Objective: To determine the presence of laryngeal framework fractures and clinical outcome after laryngeal trauma.

Methods: Retrospective chart review of patients in a tertiary institution. Between 1998 and 2004 a total of 71 patients with neck trauma who presented at the emergency room of our institution were evaluated. Age, gender, causes of trauma, clinical and/or radiological findings, treatment and outcome were analyzed. Patients with a confirmed laryngeal framework or tracheal fracture were reevaluated by means of an interview and voice analysis.

Results: 12 laryngotracheal fractures (17%) were identified out of 71 neck traumas. The most common cause of trauma was a work associated-injury (70%) followed by violence. 3 cases presented with a thyroid cartilage fracture, 2 with a cricoid fracture and 5 with a tracheal rupture. All patients survived. Long term follow-up showed a good laryngeal function 11 out of 12 cases. One patient had a significant dysphonia due to vocal cord dysfunction.

Conclusion: Laryngeal fractures are mostly caused at work. Proper management of the airway at the emergency department ensures good survival. Long-term functional outcome is very good.

Significance: Laryngeal fractures represent a difficult to manage problem in the emergency with good long-term results.

10:24 AM

Bioactive Stents in the Prevention of Airway Stenosis
Logan C. Sondrup (presenter); Yanchun Liu, MD; Xiaozheng Shu, PhD; Glenn D. Prestwich, PhD; Marshall E Smith, MD
Salt Lake City UT; Salt Lake City UT; Salt Lake City UT; Salt Lake City UT; Salt Lake City UT

Objective: Subglottic stenosis (SGS) is a problem that can be difficult to solve and prevent. Endotracheal tubes and stents are useful in airway management but may also be a source of the injury that creates SGS. This project studies the use of airway stents coated with a bioactive material hyaluronan (HA) in a rabbit airway model of SGS.

Methods: Thirty-six rabbits were randomized to six different study groups. Groups 1–4 had their subglottic mucosa denuded at the cricoid. Groups 5–6 received no injury. All groups, except 1, had an airway stent made of 1 cm segment of 3.5 endotracheal tube placed at the cricoid level. Groups 3, 4, & 6 were treated with two preparations of HA coated stents. Groups 2 & 5 were treated with uncoated stents. After three weeks the stents were removed and the animals were allowed three more weeks to heal. At sacrifice each larynx and trachea were harvested and sectioned for histology. Morphometric measurements of subglottic lumen area and diameters were taken.

Results: In post-traumatic models there were no significant differences found in airway cross-sectional area measures between groups (groups 1 & 4- $\alpha = .05$, $p = .86$). In non-subglottic injury groups there was a statistically significant difference in the lumen areas of HA vs. non-HA coated stents (groups 5 & 6- $n = 12$, $\alpha = .05$, $p = .05$).

Conclusion: In a model of acute subglottic mucosal injury, there was not a significant benefit observed in prevention of stenosis using a stent coated with HA (film or gel). In the airway stent model without mucosal injury, treatment with a HA film coated stent resulted in significantly larger airway areas compared to a non-coated stent.

Significance: Patients who have not sustained airway injury, but necessitate long-term intubation, laryngeal or tracheal stenting, may experience a reduction in stenosis risk from HA coating of the stent or endotracheal tube.

Support: This research was supported by a Financial Incentive Seed Grant from The University of Utah Research Foundation, the Center for Therapeutic Biomaterials (a member of the Utah Centers of Excellence program), NIH Grant RO1 DC4336 from the National Institute on Deafness and other Communicative Disorders (NIDCD), and NIH Grant T35 HL07744 from the National Heart Lung and Blood Institute (NHLBI).

10:32 AM

Endoscopic Holmium Laser Treatment of Tracheal Stenosis
Daniel Joseph Verret, MD (presenter); Yadranko Ducic, MD
Dallas TX; Colleyville TX

Objective: Patients with tracheobronchial stenosis present a difficult challenge for practitioners. Traditional carbon dioxide laser excision of tracheal stenoses with rigid endoscopic techniques has a number of limitations including difficulty with distal airway access, suboptimal photodocumentation as well as significant risks of airway fire and pneumothorax.

Methods: A retrospective review was conducted of all patients treated with the holmium laser delivered with flexible endoscopic techniques for tracheal stenoses over a period of six years. Patients were identified who underwent endoscopic laser resection of tracheal stenosis. Outcome measures including interval between surgery, surgical complications, and laser settings were recorded. In addition, reason for stenosis was recorded.

Results: 20 patients who underwent 37 procedures were identified who met criteria for inclusion. No operative complications were identified. No patient required postoperative intubation. No airway fires or pneumothoraces were identified.

Conclusion: The holmium laser is a safe and efficacious laser for use in tracheal stenosis.

Significance: Current methods for excision of tracheal stenosis include CO2 laser, stenting, and tracheal resection.
We present a safe and efficacious method for resecting tracheal stenosis with the ability to perform the procedure through an endotracheal tube under direct visual endoscopic guidance. The risks of airway fire and pneumothorax are significantly decreased.

10:40 AM

**Tracheotomy in the First Year of Life: Outcomes in Term Infants**

Christopher Wootten, MD (presenter); Lesley C. French; Jay A Werkhaven, MD; Shelagh A Cofer, MD

Nashville TN; Nashville TN; Nashville TN; Nashville TN

**Objective:** In an era emphasizing critical care of the preterm infant, term infants requiring tracheotomy remains an understudied population. We characterize pediatric tracheotomy performed in the first year of life in term infants, describing outcomes.

**Methods:** Retrospective review of 127 tracheotomies performed in the 1st year of life at a tertiary-care Children’s Hospital between 1988-2004.

**Results:** Mean gestational age between term and preterm groups was 39.5 and 29.0 weeks, respectively (p < 0.001). Indications for tracheotomy were attributable to upper airway abnormalities in 50% for both groups. The number of subsequent airway procedures required was 1.5 in the term group, achieving decannulation in 50%, compared to 3.0 in the preterm group, who had a 36% decannulation rate. Mortality rates were 36% (term) and 14% (preterm), and were unrelated to tracheotomy.

**Conclusion:** In this gestationally older population, decannulation rates compared favorably, as chronic lung disease was less common. However, non-tracheotomy-related mortalities remained high, reinforcing that term infants receiving tracheotomy have significant comorbidities.

**Significance:** Medical and congenital comorbidities not related to tracheotomy dictate adverse outcomes in term infants requiring tracheotomy in the first year of life.

10:56 AM

**Quality of life outcomes after tonsillectomy - results from the TO TREAT study**

Michael G Stewart, MD MPH (presenter); David L Wittell, MD; Maureen T Hannley, PhD; Beatrice L Casselbrant, MD; Edward M Weaver, MD MPH; Bevan Yueh, MD MPH; Timothy L Smith, MD MPH

Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA

**Objective:** To assess disease-specific quality of life (QOL) outcomes in adults and children with recurrent tonsillitis or chronic infectious tonsillitis after tonsillectomy. Most prior studies addressing recurrent tonsilitis have assessed only the frequency of infections as an outcome measure.

**Methods:** Adult patients and the parents of pediatric patients completed a validated outcomes instrument - the Tonsil

10:48 AM

**Cross-Linking of an Esophagus Acellular Matrix Tissue-Scaffold**

Amit Bhrany, MD (presenter); Neal D Futran, MD; Casey Lien; Nimish H. Muni; Colleen A. Irvin; Buddy D. Ratner, PhD; Cecilia M. Giachelli, PhD

Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA; Seattle WA

**Objective:** The esophagus acellular matrix (EAM) tissue-scaffold has the potential to serve as the foundation for a tissue-engineered esophagus for repair of ablative defects. Similar to all collagen-based biomaterials, the EAM is subject to enzymatic degradation in vivo. The introduction of exogenous cross-links to collagen molecules via glutaraldehyde (Glu) is the most accepted method to stabilize collagen biomaterials, but fixation with Glu incurs adverse effects. Genipin (Gp), a naturally occurring cross-linking agent, has shown to be effective at improving the stability of collagen-based biomaterials with less cytotoxicity and reduced in vivo inflammatory responses than Glu. The aim of this study was to show that cross-linking with Gp improves the stability of the EAM tissue-scaffold while maintaining its minimal antigenicity.

**Methods:** EAMs were cross-linked with Gp and Glu. Uncross-linked EAMs served as controls. Differential Scanning Calorimetry was used to measure denaturation temperature and burst pressure measurement after incubation with collagenase assessed resistance to enzymatic degradation. Subcutaneous allograft implantation with quantification of macrophage response assessed EAM antigenicity.

**Results:** Both Gp and Glu increased denaturation temperature and reduced in vitro enzyme degradation significantly. Glu resulted in slightly higher denaturation temperature. Uncross-linked EAMs were completely degraded after 24 hours of collagenase exposure, while cross-linked EAMs maintained strength greater than unexposed uncross-linked EAMs. After 30 days of implantation, the EAM elicits a minimal inflammatory response and cross-linking agents do not increase inflammation.

**Conclusion:** Genepin improves the stability of the EAM while maintaining minimal antigenicity; yielding a tissue-scaffold that may form the basis of a durable and biocompatible tissue-engineered esophagus.

**Significance:** Current reconstructive techniques of the esophagus have significant post-operative complications. The EAM contains intact structural proteins and growth factors in the native 3-D esophageal structure that can lead to greater cell growth and reduced inflammation of a tissue-engineered implant, decreasing the risk of graft stricture and leak.