Post-operative Safety of Pediatric Supraglottoplasty: Is Post-operative Admission Necessary?

Ani Mnatsakanian, DO, Jithin John, MD, Anya Costeloe, DO, Katrina Minutello, DO, Holly Shifman, Prasad Thottam, DO, Michael Haupert, DO

Ascension St. John Hospital

Detroit, Michigan

Ascension St. John Hospital

Introduction

- Laryngomalacia (LM) is a congenital abnormality that comprises the most common etiology of stridor in the pediatric population[1, 2]. In LM, an occlusion above the laryngeal outlet causes symptoms including failure to thrive, apneas, cyanotic episodes, difficulty feeding, and poor weight gain.
- Prior studies have shown risk factors for patients needing a supraglottoplasty to include severe symptoms, prematurity, and emergency room visits for respiratory complaints[5, 6]. Severe cases include cyanosis, respiratory distress, obstructive sleep apnea, pectus excavatum, failure to thrive, and aspiration events, prompting surgical intervention[3].
- Overall, supraglottoplasty is a well-tolerated surgery with low morbidity and mortality. However, previous literature has indicated approximately 10% of patients develop complications, including laryngeal edema, supraglottic stenosis, or aspiration[1]. Post-operatively, most patients are observed in the intensive care unit (ICU)[7]. In this current study, patients are admitted to the ICU, step-down unit, or general pediatrics floor to monitor for postoperative complications and for airway integrity. In a small subset of patients with no other co-morbidities, the patients are discharged to home with close outpatient follow up in 1-2 weeks.

Materials and Methods

Objective:

The purpose of this study is to determine the adverse event incidence rate within 48 hours (acute) and 14 days (subacute) in patients undergoing supraglottoplasty and to determine whether postoperative hospital admission is necessary by following the post-operative course. Additionally, the goal was to stratify the level of care for those patients requiring admission post-operatively.

Methods:

A retrospective review was conducted of patients undergoing supraglottoplasty between 2017- 2020. Charts were reviewed to confirm the inclusion criteria of pediatric patients (patients ≤ 18 years of age) who underwent supraglottoplasty and were either admitted for overnight monitoring or discharged home the same day. Patients who underwent other airway procedures in addition to supraglottoplasty, such as a tonsillectomy or lingual tonsillectomy, were excluded. One hundred and five patients (N=105) were included in the analysis.

Post-operatively, the patients were monitored closely for adverse events, described below. Each patient was monitored for desaturations of oxygen through continuous pulse oximetry monitoring, adequate oral intake, urine output, and episodes of cyanosis, apnea, stridor, or respiratory distress. If patient did not experience any adverse events during the observation period, then patients were discharged home.

Data Collection

Patient demographics, operative, and relevant postoperative hospital course data were collected and examined. Postoperative hospital course data that were evaluated and analyzed include length-of-stay, post-operative adverse events (including respiratory distress, decreased oral intake, decreased urine output, nausea/vomiting), unit of admission, known congenital or neurocognitive deficits, known pulmonary disease, presence of comorbid conditions, and readmission data if applicable.

Statistical Analysis

Categorical data are reported as frequencies and percentages. Continuous data were compared between groups using Wilcoxon rank sum tests and are reported as medians and ranges. Categorical data were compared between groups using Fisher's exact 2-tail tests or Chi-squared tests, as appropriate, and frequencies and percentages were reported. Comparisons between dichotomous categorical variables are reported as odds ratios and 95% confidence intervals. For all measures, statistical significance was accepted if the p-value was < 0.05. All statistical analyses were performed in R (Version 4.1.0, The R Project for Statistical Computing).

Results

Table 1. Demographic and clinical characteristics of 105 pediatric patients who underwent supraglottoplasty.

Characteristic	Frequency (%) or Median (Range)
N	105
Age at Surgery (mo.)	6.0 (0.03, 102.0)
Sex (F)	40 (38.1)
Unit of Admission	
General Floor	36 (36.4)
ICU	58 (58.6)
Discharged Home Day of Surgery	5 (5.1)
Intraoperative Duration (min.)	44.0 (21.0, 195.0)
Clinical Conditions	
Laryngomalacia	88 (83.8)
OSA	54 (51.4)
GERD	46 (43.8)
Stridor	35 (33.3)
Other	43 (41.0)
Laryngomalacia with other conditions	
Laryngomalacia + OSA	44 (41.9)
Laryngomalacia + GERD	42 (40.0)
Laryngomalacia + Stridor	33 (31.4)
Intraoperative Adverse Events	0 (0)
Postoperative Adverse Events	6 (5.7)
Readmission/Return to ED within 2 wks.	8 (7.6)

B. Readmission/return to emergency department with 2 weeks of surgery.

Characteristic	Total (N=105)	Readmit/Return to ED N=8	No Readmit/Return to ED N=97	OR (CI)	p-value
N	105	8 (7.6)	97 (92.4)		
Age at Surgery (mo.)	6.0 (0.03, 102.0)	9.5 (3.0, 84.0)	6.0 (0.5, 102.0)	N/A	0.31
Sex					
Female	40 (38.1)	2 (25.0)	36 (37.1)	0.53 (0.05, 3.18)	0.71
Unit of Admission					
General Floor	36 (36.4)	1 (12.5)	35 (36.1)	N/A	0.57
ICU	58 (58.6)	5 (62.5)	49 (50.5)	N/A	
Discharged Home Day of Surgery	5 (5.1)	0 (0.0)	5 (5.2)	N/A	
Intraoperative Duration (min.)	44.0 (21.0, 195.0)	45.5 (33.0, 78.0)	42 (21.0, 195.0)	N/A	0.66

Study Results:

- A total of 105 pediatric patients underwent supraglottoplasty between 2017 and 2020 and were included in the study. Baseline demographic and clinical characteristics are listed in Table 1.
- The average age at the time of surgery was 6.0 months (range: 0.03, 102.0). Most children (58.6%) were admitted to the PICU after surgery, while the rest of the patients were either admitted to the general care floor (36.4%) or discharged home the same day as the surgery (5.1%).
- The selection criteria for patients who were discharged home included patients who were otherwise healthy, other than the diagnosis of laryngomalacia, and were able to be discharged on room air without any concerns from the primary surgeon, nursing staff, and the anesthesiologist in the post anesthesia care unit (PACU).
- Eighty-eight patients (83.8%) underwent supraglottoplasty for the treatment of LM. Additional clinical conditions present at the time of surgery included obstructive sleep apnea (OSA), gastroesophageal reflux disease (GERD), stridor, or "other" (tonsil hypertrophy, laryngeal cleft, subglottic stenosis, oral motor dysfunction, pharyngeal dysphagia, vocal fold paralysis, failure to thrive, ankyloglossia, and Norrie disease). Those patients with laryngomalacia were also further analyzed if they had comorbid conditions. The three most prevalent comorbidities were evaluated, which were OSA (N=44), GERD (N=42), and stridor (N=33).
- Six patients (5.7%) experienced postoperative adverse events, and eight patients (7.6%) returned or were readmitted to the emergency department within two weeks of surgery. Postoperative adverse events included respiratory distress, decreased oral intake, low urine output, retractions, stridor, nausea/vomiting, and ventilator-dependent respiratory failure.
- No demographic or clinical characteristic was associated with increased odds of post-operative adverse events or return to the emergency department within two weeks of surgery (Table 2). The most common postoperative events are denoted in Table 3.

Table 3. Most common postoperative adverse events.

Complication	Incidence
Respiratory distress	2
Decreased oral intake	1
Low urine output	1
Retractions	1
Stridor	1
Nausea/vomiting	1
Ventilator-dependent respiratory failure	1

Summary

- This current study analyzed patient age, sex, intraoperative duration, associated clinical diagnoses, and the frequency of intraoperative or postoperative complications. The factors analyzed were not found to be associated with an increase in adverse events, return to the emergency department, or readmission within a two-week period.
- This study had 5% of its cohort undergo supraglottoplasty as an outpatient procedure without significant adverse events in the postoperative period. This is an under-published practice in the literature currently, although clinically it is slowly becoming more acceptable amongst pediatric otolaryngologists. The authors aim that this evidence supported literature regarding the safety of outpatient supraglottoplasty in a very select cohort of pediatric patients will provide a move towards this becoming standard of care and acceptable management.
- The data in this study suggests that for patients without associated comorbidities, postoperative ICU and general surgical ward observation may not be not necessary. When factoring in the significant financial burden of hospital admission and the infrequent rate of adverse events, clinicians could consider selective postoperative admission[9]. Additional considerations may include the benefit of limiting potential exposure of the patient and patient caregivers to nosocomial infections, as well as added psychosocial stressors with ICU and general hospital admission.

Conclusions

Selective ICU admission after supraglottoplasty reduces ICU utilization and healthcare costs without increasing postoperative adverse events. Fortunately, major complications post-supraglottoplasty are uncommon. De-escalation of postoperative care to a general pediatric floor or discharge to home is warranted in those without significant comorbidities.

Future Directions

- Further prospective data is required to make a more certain claim that most patients without comorbid conditions could be managed in an outpatient setting. Future studies are being conducted to determine perioperative considerations during supraglottoplasty that determine patient placement postoperatively.
- The correlation between patients' polysomnography findings and their risk of postoperative adverse events is a future aim of this study. Lastly, a future aim is to further study and describe selection criteria for patients in this cohort who have supraglottoplasty performed in the outpatient setting. There is currently a second supplemental study being performed at our institution to evaluate these factors. The aim of this supplemental study is to provide evidence-based support regarding the clinical decision making for this patient cohort and their postoperative course.

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