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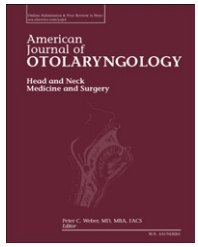

Pediatric otolaryngology: principles and practice

Evaluation of growth curves in children after supraglottoplasty☆,☆☆,★

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ABSTRACT

Objectives: To determine if monitoring weight growth curves is a sensitive objective parameter for evaluating operative outcomes after supraglottoplasty.
Study design: Retrospective chart review.
Methods: An IRB approved retrospective review of patients who underwent supraglottoplasty from 2/28/2012 to 10/20/2014 by the otolaryngology department at a single institution was performed. Variables collected included age, race, sex, preoperative weight percentiles, and weight percentiles at 3 month, 12 month, and 3 year followup intervals.
Results: 20 patients met inclusion criteria. 15 (75%) patients were male and 5 (25%) were female. 9 (45%) patients were African American, 8 (40%) were Caucasian, and 3 (15%) were other. Average weight for age at surgery was 29.8 percentile. 6 (30%) had failure to thrive by weight. By 3 months postop average weight had increased by 7.67 percentile ($p = 0.09$, 95% CI –1.62 to 17.0), by 12 months there was an observed increase of 19.1 percentile ($p = 0.06$, 95% CI 0.47–37.8), and by 3 years the average weight had increased by 26.53 percentile ($p = 0.03$, 95% CI 4.47-48.59). By three years postop the average weight had normalized (64.5 percentile). Among those who met preoperative failure to thrive criteria (average 0.11 percentile), weight gain was still dramatic with average weight percentile of 37.5 by 3 years postop.
Conclusion: Patients undergoing supraglottoplasty are typically underweight for age. Statistically significant weight gain occurs in children after going supraglottoplasty. This intervention can normalize their growth chart growth patterns by 3 years postoperatively, even in children with failure to thrive.

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1. Introduction

A disorder of up to 10% of pediatric patients seen in the primary care setting, failure-to-thrive is typically characterized by weight for age that falls below the 5th percentile or significant weight deceleration resulting from an imbalance of caloric intake, absorption, and expenditure [1]. Poor weight gain has previously been reported in children with obstructive sleep apnea due to adenotonsillar hypertrophy with significant weight gain occurring after tonsillectomy, even among children classified preoperatively as failure-to-thrive. It is postulated that respiratory distress during feeding, increased

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caloric expenditure due to increased work of breathing, and alterations of the normal nocturnal growth hormone secretion can contribute to poor weight gain [2–6].

Laryngomalacia is the most common congenital pediatric airway abnormality as well as the most common cause of stridor in infants [7]. Other congenital laryngeal obstructions are bilateral vocal cord paralysis, subglottic stenosis, and cysts [8]. Anatomical manifestations of laryngomalacia typically entail an omega shaped epiglottis, shortened aryepiglottic folds, and redundant arytenoid mucosa and are commonly treated conservatively with a combination of observation, anti-reflux therapy, proper positioning during feeds, prolonged burping, and prone positioning in bed [9–11]. The indications for diagnostic airway evaluation with the potential for surgical intervention vary but are typically considered in cases of severe stridor, apparent life-threatening events (ALTEs), respiratory insufficiency, feeding difficulties, and failure to thrive [12,13]. Techniques for surgical correction of laryngomalacia, known as supraglottoplasty, include but are not limited to division of the aryepiglottic folds, reduction of redundant supraglottic tissue and arytenoid mucosa, and epiglottopexy. This in effect increases airway diameter thus improving stridor and decreasing work of breathing. The procedure is commonly performed with sharp instrumentation such as the laryngeal microscissors, a laser, or a combination of both [12–17].

Many studies have documented weight gain in children after adenotonsillectomy to improve obstructive sleep apnea, but few have evaluated the effects of relief of other forms of airway obstruction on growth patterns. Our objective was to evaluate the short and long term weight changes in children undergoing supraglottoplasty for laryngomalacia to determine if monitoring weight for age percentile growth curves is a sensitive objective parameter for evaluating operative outcomes after supraglottoplasty. All children who had symptomatic laryngomalacia, clinically judged to be severe enough to warrant surgical intervention were treated surgically. Children with a second airway compromise in addition to laryngomalacia, regardless of its severity, were excluded. In clinical practice, pediatric ENT subspecialists are trained to detect and judge the severity of obstruction caused by abnormal laryngeal dynamics during an airway examination. Once the surgeon is convinced of the severity of the pathology, surgical treatment (supraglottoplasty) becomes the choice of treatment. It is the careful selection of the severe subset of pathology by the experienced subspecialist that provides good results in surgical practice. Withholding treatment, therefore allowing for a matched control group is not feasible or ethical for treatments that are known to work, and work well. Age matched children without airway problems were used (standardized growth curves of American children) as an objective measure of catch up growth following surgery.

2. Methods

An institutional review board approved (Louisiana State University Shreveport STUDY00000270) retrospective chart review of patients who underwent a supraglottoplasty by the otolaryngology department at a single institution from 2/28/2012 to 10/20/2014 was performed. Patients were identified using the search function of an electronic medical record for procedure CPT codes corresponding to supraglottoplasty (31780 excision tracheal stenosis or 31999 larynx unlisted procedure). Operative notes were reviewed and patients who underwent a traditional supraglottoplasty with scissors and/or laser for laryngomalacia were included. Patients were excluded if any additional airway procedure was performed at the time of surgery or within the 3 year period postop, such as an adenoidectomy, tonsillectomy, tracheostomy, etc. Patients were also excluded if they had severe co-morbidities or co-morbidities with failure to thrive, such as diagnosed syndromes, chromosomal abnormalities, or neurological deficits. The patient population is defined through limiting clinical variables to enable measurement of treatment effects.

Thirty seven charts were identified and reviewed. Four patients who did not have a supraglottoplasty were excluded. Twelve were excluded due to significant medical co-morbidities and/or other airway surgeries at the time of procedure or during the postoperative period. One patient was excluded as no weight data were available. Twenty patients met inclusion and exclusion criteria and were included in the study. Ages of patients meeting criteria ranged from 18 days to 3 years old. 15 (75%) were male and 5 (25%) were female. Nine (45%) were African American, 8 (40%) were Caucasian, and 3 (15%) were of other races. The average weight at preop on CDC sex adjusted growth curves for weight by age was 29.8 percentile. Six patients (30%) met failure-to-thrive criteria by weight less than 5 percentile. Supraglottoplasty was performed with either laryngeal microscissors and/or laser. Microscissors alone were used in 17 cases, 2 cases utilized a combination of scissors and laser, and one case used the laser alone. Weights were recorded for preoperative, 2 week to 3 month postop, 3 month to 1 year postop, and 1 year to 3 year postop intervals. The last recorded weight within each interval was used. 18 patients had weight data in within the first 3 months, 9 patients within 1 year, and 7 within 1–3 years. Paired t-test was used to compare the changes in weight chart percentiles compared to preop at each time interval and p-values and confidence intervals were calculated. The standard p-value of .05 was considered statistically significant.

3. Results

For many patients weight percentile gain was noted after supraglottoplasty (Fig. 1). At 3 months postop average weight had increased by 7.67 percentile ($p = 0.09$, 95% CI −1.62 to 17.0). At 12 months postop average weight had increased by 19.1 percentile ($p = 0.06$, 95% CI 0.47–37.8). At 3 years postop average weight had increased by 26.53 percentile ($p = 0.03$, 95% CI 4.47–48.59). By three years postop the average weight had normalized (64.5 percentile). Interestingly among those who met preoperative failure to thrive criteria (average 0.11 percentile), weight gain was still dramatic with average weight percentile gain of 37.5 percentile by 3 years postop.

4. Discussion

Surgical relief of airway obstruction has previously been reported to be associated with weight gain in the pediatric