.003). Linear regression showed that with each one-year increase in age, the odds of developing presbyphagia increases by 6% (OR=1.06, 95% CI 1.03-1.09).

Conclusion: There is a significant difference in the etiology of dysphagia as a function of age amongst the elderly, with presbyphagia accounting for nearly half the cases in patients aged over 75. This emphasizes the importance of screening our oldest patients for presbyphagia.
Clinical Practice Patterns in Laryngeal Cancer and Introduction of CT Lung Screening

Presenter: Krzysztof Piersiała

Authors: Krzysztof D Piersiała, Simon R Best, Lee M Akst, Alexander T Hillel

Institution: Johns Hopkins University

Objective: After the publication of large clinical trials, in January 2014 The U.S. Preventive Services Task Force (USPSTF) recommended annual lung cancer screening with low-dose CT in a well-defined group of high-risk smokers. A significant proportion of patients with laryngeal cancer (LC) meet the introduced criteria, and we hypothesized that clinical practice would change as a result of these evidence-based guidelines.

Method: Retrospective chart review of patients diagnosed with LC and treated at X who met USPSTF criteria for annual chest screening and were followed for at least 3 consecutive years in the years surrounding the introduction of screening guidelines (January 2010 to December 2017).

Results: A total of 153 patients met the inclusion criteria of the study and were followed for a total of 746 patient-years. 184/332 (55%) patient-years in the pre-guidelines period and 246/414 (59%) in the post-guidelines period included at least one recommended chest imaging (CT or PET-CT, p=0.27). 248/332 (75%) patient-years in the pre-guidelines period and 314/414 (76%) in the post-guidelines period included any radiological chest imaging (Xray, CT or PET-CT, p=0.72). Screening scans were ordered by OHNS (45%), Medical Oncology (31%), Radiation Oncology (8%), and primary care (14%) with 68% of patients missing at least one year of indicated screening.

Conclusion: The implementation of new lung cancer screening guidelines did not change clinical practice in the management of patients with LC and many patients do not receive recommended screening. Further study concerning potential barriers to effective evidence-based screening and coordination of care is warranted.
CO2 Laser Supraglottoplasty in Unilateral Vocal Fold Paralysis Patients with Airway Obstruction Secondary to Severe Arytenoid Prolapse: A Case Series

Presenter: Sean McDermott

Authors: Sean M McDermott, Jaron Densky, Laura Matrka

Institution: The Ohio State University

Objective: Arytenoid prolapse commonly occurs in patients with unilateral vocal fold paralysis. In a small subset of these patients, symptomatic airway obstruction may occur. Currently, the main treatment option for this clinical presentation is arytenoid abduction. Here, we present a case series investigating the efficacy of endoscopic carbon dioxide (CO\textsubscript{2}) laser supraglottoplasty as a less invasive treatment modality to relieve airway obstruction in these patients.

Method: We retrospectively reviewed four patients who underwent CO\textsubscript{2} laser supraglottoplasty at a single institution. Clinical data was collected, including the Dyspnea Index (DI), Voice Handicap Index (VHI), and flexible fiberoptic laryngostroboscopy.

Results: No intraoperative complications occurred. One patient developed a postoperative granuloma that was successfully ablated with a potassium titanyl phosphate (KTP) laser. Each patient reported subjective improvement in their dyspnea, and remarkably, the vocal quality of each patient improved, even when no additional interventions for dysphonia were performed. Flexible fiberoptic laryngoscopy confirmed increased supraglottic airway patency in all patients. Three patients had preoperative and postoperative DI & VHI scores. Their average preoperative and postoperative DI scores were 27.2 and 14.7, respectively. Their average preoperative and postoperative VHI scores were 24.5 and 6.3, respectively. The fourth patient did not complete preoperative questionnaires but had postoperative DI and VHI scores of 0.

Conclusion: Arytenoid prolapse may cause symptomatic airway obstruction in patients with unilateral vocal fold paralysis. CO\textsubscript{2} laser supraglottoplasty is an effective treatment modality and should be considered as a less invasive option. Further investigation is needed to compare outcomes to arytenoid abduction.
Comparing Post-Treatment Improvements in Reflux Symptom Indexes with Reflux Finding Scores in the Management of Laryngopharyngeal Reflux

Presenter: James Alrassi

Authors: James Alrassi, Chima Amadi, Kevin Fujita, Sina Mehraban-Far, Melissa Mortensen

Institution: Stony Brook University Hospital

Objective: To evaluate whether symptom improvement in patients with laryngopharyngeal reflux translated to improvements in physical findings on laryngoscopic examination following medical therapy.

Methods: This study is a retrospective chart review of all patients who were diagnosed and medically treated for laryngopharyngeal reflux (LPR) at an academic hospital between January 1st, 2010 and August 5th, 2018. Only patients with pre- and post-treatment reflux symptom indexes (RSI) (n=74) and reflux finding scores (RFS) (n=44) were included in the study. All patients were treated with a proton pump inhibitor (PPI). Patient charts were reviewed for pre-treatment RSI, post-treatment RSI, pre-treatment RFS, and post-treatment RFS. Assessments were recorded and analyzed for improvements.

Results: Our analysis revealed a 6% decline in pre- to post-treatment RFS (P=0.0002) and an 11% decline in pre- to post-treatment RSI (0.0063) after an average of 117.3 days of treatment. Among the individual symptoms composing the RSI, every component showed statistically significant decreases in pre- to post-treatment averages except for globus sensation (P=0.1833) and difficulty breathing (P=0.5879). Conversely, granuloma/granulation was the only RFS component that demonstrated a statistically significant decrease after treatment (P=0.0312). When the data was isolated only for patients who received treatment for greater than six months, there were no statistically significant decreases found in any individual RFS component.

Conclusion: The reflux finding score and reflux symptom index are effective tools to screen for laryngopharyngeal reflux. The reflux symptom index is more sensitive than the reflux finding score for monitoring response to treatment.
Concentrations Considerations for Broader Utilization of Mitomycin-C

Presenter: Christina Palomo

Authors: Christina M Palomo¹, Anita Jeyakumar²

Institutions: ¹Northeast Ohio Medical University, ²Akron Children's Hospital

Objective: To examine the dosing of topical Mitomycin-C (MMC) in the fields of Otolaryngology, Ophthalmology, and Urology, and an analysis of dosing concentrations.

Methods: A comprehensive PubMed literature search was performed with a goal of identifying manuscripts within the last 20 years detailing experiences with MMC within the fields of ophthalmology, otolaryngology, and urologic neoplasia. In-vitro, in-vivo, and prospective clinical studies were included in our review. Canine and rabbit models were also used to evaluate the dose relationship of MMC on fibroblast cells. Results: Twenty-one articles were selected for review in this study. MMC dose concentrations have been utilized secondary to a de facto standard that has been adopted. Ophthalmology studies examining different dose concentrations of MMC showed superior dosing concentrations with fewer side effects. The de facto standard dose in Urology is 1 mg/mL but a study looking at higher MMC concentrations for prevention of bladder tumors showed favorable results.

Results: Studies in the field of Otolaryngology are limited. Use of topical MMC has been utilized in various otolaryngology procedures, however, no specific concentration has been studied in depth and studies have shown varying results. Animal models studying the action of MMC on respiratory epithelium also show conflicting results.

Conclusion: MMC has known chemotherapeutic and anti-proliferative properties. There remains marked heterogeneity regarding the concentration used for optimal effectiveness. MMC has potential for greater implementation in the field of otolaryngology. Further studies are needed to understand and address clinically meaningful doses, without compromising safety.
Congenital vallecular cyst as a cause of neonatal respiratory distress

**Presenter:** Cinzia Marchica

**Authors:** Cinzia Marchica, Kavita Dedhia

**Institution:** Emory University

**Objective:** Describe the etiology and management of an infant with stridor and respiratory distress.

**Method:** A 9-day old presented to the emergency department with two-day history of stridor and difficulty breathing. History was significant for “noisy breathing” since birth with recent exacerbation. No weight loss, episodes of cyanosis or choking with feeds were reported. Examination was notable for stridor, retractions and pectus excavatum. The pediatric ICU initially managed him with supplemental oxygen for intermittent desaturations. Otolaryngology was urgently consulted within 12 hours for increasing airway obstruction and concern for difficult airway. Bedside direct laryngoscopy was performed revealing a large cyst obstructing the view of the larynx. A 3.0 cuffed endotracheal tube threaded onto a 4mm Hopkins rod was used to intubate under direct visualization. CT imaging revealed a 2.1x2.1 cm cystic lesion in the oropharynx. Laryngoscopy and bronchoscopy with partial needle aspiration was performed showing the cyst originating from the vallecula. A microdebrider was then used to marsupialize the cyst cavity.

**Results:** Patient was extubated on post-operative day 1, with no complications. A swallow assessment demonstrated good oral intake without signs of aspiration. At the 2-month follow up, the patient was asymptomatic and scope was normal.

**Conclusion:** Laryngomalacia is the most common cause of neonatal stridor, however in cases without classic symptoms, one should have clinical suspicion for an alternate diagnosis and consider early airway evaluation. Congenital vallecular cyst, although rare, should be included in the differential with timely diagnosis being imperative to safely manage and protect the airway.
Creating a pathway using the larynx is the last resort for oral intake in a hypopharyngeal cancer patient with severe complications

Presenter: Toshihiko Suzuki

Authors: Toshihiko Suzuki

Institution: Fukushima Medical University

Objective: The original function of the larynx is to defend the airway from aspiration. Laryngotraceal separation and tracheoesophageal diversion (TED) are useful procedures to prevent aspiration. In this report, we paradoxically utilized TED to create a new oral intake route in a hypopharyngeal cancer patient with severe complications

Method: A 64-year-old man was diagnosed as having T2N0M0 squamous cell carcinoma of the posterior wall of the hypopharynx. He had previously undergone radiotherapy for laryngeal cancer and tricuspid valve replacement surgery, and suffered from atrial flutter and renal dysfunction. Therefore, radiotherapy was not considered. On the other hand, larynx-preserving partial hypopharyngaeactomy seemed to have a high risk of postoperative aspiration. Furthermore, free jejunum flap was not considered due to his severe general condition. After vigorous discussion with him, we performed surgery with curative intent. With tumor resection, the hypopharynx was primarily closed. TED with end-to-end anastomosis of the trachea to the esophagus was performed. The recurrent laryngeal nerve was sacrificed in both sides. He achieved complete oral feeding using the new pathway after surgery. No recurrence has been observed for two years since then.

Results: As an alternative to pharyngeal reconstruction, we performed TED with curative intent and created a new route to the esophagus after removal of a tumor in a hypopharyngeal cancer patient. This is a unique case as originally no food can pass through the larynx.

Conclusion: The larynx, in contradiction with its role, could be used as a pathway to the esophagus based on our revolutionary technique.
Cricoid Chondronecrosis: A Case Report and Review of the Literature

Presenter: Mark Mims

Authors: Mark Mims, Andree Leclerc, Libby Smith

Institution: University of Pittsburgh

Objective: Cricoid chondronecrosis is a rare entity that has significant consequences for patients. Reports of its occurrence are scattered in the literature and currently there is no comprehensive review to help guide providers.

Methods: A case report from our institution is presented. A review of available literature is then provided with assessment of risk factors, signs and symptoms at presentation, laryngeal exam findings, radiologic findings, and surgical techniques undertaken.

Results: 24 total cases were reviewed. Patient age ranged from 8 months to 76 years. A history of endotracheal intubation from a variety of etiologies was present in all but two cases, and duration of intubation ranged from six hours to 28 days. Patients presented with airway compromise in all but two cases - one asymptomatic patient with a prior tracheostomy and another with dysphagia after radiation. Dysphonia (n=6) and dysphagia (n=3) were less commonly present. Subglottic stenosis (n=19) was the most common exam finding followed by vocal fold impairment (n=11). When CT scan findings were reported, fragmentation of the cartilage and/or hypodensity of the central lamina were described in all but one case. Interventions ranged from observation on antibiotics and steroids to surgical therapies including tracheostomy, dilation, and posterior cricoid split, with or without stent placement.

Conclusions: Cricoid chondronecrosis is a serious, rare entity that can occur even after a short period of endotracheal intubation. Providers must have a high level of suspicion in patients that present with upper airway dyspnea with a history of prior intubation.
Development of Joint Commission compliant difficult airway carts with predominantly disposable equipment

Presenter: Andrew Stein

Authors: Andrew P Stein, Anish Abrol, Kathryn R Hoppe, Akina Tamaki, Rod P Rezaee, Nicole C Maronian

Institution: Case Western Reserve University

Objective: Difficult airway carts are important, but underutilized tools for rapid airway response teams at academic medical centers. Placement of carts in key hospital locations requires investment into many carts, which can be expensive and hard to maintain. We sought to develop and implement cost-effective difficult airway carts with predominantly disposable equipment.

Method: A multi-disciplinary team including otolaryngologists, emergency medicine physicians/nurses, anesthesiologists, trauma surgeons and intensive care nurses identified the equipment needed by each service. The focus then turned to identifying disposable options for each of the necessary components. The cost related to reusable versus disposable instrumentation was compared.

Results: We developed unique appearing, 5-drawer carts containing advanced airway equipment, including otolaryngology specific items, such as flexible Ambuscope® with mounted video monitor and a disposable open tracheostomy tray. The carts contain 85 disposable and 15 reusable instruments. Before our team investigated disposable options, each cart would have cost $25,306.37 for the initial equipment as compared to $15,742.36 (38% decrease). Carts were strategically placed in all intensive care units, the emergency department, radiology, operating room and each hospital tower.

Conclusion: Sterilization costs for reusable equipment are high, and the Joint Commission compliance requirements increase the amount of supplies required to assure adequate sterilization. Access to high level disinfection, particularly during off hours, can affect equipment availability. Therefore, we developed and implemented a system of difficult airway carts composed of primarily disposable equipment in order to provide cost-effective, efficient and safe care to any patients with complex or urgent airway issues.
Dilated Esophagus from Achalasia Presenting as a Neck Mass

Presenter: Jared Goldfarb

Authors: Jared Goldfarb, Colin Huntley, Christina Tofani, Andrew Elden, Joseph Spiegel

Institution: Thomas Jefferson University

Objective: Review management of esophageal achalasia and the workup of adult neck masses in the context of a case report describing severe esophageal achalasia.

Method: Retrospective chart review case report.

Results: We report a case of a 64 year old female with chronic progressive achalasia over a 15 year period who presented with a new left sided neck mass. Imaging workup revealed significant esophageal dilation extending to the thoracic and cervical esophagus expanding toward the skin through the infrahyoid strap muscles.

Conclusion: Management of severe achalasia requires a multidisciplinary approach utilizing multiple medical and surgical management options. Additionally, a systematic approach is necessary in evaluating adult neck masses. Alternative formatting: Esophageal achalasia is a degenerative neuromuscular process resulting in failure of the lower esophageal sphincter to relax resulting in functional obstruction of the esophagus. Clinically this is classically associated with the development of esophageal distention, intermittent dysphagia, cough, regurgitation, halitosis, weight loss and aspiration sensation. We report a case of a 64 year old female with chronic progressive achalasia over a 15 year period who presented with a new left sided neck mass. Imaging workup revealed significant esophageal dilation extending to the thoracic and cervical esophagus expanding toward the skin through the infrahyoid strap muscles. In this review we discuss the disease process and multidisciplinary management options for severe esophageal achalasia. We also discuss the systematic process and considerations to approaching neck masses in adults in the context of this severe and rare manifestation of achalasia.
Distribution of Human Tongue Fat and Obstructive Sleep Apnea

Presenter: Kerry Baumann

Authors: Kerry Baumann, Lilit Garibyan, Richard R Anderson, Bradley E Jones, Bill Farinelli, Michael I Orestes

Institution: Walter Reed National Military Medical Center

Objective: No other study to date to date has evaluated, in detail the amount and distribution of human tongue fat. Our goal was to determine the amount and distribution of human tongue in a cadaver model.

Method: We evaluated 6 human cadavers. The tongue was removed from the hyoid bone to the tip and excised at the floor of mouth. Tongues were sectioned and inked. Adipose content was measured in each section.

Results: The tongues were divided into 7 sections for analysis. Dorsal, ventral, anterior, medial and posterior. Mean fat percentage was calculated. The ventral and posterior tongue was noted to have 38.8% and 32.9% respectively, compared with the anterior and dorsal tongue which was noted to have 29.5 and 25.5% respectively, ANOVA, p=0.01.

Conclusion: Our findings show there is a clearly increased percentage of adipose tissue within the human tongue, particularly in the dorsal and posterior aspects. We believe that this increased fat may contribute to sleep apnea in certain individuals and may represent a target for treatment in the future.
Effects on swallowing assessments between Laryngeal cleft injection compared to formal repair

Presenter: Cinzia Marchica

Authors: Cinzia Marchica, Anita Deshpande, Nikhila Raol

Institution: Emory University

Objective: Describe the effect of laryngeal cleft injection compared to formal repair on swallowing oropharyngeal motility study (OPMS) results.

Method: A retrospective chart review of children aged 0-18 years old with deep or type 1 laryngeal clefts having undergone injection followed by repair from 2014 to 2018 was undertaken. Presenting symptoms, underlying medical diagnoses, oropharyngeal swallowing assessments as well as functional endoscopic evaluations of swallowing were reviewed. In cases where these studies were not available, parental reports were utilized. In particular, pre-injection, post-injection and post-repair OPMS results were reviewed.

Results: Eighteen patients (9 female, 9 male) were identified as having undergone both laryngeal cleft injection followed by repair. Average age at time of injection was 2.7 years old (range 1.1-6.3 years), and at time of repair was 3.2 (range 1.6-6.9 years). Twelve patients were diagnosed as having a type 1 laryngeal cleft, whereas 6 were characterized as having a deep notch on diagnostic laryngoscopy. There was an average of 203 days (78-482 days) between injection and repair. Finally, OPMS results were improved after repair compared to post-injection with penetration and aspiration of thin liquids being seen in 6 and 4 patients respectively after formal repair compared to 11 and 8 patients after injection. Similar findings were seen for nectar-thickened liquids.

Conclusion: This study demonstrates that formal repair for laryngeal clefts may result in improved swallow function when compared to injection. This has important implications in limiting the number of operative procedures a child undergoes as well as radiation exposure from repetitive OPMS testing.
Efficacy of ADRCs for autologous fat injection laryngoplasty

Presenter: Hisaichiro Tanaka

Authors: Hisaichiro Tanaka¹, Hirohito Umeno¹, Ryota Mihashi¹, Fumihiko Sato¹, Shintaro Sueyoshi¹, Shun-ichi Chitose¹, Kiminori Sato¹, Toshiyuki Okada¹, Akihiko Kawahara¹, Hideki Iwaguro²

Institutions: ¹Kurume University School of Medicine, ²Sobajima Clinic

Objective: Adipose Derived Regenerative Cells (ADRCs) have the abilities to home to damaged tissue, to self-propagate, and to promote angiogenesis/tissue regeneration even in a hypoxic condition. The aim of this study was to clarify the efficacy of ADRCs to prevent the resorption of injected fat tissue in autologous Fat Injection Laryngoplasty (FIL).

Method: Prospective animal experiment. Two canines were used for the experiment. With Celutionsystem™, fresh ADRCs were isolated from fat tissue harvested by the liposuction or open resection technique. 0.5ml autologous fat with 0.5ml ADRCs was injected into the right vocal fold of each canine. 0.5ml fat with 0.5ml lactate Ringer solution was injected into the left vocal fold as a control. Larynges were removed after 12 months and examined histologically. 8 coronal sections were formed, then each fat graft’s area was measured to estimate the remaining graft volume. Total graft area of each side was then compared. The total number of vasculoendothelial cells around adipocytes in randomly-selected 40 fields of 400X microscope was counted to evaluate angiogenesis. The quantities of HGF in ADRCs and normal fat tissue was assayed respectively by qPCR.

Results: The side with ADRCs contained larger fat graft area and more vasculoendothelial cells compared with control side. However, there seemed no significant differences in the canine with ADRCs harvested by liposuction. ADRCs produced more HGF than normal fat tissue.

Conclusion: FIL with ADRCs can reduce the resorption of injected fat tissue. Growth factor produced by ADRCs may be associated with fat tissue regeneration.
Endolaryngeal Extrusion of Gore-tex Graft after Medialization Laryngoplasty - a Complication in Complicated Patients

Presenter: Cristen Cusumano

Authors: Cristen Cusumano, Melin Tan-Geller

Institution: Montefiore Medical Center

Objective: Endolaryngeal extrusion of graft material is a known but rare complication of medialization laryngoplasty (ML). Literature to date regarding long-term complications of ML is limited. We report two cases of endolaryngeal implant extrusion which occurred two years post ML.

Method: Two case presentations of patients who underwent gore-tex graft ML and later presents with endolaryngeal implant extrusion. Review of the literature of complications of ML.

Results: Patient one is a 62-year-old male with history of supraglottic squamous cell carcinoma status post prior chemoradiation and partial laryngectomy. Patient two is a 39-year-old male with history of foreign body ingestion and severe neck infection in childhood requiring removal of the right clavicle and free flap reconstructions. Both patients presented with dysphonia, underwent ML, and presented 2 years after surgery with endolaryngeal implant extrusion requiring endoscopic removal of the implant. Review of the literature reveals reported rate of this complication at 0.5%.

Conclusion: Endolaryngeal implant extrusion is a long-term risk of ML, particularly in patients with complicated histories and poor tissue protoplasm. Caution is warranted when proceeding with ML with patients with potentially compromised laryngeal tissue and long-term follow up is recommended.
Endoluminal Stenting with Split Thickness Skin Grafting for Post-Intubation Injury in Mucous Membrane Pemphigoid

Presenter: David Young

Authors: David Young, Alexander Gelbard

Institution: Vanderbilt University

Objectives: Case report of laryngeal injury in a patient with mucous membrane pemphigoid, discussion of successful management with endoluminal stenting and split thickness skin grafting, and review the current literature on the airway manifestations of mucous membrane pemphigoid.

Methods: A 68 year old woman with known mucous membrane pemphigoid sustained laryngeal trauma following intubation resulting in complete erosion of the interarytenoid mucosa. Serial examinations demonstrated fibrotic contracture, restricted glottic mobility and progressive dyspnea. Ultimately, she required an awake tracheostomy. Endoluminal stenting and split thickness skin grafting was applied to the mucosal injury at the time of the first tracheostomy tube change at post-operative day 5.

Results: Endoluminal stenting and split thickness skin grafting facilitated mucosal healing of laryngeal injury with return of glottic mobility and preserved airway patency with sustained phonatory function.

Conclusion: Early endoluminal stenting and skin grafting is a viable option for mucosal injuries following upper airway trauma in patients with mucous membrane pemphigoid and may mitigate scar formation and subsequent cricoarytenoid joint mobility restriction.
Endoscopic Carbon Dioxide Laser Zenker Diverticulectomy followed by Balloon Dilation: Rate of Recurrence and Patient Reported Quality of Life Measures

Presenter: Raluca Tavaluc

Authors: Raluca Tavaluc, Dinesh Chhetri

Institution: University of California - Los Angeles

Objective: Zenker’s diverticulum remains a significant cause of dysphagia in the elderly population. Approaches to treatment range from observation to endoscopic or transcervical interventions. The aim of this report is to show the safety and efficiency of treatment using an endoscopic approach with the carbon dioxide laser followed by balloon dilation and pre and post operative associated patient reported quality of life measures.

Method: Retrospective chart review of zenker’s diverticulectomy over a two year period.

Results: Twenty-six cases were identified in this period, with 8 of 26 cases (31%) being referred for revision surgeries. Twenty-five patients, 96%, had resolution of the Zenker’s diverticulum and dysphagia complaint. One patient (4%) had an incomplete resection with persistence of Zenker’s diverticulum post-operatively identified by modified barium swallow study evaluation and persistent dysphagia complaint. Mean pre-operative Eating Assessment-10 (EAT-10) score of 18 (range 3-32) decreased post-operatively to 10 (range 0-38). Mean pre-operative Reflux Symptom Index (RSI) of 22 (range 3-32) decreased post-operatively to 12 (range 0-6). Pre-operative and post-operative Voice Handicap Index-10 (VHI-10) score remained at 6 (range 0-6).

Conclusion: Endoscopic Zenker’s diverticulectomy using the CO2 laser followed by balloon dilation is an efficient and safe option for all patients, including revision cases.
Endoscopic Removal of a Cervical Esophageal Duplication Cyst

Presenter: Brittany Leader

Authors: Brittany A. Leader¹, Matthew M. Smith², Sally R. Shott², Michael J. Rutter²

Institutions: ¹University of Cincinnati, ²Cincinnati Childrens Hospital

Objective: Describe a novel endoscopic technique for removal of cervical esophageal duplication cysts.

Method: We present a novel endoscopic surgical approach for the removal of a cervical esophageal duplication cyst in a six-month old child. Computed tomography revealed a non-enhancing 3.6 x 2.3 x 3.5 cm cystic prevertebral mass spanning C2-T1 that laterally displaced the carotid arteries. Direct laryngoscopy was used to expose the mass which was found to be in the right post-cricoid space between the esophagus and the trachea, displacing the esophagus to the left. The patient was placed in suspension and the overlying pharyngeal mucosa was incised with electrocautery. The cyst was freed from the surrounding mucosa with blunt microlaryngeal instruments. There was a firm attachment inferiorly, so the cyst was decompressed and then fully excised.

Results: Post operatively she had biphasic stridor. Flexible laryngoscopy revealed limited abduction of her true vocal folds and subglottic swelling. She was treated with dexamethasone and racemic epinephrine and was subsequently weaned to room air. Nasogastric feeds were maintained until the pharyngeal defect completed healing via secondary intention on POD 23. Two months postoperatively she was evaluated in clinic, tolerating an oral diet and breathing well. Flexible laryngoscopy revealed bilateral cord movement.

Conclusion: Duplication cysts of the gastrointestinal tract are rare congenital anomalies. Traditionally these are removed via an open approach, but recently thoracic esophageal cysts have been excised via laparoscopic or robotic-assisted thoracoscopic surgery. This is the first reported removal of a cervical esophageal duplication cyst via an endoscopic approach.
Examining Changes in Computational Fluid Dynamics Modeling Metrics of the Normal Airway with Pediatric Development

Presenter: Eric Mason

Authors: Eric C Mason, Sam McGhee, Jennifer Markley, Maria Koenigs, Amanda Onwuka, Kai Zhao, Tendy Chiang

Institution: The Ohio State University

Objective: Computational fluid dynamics modeling provides functional data not possible with conventional diagnostic tools. This instrument has demonstrated utility in multiple otolaryngologic applications, including the assessment of pediatric laryngotracheal pathology. Our aim is to report changes in computational airflow metrics in the pediatric airway with normal development.

Method: Computed tomography scans of the neck in children were assessed. Presence of airway pathology was excluded. Scans representing five different age cohorts during development were modeled (N = 5/group). Wall shear stress (WSS) and peak flow velocity (PFV) were calculated, and the distributions of WSS and PFV in infants and older children ages 13-17 were compared using Kolmogorov-Smirnov tests. Each patient was ascribed a unique respiratory flow rate based on their weight at time of scan.

Results: Mean WSS for infants was 0.53±0.12-Pa compared to 0.22±0.09 for older children ages 13-17, and this difference was statistically significant (p=0.01). Similarly, we noted significant difference in the PFV, such that infants had faster velocity than the older children (infant PFV = 3.45±0.40-m/s vs older children PFV = 1.72±0.25-m/s, p for difference 0.01). Patient weight had important ramifications on both PFV and WSS.

Conclusion: CFD and its calculated metrics evolve with age in the normal pediatric airway. We observed higher WSS and PFV, as well as more variation in these metrics, in younger ages. These normative values could be used to examine changes in airway stenosis.
Examining Referral Patterns Between Otolaryngology and Gastroenterology at a Single Institution: A Window Into Potential Inter-Specialty Knowledge Gaps

Presenter: Adam Haines

Authors: Adam Haines¹, Michael Lerner²

Institutions: ¹Albert Einstein College, ²Montefiore Medical Center

Objective: The objective of this study was to analyze referral patterns between the otolaryngology and gastroenterology departments at a single academic medical center as an effort to highlight potential inter-specialty knowledge gaps.

Method: Using Clinical Looking Glass, a data analytic decision support tool, bidirectional referral data from 2015 to 2018 was extracted for analysis including all referrals placed by gastroenterology to otolaryngology (n=53) and vice versa (n=188). Each ICD-10 code affiliated with an ambulatory referral was recorded as a data point and the rate for the three most frequent referral reasons were calculated for both cohorts. All other referral reasons were categorized into a fourth category.

Results: For referrals from gastroenterology to otolaryngology—11.3% were for GERD/LPRD, 28.3% were for Dysphagia, 7.5% were for Throat Pain, and 52.8% were for other reasons. For referrals from otolaryngology to gastroenterology—61.7% were for GERD/LPRD, 18.6% were for Dysphagia, 2.7% were for Gastrostomy Tube management, and and 17% were for other reasons. All other referrals reasons will be reported separately to characterize the composition of less commonly referred conditions.

Conclusion: GERD/LPRD was more frequently referred out by otolaryngology than it was by gastroenterology, suggesting the need for further characterization of the discrepancy in management of a disease commonly treated by both specialties. The differing rates in dysphagia also suggest a need to better understand what factors contribute to the differences in management of a clinical condition commonly assessed by both specialties.
Fibromyalgia and Chronic Cough

Presenter: G. Todd Schneider

Authors: Glenn T Schneider

Institution: University of Rochester

Objective: To examine the correlations between patients with both Fibromyalgia and Chronic Cough.

Method: We used I2B2 software to gather data from our electronic medical record over the last eight years. We examined the patient demographics, comorbid conditions, cough treatments prescribed, and incidence of common fibromyalgia-associated diagnoses.

Results: The incidence of Fibromyalgia in our population was 2.3% and chronic cough incidence was 7.0%, which are close to those predicted of the average population. These patients represented mostly Caucasian females between 45-74 years old. The odds ratio of developing Chronic Cough given a diagnosis of Fibromyalgia was 3.3 (95% CI 3.2-3.4).

Conclusion: Chronic cough may be an under-recognized symptom of Fibromyalgia given the high relative incidence in this population. In the future, the goal is to help better understand the etiology of chronic cough and how to better tailor treatment to this population.
Floor of Mouth Foregut Duplication Cyst in a Middle Aged Man

Presenter: Priscilla Pichardo

Authors: Adam Bender-Heine, Priscilla Pichardo, Rusha Patel

Institution: West Virginia University

Objective: This case report describes a middle aged man who presents with a midline floor of mouth cyst with gross pathological and radiological findings consistent with a bronchogenic cyst or foregut duplication cyst. Foregut duplication cysts are congenital malformations which are rarely found in the head and neck. This case represents one of only a few foregut duplication cysts ever described in the literature excised from the oral cavity of an adult.

Method: In this case report and review of literature this rare instance of an adult with a bronchogenic cyst is described in detail including clinical, surgical, radiological, and pathological findings. Moreover, a brief, comparative review of the most common midline neck masses and their histological and radiological characteristics are compared to those of a foregut duplication cyst.

Results: This case represents one of only a few foregut duplication cysts ever described in the literature excised from the oral cavity of an adult.

Conclusion: Although rare, a foregut duplication cyst should be included in the differential diagnosis during a comprehensive midline or even lateral neck mass evaluation in both the pediatric and adult patient.
**Glottal Insufficiency in Transgender Patients**

**Presenter:** Charlotte Hughes

**Authors:** Charlotte K Hughes¹, Danielle Morrison¹, Patrick McGarey², Alexandria Lawton¹, Laura Dominguez², Gregory R Dion¹

**Institutions:** ¹San Antonio Military Medical Center, ²University of Texas

**Objectives/Hypothesis:** Transgender individuals strive to match voice and gender identity. An increased glottal gap in transgender patients on stroboscopy is common with no direct correlation to hormone use. We hypothesize that videostroboscopy measurements and a novel glottal area calculation correlate with hormone therapy. <u>Study Design.</u> Retrospective cross-sectional study

**Methods:** Videostrobolaryngoscopy and electronic medical record data were collected for transgender patients, plus female/male controls, seen in a tertiary care laryngology practice over two years. Data included hormone duration/type and voice therapy duration. Modal pitch videostroboscopy frame counts determined open frame percentage in consecutive vocal fold cycles. Glottal opening was measured using the widest still frame gap during a modal stroboscopic cycle relative to vocal fold length.

**Results:** Sixteen patients, 21-56 years old (mean=29) were included with one patient not on hormone therapy (ranging 2-90 months, mean=18). Voice therapy, employed in 10/16 patients, ranged 4-90 months (mean=6.4). One-way ANOVA testing was significant between open frame percent and glottal areas between transgender patients and male/female controls, confirmed with Tukey’s post hoc test (P<0.05). Time on hormones did not correlate to glottal area measurement or open frame percentage. However, length of voice therapy did positively correlate to increased glottal area measurement (Kendall’s Tau = 0.05). Mean phonation time, VHI10, and mean pitch did not correlate to measured glottal area on stroboscopy.

**Conclusions:** Transgender patients have larger glottal opening areas and open frame percentages than female/male controls. These findings may originate from glottal configuration alterations over time with voice therapy and not hormone therapy.
Histological Features of Tonsils in Adult with Periodic Fever, Apthous Stomatitis, Pharyngitis, and Cervical Adenitis Syndrome

Presenter: Kohei Yamahara

Authors: Kohei Yamahara, Yuki Egawa, Shinya Hori, Yuki Katsura, Satoshi Ikegami

Institution: Shizuoka Hospital

Objective: To describe the histological features in tonsils of adult onset of periodic fever with aphthous stomatitis, pharyngitis, and adenitis (PFAPA).

Method: A 37-year-old man with adult-onset PFAPA and age-matched 15 control patients with chronic tonsillitis who had undergone tonsillectomy were recruited. After informed consent, archival paraffin-embedded, formalin-fixed tonsil tissues were obtained. Features of tonsils from PFAPA patient and control patients were evaluated. Sizes of germinal centers were measured by hematoxylin and eosin staining. The number of B and T lymphocytes in germinal centers were counted by CD3 and CD8 immunohistochemistry, respectively.

Results: Histologic examination demonstrated that adult-onset tonsils seem to have much smaller germinal centers compared with control patients. The numbers of B and T lymphocytes seem to be compatible in germinal centers from PFAPA patient and control patients. These results are compatible with features of tonsils of pediatric-onset PFAPA.

Conclusion: This is the first report about histological features in tonsils of adult-onset PFAPA. Our report describes only one patient of adult-onset PFAPA because adult-onset PFAPA is still a rare entity. Although further studies are needed to assess, our results might suggest that the pathogenic mechanisms of adult- and pediatric-onset PFAPA are completely the same and that histological examination of tonsils are useful to make an accurate diagnose of PFAPA.
Iatrogenic Tracheal Injuries: Case Series and Review of the Literature

Presenter: Ariel Frost

Authors: Ariel Frost¹, Nicole Ruszkay², Toby Steinberg¹, Joshua Atkins¹, Natasha Mirza¹

Institutions: ¹University of Pennsylvania, ²Drexel University

Objective: Iatrogenic tracheal injuries are an uncommon but serious and a potentially life-threatening complication of endotracheal intubation. (1) To present two cases of iatrogenic tracheal injury. (2) To review the literature on iatrogenic tracheal injury.

Method: 2 female patients with iatrogenic tracheal injuries were diagnosed at our institution.

Results: The tracheal injuries were diagnosed by fiberoptic bronchoscopy. One patient with massive subcutaneous emphysema and pneumomediastinum with a clinically stable airway recovered after conservative treatment. One patient with a 3 cm posterior membranous tracheal tear was managed with hemostatic agents, and placement of tracheostomy tube with the cuff distal to the injury. Both patients received antibiotic prophylaxis for mediastinitis.

Conclusion: Iatrogenic tracheal injury requires early recognition to avoid acute complications of pneumothorax and anoxia, and subacute complications of mediastinitis and tracheal stenosis. Conservative versus surgical management is determined by the size of the injury and the clinical stability of the patient.
Incidence of Epiglottic Dysfunction after Radiation Therapy for Head and Neck Cancer

Presenter: Raluca Tavaluc

Authors: Raluca Tavaluc, Andrew Erman, Dinesh Chhetri

Institution: University of California - Los Angeles

Objective: History of radiation therapy is a known risk factor for short and long term dysphagia in head and neck cancer survivors. Dysfunction is due to a combination of fibrosis and loss of function. Epiglottic dysfunction is a known sequela, but its evaluation is often missed. The objective is to identify the rate of epiglottic dysfunction in the head and neck cancer survivor patient population.

Method: Retrospective review of patients with prior head and neck cancer treated with radiation as one of the treatment modalities who underwent a modified barium swallow study (MBSS). This was viewed and rated by a consensus between speech and language pathology and laryngology. Patients were excluded if they had supraglottic scarring or pharyngeal free flap reconstruction with altered anatomy.

Results: Thirty patients with head and neck cancer treated with radiation were identified to fit the inclusion criteria. Twenty-one (70%) of patients presented with epiglottic dysfunction. The remaining, nine (30%) of patients did not have epiglottic dysfunction on MBSS. Demographic, primary cancer location, duration from radiation therapy, penetration-aspiration score, evidence of upper esophageal dysfunction and patient reported surveys—eating assessment 10 (EAT-10), reflux symptom index (RSI)—were not different between the two groups.

Conclusion: Epiglottic dysfunction has a high incidence in head and neck cancer survivors treated with radiation and should be evaluated and treated as part of dysphagia management.
Influence of Laryngeal Afferents on Activity of the Swallowing Interneurons in Perfused Rats

Presenter: Yoichiro Sugiyama

Authors: Yoichiro Sugiyama, Shinya Fuse, Keiko Hashimoto, Shigeyuki Mukudai, Shigeru Hirano

Institution: Kyoto Prefectural University of Medicine

Objective: The pharyngeal stage of swallowing consists of well-coordinated and stereotyped movements of the pharyngeal and laryngeal muscles. However, in terms of rheological characteristics, the bolus transit through the alimentary tract seems to be altered depending on its viscosity and volume, which might be recognized as the relative effects of sensory feedback on the swallowing pattern regulation. In order to investigate whether the pattern generation of the oropharyngeal swallow could be influenced by laryngeal afferent inputs during swallowing, we recorded the activity of swallowing-related neurons in the medulla during fictive swallowing with or without laryngeal sensory stimulation in perfused rats.

Method: The animals were decerebrated and then perfused with artificial cerebrospinal fluid. The activities of the phrenic and the vagus nerves were recorded to identify respiration and swallowing. Stimulation of the superior laryngeal nerve was used to elicit swallowing. The activity of the swallowing-related neurons during fictive swallowing concomitant with repetitive stimulation of the superior laryngeal nerve was compared that without laryngeal sensory stimulation.

Results: Many swallowing interneurons did not significantly change in firing frequency by repetitive stimulation of laryngeal afferents during swallowing.

Conclusion: The pharyngeal stage of swallowing would be strictly controlled by the central regulatory mechanisms that generate its intrinsic motor pattern, resulting in prevention of functional instability of swallowing.
Interprofessional Tracheostomy Education Course

Presenter: Tammy Wang

Authors: Tammy Wang, Shelley Diane, Josephine Czechowicz

Institution: University of California - San Francisco

Objective: Evaluate the efficacy of an interprofessional tracheostomy education course designed for pediatric care providers, assess improvement in self-rated confidence, principles of emergency tracheostomy care, and common tracheostomy terminology.

Methods: A half-day tracheostomy education course was provided for registered nurses, respiratory therapists, and resident physicians at an academic pediatric hospital. Participants completed surveys before and after an educational curriculum consisting of didactics and hands-on training stations. The course was coordinated and conducted by representatives in otolaryngology, nursing, respiratory therapy, and speech therapy.

Results: Twenty-four health care providers (17 registered nurses, 5 respiratory therapists, 1 otolaryngology resident) participated in a tracheostomy education course. Participants completed pre- and post- course surveys assessing self-rated confidence, as well as principles in emergency tracheostomy care and common tracheostomy terminology. A mean average self-rated confidence based on a 5-point likert scale across four categories improved from 2.66 before the course to 3.94 after the course. Similarly, scores on a ‘fill-in-the-blank’ tracheostomy diagram improved from 61% before the course to 95% after the course.

Conclusion: Pediatric tracheostomy care is critical for many nurses, respiratory therapists, and resident physicians. A tracheostomy course consisting of interprofessional didactics and hands-on training stations improves self-rated confidence and knowledge of tracheostomy principles and emergency management. Standardized tracheostomy education courses can provide a foundation for more consistent clinical care across professional disciplines, as well as greater insight regarding tracheostomy care, from pre-operative discussions through peri-operative management and discharge planning.
In-Vivo Oxygenation and Hydration Levels of Vocal Folds Measured by Diffuse Reflectance Spectroscopy

Presenter: Chi-Te Wang

Authors: Chi Te Wang

Institution: Far Eastern Memorial Hospital

Objective: Diffuse reflectance spectroscopy (DRS) is originally designed to measure in-vivo optical properties of skin. After delivering visible light source (500-1000 nm), a spectrometer collect and analyze the photons after travelling 100-1000 nm depth in the tissue. Comparing with known existing optical properties of physiological chromophores, tissue compositions can be calculated in a non-invasive manner. This study intends to explore the potentials of DRS in measuring in-vivo oxygenation and hydration levels of vocal folds.

Method: We designed a prototype system to apply DRS under microsurgical settings, including a laryngeal probe, an integrated apparatus of light source, spectrometer and controlling board, and a customized software for real-time computing and monitoring. Contralateral, healthy vocal folds were measured as the control sites. Oxygenation and hydration levels were calculated using artificial neural network.

Results: We recruited 20 cases of various laryngeal disorders, including vocal polyp, cyst, and glottic neoplasm. Average oxygen saturation was 61.8% in the lesion sites, compared with 68.9% in the control sites. Average hydration levels were 47.4% and 42.2% in the lesion and control sites, respectively. Laryngeal neoplasm displayed a prominent lower oxygenation (51~65%) and hydration (10~38%) levels than the control sites.

Conclusion: DRS holds promise to advance current understanding of vocal folds, especially the oxygenation and hydration levels under physiological and pathological conditions. Preliminary results showed that DRS results may be helpful to detect neoplasm in a non-invasive manner. Nevertheless, further refinements of probe is mandatory to obtain a more stable and consistent measuring results.
Knowledge of PPI side effects among otolaryngologists

Presenter: Anaïs Rameau

Authors: Anaïs Rameau, Katerina Andreadis

Institution: Weill Cornell Medicine

Objective: To investigate the awareness of proton pump inhibitors (PPIs) side effects and the resulting changes in reflux care among American Broncho-Esophagological Association (ABEA) members, in light of mounting evidence of PPIs association with significant adverse events.

Method: An online survey was electronically distributed to ABEA members, inquiring about awareness of PPIs side effects and current practice in reflux management.

Results: Three hundred seventy-four members were emailed, of whom 43 (11.5%) responded. The majority of respondents (94.1%) selected laryngology as the principal focus of their practice. This entire cohort warned their patients about PPI side effects, with highest concern for osteoporosis risk (64.7%). An increasing number of patients inquiring about stopping PPIs was reported by the majority (85.3%). Most respondents (88.2%) had changed their PPI prescription frequency in light of recent studies on PPI side effects, with 55.9% avoiding PPI prescription altogether and 94.1% limiting the duration of PPI courses. Instead of PPIs, 73.5% of responders prescribe histamine H2-receptor blockers. The primary reasons for starting patients on PPIs were typical gastroesophageal reflux symptoms (47.1%), followed by laryngopharyngeal reflux symptoms (41.2%), and endoscopic findings suspicious for reflux (11.8%). Finally, the majority of respondents (82.4%) had referred at least one patient for surgical management of gastroesophageal reflux in the past year.

Conclusion: Surveyed ABEA members reported awareness and concern for PPI side effects, and have decreased PPI prescription as result. Osteoporosis was the side effect of highest concern. Referral to general surgery for the management of reflux was considered by the majority of respondents.
Laryngeal Adductor Pressure Testing in a Porcine Model

Presenter: Sarah Brookes

Authors: Ajay Hari Nachiappan, Randal Paniello, Sarah Brookes, Lujuan Zhang, Asem Aboelzahab, Sherry Harbin, Stacey Halum

Institution: Purdue University

Objective: With recent advances in laryngeal tissue engineering and treatments for vocal fold paralysis, there is a need for minimally invasive methods of assessing engineered dynamic laryngeal muscle contraction as part of preclinical porcine studies. Previous studies have established that laryngeal adductor pressure (LAP) is correlated with glottic closing force (GCF) in a canine model. The present study investigates the use of LAP measurements in a porcine model, with ex-vivo and in-vivo validation for monitoring laryngeal force of contraction.

Methods: Standard endotracheal tubes (ETTs) of successive sizes were tested within variable sized, ex-vivo models of laryngeal contraction. An MXP2010 pressure sensor was attached to the pilot balloon, calibrated, and used to measure simulated LAP. LAP was then measured in anesthetized mini-pigs weighing roughly 25 kg with transcutaneous recurrent laryngeal nerve stimulation (RLN) at various frequencies.

Results: Ex-vivo studies included testing with ETTs sized 4.0-8.0. Pearson's correlation plots (induced pressure:output voltage) demonstrated that laryngeal inlet size and elasticity of the endotracheal cuff affected measurement accuracy and reproducibility. Testing of the device in anesthetized mini-pigs showed that LAP values increased with RLN stimulation frequency, as would be expected. Upon repeat testing following 1 month, data suggested that this method of transcutaneous LAP measurement is efficient and accurate.

Conclusion: LAP has not been previously tested outside a canine model. While the cervical anatomy of the porcine is different from the canine, this study demonstrates that noninvasive means for detecting LAP can be reliability performed in preclinical porcine models.
Laryngeal Distribution of Adult-Onset Recurrent Respiratory Papillomatosis: A Longitudinal Study

Presenter: Lizbeth Hu

Authors: Lizbeth Hu, Peter Benedict, David Garber, Binhuan Wang, Milan R. Amin, Ryan C. Branski

Institution: New York University

Objective: To describe recurrence patterns in patients with recurrent respiratory papillomatosis (RRP) following surgical intervention.

Method: Initial and follow-up laryngoscopic examinations of seven previously untreated adult-onset RRP patients were reviewed. Patients were followed longitudinally for periods ranging from three months to seven years. Lesion locations were recorded using a twenty-one region laryngeal schematic and maps were generated to illustrate the distribution of disease before and after cold knife or potassium-titanyl-phosphate (KTP) laser intervention. Univariate and multivariate analyses were employed to examine variables affecting recurrence patterns.

Results: Across all patients, a statistically significant correlation between initial distribution and primary recurrence was observed. Seventy-five percent of new lesions were adjacent to regions with pre-existing disease, 83% of new glottic lesions were adjacent to pre-existing glottic lesions, and 66% of supraglottic lesions were adjacent to pre-existing supraglottic regions. No statistically significant differences in recurrence rate were observed across sites.

Conclusion: In previously untreated patients with adult-onset recurrent respiratory papillomatosis, lesions tended to recur either in the same regions or regions adjacent to those affected at the time of initial surgery.
Lessons Learned from 21 Pediatric Recurrent Laryngeal Nerve Reinnervations

Presenter: Christen Caloway

Authors: Christen Caloway, Sarah Bouhabel, Christopher Hartnick

Institution: Massachusetts Eye and Ear Infirmary

Objective: Ansa to recurrent laryngeal nerve (RLN) reinnervation is gaining popularity in treatment of unilateral vocal fold paralysis (UVFP) in children. Surgical success relies on accurate identification of the ansa cervicalis (where there is often variation in anatomy), accurate identification of the RLN when the nerve is often not stimulable, and achievement of a tension-free neurorrhaphy. Here, we aim to outline techniques for surgical success following our experience with 21 cases.

Method: 21 patients (mean age 9.1 [1-30], 10 male) with UVFP were evaluated for reinnervation. No children exhibited signs of true vocal fold (TVF) atrophy on direct laryngoscopy. Patients underwent unilateral neck exploration with identification of the ansa cervicalis with subsequent neurorrhaphy to the ipsilateral RLN.

Results: While various approaches can be used to identify the ansa cervicalis, we found identification of the hypoglossal nerve to be unnecessary and adequate surgical landmarks are provided by the omohyoid muscle and internal jugular vein. We found medial to lateral mobilization of the superior lobe of the thyroid to be critical in the identification of the RLN. Finally, division of the omohyoid and dissection deep to the strap muscles are imperative for a tension-free anastomosis, and successful neurorrhaphy is achieved with a two-stitch approach. 19/21 (90.5%) had resolution of dysphonia and/or aspiration by 6 months post-operatively.

Conclusion: Ansa-RLN reinnervation is a common procedure being used to treat UVFP in children. Here, we detail our own experience in patient selection and surgical technique in order to maximize benefit from this procedure.
Longitudinal Laryngeal Thermal Injury Model in Swine

Presenter: Gregory Dion

Authors: Gregory R Dion, Chrisitian S Pingree, Pedro J Rico, Christine L Christensen

Institution: Brooke Army Medical Center

Objective: A lack of reliable laryngeal thermal injury models precludes laryngeal burn wound healing studies and investigation of novel therapeutics. We hypothesize that a swine laryngeal burn model can allow for laryngeal burn evaluation over time.

Study Design: Animal Study

Method: Twelve Yorkshire crossbreed swine underwent tracheostomy and endoscopically directed laryngeal burns using heated air (150-160°C). Swine larynges were evaluated and sectioned/stained at 12 hours, 1, 3, 7, 14, and 21 days. A board-certified veterinary pathologist assessed anatomic regions (left and right: epiglottis, true/false vocal folds, and subglottis) using a 9 criteria histologic injury scoring scale.

Results: Six swine were euthanized at scheduled endpoints, three prematurely (airway concerns), and three succumbed to airway complications after 16-36 hours. Endoscopic and gross examination from scheduled endpoints revealed massive supraglottic edema and tissue damage, particularly around the arytenoids, extending transglottically. Swine from premature endpoints had comparatively increased edema throughout. Microscopic evaluation documented an inverse relationship between injury severity score and time from injury. Inflammation severity decreased over time, nearly resolving by 14 days. Neutrophils predominated early with histiocytes appearing at 3 days. Granulation tissue appeared at 3 days, and early epiglottic and/or subglottic fibrosis appeared by 7 days and matured by 14 days. Edema, abundant initially, decreased by day 3 and resolved by day 7.

Conclusion: This approach is the first to provide longitudinal analysis of laryngeal thermal injuries, reflecting some of the first temporal wound healing characteristic data in laryngeal thermal injuries and providing a platform for future therapeutic studies.
Longus Colli Tendinitis Without Calcification

Presenter: Wesley Davison

Authors: Wesley L Davison, Gul Moonis, Michael J Pitman

Institution: New York Presbyterian Hospital - Columbia University Medical Center

Background: Longus Colli Calcific Tendonitis (LCCT) has been a known cause of neck pain since Hartley identified the longus colli (LC) as the source in 1960s. It is an acute diagnosis of midlife. Symptoms include neck rigidity, pain, and dysphagia, which may mimic a retropharyngeal abscess or meningitis. Elevated ESR and CRP are common. Prevertebral swelling from C1 to C4 with calcification of the LC tendon is seen acutely and reabsorbed within two weeks. On MRI, hyperintensity of the LC muscle on T2 with dark areas representing calcium are seen. Treatment includes anti-inflammatories and analgesics. Symptoms resolve after one to two weeks.

Clinical Case: A 32-year-old woman with a rheumatoid arthritis (RA) flare on infliximab presented with two weeks of severe neck pain and stiffness. CT showed retropharyngeal edema without abscess or calcifications. MRI showed inflammation of the left LC muscle and tendon. She was diagnosed with LC tendonitis and given celecoxib. Rheumatology started prednisone and increased her infliximab dose, which provided rapid relief.

Conclusion: Both LC tendinitis without calcification and LCCT in patients with RA are rare, despite prior reports. This case is unique as the patient had RA but lacked calcific tendinitis. The etiology may have been rheumatoid myositis. The differential diagnosis for retropharyngeal swelling includes infectious causes, LCCT, thrombus of the internal jugular vein and prior radiation among others. Finally, LCCT should not be excluded when calcifications are absent, especially beyond 2 weeks of presentation, but rheumatologic conditions should increase suspicion for non-calcific tendonitis of the LC.
Low Frequency Low Pressure Jet Ventilation: Patient Selection, Safety and Complications

**Presenter:** Calvin Myint

**Authors:** Calvin W Myint¹, Jacline Griffeth², Mark A Fritz², Abdulmalik Alsaied¹, Gregory N Postma¹

**Institutions:** ¹Augusta University,²Medical College of Georgia,³University of Kentucky

**Objective:** Jet ventilation (JV) is a specialized technique not available in all facilities. Prior to JV, endotracheal tubes were intermittently inserted to perform various laryngologic procedures. Complications from JV include barotrauma, mucosal damage, laryngospasm, hypoxemia, cervicamediastinal emphysema, pneumothorax, and gastrointestinal distention.

**Method:** The objective is to review our center experience on a large number of patients undergoing laryngoscopic surgery using jet ventilation from 2000. Data collected include types of procedures, patient demographics, and rate of complications from JV. Fisher exact test and receiver operation curve was used for statistical analysis.

**Results:** Our patients consist of 425 patients undergoing a total of 834 microlaryngeal surgeries. The types of surgery include 267 subglottic stenosis, 142 tracheal stenosis, 179 voice disorder, 179 masses and lesions. There were no major complications. Brief intubation were required in 148 cases (17%). For 88 cases (11%), the oxygen saturation went down below 90%. The need for intubation was not associated with history of smoking, hypertension, neurocognitive disorder, but was associated with diabetes (p 0.0087) and cardiopulmonary conditions including sleep apnea (p 0.0012). For body mass index (BMI), intubation rates were 7.5% for normal weight (BMI<25, N=199), 13.1% for overweight (BMI 25-30, N=269), 23.9% for obese (BMI 30-40, N=317) and 38.8% for morbidly obese (BMI >40, N=49) patients. Three patients developed stridor in recovery unit and two patients were intubated due to airway edema. One suffered tongue laceration.

**Conclusion:** Low frequency low pressure jet ventilation is safe and effective but intermittent endotracheal intubation should always be anticipated.
Low Risk Assessment of Swallowing Impairment Using Flexible Endoscopy Without Food or Liquid

Presenter: Mitsuyoshi Imaizumi

Authors: Mitsuyoshi Imaizumi¹, Toshihiko Suzuki¹, Takashi Matsuzuka¹, Shigeyuki Murono¹, Koichi Omori²

Institutions: ¹Fukushima Medical University, ²Kyoto University

Objective: Flexible endoscopic evaluation of swallowing (FEES) is a relatively safe procedure to determine the safety of oral feeding, and consists of the introduction of food and liquid, as well as a sensitivity test. However, the introduction of food and liquid can cause pneumonia secondary to aspiration. To solve this problem, we investigated the possibility of performing FEES without introduction of food or liquid in order to assess swallowing impairment severity.

Method: A total of 106 subjects with swallowing impairment underwent conventional FEES, and both their salivary pooling degree and larynx sensitivity were analyzed to detect swallowing impairment without the introduction of food or liquid. The subjects were divided into two groups: an undetectable swallowing impairment (USI) group, and a detectable swallowing impairment (DSI) group. The general characteristics, functional impairment status, and clinical assistance requirements of the two groups were investigated and compared.

Results: The numbers of subjects in the USI and DSI groups were 64 and 42, respectively. The DSI group showed a significantly higher prevalence of aspiration during FEES, and their required levels of care were also significantly higher. Additionally, their levels of consciousness, oral intake ability, and activities of daily living were significantly low, compared to the USI group.

Conclusion: This study demonstrated the feasibility of FEES without introduction of food or liquid for assessment of swallowing impairment severity. Using our low risk assessment, we were able to accurately identify subjects with low oral intake ability, as well as those who required intervention.
Measurement of vocal fold abduction and adduction in vocal fold paralysis vs. paresis

Presenter: Peak Woo

Authors: Peak Woo, Benjamin J. Rubinstein

Institution: Mount Sinai School of Medicine

Objective: The diagnosis of paresis is challenging based on endoscopy alone. Image analysis of abduction and adduction may yield useful information regarding dynamic timing and speed of vocal function.

Method: Image analysis of videostroboscopy motion. Twenty patients with suspected paresis were studied. Ten normal and seven patients with unilateral vocal fold paralysis (VCP) served as positive and negative controls. Video montage of adduction and abduction was assembled with 10 video frames each with 66 milliseconds between each frame. The line corresponding to each membranous vocal fold was captured for motion analysis. Glottis angle, vocal fold length and rate of angular change for each gesture were analyzed.

Results: Six hundred forty video frames were analyzed. Maximal abduction and adduction angle for each fold in normal is 22 and 25 degrees. This is similar to the non paralyzed side in the paralysis group. The VCP side had significant changes compared to the innervated side (abstain degree adduction, 1 degree abduction). Paresis showed significant reduction in abduction angles compared to the contra lateral side (paresis = 13 vs. normal = 21) but not in adduction. There were non-significant differences in maximal adduction angles or rate of angle change in paresis compared to normal. The paretic side often showed greater abduction and adduction motion than normal, suggestive of hyperkinetic vocal fold paresis.

Conclusion: Vocal fold paresis appears to have excellent adduction but not abduction. Other endoscopic features including vocal fold kinesis, configuration and atrophy must factor in the diagnosis of paresis.
Medialization Laryngoplasty and Evaluation of True Vocal Fold Compression with Adjustable Silicone Cushion Implants

Presenter: Rebecca Nelson

Authors: Rebecca C Nelson, Saranya Reghunathan, Paul C. Bryson, Michael Benninger

Institution: Cleveland Clinic Foundation

Objective: Medialization laryngoplasty (ML) can be performed with different implants materials, and in this study, an adjustable silicone implant that can be expanded with injected saline was evaluated. Our goal was to compare results of this implant with the previously described model to predict true vocal fold (TVF) compression when using silastic implants.

Method: ML was performed on two cadavers, one male and one female, using the implants with injected saline. Post-operative flexible laryngoscopy and CT imaging were performed. Measurements taken from CT scans were analyzed and compared to a previously developed model for prediction of TVF tissue compression with silastic medialization implants. Actual tissue compression of the true vocal fold was determined by comparing the implanted TVF width to the unimplanted contralateral vocal fold width (a surrogate for preoperative TVF width), post-operative TVF width and the maximal medialization provided by the implant.

Results: Flexible laryngoscopy revealed medialization of the TVF from the implants. For the male implant, our expected TVF tissue compression was 4.5 mm, while actual compression was 7.8 mm. For the female cadaver, expected TVF compression was 2.6 mm, and actual compression was 2.3 mm.

Conclusion: Prefabricated, adjustable silicone implants are a feasible option for ML. However, given the demonstrated variability, previously developed tissue compression modeling may or may not be applicable. Discrepancies may relate to differences in material and/or shape. Further studies could help determine a tissue compression model specific to this implant.
Model of Radiation Induced Tissue Damage

Presenter: Johnathon Anderson

Authors: Johnathon D Anderson

Institution: University of California - Davis

Objective: To develop a model of radiotherapy soft tissue damage with quantitative functional outcomes in order to test drug candidates for efficacy. However, no preclinical models currently exist to study the putative drug’s efficacy in terms of functional recovery, thereby inhibiting the development of targeted therapeutics.

Methods: Twelve C57BL/6 mice were randomized into 4 groups: negative controls (Con), low radiation dose (30Gy), medium radiation dose (40Gy) or high dose (50Gy). Mice received a single administration of radiation focused on the right, hind leg while under anesthesia. A blinded observer weighed each mouse and performed motors skills assessments weekly for the duration of the study (8 weeks). At the end of the study mice were euthanized, assessed for hindlimb range of motion and tissue analysis was performed, evaluating tissue morphology, fibrotic scarring and collagen content.

Results: Mice presented significant motor skills deficits that positively correlated with the dose of radiation administered, as well as reduced range of motion and increased fibrotic scarring across all treatment groups.

Conclusion: The current study is the first to describe a preclinical model of functional skeletal muscle deficits following radiation injury, which will be useful for the assessment of novel drug candidates to treat radiotherapy induced soft tissue damage.
Multilevel Airway Stenosis Secondary to Mucous Membrane Pemphigoid – A Challenging Entity

**Presenter:** Dennis Tang

**Authors:** Dennis Tang, Paul Bryson

**Institution:** Cleveland Clinic Foundation

**Objective:** Mucous membrane pemphigoid (MMP) is a rare autoimmune disease characterized by sub-epithelial blistering. Cicatricial scar and inflammation involving the larynx and upper airway is a serious complication of MMP. We present a rare case of MMP complicated by stenosis of the nasal valve, velopharynx, supraglottis, and glottis requiring multiple surgical interventions.

**Method:** Case Report

**Results:** Patient is a 68 yo female with multiple oral, nasal, and laryngopharyngeal ulcers consistent with MMP. She was found to have significant unilateral nasal stenosis, supraglottic stenosis secondary to cicatricial scar, interarytenoid fixation, and active ulcerations. An awake tracheostomy was performed to secure her airway. Immunosuppressants were started resulting in remission. However, she continued to have multilevel stenosis. On examination, she was found to have a pinpoint supraglottic opening and underwent lyses of adhesions and dilation of her supraglottis and glottis. Her nasal cavity was stented with a Doyle split. These maneuvers established an acceptable airway but she continued to have velopharyngeal stenosis. A pharyngoplasty was performed with placement of a nasal trumpet in addition to repeat supraglottic dilation and application of mitomycin C. At 10 month follow-up, she has maintained decannulation and a patent upper airway with minimal restenosis of the velopharynx.

**Conclusion:** MMP is a rare autoimmune condition that can have devastating consequences in the upper airway. This is a unique case of MMP involving 4 subsites requiring multiple interventions to restore airway patency. Effective immunosuppression and collaboration with rheumatology is critical to controlling the disease to allow for airway interventions.
Natural History and Management of Upper Esophageal Dysfunction in the Pediatric Population

Presenter: Ray Wang

Authors: Ray Y Wang, Katherine Dong, Julina Ongkasuwan

Institution: Baylor College of Medicine

Objective: Due to its rarity, there is little data describing outcomes in patients with upper esophageal sphincter (UES) dysfunction. The purpose of this study is to characterize the prevalence and natural history of UES dysfunction in pediatric patients.

Methods: Retrospective review of patients with UES dysfunction on videofluoroscopic swallow study (VFSS) performed between June 2008 and January 2018 at a tertiary children’s hospital.

Results: 60 patients were identified with UES dysfunction. Mean age of presentation was 5.5 months (range 1 month - 35 months), mean length of follow up was 35 months. All but three patients had comorbid disorders. 20/60 (33 %) were born prematurely, 25/60 (42%) had congenital heart disease, and 36/60 (60%) had a neurologic disorder. At presentation, 15 patients had gastrostomy tubes (g-tubes). 6 additional patients required g-tube placement while one patient had their g-tube removed. 19/20 (95%) of patients with g-tubes had underlying congenital heart disease or a neurologic disorder. Two patients underwent endoscopic intervention for their UES dysphagia - one patient remained g-tube dependent while the other resumed regular feeding with improved UES relaxation on repeat evaluation. All 3 patients with primary UES dysfunction, without co-morbid conditions, did not require feeding tube placement.

Conclusion: UES dysfunction is a rare cause of dysphagia in the pediatric population. Systemic comorbidities are common in these patients. While many patients were g-tube dependent at follow up, their underlying comorbidities were likely contributors in addition to their dysphagia. Patients with primary UES dysfunction may benefit from conservative management.
Natural History of Tracheal Microvasculature in a Mouse Model of Syngeneic Tracheal Replacement

Presenter: Audrey White

Authors: Audrey White¹, Matthew Wiett¹, Sayali Dharmadhikari², Susan D. Reynolds³, Tendy Chiang⁴

Institutions: ¹Ohio State University, ²Center for Regenerative Medicine, ³Center for Perinatal Research, ⁴Nationwide Childrens Hospital

Objective: Tissue engineered tracheal grafts are commonly complicated by infection, granulation, stenosis, and vascular erosion. The vascular repair mechanisms underlying these complications however remain unclear. To delineate the surgical impact of tracheal replacement from scaffold related morbidity, this study investigated the natural history of endothelial cells in a murine model of syngeneic tracheal replacement.

Method: Syngeneic tracheal grafts were obtained from C57BL/6 female mice and implanted orthotopically following creation of a long segment tracheal defect. Grafts were explanted at days 0, 3, 7, 14, 30, 60, 6 months, and one year (N=4). Endothelial cell expression within the lamina propria was compared across tissue regions over time. Tissue engineered grafts composed of an electrospun PET/PU scaffold seeded with bone marrow-derived mesenchymal stem cells were implanted similarly and examined 7 days post-implantation. Syngeneic tracheal grafts were sectioned coronally across graft and host tissues. Sections were stained for endothelium with DAPI and CD31 antibody. CD31 percentage fluorescent area was analyzed using ImageJ software. Regions or timepoints were compared using the Student’s T Test.

Results: Fluorescence quantification revealed no significant difference in CD31 expression over all timepoints during the incorporation of syngeneic tracheal grafts (P> 0.05). In tissue engineered grafts, CD31 appears to increase near regions of successful scaffold re-epithelialization.

Conclusion: Endothelial cell expression did not change during the incorporation of syngeneic tracheal grafts, suggesting that the existing microvasculature remained intact during early phases of repair. Further investigation will uncover how neovascularization and reperfusion mitigate repair in tissue engineered grafts compared to syngeneic trachea.
Novel Application of the Ultrasonic Bone Aspirator for Endoscopic Treatment of a Laryngeal Chondroma

Presenter: William Reschley

Authors: Neil Chheda, William Reschly, Bianca Festa

Institution: University of Florida

Objective: To describe a novel use of the ultrasonic bone aspirator to endoscopically relieve an airway obstruction caused by a laryngeal chondroma

Method: Case Report

Results: Successful endoscopic relief of airway obstruction

Conclusion: Benign chondroma may present in the larynx and upper trachea causing obstructive symptoms. Due to the solid and firm nature of these masses, endoscopic excision can be difficult with cup forceps, lasers or powered debrider type instruments. The ultrasonic bone aspirator has been previously described in neurosurgical and rhinologic procedures to remove calcified masses. We present a novel use of this instrument where the ultrasonic bone aspirator was successfully employed to endoscopically relieve an airway obstruction caused by a chondroma.
Novel Treatment of Airway Obstruction from Redundant Postcricoid Mucosa with In-Office KTP Laser Ablation

Presenter: Victoria Yu

Authors: Victoria Yu, Yin Yiu, Michael Pitman

Institution: Columbia University

Objective: Posterior supraglottic and/or postcricoid mucosal redundancy is a poorly understood phenomenon in adults that can cause obstructive symptoms such as dyspnea and inspiratory stridor. As an entity it has been described in association with obesity, obstructive sleep apnea (OSA), and reflux.

Method: We describe two patients who presented with dyspnea, inspiratory stridor, and sleep disturbance who were found to have redundant, intermittently prolapsing postcricoid and arytenoid mucosa on laryngostroboscopic exam. We discuss relevant clinical history, procedural details of treatment techniques, and post-treatment outcomes.

Results: Patient 1 is a 63-year-old man with severe reflux with esophagitis and a hiatal hernia who complained of inspiratory stridor disrupting his sleep. Laryngoscopy demonstrated prolapsing postcricoid mucosa that recreated the patient’s symptoms. Staged in-office KTP laser ablation was pursued with significant improvement in stridor and increased exercise tolerance. Patient 2 is a 62-year-old woman with OSA and poor CPAP tolerance who complained of dyspnea on exertion and stridor. She was found to have redundant interarytenoid mucosa. She underwent single-stage in-office KTP laser ablation with improvement in stridor and increased CPAP tolerance. No complications were noted in either case.

Conclusion: Redundant supraglottic and/or postcricoid mucosa results in clinically significant snoring, airway obstruction, and CPAP intolerance. We suggest the prolapsing mucosa can be safely and successfully treated using in-office KTP laser ablation with symptomatic relief.
Paradoxical Vocal Fold Dysfunction vs Tracheomalacia in an adult: An important consideration

Presenter: David Bracken

Authors: David J Bracken, Andrew Vahabzadeh-Hagh

Institution: University of California - San Diego

Objective: The evaluation of upper airway noise and work of breathing involves an understanding of broad differential diagnoses. It is important to recognize the overlap of signs and symptoms between obstructive breathing disorders. This case report presents the consideration of tracheomalacia in the geriatric patient population as a cause of upper airway distress.

Methods: A 72 year old female with severe kyphosis and anxiety disorder presented with transient stridor and dyspnea. Laryngoscopy was overall normal with a patent glottis and sub-glottis. The diagnosis of paradoxical vocal fold motion (PVFM) was made based on clinical presentation and exclusion of other potential causes. She demonstrated minimal response with speech therapy as well as botulinum toxin injection to the thyroarytenoid muscles. With failed improvement and after multiple intubations a tracheostomy tube was placed. Despite tracheostomy persistent desaturation events occurred. Imaging revealed abnormal trachea orientation secondary to thoracic habitus. Tracheoscopy at the time of her exacerbation events revealed complete respirophasic collapse of her trachea.

Discussion: Tracheobronchomalacia in geriatric patients is described in medical literature. Dyspneic paroxysms and dynamic nature of collapse from negative inspiratory pressure can mimic paradoxical vocal fold dysfunction. Limitations of standard bedside laryngoscopy are discussed. Intraoperative diagnosis of tracheal collapse can be delayed by evaluation under muscle paralysis and positive pressure ventilation.

Conclusion: The differential diagnosis of airway obstruction in geriatric patient populations should be broad and tracheomalacia considered. Addition of bedside bronchoscopy to the standard head and neck exam for tracheal visualization and evaluation of dynamic collapse may be warranted.
PEDIATRIC TRACHEAL SCHWANNOMA: CASE REPORT AND REVIEW OF THE LITERATURE

**Presenter:** Natasha Premmanisakul

**Authors:** Dhave Setabutr, Natasha Premmanisakul

**Institution:** Thammasat University

**Objective:** To present an interesting case and review the literature regarding presentation and treatment of pediatric tracheal schwannoma.

**Subjects and Methods:** We discuss an interesting case of a tracheal schwannoma uniquely presenting as a case of persistent obstructive sleep apnea in a 9-year old Thai male. The patient presented four-weeks postoperatively from an adenotonsillectomy with faint stridor, but severe retractions and snoring at night. Following appropriate diagnosis, repeated endoscopic debulking was completed. We follow by then reviewing the literature regarding incidence, common presentation, and appropriate treatment strategies for this rare entity. PUBMED was searched for the terms "pediatric tracheal schwannoma." Results in the English literature were mined for relevant clinical data when available. Literature analysis of case reports was performed.

**Results:** A review of tracheal schwannoma in the pediatric population has only been previously reported seven times, five of which were in English. It was found that the average reported age is 13 years (the reported age ranged between 9-17 years). There was no sex predilection. Of the five reported cases, three cases mentioned that the schwannoma obstructed more than two thirds of the tracheal lumen. All cases reported describes patients with symptoms that mimics asthma having been treated with bronchodilators and/or steroids.

**Conclusion:** Tracheal schwannoma is an extremely rare condition, and even more uncommon in the pediatric population. Prompt diagnosis and conservative surgical management remains the standard treatment.
Pneumonia Following Injection Laryngoplasty in Cardiothoracic Patients with Unilateral Vocal Fold Paralysis

Presenter: Jason Barnes

Authors: Jason H Barnes, Diana Orbelo, Michael Armstrong, Christine Lohse, Dale Ekbom

Institutions: Mayo Clinic

Objective: Recurrent laryngeal nerve (RLN) injury is a potential complication of cardiothoracic surgery that can result in unilateral vocal fold paralysis (UVFP). Symptoms of UVFP include dysphagia, reduced vocal loudness and weak cough with potential for aspiration. Injection laryngoplasty (IL) is often offered to UVFP patients. IL, known to improve voice following UVFP, intuitively may be anticipated to decrease risk of developing aspiration pneumonia. However, little evidence is available to support this clinical impression. The purpose of this study is to identify the rate of pneumonia in patients with UVFP who did or did not undergo IL.

Method: Retrospective chart review of cardiothoracic surgical patients from 01/2008 to 09/2017, with endoscopically diagnosed UVCP. Patients were divided into two groups, those who underwent IL and those who did not. The 6 month occurrence of pneumonia was assessed.

Results: 92 patients were included. 35(38%) received IL and of those, 4(11%) developed pneumonia after IL. 57(62%) did not receive IL and of those 15(26%) developed pneumonia. Univariate analysis suggested a trend that patients who received IL were less likely to develop pneumonia compared to patients without IL. This difference did not reach statistical significance (hazard ratio 0.34, 95% CI 0.11-1.03, p=0.056).

Conclusion: Our findings suggest that there may be a trend toward decreased pneumonia rates in those receiving IL. Further research is needed to quantify the possible protective nature of IL for UVFP after cardiothoracic surgery.
Precedex Assisted Laryngeal Procedures (PALP): A Novel Pathway for Laryngeal Interventions

**Presenter:** Resha Soni

**Authors:** Resha S Soni, Seth Dailey

**Institution:** University of Wisconsin - Madison

**Objective:** Current treatment options for idiopathic subglottic stenosis include various open and endoscopic procedures under general anesthesia to more recently described office-based interventions such as steroid injections. For a subset of patients who cannot tolerate in-office procedures or for those in whom we wished to avoid general anesthesia, we sought a safe, reasonable alternative for management of their airway pathology. We present details of the precedex assisted laryngeal procedures pathway utilized at our institution.

**Method:** Retrospective case series and detailed description of patients undergoing the PALP pathway for idiopathic subglottic stenosis. Outcome measures included percentage of airway stenosis, patient tolerance, procedure completion rate, and complications.

**Results:** We present patients undergoing the above-described PALP pathway at our institution in the last one year. Procedure completion rate was greater than 95%. There were no immediate complications.

**Conclusion:** We describe a promising new pathway for idiopathic subglottic stenosis, a disease process which often requires long-term management and has been traditionally treated under general anesthesia. This pathway can be expanded to aid in the management of other chronic laryngeal conditions in patients where general anesthesia or in-office interventions is not ideal.
Rate of Percutaneous Versus Surgical Tracheotomy Among Six ICUs at a Tertiary Care Teaching Hospital

Presenter: Ross O'Hagan

Authors: Mingyang L. Gray, Ross O'Hagan, Daria G. Ade, Christopher H. Park, Kevin Wong, Adel Bassily-Marcus, Mark S. Courey

Institution: Icahn School of Medicine

Objective: The purpose of this study is to identify the rate of percutaneous tracheotomy at one tertiary-care teaching hospital among six intensive care units.

Method: A retrospective analysis of all patients who underwent tracheotomy at one tertiary-care teaching hospital in 2016-2017 was performed. Patients were identified using the International Statistical Classification of Diseases, 10th Revision, and stratified by percutaneous tracheotomy and non-percutaneous tracheotomy. Patients were aggregated by the six hospital units where they were located at the time of their tracheotomy.

Results: Of the 652 records reviewed, 513 had complete data. Among the 513 complete records, 176 (34%) were done percutaneously and 337 (66%) were not done percutaneously. There was no difference in tracheotomy technique in ACT6 and CCU (p=0.1958 and 0.1238 respectively). In the CSIU and SICU, there were significantly more percutaneous tracheotomies (p=0.0462 and p=0.0152 respectively). In the MICU and NSICU, however, there were significantly more non-percutaneous tracheotomies (p<0.0000 for both).

Conclusion: At one tertiary-care teaching hospital, 34% of tracheotomies were done percutaneously in the last two years. This rate is comparable to that of New York State. However, the rate of percutaneous tracheotomy is different among each of the intensive care units at our institution. Future study should focus on the cost of care and long-term outcomes based on tracheotomy technique.
Symptomatology of Substernal Thyroid Masses with Tracheal Deviation

Presenter: Aryan Shay

Authors: Aryan Shay, Summet Dua, Inna Husain, Samer Al-khudari

Institution: Rush University

Objective: To evaluate the correlation of symptoms to tracheal deviation in patients with substernal goiters.

Methods: Adult subjects with substernal goiters causing tracheal deviation that were surgically treated from 2013 to 2018 were retrospectively reviewed. Tracheal deviation was measured by a neuroradiologist using axial computed tomography (CT) scans. Linear regression models and descriptive statistics were utilized to evaluate the correlation between symptoms and tracheal deviation. A substernal goiter was defined as a thyroid mass extending through the level of clavicles verified by CT imaging.

Results: A total of 34 subjects were selected. Mean age of 54 years. The most common presenting symptom was dysphagia (53%, n = 18), followed by dyspnea (41%, n = 14) and coughing (8.8%, n = 3). All subjects had evidence of tracheal deviation with mean deviation of 1.50 cm (range 0.2-3.7 cm). There were 17 subjects (50%) with evidence of tracheal compression. The average specimen weight of the resected goiter was 151 grams. The average BMI was 32.9, which was associated with increased symptoms after controlling for tracheal compression (p=0.02). Specimen weight, tracheal compression, and tracheal deviation were not associated with preoperative symptoms (p=0.74, p=0.33, p=0.63, respectively).

Conclusion: Increased BMI was associated with increased preoperative symptoms, whereas specimen weight, tracheal deviation, and tracheal compression were not. Patients who have substernal thyroid masses with tracheal deviation often have symptoms with the most common being dysphagia in this series.
Synchronous Idiopathic Subglottic Stenosis and Bronchial Stenosis: A Case Report and Literature Review

Presenter: Resha Soni

Authors: Resha S Soni, Seth Dailey

Institution: University of Wisconsin - Madison

Objective: Evaluation and treatment options for idiopathic subglottic stenosis are currently well described in the literature. What is not so evident is the incidence and subsequent management of synchronous airway lesions in this patient population due to the infrequency of this event. We sought to elucidate this further by presenting a unique case.

Method: Case report and literature review.

Results: We present a case of a young woman with idiopathic subglottic stenosis, who in the course of her management, was found to have a new bronchial stenosis with features similar to her subglottic pathology. We found this to be a unique situation as most reported cases of subglottic stenosis and synchronous tracheal or bronchial stenosis are in the context of granulomatosis with polyangiitis.

Conclusion: Synchronous airway lesions can complicate the management of patients with subglottic stenosis. Concurrent idiopathic subglottic stenosis and bronchial stenosis is a rare entity which is infrequently reported.
Systemic Bevacizumab for End-stage Juvenile Recurrent Respiratory Papillomas: A Case Report

Presenter: Osama Hamdi

Authors: Osama Hamdi, Diego Preciado, Jeffrey Dome

Institution: Children's National Health System

Objective: Surgical debridement and excision of papillomas in recurrent respiratory papillomatosis (RRP), although effective at management of symptoms, does not prevent recurrence. We report a case of severe tracheal and pulmonary involvement where the anti-vascular endothelial growth factor (VEGF) antibody bevacizumab IV has been administered over the last 4 years.

Method: A 12-year-old male presented with RRP at 4 months of age, requiring monthly debridement. Over the years adjuvant therapy with interferon-alpha, cidofovir, and indole 3 carbinol, was unsuccessful. Given severe tracheal disease, airway obstruction, and pulmonary involvement, a trial of 10 mg/kg bevacizumab IV every 12 weeks per course was started.

Results: Following systemic bevacizumab, the frequency required debridements decreased from monthly to semiannually, with only 7 microdebrider ablations needed since 2014. Notably, there have not been any episodes of urgent transfer to the hospital for obstructive events since the bevacizumab was started. Following treatment, the disease no longer forms bulky exophytic lesions in the trachea. It is important to note however, that the disease has not been eliminated. While some pulmonary nodules continue to grow, they have become cavitated. The overall number and size of pulmonary lesions has decreased.

Conclusion: Current treatment standards are invasive and often times difficult in patients with poorly accessible papilloma lesions. Therefore, VEGF-targeted therapies, Bevacizumab, could prove to be a promising novel approach to the long-term treatment of severe RRP.
Temporary Breach of the Posterior Tracheal Wall Attributable to the Cuff of an Endotracheal Tube

Presenter: Andrew Lerrick

Authors: Andrew J Lerrick, Andrea J. Rothe, Coleen J. Smith, Karen L. Cicak

Institution: United Health Services Hospitals

Introduction: Posterior tracheal wall defects through which air can escape are rare entities, likely due to their detrimental impact on survival. We present a patient who developed pneumomediastinum and cervical subcutaneous emphysema following extubation attributable to an inadvertent breach of the "party" wall.

Clinical Course A patient underwent “second-look” biopsies following uneventful initial laser ablation of a T1 TVC carcinoma. A metal endotracheal tube, having proximal and distal cuffs, was placed in the event the laser was warranted. Rigid esophagoscopy was not performed. With both cuffs deflated the small caliber ETT easily permitted anterior passage of a flexible bronchoscope. In the PACU he had a severe coughing episode, followed by hemoptysis. Radiographs identified mediastinal and cervical air. A barium swallow confirmed an intact esophagus. Chest CT revealed an 8-millimeter posterior tracheal wall defect having an “irregular convexity” situated 3-centimeters above the carina. Subsequent X-rays and CT scans showed improvement. He was discharged home on POD #2, reportedly having no SOB while hunting coyotes three days later. Inexplicably, a CT scan three months later found no evidence of the tracheal wall abnormality.

Discussion Had positive pressure ventilation been the mechanism the injury would have manifested intra-operatively. More plausible is that during each inflation the distal cuff disrupted the trachealis muscle, but maintained a seal. Ventilation was withheld during bronchoscopy. Air escape likely first occurred moments after extubation.

Conclusions Despite proper use of an endotracheal tube, an inflated cuff appears to have caused a temporary breach of a vulnerable tracheal wall site.
The Balloon that Would Not Pop: A Cautionary Tale About Tracheostomy Tube Management

Presenter: Priya Krishna

Author: Priya Krishna

Institution: Loma Linda University

Objective: To describe a tracheostomy tube management complication

Methods: single retrospective case report study

Results/Report: A 26 y/o male with a history of a gunshot wound to C1 2 years prior was tracheostomy tube dependent and paraplegic as a result. His presenting complaint was inability to tolerate his Passy Muir valve and difficulty eating because of a feeling of choking which induced panic which had been occurring for the last 2 months. The patient was ventilator dependent so a decision was made to do a more thorough rigid operative laryngotraceoscopy. A standard 10 cc syringe was used to deflate the cuff of his 5-0 Shiley distal XLT tracheotomy tube. However, a fully inflated balloon with 50 cc of air was withdrawn from the stoma. Also noted was impressive ulceration of the posterior tracheal wall in the shape of the balloon. Further investigation revealed poor understanding of tracheostomy cuff management by nursing and RT staff at the patient’s care facility.

Conclusion: This case demonstrates the need for awareness of the strength of the tracheostomy cuff balloon and better education of long term care facility staff on cuff management in order to prevent complications.
The Incidence of Laryngotracheal Stenosis in Neonates with History of Ventilator Associated Pneumonia

Presenter: Anne Lowery

Authors: Anne S Lowery, Alexander Gelbard, Christopher T Wootten

Institution: Vanderbilt University

Objective: This study aims to investigate the effect of ventilator-associated pneumonia (VAP) on the development of laryngotracheal stenosis (LTS) in the neonatal critical care population.

Method: Retrospective cohort study of neonates with VAP treated at a tertiary care medical center from 2004 to 2014. Eligible patient records were assessed for the development of LTS. Demographics, medical comorbidities, infection characteristics and treatment variables were compared using unpaired Student t-test or Chi-squared. Statistical significance was set a priori at p<0.05.

Results: Of 86 neonates with VAP, 8 (9.3%) developed LTS. The average time to LTS diagnosis was 1.9 ± 1.5 years with 75% of patient requiring chronic tracheostomies. When comparing LTS vs. non-LTS patients, they demonstrated similar demographics, 100% vs. 86.9% premature, birth weight of 1.37 vs 1.15kg respectively, and similar medical comorbidities including cardiac abnormalities, allergies, asthma and GERD. There was no significant difference in the intubation duration (p=0.23), number of patients requiring re-intubations (p=0.79) or inflammatory markers at time of diagnosis. LTS patients trended towards older gestational age (30.3 weeks vs. 28.1, p=0.11) and later onset of VAP (94.3 days vs. 56.4, p=0.09).

Conclusion: Almost 10% of children with VAP developed LTS. There is a trend towards older gestational age and onset of VAP in LTS patients. Further analyses will include a matched cohort method to compare neonatal patients with VAP to those without VAP based on gestational age and intubation duration to elucidate if VAP is associated with higher incidence of LTS development.
Tongue Symptoms, Suspension Pressure and Duration During Operative Laryngoscopy

Presenter: T. Logan Lindemann

Authors: T. Logan Lindemann, Brandon Kamrava, David Sarcu, Ahmed M.S. Soliman

Institution: Temple University

Objective: Suspension laryngoscopy is a commonly performed procedure in Otolaryngology. During the procedure, the laryngoscope applies direct pressure to the tongue. Patients often complain of postoperative tongue symptoms including pain, swelling, numbness, taste disturbance, and rarely motor deficits. The duration and magnitude of force applied have previously been associated with post-operative tongue pain. We sought to correlate additional postoperative tongue symptoms with the magnitude of force applied and/or duration of suspension.

Method: A sample of patients undergoing suspension laryngoscopy between 2015 and 2018 were prospectively recruited. Those with a history of preexisting tongue symptoms, disease or surgery were excluded. Patients completed preoperative and postoperative questionnaires evaluating tongue swelling, numbness, movement and taste disturbance. Symptoms were subjectively scored on a Likert Scale from 0-10. Patient demographics, past medical and social history were also recorded. Intraoperative pressures were measured using a spring pressure gauge, positioned between the laryngoscope suspension arm and the Mayo stand. Initial and end suspension pressures, and duration of suspension were recorded.

Results: 110 patients met all inclusion criteria, of which 57 completed both preoperative and postoperative questionnaires. Six patients (10.5%) experienced postoperative tongue symptoms. No significant differences in suspension pressure or duration of suspension were observed between those with or without postoperative symptoms. Significantly, all patients reporting postoperative tongue morbidity were current or former cigarette smokers.

Conclusion: Neither suspension pressures nor duration of suspension were predictive of postoperative tongue morbidity. Current or previous tobacco use may predispose patients to developing post suspension laryngoscopy tongue symptoms.
Tracheostomy Boot Camp: A Simulation-Based Standardized Tracheotomy Care Curriculum for Resident Physicians and Medical Students

Presenter: Apoorva Tewari Ramaswamy

Authors: Apoorva T Ramaswamy, Victoria Yu, Michael J Pitman

Institution: New York Presbyterian - Columbia University

Objective: Providers report variable levels of comfort and knowledge regarding tracheostomy care. Curriculums using simulation can be effective teaching tools for improving tracheostomy care. We present our experience with a previously described resident- and student-oriented, simulation-based tracheostomy care competence survey and curriculum, with the goal of further validating this curriculum by assessing its efficacy at a non-origin institution.

Method: One-hour tracheostomy care workshops were administered to groups of 5 to 15 medical and dental students and/or non-otolaryngology resident physicians. A previously described curriculum was employed, consisting of a 15-minute presentation about tracheostomy fundamentals and 3 simulation stations. Participants’ knowledge and confidence were assessed using multiple-choice pre- and post-assessments.

Results: To date teaching sessions have been conducted with 11 medical/dental students and 11 internal medicine residents. 22% of participants felt comfortable caring for patients with tracheostomies pre-course, compared to 91.6% post-course. Similarly, 9% of participants felt comfortable managing tracheostomy dislodgement pre-course, in contrast to 92% post-course. Participants answered an average of 35% of knowledge-based questions correctly pre-course, compared to 73% post-course. While 50% of participants knew to use an obturator for tracheostomy tube reinsertion pre-course, 100% knew to do this post-course. Knowledge of decannulation protocols increased from 59% to 83%.

Conclusion: This curriculum improved participant confidence and knowledge about tracheostomies and tracheostomy care. As this was a non-origin institutional study, we suggest this curriculum is generalizable to other institutions. Longer-term follow-up is required to assess retention of material and impact on patient care.
Traversing the Glottis: Arytenoid Mucosal Redundancy in Airway Obstruction

**Presenter**: David Bracken

**Authors**: David J Bracken, Andrew Vahabzadeh-Hagh

**Institution**: University of California - San Diego

**Objective**: Laryngomalacia involves arytenoid mucosal hooding, foreshortened aryepiglottic folds, and retroflexed epiglottic positioning. Dynamic collapse of supraglottic tissues, commonly observed within the pediatric patient population, manifests in adults as idiopathic, adult onset and exercise-induced laryngomalacia. Arytenoid mucosa alone is not typically thought to be of sufficient laxity to directly cause obstruction in the adult. We present an extreme case of aryepiglottic mucosal redundancy causing both dyspneic and dysphonic symptoms.

**Method**: A 61-year-old morbidly obese male with restrictive lung disease, obstructive sleep apnea, and extreme tobacco exposure (> 150 pack-years) presented for evaluation of dysphonia and noisy breathing progressive over decades. He has no history of neurologic or traumatic insult. Laryngoscopy revealed redundant prolapsed mucosa that directly interrupted mucosal wave propagation during speech and traversed the glottic opening on inspiration. He underwent supraglottoplasty and demonstrated marked improvement.

**Discussion**: Supraglottic mucosal redundancy occurs rarely and has been correlated to transient respiratory distress, upper airway noise, and chronic cough. A convergence of medical comorbidities including deep inspiratory forces and chronic pro-inflammatory exposure may explain the emergence of such physiologic redundancy. Physical exam findings were consistent with severe type 1 laryngomalacia of adult onset. Adult onset laryngomalacia differs from exercise induced laryngomalacia given persistence of symptoms and often requires supraglottoplasty for long term management.

**Conclusion**: Laryngomalacia in adults is poorly understood. Severe laxity of arytenoid mucosa can be a rare cause of dysphonia and dyspnea in adult patients without a history of congenital laryngeal phenomenon.
Use of Vagal Nerve Stimulation with Laryngeal Electromyography for Recurrent Laryngeal Nerve Reinnervation in Children

Presenter: Christen Caloway

Authors: Christen Caloway, Gillian Diercks, Gregory Randolph, Christopher Hartnick

Institution: Massachusetts Eye and Ear Infirmary

Objective: Ansa-recurrent laryngeal nerve (RLN) procedures are now often first line treatment for some children with unilateral vocal fold immobility (UVFI). While many describe that children with prolonged denervation and vocal fold (VF) atrophy should not undergo this procedure, there has been no gold standard means of identifying true denervation. Here, we describe a novel technique using evoked vagal electromyography (VEMG) to predict degree of chronic nerve injury prior to RLN reinnervation in children.

Method: Case series of 3 children (ages 2, 3, and 14, 2 females) undergoing ansa-RLN reinnervation using VEMG. Both the mean amplitude and latency of evoked signals from the vagus nerve were recorded and compared to age-matched pediatric norms.

Results: Mean amplitudes and latencies (age-matched interquartile range) were 467 (320-1525) uV & 5.63 (5.35-6.15) msec, 1128 (300-870) uV & 16 (5.16-6.80) msec, and 50 (530-1227) uV & 1.3 (5.20-6.38) msec. In the first two cases, these results were consistent with intact circuits. In the last case where the vagal stimulation revealed some, albeit low, amplitude, we proceeded with reinervation rather than aborting to thyroplasty as some neuronal activity existed. We subsequently followed these children to assess the correlation between evoked LEMG with vocal and/or aspiration outcomes.

Conclusion: Evoked vagal stimulation and subsequent laryngeal nerve monitoring is a simple, readily available technique that may play an important role in patient selection and nerve identification in pediatric ansa-RLN reinnervation. Larger clinical studies are needed to correlate such testing with long term vocal and aspiration outcomes.
Using a 4K 3-Dimensional Exoscope for Upper Airway Stimulation Surgery: Proof of Concept

**Presenter:** Vijay Patel

**Authors:** Vijay A Patel, Neerav Goyal

**Institution:** Penn State Health

**Objective:** Demonstrate potential of a 4K 3-Dimensional Exoscope during upper airway stimulation surgery (UAS).

**Method:** A proof of concept was performed to evaluate the feasibility of utilizing the ORBEYE 4K-3D Video Microscope (OVM) during 3 consecutive UAS.

**Results:** The OVM was employed during UAS including cuff electrode, implantable pulse generator, and sensing lead placement. All 3 cases were successfully completed, with a mean operative time of 200 minutes (range 188-218 minutes) and reduction in operative time with consecutive OVM usage. The mean operative time with OVM was slightly longer than published reports of 179 minutes with traditional microscopic technology. The OVM allowed for 3-Dimensional visualization of the entire operative field by the operating surgeon, assistant surgeons, surgical technologists, and nursing staff. No adverse events or complications were attributed OVM usage.

**Conclusion:** In this initial experience, the OVM provided notable advantages over traditional binocular microscopy including improved ergonomics, unobstructed surgical field access, wide depth of field visualization, and ease of use. Additionally, it allowed all surgical personnel to have similar visualization as the primary surgeon, facilitating the ability to assist and anticipate procedure progression. In an academic institution, it also served as an educational tool and allowed the supervising surgeon to safely follow all aspects of the operation. In the setting of UAS, which requires clear delineation of the functional breakpoint within the hypoglossal nerve in order to provide optimal implant functionality, this unique visualization device has the potential to become a valuable tool in the sleep surgeon’s armamentarium.
Vagal Nerve Stimulator Induced Stridor Following an Anterior Cervical Discectomy and Fusion

Presenter: Robert Lewis

Authors: Robert J Lewis, Michael I Orestes

Institution: Walter Reed National Military Medical Center

Objective: Present a rare case of a 57 year old female with a known history of drug-resistant epilepsy well controlled with a vagal nerve stimulator who developed frequent, intermittent episodes of stridor following an anterior cervical discectomy and fusion procedure. A review of the current literature and cases of stridor presenting in patients with a vagal nerve stimulator will also be discussed.

Method: Retrospective chart review of the patient’s available medical record was utilized. A systematic literature review using medical subject headings such as “vagal nerve stimulator” and “stridor” or “airway compromise”. Articles were narrowed based on relevance after reviewing abstracts.

Results: At the time of presentation, flexible laryngoscopy showed that the patient was found to have right vocal fold paralysis and left vocal fold paresis with some paradoxical motion. The right vocal fold paralysis was likely due to her recent surgery, but the cause of her left vocal fold findings was unknown. Her vagal nerve stimulator was also interrogated, and when deactivated her stridor immediately resolved. Only a handful of cases were found in the literature of a vagal nerve stimulator causing stridor significant enough to cause airway compromise.

Conclusion: Airway compromise due to a vagal nerve stimulator is rare. This case is the first to report a vagal nerve stimulator causing stridor after an unrelated surgery and many years after initial implant placement. This is also an important complication that otolaryngologist need to be aware of as well as cervical spine surgeons.
Where Dysphagia Begins - Xerostomia

Presenter: Karuna Dewan

Authors: Karuna Dewan, Stephen Marcott, Miki Kwan, Yu-Jin Lee, Davud Sirjani

Institution: Stanford University

Objective: Xerostomia contributes to dysarthria, dysphagia, globus, and reduced quality of life. The causes are poorly understood and treatment ineffective. The purpose of this study is to evaluate, in a Veteran population, the prevalence and incidence of xerostomia, the relationship between dry mouth and other oral conditions, and the effect of polypharmacy on dry mouth.

Methods: This is a retrospective cross-sectional study of all patients seen in 2015 at an academically affiliated VA hospital. Patients diagnosed with xerostomia were identified using ICD-9 codes (527.7, 527.8, R68.2) and SNOMED CT codes (87715008, 78948009). Analysis included xerostomia diagnosis vs. quantity of medications prescribed, patient age vs. number of medications prescribed, xerostomia treatments and reports of concomitant speech, swallowing or dental issues (SDS).

Results: 137 patients were diagnosed with xerostomia, 61% had concomitant SDS diagnoses. Of the 4,971 patients identified with SDS problems, only 77 patients (1.5%) had been diagnosed with xerostomia. The prevalence of xerostomia among subjects taking 12+ medications was significantly greater than that among subjects taking fewer medications. The most frequently refilled medications by these patients were omeprazole, sildenafil, gabapentin, hydrocodone/acetaminophen, and oxycodone.

Conclusions: Xerostomia patients often presented with comorbid SDS disorders. Very few patients with SDS diagnoses had concomitant xerostomia, this is either a true infrequency of xerostomia or under-recognition by clinicians. Heighted physician awareness regarding the signs, symptoms and causes of xerostomia is needed to improve diagnosis and treatment.
Which Surgical Technique Should be Utilized to Secure the Airway in the Emergency Room?

Presenter: Elliana Kirsh

Authors: Elliana R Kirsh¹, Andrew Redmann², Rebecca Howell², Sid Khosla²

Institutions: ¹Harvard Medical School, ²University of Cincinnati

Objective: In the case of an emergency surgical airway, current guidelines state that surgical cricothyrotomy is preferable to tracheotomy. However, complications associated with cricothyrotomy may be more frequent and severe. We examined current evidence regarding the most appropriate surgical airway procedure in the “cannot ventilate - cannot oxygenate” scenario.

Method: We performed a systematic review of current literature. A search of PubMed and the Cochrane Library revealed 2381 articles using keywords tracheostomy, tracheotomy, cricothyrotomy, cricothyroidotomy, and emergency. We included all case series, retrospective analyses, systematic reviews, and meta-analyses reporting tracheostomy and cricothyroidotomy outcomes. After review in a systematic fashion, 20 articles pertinent to tracheostomy and cricothyrotomy complications were identified.

Results: Severity and timing of complications with both cricothyrotomy and tracheotomy were comparable (6.9% and 6.2% for immediate complications, 20.9% and 22.0% for early complications, 7.0% and 6.3% for late complications for tracheostomy and cricothyrotomy, respectively). The most frequent immediate complications were bleeding (4.2%) and failure to obtain an airway (1.7%). Airway stenosis was the most common long-term complication, occurring at low rates in both procedures (0.22-5.0%). Tracheotomy, rather than cricothyrotomy, was the most common emergency airway procedure performed. Reports regarding changes in complication rate based on provider specialty were inconclusive.

Conclusion: Long-term complications associated with cricothyrotomy may not occur as frequently as presumed. Tracheotomy may be an effective means of securing the airway in an emergent setting, with similar risk for intraoperative and postoperative complications compared to cricothyrotomy. Choice of which procedure to use should depend on clinician preference.
Fork in the Pharynx: A Case Report

Presenter: Danielle Smith

Authors: Danielle P Smith, Philip Gardner, Marisa Earley

Institutions: University of Texas - San Antonio

Objective: To share the challenges and management of a rare oropharyngeal and esophageal foreign body in a pediatric patient.

Method: The presentation, management, imaging studies, operative findings, and clinical course of a pediatric patient with a unique foreign body in his oropharynx and esophagus are described. A review of the literature provides supplemental information.

Results: We present a case of a two-year-old male who presented to the Emergency Department with a plastic dinner fork lodged in his oropharynx and esophagus. We discuss the management and clinical course of this patient.

Conclusion: To our knowledge, there are no other cases documented in the English literature of a pediatric patient presenting to the emergency department after ingesting a plastic dinner fork. This novel case of an oropharyngeal and esophageal foreign body in a pediatric patient demonstrates the importance of a complete history and thorough physical exam. It highlights the use of rigid esophagoscopy in the management of difficult foreign bodies.
Sounds Like I Actually Have a Whistle In My Throat

Presenter: Brandon Cardon

Authors: Brandon Cardon, Jeremy Meier

Institution: University of Utah

Objective: TB an otherwise healthy 8 year old male with a possible aspiration event 4 hours prior to arrival at the hospital. He reports playing with a "squeaky toy" when he accidentally "breathed in too hard". He reports intense coughing immediately following, but denies respiratory distress at any point following the event. He is able to make the squeaking noise on demand, is in no distress on exam, and enjoys entertaining staff members with squeaking noise.

Method: Case report of a foreign body of undetermined location, video presentation.

Results: Successful direct rigid microlaryngoscopy, bronchoscopy for removal of right mainstem "squeaky toy".

Conclusion: Identifying the location of foreign bodies can be difficult. Adequate inspection in the setting of potential airway foreign bodies is essential to proper treatment.
Acute Airway Obstruction Secondary to Esophageal Food Impaction

Presenter: Stefan Rozycki

Authors: Stefan Rozycki¹, Tzyy-Nong Liou², Matthew Brigger²

Institutions: ¹Naval Medical Center, ²Rady's Children's Hospital

Objective: Esophageal foreign body rarely presents as an apparent, life-threatening event. We report a case of a child in respiratory distress presenting after an asphyxiating incident where endoscopy revealed near total tracheal compression from esophageal food impaction.

Method: Case report and review of literature.

Results: A 3-year-old boy with trisomy 21 and history of tracheoesophageal fistula (TEF) repair was transported by helicopter to the ER after a choking episode. He was witnessed to have cough followed by apnea, cyanosis, and unresponsiveness, for which he underwent the Heimlich maneuver and required chest compression. He became responsive and periodically expectorated chicken. Initial exam in the emergency room revealed stridor and moderate respiratory distress. He was immediately taken to the operating room for endoscopy with planned foreign body removal. Rigid bronchoscopy noted near complete obstruction from posterior tracheal wall compression with no airway foreign body. Rigid and flexible esophagoscopy extracted a large bolus of chicken. He was observed in the intensive care unit with no further respiratory event after extubation.

Conclusion: Esophageal dysmotility is common in children with chromosomal abnormalities, particularly trisomy 21. Furthermore, anastomotic stricture after TEF repair has been reported in 32-59% of patients, and recurrent TEF after surgical repair is reported in 6-16% of cases. Mild airway symptoms are common in patients with an esophageal foreign body, however, signs of acute airway obstruction can occur particularly in a subset of patients with tracheomalacia, esophageal dysmotility, or history of TEF.
Cost Effectiveness of Open vs Endoscopic Repair of Zenker’s Diverticulum

Presenter: Jordyn Lucas

Authors: Paul Lee¹, Houmehr Hojjat², Jordyn P Lucas², Peter Svider³, Joseph Meleca⁴, Mahdi Shkoukani⁵, Andrew Johnson⁶

Institutions: ¹Oakland University; ²Wayne State University; ³Rutgers New Jersey Medical School; ⁴Cleveland Clinic; ⁵Cleveland Clinic - Abu Dhabi, United Arab Emirates; ⁶University of Colorado

Objective: To evaluate the cost-effectiveness of open vs. endoscopic surgical repair of Zenker’s Diverticulum.

Method: A decision tree was constructed using previous publications to determine the incremental cost effectiveness ratio (ICER) of open versus endoscopic repair of Zenker’s diverticulum. The probability of post-op complications, revision rates, and effectiveness of each procedure along with associated costs were extracted to construct the decision tree. Univariate sensitivity analysis was utilized to calculate what the probability of having an esophageal leak would have to be to make one surgical approach more cost-effective than another.

Results: The ICER of open repair for Zenker’s diverticulum was $53,481, above most acceptable willingness to pay (WTP) thresholds. Additionally, probabilistic sensitivity analysis using Monte Carlo Simulations shows that at the WTP thresholds of $30,000 and $50,000, endoscopic surgery is the most cost-effective method with 60% and 54% certainty, respectively.

Conclusion: With no previous cost effectiveness analysis of open versus endoscopic surgery for Zenker's diverticulum, our results support the endoscopic approach at most common WTP thresholds. Particularly with the current focus on ballooning healthcare costs, our results serves as important adjunct to medical decision making for patients undergoing treatment for Zenker's diverticulum.
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April 22–26, 2020
Hilton Atlanta
Atlanta, Georgia

April 7–11, 2021
Hyatt Regency New Orleans
New Orleans, Louisiana

April 27–May 1, 2022
Hyatt Regency Dallas
Dallas, Texas

May 3–7, 2023
Hynes Convention Center/ Sheraton Boston
Boston, Massachusetts