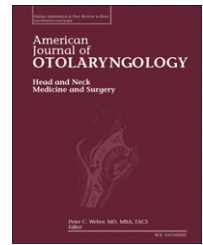


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Risk stratification in endoscopic airway surgery: is inpatient observation necessary? ☆☆☆★

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ARTICLE INFO

Article history:

Received 23 April 2014

ABSTRACT

Purpose: To compare post-operative complication rates between inpatient and outpatient endoscopic airway surgery in patients with laryngotracheal stenosis. Secondary objectives included characterization of a cohort of patients with this disease.

Methods: Retrospective review of patients with laryngotracheal stenosis in a tertiary care laryngology practice over a 5-year period.

Results: Ninety-one patients underwent 223 endoscopic airway surgeries. Of 114 outpatient interventions, 1 patient (0.8%) sought emergent medical care following discharge for respiratory distress. Of 109 procedures resulting in admission, no patients required transfer to a higher level of care, endotracheal intubation or placement of a surgical airway. There was no statistically significant difference in complication rates between patients treated as outpatients or inpatients ($p = 0.33$, chi square). There were no cardiopulmonary events. There were no pneumothoraces despite frequent use of jet ventilation. The most common etiologic category was idiopathic (58%), followed by granulomatosis with polyangiitis (16%) and history of tracheotomy (12%). Most patients with idiopathic disease were female ($p < 0.001$, Fisher's exact test).

Conclusion: Patients undergoing endoscopic surgery for airway stenosis rarely have post-operative complications, and outpatient surgery appears to be a safe alternative to post-operative admission and observation.

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1. Introduction

Laryngotracheal stenosis (LTS) remains a dominant clinical entity in the modern adult laryngology practice. Traditionally, common risk factors for the development of LTS include prolonged intubation, tracheotomy and external laryngeal trauma [1]. Idiopathic adult LTS, diagnosed in the absence of

obvious antecedent airway mucosal trauma, may be associated with extra-esophageal reflux [2–4], autoimmune/inflammatory diseases [5] or dysregulated responses to hormones [6] and occurs almost exclusively in females [6–9]. Level and focality of the stenosis in patients with LTS are often associated with the underlying cause and are important for prognosis [1,8,10].

☆ Financial Disclosure: None.

☆☆ Conflict of Interest: None.

★ Grant Support: None.

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Both medical and surgical treatment options have been advocated for the management of LTS. While aggressive medical treatments may stabilize symptoms of airway obstruction, durable therapeutic responses typically require surgical intervention [11,12]. Surgical intervention utilizes either endoscopic or open approach. Open surgical resection of stenotic airway, pioneered by Grillo and colleagues, is a well-established treatment modality with restenosis rates of 10–30% [13–15]. As an alternative to open airway surgery, endoscopic dilation of airway stenosis with or without adjuvant treatments designed to limit scar re-formation offers patients a less invasive means of symptom control [15,16]. However, up to 70% of patients with LTS treated with endoscopic dilation require multiple procedures to control their symptoms over time [15,17,18].

In addition to considering the degree of invasiveness and recurrence rates, length of hospitalization is an important factor when patients are deciding between open and endoscopic airway procedures. Several studies have reported data suggesting that patients with LTS can be managed endoscopically in the outpatient setting [9,16,19], but none have specifically focused on differences in complication rates between outpatients and those observed as inpatients following endoscopic airway surgery. Here, we hypothesized that patients who undergo outpatient endoscopic airway surgery have a higher rate of post-operative complications than those who are admitted and observed following surgery. Secondary objectives of this study include analysis of patient characteristics to identify evolving patterns of etiology in adult patients with LTS.

2. Materials and methods

This study received approval from the University of Washington Medical Center Institutional Review Board. A retrospective chart review was performed on all patients over the age of 18 years who carried the diagnosis of airway stenosis seen at the University of Washington Medical Center during a 5-year study period. Exclusion criteria included patients who did not undergo endoscopic airway surgery and patients without at least one post-operative clinic visit. Recorded information included age, sex, etiology of LTS, tracheotomy history, intubation history, dates of procedures, use of topical mitomycin or injected triamcinolone, dilation technique, inpatient or outpatient post-operative status and post-operative course.

Regarding determination of LTS etiology, prolonged intubation was considered any single intubation event lasting greater than 24 hours [20]. Patients with LTS related to autoimmune, inflammatory or infectious diseases had these diagnoses made in consultation with our rheumatology or internal medicine colleagues. When no clear etiology was present, serology was performed to rule out the presence of selected systemic autoimmune and inflammatory disorders when clinically indicated.

Procedures performed by three providers were included. Patient airways were accessed endoscopically with a variety of laryngoscopes. Ventilation was delivered via supralaryngeal jet

ventilation, ventilating bronchoscopes or endotracheal tubes. The majority of patients who underwent jet ventilation had a post-operative chest x-ray (CXR) to rule out the presence of pneumothorax. Dilation techniques included use of pulmonary balloon dilators, rigid bronchoscopes and rigid Jackson dilators. Events considered to be complications of outpatient surgery included any patient who sought medical care for symptoms of airway obstruction following discharge from the hospital. Events considered to be complications of inpatient surgery included any event leading to transfer to a higher level of care within the hospital, endotracheal intubation or need for a surgical airway. The decision of whether to discharge the patient home or admit the patient to an inpatient observation unit was made based upon each individual surgeon's established practices and routines, and was independent of tracheotomy status, degree of LTS and surgical method. Post-operative oral or intravenous steroid was not routinely given to either outpatients or inpatients.

Statistical analysis to determine whether differences in rates of complications following outpatient or inpatient endoscopic airway surgery were significant was performed using chi-square (χ^2) analysis. Analysis evaluating how patient variables related to etiology of LTS was performed using the Fisher's exact test. A p-value of <0.05 was considered significant.

3. Results

Ninety-one patients underwent 223 endoscopic airway procedures in the 5-year study period. Of 223 endoscopic airway surgeries, 114 (51%) occurred in the outpatient setting with same-day discharge. The decision to discharge the patient was made at the end of the surgical procedure and after an uneventful, brief (1–2 hours) period of observation in the recovery room. Of 114 outpatient procedures, 1 patient (0.8%) returned to the emergency room the evening of post-operative day 0 for symptoms of airway obstruction. The patient was found to have moderate glottic/subglottic edema and was admitted to the hospital for medical airway management (humidification, steroids). The patient responded quickly without need for additional interventions and was discharged home on post-operative day 1.

Conversely, 109 (49%) endoscopic airway surgeries resulted in admission to the hospital for inpatient observation. Of patients admitted post-operatively, 99/109 (91%) were observed on the ward with continuous pulse oximetry monitoring, while 10/109 (9%) were observed in the ICU. No patient observed in the hospital required transfer to a higher level of care, endotracheal intubation or placement of a surgical airway during his or her admission. One patient developed asymptomatic bradycardia believed to be unrelated to the airway surgery. Of 109 admissions, 101 (93%) resulted in a single-night observation only. Table 1 lists details of 8 admissions requiring greater than a one-night observation period, 5 of which were in a single patient, and all of which were unrelated to the endoscopic airway surgery. Chi-square analysis used to test the null hypothesis that there was no difference in complications between the two cohorts yielded a

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