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Indications for tonsillectomy: A 10 year retrospective review

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ABSTRACT

Objective: Recurrent tonsillitis and obstructive sleep apnea (OSA) are the most common indications for tonsillectomy. This study was undertaken to determine if recurrent tonsillitis is increasing as an indication for tonsillectomy by reviewing the recent trend at a single institution.
Methods: A retrospective chart review of patients undergoing tonsillectomy from 2003 to 2012 was performed. Data was gathered from pre-operative symptoms and sleep study results. Patients were categorized by the following indications: (1) obstructive sleep apnea, (2) recurrent tonsillitis and OSA, (3) recurrent tonsillitis alone and (4) other. Literature review was conducted to find similar studies; the results of the literature review were compared to our results.
Results: A total of 2369 patients were included, 52% were boys. Over the study period OSA was the indication for surgery for 67% of patients. There was an increasing trend in OSA as the indication for tonsillectomy ($p < 0.0001$). Girls were more likely to have tonsillitis as an indication for tonsillectomy (21% vs. 17%, OR: 1.32, $p < 0.0001$). Children younger than 2 or 2–5 are less likely than those older than 5 to have tonsillitis as an indication for surgery (2.30% and 6.26% vs. 27.46%, OR = 0.06 and 0.18, $p < 0.0001$). 987 of 2370 (42%) patients undergoing tonsillectomy had a pre-operative sleep study. Younger children were more likely to have had a sleep study.
Conclusion: There were mild variations from year to year; however, obstructive sleep apnea is the most common reason for tonsillectomy.

1. Introduction

Tonsillectomy is the second most commonly performed surgery today. While the concept of tonsillectomy has existed for more than 2000 years, it was not common for most of history because of complications. In the 20th century the number of tonsillectomies performed skyrocketed due to the focal theory of infection and surgical advancements [1].

Prior to the widespread use of antibiotics, recurrent tonsillitis was the most common indication for tonsillectomy. With the advent of effective antibiotic therapy for treatment of tonsillitis, tonsillectomy became controversial [2]. Many physicians began to question the medical necessity of tonsillectomy, due to the lack of reliable evidence showing the benefit the procedure. Eventually, the "Paradise criteria," based on clinical studies, were developed to guide decision-making [3]. Benefit was shown in patients experiencing greater than seven episodes of tonsillitis in one year, or five episodes in two consecutive years or three episodes in the previous three years [4]. There was a strong recommendation to pursue watchful waiting in patients with a short history of recurrent tonsillitis due to high rates of spontaneous resolution of symptoms. Modifying factors also play a role in determining if tonsillectomy is beneficial. Multiple drug allergies, PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and adenitis), and a history of recurrent peri-tonsillar abscess associated with recurrent tonsillitis are examples of these factors [3].

More recent studies evaluating indications for performing tonsillectomy have shown that sleep disordered breathing (SDB) and obstructive sleep apnea (OSA) have become the most common indications for surgery [5]. Sleep disordered breathing can be clinically assessed based on history consistent with upper airway obstruction during sleep including: snoring, mouth breathing and

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pauses in breathing. The diagnosis of OSA requires confirmation of obstruction by polysomnography (PSG) [6]. OSA is also associated with symptoms such as hyperactivity, aggression, poor school performance, failure to thrive and nocturnal enuresis [3]. When the history is uncertain or unclear or there seems to be a poor correlation with physical exam, PSG is recommended even for an otherwise healthy child.

Recently, tonsillectomy has once again come under scrutiny due to increasing healthcare costs. It is important to be aware of the indications for performing surgery and nationwide trends in indications for surgery. There are few studies based on individual chart review reporting the indications for performing tonsillectomy. This study is the largest retrospective chart review to study how the indications for tonsillectomy in a pediatric population have changed over the last 10 years. Previous studies of indications for tonsillectomy are also reviewed to evaluate for a potential change in current trends.

2. Methods

Approval to conduct this study was obtained from the Pennsylvania State University College of Medicine Institutional Review Board. A retrospective chart review of children undergoing tonsillectomy from 2003 to 2012 was performed. All patients were evaluated and treated by the pediatric otolaryngologist at Penn State Hershey Medical Center. Data was gathered from diagnoses made in pre-operative clinic visits based on presenting symptoms and sleep study results when available. Patients were included in the obstructive category if they were noted to have a positive sleep study or sleep disordered breathing by history. Such symptoms included loud snoring, witnessed apneic events, restless sleep, nocturnal awakening, delayed sleep latency, difficulty awakening, falling asleep at school or routinely in the car, or hyperactivity. Snoring children without other OSA symptoms or without large tonsils underwent PSG. Patients were categorized by indication with the following group classifications: (1) obstructive sleep apnea/sleep disordered breathing (OSA/SDB), (2) tonsillitis and SDB/OSA, (3) tonsillitis alone and (4) other. The presence or absence of a sleep study was also recorded. The collected data was then analyzed using SAS version 9.3 (SAS Institute, Cary, NC). A Cochran–Armitage trend test was used to analyze the trend over the study period by year for each indication. Logistic regression was used to compare the indication for surgery amongst genders and age categories, and odds ratios were calculated to quantify the direction and magnitude of any significant associations.

Literature review was conducted using Pubmed, Embase CINAHL, Cochrane library, Web of Science, Science Direct and OVID Medline using keyword search terms "pediatric", "tonsillectomy", "retrospective" and "indication". Search results were then reviewed to identify all retrospective chart reviews performed in the United States and internationally for pediatric patients undergoing tonsillectomy. Studies in which the indication for surgery or exclusion criteria could not clearly be identified were excluded. Fourteen studies were identified and are summarized in Table 1.

3. Results

A total of 2369 patients undergoing tonsillectomy were identified, 52% of the patients were male. The mean age at the time of surgery was 6.5 years, 6.1 in boys and 7.0 in girls, which was significantly different ($p < 0.0001$). The median age in the total population was 6.0 and the majority of children were ages 3.6 through 8.6 (Fig. 3). In girls, the median age was 6.4 and in boys it was 5.4. 55% of all male patients were older than 5 compared to 65% of female patients.

Over the ten year period OSA/SDB was the indication for surgery for 1592 (67%) of the 2369 patients who underwent tonsillectomy. The data was then analyzed to examine the indication for surgery for each year included in the data set. The first year evaluated was 2003, at which time obstructive upper airway symptoms were the indication for tonsillectomy for 37% of the patients. Since 2005, obstruction alone has increased to the sole indication for surgery in 60% or more of the patients each subsequent year. The Cochran–Armitage trend test showed a statistically significant increasing trend in OSA as an indication in this study period ($z = 5.8$; $p < 0.0001$). In 2003, tonsillitis alone was the indication for surgery in 33% of patients undergoing tonsillectomy. This was the highest percentage of tonsillitis alone as an indication for surgery. The lowest proportion of tonsillitis as an indication for surgery was 11% in 2010. There was a significant decreasing trend for tonsillitis as revealed by the Cochran–Armitage trend test ($z = -4.04$; $p < 0.0001$) (Fig. 1).

Table 1
Summary of indications for tonsillectomy from literature review.

Summary of literature review								
Study	Location	Year of Surgery	Age	Total #of Patients	Indications			
					Obstructive %	Tonsillitis %	Both	Other%
Rosenfeld [7]	New York, NY	1978	Unspecified	282	0	100		
		1986		135	19	81		
Rothschild [8]	New York, NY	1989–1990	0–19	153	45			
Nicklaus [9]	Albuquerque, NM	1988–1991	2–17	233	32	47	20	1
Postma and Folsom [10]	Tallahassee, FL	1996–1999		826	75	25		
Potts [11]	Louisville, KY	2001–2003	Mean 6.3	605	60	40		
Koshkareva [12]	Pittsburgh, PA	2004–2006	2–10	875	66	14	20	0.5
Parker [5]	Cleveland, OH	2004–2005	0–3	77	100	3		
			4–10	92	92	13		
			11–18	86	86	33		
			0–18	302	85	12.9		
Berkowitz [13]	Washington DC	1984–1988	0–3	170	84	15		1
Wiatrak [14]	Cinncinati, OH	1985–1989	0–3	200	63	37		
Tom [15]	Philadelphia, PA	1987–1988	0–3	223	70	9	21	
Ross [16]	Philadelphia, PA	1997–1999	0–3	421	91	4	4	
Werle [17]	Kansas City, KS, MO	1995–2000	0–2	96	51	32	12	2
Ahmed [18]	Kano, Nijeria	2009–2010	0–18	115	68	31		
Koshy [19]	England	(2001/2) 2011/12	0–16	57,429	(18) 39			