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The safety and efficacy of pediatric lingual tonsillectomy

M.A. DeMarcantonio [a], E. Senser [b], J. Meinzen-Derr [a, c], N. Roetting [a], S. Shott [a, d], S.L. Ishman [a, d, e, *]

[a] Division of Pediatric Otolaryngology – Head and Neck Surgery, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA
[b] University of Cincinnati College of Medicine, Cincinnati, OH, USA
[c] Division of Biostatistics and Epidemiology, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA
[d] Department of Otolaryngology-Head and Neck Surgery, University of Cincinnati College of Medicine, Cincinnati, OH, USA
[e] Division of Pulmonary Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA

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ABSTRACT

Objective: Lingual tonsillar hypertrophy is recognized as a cause of persistent obstructive sleep apnea (OSA) after adenotonsillectomy in children. However, little has been reported regarding the complications, postoperative course and effectiveness of lingual tonsillectomy (LT). Our objective was to review the safety and effectiveness of LT in children.

Methods: Retrospective review of children undergoing LT from January 2009 to December 2015 at a tertiary children's hospital. Complications, postoperative course and polysomnographic (PSG) outcomes were recorded for all patients.

Results: We identified 92 children (mean age = 8.6 years, 50% female) who underwent LT; 43.5% had a syndromic diagnosis. The most common complications were emergency department presentation for bleeding (4.4%) and poor oral intake (3.3%). The readmission rate was 4.4% including 2 children (2.2%) who required operative control of hemorrhage. No children required unplanned reintubation or ICU admission. In children with PSG data (n = 18), the median apnea-hypopnea index (AHI) decreased from 8.5 to 3.8 events/hour ($p = 0.022$) and the median obstructive AHI (oAHI) decreased from 8.3 to 3.1 events/hour ($p = 0.021$). In addition, the oxygen saturation nadir increased from 83.8% to 89.0% ($p = 0.0007$). After surgery the percentage of patients with oAHI<5 events/hour increased from 27.8% to 61.1% ($p = 0.08$).

Conclusions: Readmission and bleeding rates after lingual tonsillectomy in children were similar to that seen with tonsillectomy. Polysomnographic data showed that lingual tonsillectomy resulted in a significant reduction of both AHI and oAHI with a postoperative oAHI <5 achieved in 61% of patients.

1. Introduction

The lingual tonsils are composed of lymphoid tissue situated at the base of the tongue; they constitute one component of Waldeyer's ring, which was first described by Vesalius in 1543 [1]. Lingual tonsil hypertrophy was further described four hundred years later by Elia [2] in patients with lingual tonsillitis following adenotonsillectomy. Two additional reports later characterized the lingual tonsils as a possible site of acute upper airway obstruction and as a source of tonsillitis in patients who had previously undergone adenotonsillectomy [3,4]. Eventually lingual tonsils were identified as a possible anatomical cause for obstructive sleep apnea (OSA) and a trial of lingual tonsillectomy was carried out in adults in 2003 [5].

In children, removal of the tonsils and adenoids (T&A) is the standard first line surgical therapy for OSA. However, it has become evident that up to 40% of children will have persistent OSA following T&A [6]. Causes of persistent OSA following T&A include nasal deformity, inferior turbinate hypertrophy, regrowth of adenoids, retro-palatal collapse, oropharyngeal collapse, glossoptosis, laryngomalacia and lingual tonsillar hypertrophy. Lingual tonsillectomy was first reported in a child with persistent OSA in 2006 by Kluszynski [7] and colleagues. Since that time, lingual tonsillectomy has become one of the most commonly described procedures

* Corresponding author. Upper Airway Center, Divisions of Pediatric Otolaryngology – Head and Neck Surgery & Pulmonary Medicine, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, MLC 2018 Cincinnati, OH 45229, USA.
E-mail address: stacey.ishman@cchmc.org (S.L. Ishman).

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employed for children with persistent OSA [8]. While several other small studies have evaluated the effectiveness of lingual tonsillectomy, none have described associated complications [9–12]. In light of these findings, the objective of our study was to describe the short-term complications as well as the effectiveness of lingual tonsillectomy in children.

2. Materials and methods

A retrospective chart review was performed identifying patients who underwent lingual tonsillectomy, for any indication, between January 1st, 2009 and December 31st, 2015. All patients <18 years of age were included for review. Patients were excluded if they underwent concurrent upper airway surgery including tonsillectomy, adenoidectomy, nasal procedures, midline posterior glossectomy or laryngeal/tracheal procedures. Patients with follow-up less than 3 weeks were considered to have inadequate short-term follow-up and were also excluded. Institutional review board approval (IRB) was obtained prior to data collection (CCHMC IRB: 2015–2260).

Prior to surgery, patients underwent complete office physical exam including flexible fiber optic laryngoscopy when tolerated. In patients with OSA, drug induced sleep endoscopy (DISE) was performed at the surgeon's discretion. All patients with persistent OSA (AHI>1) were offered medical therapy (eg. nasal steroids) and those with moderate or severe OSA were offered CPAP prior to surgery. Lingual tonsillectomy was offered in children with persistent OSA, clinical symptoms and lingual tonsillar hypertrophy. Children were evaluated for lingual tonsillitis when symptoms of recurrent or chronic pharyngitis persisted despite T&A. Surgery was offered when flexible endoscopy demonstrated lingual hypertrophy.

Lingual tonsillectomy was performed under general anesthesia, utilizing orotracheal or nasotracheal intubation. Surgery was performed via laryngoscopic direct visualization with a Lindholm scope or through the endoscopic approach described by Maturo et al. [13,14]. Both suction cautery and coblation were utilized for removal of lingual tonsils. Patient electronic medical records (EMR) were reviewed for surgical technique, hospital stay, immediate post-operative complications, emergency department (ED) presentation, short-term complications, need for revision surgery and polysomnographic data. All patients included had clinic or telephone follow-up 3 or more weeks after surgery with specific questioning about bleeding, emergency room presentation and other postoperative complications.

2.1. Polysomnography group

A subset of patients was identified who underwent lingual tonsillectomy for persistent OSA and had available preoperative and postoperative sleep studies. Results of overnight polysomnography (PSG) were reviewed via the electronic medical record system. Polysomnography data collected included sleep parameters, apnea hypopnea index (AHI), obstructive apnea hypopnea index (oAHI), Oxygen saturation (O_2) nadir, and % time with CO_2 > 50 mm Hg. OSA was categorized by severity, with an oAHI of 1–5 defined as mild, oAHI of 5–10 as moderate and oAHI of >10 as severe OSA.

2.2. Statistical analysis

Demographic data was summarized for categorical and continuous measures. Means and ranges are presented for continuous normalized data. Medians are presented for non-normal data. Categorical variables are presented as percentages. Continuous data was compared between groups using Wilcoxon rank sums test for non-normal data and Fisher's exact test for categorical measures. Categorical data was compared among groups using chi-square analysis and Fisher's exact tests as appropriate. Pre and post-operative changes in sleep data within each subject were tested using Wilcoxon signed rank or McNemar's test (for paired analysis). All analyses will be performed using SAS® for Windows (SAS Institute Inc., Cary, NC USA).

3. Results

3.1. Demographics

189 patients underwent lingual tonsillectomy during the study period. Of these children, 99 had lingual tonsillectomy alone; 92 of these patients had adequate follow-up for inclusion. These children had a median age of 8.6 years (mean age = 8.4 years, range 2.1–17.9 years) at the time of surgery; 50% were female, and 87% were white. Comorbid diagnoses were recorded in 43.5% of these children; Down syndrome (DS) was identified as the most common comorbidity (28.3%). [Table 1].

3.2. Surgery and hospital course

The most common indication for surgery was OSA (n = 57,62.0%) followed by recurrent lingual tonsillitis (n = 32, 34.8%). With respect to surgical technique, 51 (55.4%) surgeries were performed using coblation lingual tonsillectomy, while suction cautery was used in 41 (44.6%) cases [Table 2]. Following surgery, the median length of stay (LOS) was 1 day (mean LOS = 0.8 [0–4] days) and no patients experienced unplanned intubation or unplanned intensive care unit (ICU) admission. Median follow-up for all patients was 5.9 months (mean = 7.9 [0.6–71.6] months). [Table 2].

3.3. Postoperative complications

Presentation to the ED was recorded for 9 (9.8%) children after surgery. During ED evaluation patients complained of bleeding (n = 4, 4.4%), voice change (n = 4, 4.4%), and decreased oral intake (n = 3, 3.3%). Readmission was recorded in 4 (4.4%) children; bleeding and decreased oral intake were the most common reasons for readmissions. The overall bleeding rate for lingual tonsillectomy was 4.4%. Bleeding was further categorized as patient reported without evidence of bleeding on physical examination (n = 1, 1.1%), confirmed bleeding treated with observation only (n = 1, 1.1%), and confirmed bleeding with operative intervention (n = 2, 2.2%). There

Table 1
Demographic characteristics of patients undergoing lingual tonsillectomy.

Patient characteristic	Value
No. of Patients	92
Age, yr, median, (mean) [range]	8.6, (8.4) [2.1–17.9]
Gender (% female)	50.0%
BMI at Surgery %, median, (mean) [range]	71.7, (91) [1.0–99.7]
Race, n (%)	
White	80 (87.0%)
Black	2 (2.1%)
Other/Unknown	10 (10.9%)
Syndrome Diagnosis, n (%)	40 (43.5%)
Down Syndrome	26 (28.3%)
Charge Syndrome	4 (4.4%)
Other Syndromes	8 (8.7%)
Other Comorbid Conditions, n (%)	
Tracheostomy Dependence	10 (10.9%)
Neurologic Malformations	2 (2.1%)
Other Syndromes	8 (8.7%)