Synchronous Airway Lesions and Esophagitis in Young Patients Undergoing Adenoidectomy

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Objective: To determine the prevalence of synchronous airway lesions and esophagitis in children younger than 18 months undergoing adenoidectomy for adenoid hypertrophy and upper airway obstruction.

Design: Retrospective review spanning 4.5 years.


Patients: All children younger than 18 months who underwent adenoidectomy for upper airway obstruction by 2 pediatric otolaryngologists. Exclusion criteria: craniofacial dysmorphism and congenital syndromes.

Interventions: Simultaneous interventions during adenoidectomy included flexible nasopharyngolaryngoscopy (n=32), direct laryngoscopy (n=31), rigid tracheobronchoscopy (n=30), and esophagoscopy with biopsy (n=32).

Main Outcome Measures: Prevalence of synchronous airway lesions and histologic esophagitis.

Results: Thirty-five children younger than 18 months underwent adenoidectomy for airway obstruction (2 also had simultaneous tonsillectomy). Synchronous airway lesions were found in 19 (59%) of 32 patients who underwent airway endoscopy, including laryngeal edema (n=9), laryngomalacia (n=8), tracheal vascular compression (n=4), subglottic stenosis (n=4), midmembranous vocal fold lesions (n=3), bronchial stenosis (n=1), and true vocal fold immobility (n=1). Among 32 patients who underwent esophageal biopsy, histologic evidence of gastroesophageal reflux disease was found in 10 patients (31%), and eosinophilic esophagitis was found in 4 patients (13%). Overall prevalence of any synchronous finding (airway and/or esophagus) was 27 (77%) of 35.

Conclusions: Synchronous airway lesions and esophagitis (both gastroesophageal reflux disease and eosinophilic esophagitis) were prevalent among children younger than 18 months undergoing adenoidectomy for adenoid hypertrophy and upper airway obstruction. The presence of these findings argues for consideration of endoscopy during adenoidectomy for very young children.
glottic stenosis was sized using the Cotton-Myer grading scale.4
sent if the operative report described edema of the arytenoid,
teleoscope (Karl Storz) were used to perform laryngobronch-
aera adaptor and a xenon light source (Karl Storz, Culver City,
known congenital syndromes, craniofacial anomalies, or severe
breathing, and restless sleep. Since the goal of the study was to
toms of upper airway obstruction, including snoring, mouth
agnosed with adenoid hypertrophy with associated clinical symp-
tributing to airway obstruction in addition to adenoid hyper-
trophy in these very young patients.
To be included in the study, patients needed to have been di-
agnosed with adenoid hypertrophy with associated clinical symp-
toms of upper airway obstruction, including snoring, mouth
breathing, and restless sleep. Since the goal of the study was to
determine the prevalence of synchronous airway lesions among
otherwise healthy infants with adenoid hypertrophy, children with
known congenital syndromes, craniofacial anomalies, or severe
neurodevelopmental delay were excluded.
Endoscopic images were viewed on a Sony HR Trinitron color
video monitor (Sony Corp, Tokyo, Japan) using a Storz cam-
era adaptor and a xenon light source (Karl Storz, Culver City,
Calif.). Flexible fiberoptic nasolaryngoscopy was performed using a
4-mm Storz flexible laryngoscope (Karl Storz) to assess dy-
Vascular compression of the trachea was diagnosed when pul-
satile compression of the trachea resulting in an estimated 50%
or more narrowing of the tracheal lumen was witnessed endo-
coscopically. Two posterior wall mucosal biopsy specimens were
obtained from the endoscopically estimated distal third of
the esophagus using optical biopsy forceps (Karl Storz Inc,
Tuttlingen, Germany). Occasionally, flexible (in lieu of rigid)
esophagoscopy with blinded grasp biopsy through the scope
(Olympus, Tokyo, Japan) was performed by gastroenterology
staff members.
Esophageal specimens underwent routine processing with
serial sectioning and staining with hematoxylin-eosin. The pa-
thology department in our hospital makes the diagnosis of his-
tologic esophagitis suspicious for GERD if at least 2 of the fol-
lowing 3 features are present: (1) basal cell hyperplasia,
(2) elevated papillary height, and (3) inflammatory epithelial
inflammation with eosinophils, neutrophils, or lymphocytes.3
For purposes of the present study, an esophageal biopsy speci-
men with 2 or 3 of the features described herein was consid-
ered positive. Eosinophilic esophagitis was diagnosed when there
were more than 20 eosinophils present per high-powered field.4


ty. Since the goal of the study was to
to address the enlarged adenoids.


trophic grade of 2 or 3) or severe sleep disordered breathing (apnea
and hypopneas each occurring ≥5 per hour) with or without
social consequences in 3 cases. Other common symptoms that
were noted were cough, hoarseness, throat clearing, and
restless sleep. Explanations for sleep disordered breathing in
these young patients included adenoid hypertrophy (72%),
adenoid surgical history (26%), or no identifiable cause (2%).6

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patients. Overall, 12 (36%) of 33 patients experienced recurrence of upper airway obstruction following adenoidectomy. A greater number of patients younger than 12 months (8/14; 57%) experienced recurrent or persistent symptoms of upper airway obstruction than older patients (4/19; 21%), although this difference was not statistically significant (P = .07). The patients with recurrent symptoms had a longer duration of follow-up (mean, 12 months; range, 5-30 months) than patients who remained asymptomatic (mean, 4 months; range, 2 weeks–12 months). Among the 12 patients who developed recurrent upper airway obstruction after adenoidectomy, subsequent interventions included tonsillectomy alone (n = 3), tonsillectomy and revision adenoidectomy (n = 5), antibiotic therapy for tonsillitis (n = 2), revision adenoidectomy alone (n = 1), and repeated upper aerodigestive tract endoscopy with esophageal biopsy showing persistence of reflux esophagitis (n = 1). All experienced symptomatic improvement after treatment.

Two patients (one with laryngomalacia and the other with vocal nodules and eosinophilic esophagitis) still had mild postoperative stridor, which persisted for up to 2 months after adenoidectomy.

Among those patients with recurrent or persistent upper airway obstruction, esophagitis (GERD and/or eosinophilic esophagitis) was present in 7 (70%) of 10 assessed with esophagogastroduodenoscopy, and synchronous airway lesions were present in 7 (58%) of 12 assessed with airway endoscopy. Among those patients who had complete resolution of symptoms postoperatively with no known recurrence, esophagitis was found in 6 (50%) of 12 assessed with esophagogastroduodenoscopy, and synchronous airway lesions were present in 11 (65%) of 17 assessed with airway endoscopy. Thus, esophagitis and synchronous airway lesions were present in similar amounts in both those patients who developed recurrent upper airway obstruction after adenoidectomy and those who did not.

### Table. Synchronous Airway Lesions and Esophagitis in Young Patients Undergoing Adenoidectomy

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>All Patients (n = 32)</th>
<th>&lt;12 (n = 14)</th>
<th>12-17 (n = 18)</th>
<th>P Value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synchronous airway lesions</td>
<td>19 (59)</td>
<td>10 (71)</td>
<td>9 (50)</td>
<td>.29</td>
</tr>
<tr>
<td>Laryngomalacia</td>
<td>8 (25)</td>
<td>7 (50)</td>
<td>1 (6)</td>
<td>.01</td>
</tr>
<tr>
<td>Laryngeal edema</td>
<td>9 (28)</td>
<td>5 (36)</td>
<td>4 (22)</td>
<td>.45</td>
</tr>
<tr>
<td>Vocal nodules</td>
<td>3 (9)</td>
<td>0</td>
<td>3 (17)</td>
<td>.24</td>
</tr>
<tr>
<td>Subglottic stenosis (grade 1 or 2)</td>
<td>4 (13)</td>
<td>3 (21)</td>
<td>1 (6)</td>
<td>.30</td>
</tr>
<tr>
<td>Tracheal vascular compression</td>
<td>4 (13)</td>
<td>2 (14)</td>
<td>2 (11)</td>
<td>&gt;.99</td>
</tr>
<tr>
<td>GER</td>
<td>10 (31)</td>
<td>6 (43)</td>
<td>4 (22)</td>
<td>.27</td>
</tr>
<tr>
<td>EE</td>
<td>4 (13)</td>
<td>0</td>
<td>4 (22)</td>
<td>.11</td>
</tr>
<tr>
<td>Any esophagitis</td>
<td>14 (44)</td>
<td>6 (43)</td>
<td>8 (44)</td>
<td>&gt;.99</td>
</tr>
</tbody>
</table>

Abbreviations: EE, eosinophilic esophagitis; GER, gastroesophageal reflux.

*Unless otherwise indicated, data are reported as number (percentage) of patients. All patients were younger than 18 months.

†Fisher exact test.

### COMMENT

In the present study, upper aerodigestive tract endoscopy was routinely performed in otherwise seemingly healthy infants who were undergoing adenoidectomy for upper airway obstruction to search for GERD and to avoid missing any potentially significant synchronous airway lesions. Based on their young age, it was believed that these children represented a special population at higher risk for these types of findings, and several recent studies have recommended endoscopy in this setting as well.1-3 Synchronous airway lesions were quite common in our patients (55%), as was esophagitis (44%). However, most patients’ symptoms completely resolved after adenoidectomy despite these other findings, with adenoid regrowth and tonsillar hypertrophy more likely to be a cause of recurrent symptoms than reflux or synchronous laryngotracheal lesions. It has been shown that the younger a child is when adenoidectomy is performed, the more likely an eventual tonsillectomy will also be performed, with 28.7% of children younger than 2 years at the time of adenoidectomy having a tonsillectomy within 5 years.7

In a study by Goldberg et al,2 endoscopic evaluation was considered to be a valuable tool in determining the cause of OSA in special populations, including those younger than 1 year or with neuromuscular disorders or craniofacial dysmorphism. In this study of 39 children with OSA who underwent flexible airway endoscopy, laryngomalacia was found in 44%, and children younger than 1 year had a greater amount of dynamic abnormalities (such as laryngomalacia) and a smaller amount of “fixed” abnormalities (such as tonsillar hypertrophy) than older children. Although the results of the present study would suggest that many synchronous airway lesions are not clinically significant, we still favor the use of rigid endoscopy to rule out the occasional serious synchronous finding, especially in children younger than 1 year. The lack of postadenoidectomy symptoms associated with most dynamic synchronous airway lesions (eg, laryngomalacia) may be owing to a decrease in upper airway resistance after adenoidectomy, thus leading to improvement in the accompanying dynamic disorder.2

A similar debate exists with regard to the evaluation of infants with laryngomalacia. Synchronous airway lesions may be present in up to 19% of infants with laryngomalacia, but only 3.9% of patients with laryngomalacia...
cia have synchronous airway lesions that are serious enough to warrant surgery.\(^6\) Thus, some authors have discouraged routine rigid endoscopy in these patients,\(^8\) whereas others have recommended routine rigid endoscopy to avoid missing the uncommon case of a rare, life-threatening synchronous lesion.\(^9\)

Gastroesophageal reflux disease, common in infants to begin with, seems to be quite prevalent in children undergoing adenoidectomy for airway obstruction. In a retrospective study of 95 children undergoing adenoidectomy for adenoid hypertrophy and chronic nasopharyngitis, GERD (assessed by a variety of tests) was present in 42% overall, and in 88% of patients 1 year or younger compared with only 7% of a control group undergoing placement of tympanostomy tubes only.\(^3\) In another study of 24 infants younger than 1 year undergoing adenoidectomy for OSA, GERD was diagnosed preoperatively in 87.5% of patients using 24-hour midesophageal pH-metry.\(^1\) Carr et al\(^10\) noted that only 50% of children who underwent adenoidectomy experienced complete resolution of symptoms, leading the researchers to suspect that GERD and laryngopharyngeal reflux were contributing factors. They recommended laryngeal endoscopy in all young patients undergoing adenoidectomy to assess for signs of laryngitis. On the other hand, Shatz\(^2\) noted that most of the infants who underwent adenoidectomy in his study were taking medication for reflux preoperatively, and none seemed to require reflux medication postoperatively, leading him to suspect that treatment of upper airway obstruction led to the resolution of reflux. It has been suggested that the negative inspiratory effort associated with airway obstruction in infants can lead to significant negative intrathoracic pressure and positive intraabdominal pressure, which can exert a significant potentiating effect on reflux.\(^10\)

Although most infants younger than 18 months who undergo adenoidectomy for upper airway obstruction experience relief of symptoms postoperatively, synchronous airway lesions and GERD are common in this population and could potentially be contributing factors to upper airway obstruction. The decision to perform endoscopy in patients younger than 18 months undergoing adenoidectomy continues to be a subject of debate. Concern regarding the potential to miss an occasional case of a serious synchronous abnormality has led us to perform endoscopy in most of our infants in this category, even in the absence of any craniofacial dysmorphism, neuromuscular delay, or congenital syndrome.

When synchronous airway lesions or esophageal inflammatory changes are found in young children with upper airway obstruction and adenoid hypertrophy, the adenoids should still be addressed in most instances, especially if they still appear to be the most obvious source of the symptoms. The decision to perform surgical or medical interventions for synchronous airway lesions would depend on the degree of obstruction perceived endoscopically, or on the degree of esophagitis perceived histologically, combined with an assessment of any ongoing airway symptoms that may persist even after the child has healed from adenoidectomy. For example, persistent failure to thrive and apparent life-threatening events following adenoidectomy in an infant with endoscopically severe laryngomalacia may lead to consideration of a supraglottoplasty procedure. Persistent nasal congestion and airway obstruction in an infant undergoing antireflux medical therapy who has healed from adenoidectomy and for whom histologic esophagitis was the only other synchronous finding should trigger consideration of studies such as esophageal and pharyngeal pH probe testing, gastric scintigraphy, and possibly a gastric fundoplication. Consideration can also be given to the potential role of environmental allergies and immunodeficiency.

Each case must be considered individually, and a multidisciplinary approach is encouraged. One must also be prepared to wait out the transient worsening of upper airway obstruction from edema and postanesthetic emergence after adenoidectomy before being able to critically reassess the contribution of any synchronous airway lesions to ongoing respiratory symptoms.

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Author Contributions: Dr Yellon had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Mandell. Acquisition of data: Mandell and Yellon. Analysis and interpretation of data: Mandell and Yellon. Drafting of the manuscript: Mandell. Critical revision of the manuscript for important intellectual content: Yellon. Statistical analysis: Mandell. Study supervision: Yellon.

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REFERENCES