Rates and Risk Factors for Subsequent Tonsillectomy After Prior Adenoidectomy

A Regression Analysis

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Objective: To determine the role of adenoidectomy without concurrent tonsillectomy in the treatment of upper airway obstruction, by determining rates and risk factors for subsequent tonsillectomy.

Design: Retrospective cohort study with nested case-control study. Data were evaluated using Kaplan-Meyer curves with Cox proportional hazards regression analysis, as well as contingency table and logistic regression analysis.

Setting: Tertiary care pediatric hospital with satellite clinics and surgical centers.

Patients: A total of 2462 patients aged 5 months to 18 years undergoing adenoidectomy without concurrent tonsillectomy.

Main Outcome Measures: A 5-year database was searched for birth dates, dates of initial surgery, and dates of subsequent tonsillectomy (if performed) or latest follow-up. Cases (tonsillectomies) were then matched 1:1 by age with controls (no subsequent tonsillectomy). Medical charts were reviewed to identify potential predisposing factors, including sex, tonsil size, and adenoidectomy or tonsillectomy indication.

Results: Within 5.4 years, 108 patients underwent subsequent tonsillectomy. The relative risk of subsequent tonsillectomy decreases by 0.83 (95% confidence interval, 0.78-0.88) for each increasing year of age at adenoidectomy. The odds of undergoing a future tonsillectomy significantly increase with increasing tonsil size at the time of adenoidectomy. There was a trend toward doubling the risk of subsequent tonsillectomy when the adenoids were removed for upper airway obstruction (including obstructive sleep apnea) compared with other indications (P = .06).

Conclusion: Knowledge of the rates and risk factors for subsequent tonsillectomy will allow more informed counseling of parents regarding whether tonsillectomy should be performed or deferred at the time of an indicated adenoidectomy.


Adenotonsillectomies and adenoidectomies are 2 of the most common surgical procedures performed. In 1996, there were 274000 adenotonsillectomies (T&As), 144000 tonsillectomies (without adenoidectomy), and 136000 adenoidectomies (without tonsillectomies) performed in the United States.1 The surgical treatments to remove pharyngeal lymphoid tissue are often performed for symptoms of upper airway obstruction. However, it is not always clinically evident to the otolaryngologist whether a tonsillectomy should be performed or whether an adenoidectomy alone will suffice.

This raises the question of what is the role of adenoidectomy without concurrent tonsillectomy in the treatment of upper airway obstruction. The goal of this study was to take some initial steps in answering that question, by determining rates of subsequent tonsillectomy when adenoidectomy is performed and by identifying underlying risk factors for needing a subsequent tonsillectomy.

METHODS

The initial data set of patients was established as a retrospective cohort. The billing records of the Children's Hospital of Pittsburgh were searched from December 1997 to May 2003. The search was conducted using Current Procedural Terminology codes.2 Patients were included if they had undergone code 42830 (primary adenoidectomy, younger than 12 years) or 42831 (primary adenoidectomy, 12 years or older). They were excluded if they had undergone the following procedure on the same date: 42820 (tonsillectomy and adenoidectomy, without tonsillectomy).
During the 5.4 years examined in this study, 2462 patients underwent adenoidectomy without concurrent tonsillectomy. Their ages at the time of surgery were 5 months to 18 years, which were skewed toward the younger ages, with a median age of 5.3 years and a mean±SD age of 5.9±3.2 years. By age category, 162 patients were younger than 2 years, 2 to 4 years, 5 to 7 years, and older than 7 years. The patients’ medical charts were reviewed for sex, adenoidectomy indication (upper airway obstruction [including obstructive sleep apnea [OSA]], otitis media, sinusitis, or other), and tonsil size at adenoidectomy. If a tonsillectomy was performed at a later date, further data were collected, including tonsillectomy indication (upper airway obstruction [including OSA], recurrent tonsillitis, or other) and tonsil size at the time of surgery. Contingency table and logistic regression analysis was then performed to identify significant risk factors associated with subsequent tonsillectomy.

The study received human rights committee approval. It was also compliant with the Health Insurance Portability and Accountability Act.

**RESULTS**

Table 1. Rates of Tonsillectomy After Prior Adenoidectomy by Age Category

<table>
<thead>
<tr>
<th>Age at Adenoidectomy, y</th>
<th>Tonsillectomy Rate per Year</th>
<th>Tonsillectomy Rate After 5 y</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2</td>
<td>5.7 (3.7-8.9)</td>
<td>28.7 (18.3-50.0)</td>
</tr>
<tr>
<td>2-4</td>
<td>3.0 (2.3-3.8)</td>
<td>14.8 (11.5-19.0)</td>
</tr>
<tr>
<td>5-7</td>
<td>1.2 (0.8-1.8)</td>
<td>6.1 (4.1-9.2)</td>
</tr>
<tr>
<td>&gt;7</td>
<td>0.4 (0.2-1.0)</td>
<td>2.0 (0.9-4.9)</td>
</tr>
</tbody>
</table>

Abbreviation: OSA, obstructive sleep apnea; UAO, upper airway obstruction.

*No characteristics were statistically significantly different between the 2 groups at $\alpha = 0.05$.

Of the 196 patients in the nested case-control study, 102 underwent a subsequent tonsillectomy (cases), while 94 did not (controls). Their descriptive characteristics regarding sex and surgical indications are presented in Table 2. Surgical indications for adenoidectomy were not mutually exclusive. Seventy-eight percent had upper airway obstruction (including OSA). 71.4% had recurrent acute otitis media or chronic otitis media with effusion, and 16.3% had chronic rhinosinusitis. If the adenoids were removed for upper airway obstruction (vs for otitis media or sinusitis only), the patients were 1.9 times (95% CI, 0.9-4.1 times; $P = 0.06$) more likely to require a subsequent tonsillectomy.

**Figure 1**. Kaplan-Meier estimates demonstrating rates of tonsillectomy by age at the time of initial adenoidectomy.
Tonsil sizes were scored on a 9-point interval scale, based on the size grading assigned by the treating otolaryngologist at the time of adenoidectomy or at the preoperative visit. Tonsil sizes were scored as 0, 0 to 1+, 1+, 1+ to 2+, 2+, 2+ to 3+, 3+, 3+ to 4+, or 4+. The control patients had a median score at the time of adenoidectomy of 2+, with a mean of 1.7 (95% CI, 1.5-1.9); cases had a median score of 2.5, with a mean of 2.3 (95% CI, 2.0-2.5).

The odds of undergoing a future tonsillectomy significantly increase with increasing tonsil size at the time of adenoidectomy, as shown in Table 3. A logistic regression analysis shows that each increase in tonsil size by 1 (eg, from 2+ to 3+) raises the risk of subsequent tonsillectomy by 1.6 times (95% CI, 1.2-2.1 times; P < .001); no other variables changed the risk significantly.

The measured tonsil sizes at the time of tonsillectomy had a median of 3.5 and a mean of 3.5 (95% CI, 3.3-3.5). The magnitudes of the changes in tonsil size from the time of adenoidectomy to tonsillectomy appeared to be normally distributed, and this was supported by the failure of the Wilks-Shapiro test to find significant deviations from normality. Patients’ tonsils size increased on average by 1 size (eg, from 2+ to 3+), with a median increase of 1 (range, 1-4) and a mean increase of 1.2 (95% CI, 0.9-1.4). The magnitude of changes was unrelated to the indications for the tonsillectomies (upper airway obstruction, including OSA (P = .06). It is anticipated that this result would have reached statistical significance with a larger sample size for the nested case-control study. The risks of subsequent tonsillectomy significantly increase with increasing tonsil size at the time of adenoidectomy (P < .001), with the risk growing by 1.6 times for each unit increase of tonsil size (eg, from 2+ to 3+). Also, the tonsil sizes for patients needing subsequent tonsillectomy increased over time, growing at a mean rate of 0.8 per year, with the growth rate being unrelated to the tonsillectomy indication.

The role of adenoidectomy without concurrent tonsillectomy in the treatment of upper airway obstruction remains an enigma. A recent survey of 704 pediatric and general otolaryngologists with 344 respondents (48.9%) addressed current trends in T&A. In managing a child with OSA, enlarged adenoids, but small tonsils, most respondents would perform an adenoidectomy rather than a T&A. Nevertheless, more than half of the respondents in each group would still sometimes perform a T&A. In managing a child with symptomatically large adenoids and incidentally large tonsils, most respondents would also perform an adenoidectomy more often than a T&A. However, when the 2 survey groups were compared, significantly more American Society of Pediatric Otolaryngology members would perform an adenoidectomy alone, and significantly more American Academy of Otolaryngology—Head and Neck Surgery members would perform a T&A. Further prospective trials are therefore warranted to shed light on these clinical challenges.

There is only one similar study in the English literature, conducted in 1962 by Young. That study involved a cohort of 609 patients who were evaluated 6 to 9 years after undergoing an adenoidectomy without concurrent tonsillectomy. Of those patients, 68 needed a subsequent tonsillectomy. Based on survey response data, 5 additional tonsillectomies were presumed to have been performed, for an estimated 73 total tonsillectomies, or a 12.0% risk. This value is higher than the overall rate of 4.4% in our study, which may reflect changing trends over time (as we are more conservative regarding performing tonsillectomies compared with 1962 practice), the increased age of this cohort compared with ours, or the overall follow-up in the study by Young.

Twenty-nine patients in the study by Young underwent tonsillectomy within 2 years of their adenoidectomy. In examining this subset of patients, the author noted the following symptoms at the time the adenoidectomies were scheduled: 5 patients had sore throats; 7 had large, red, or exudative tonsils; and 2 had both symptoms. Of the 609 patients, 203 (33.3%) were younger than 6 years at the time of adenoidectomy, of whom 48 (23.6%) underwent subsequent tonsillectomy; among the 406 older children (66.7%), 20 (4.9%) underwent subsequent tonsillectomy. This is similar to our study, in which the younger patients had higher tonsillectomy rates. In our study, 41.8% of the patients were younger than 6 years, of whom 6.1% had a subsequent tonsillectomy, while 58.2% were older, with a 1.9% tonsillectomy rate.

The interval between the adenoidectomy and subsequent tonsillectomy in the study by Young was known for only 63 patients. The range was 8 months to 7 years.
9 months; the distribution is shown in Figure 2 and may be compared with the distribution for our study in Figure 3. For children younger than 6 years, 26.7% (12/45) of Young’s patients underwent tonsillectomy within 2 years, compared with 76.1% of our patients. For the older patients, 40.0% (8/20) of Young’s patients underwent tonsillectomy within 2 years, compared with 80.2% in our study. The earlier performance of tonsillectomy in the present study may reflect the shorter overall follow-up of 5.4 years vs up to 9 years in the study by Young.

Strengths of the present study include its large sample size and systematic methods, in addition to data evaluation using Kaplan-Meier analysis rather than incidence methods only (as we are dealing with censored data). Weaknesses of the study include that we have only 5 years of follow-up data; therefore, we cannot make conclusions regarding tonsillectomy rates beyond 5 years. Indications for the initial adenoidectomy are only known for the 196 patients whose medical charts were reviewed and not for the entire 2462 patients in the analysis. Tonsil sizes in our study are treated as continuous rather than ordinal data, although for large data sets ordinal data may be analyzed as if they were continuous.²

Finally, although our institution and its satellites are the only pediatric centers in the region, it is possible that patients underwent a subsequent tonsillectomy at another facility. The rates we report are therefore likely underestimates of the true rates in the general population.

Adenoidectomy is a much safer procedure than tonsillectomy. In a cohort of 200 children, there was twice the risk of incident morbidity and complications in patients undergoing T&A compared with adenoidectomy without concurrent tonsillectomy.³ Adenoidectomy has been shown to have a markedly lower hemorrhage rate than tonsillectomy.⁴ In the latter study, among 6794 patients undergoing tonsillectomy (with or without adenoidectomy), 2.94% experienced hemorrhage, with 0.07% requiring transfusions, 0.1% undergoing external carotid artery ligation, and 0.007% resulting in death. This contrasts with the 7785 patients in the same study undergoing adenoidectomy without concurrent tonsillectomy, with a 0.21% hemorrhage rate and no transfusions, external carotid artery ligations, or deaths.

If we knew when it would suffice to perform an adenoidectomy alone without a concurrent tonsillectomy, we would greatly reduce the risks of postoperative morbidity. Conversely, if we knew when a tonsillectomy should be performed at the initial surgery, we would reduce the morbidity of a second general anesthesia and of untreated tonsillar disease. This study suggests that tonsillectomy should be deferred in older patients with small tonsils, as the risks of requiring a secondary procedure are low.

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REFERENCES