PSNet
PATIENT SAFETY NETWORK

Routine Goes Awry

June 1, 2011
Huoh KC, Rosbe KW. Routine Goes Awry. PSNet [internet]. 2011.
https://psnet.ahrq.gov/web-mm/routine-goes-awry

The Case

A 6-year-old girl with a history of asthma and chronic adenotonsillitis was referred to a surgeon and scheduled for a tonsillectomy and adenoidectomy. She was in otherwise good health, had never received anesthesia in the past, and was experiencing no acute symptoms at the time of surgery. After an uneventful surgical procedure, the patient was rapidly extubated with spontaneous ventilation and stable vital signs. Within an hour, however, the patient became hypoxic with an inability to ventilate spontaneously, and required reintubation. The etiology of the need for reintubation was unclear but thought to be related to sedation and analgesia administered during and after the case. The patient ultimately recovered with no additional complications and was discharged home with her parents.

Because of the reintubation, the case generated additional review and discussion, including concerns expressed by the parents about the safety of what they believed was a routine surgical procedure done on children every day.

The Commentary

This patient underwent tonsillectomy, the second most common pediatric surgery in the ambulatory setting, second only to ear tube placement. There are more than 500,000 such procedures performed annually in the United States.(1,2) Between 1915 and the 1960s, tonsillectomy was the most frequently performed surgical procedure. A short period of decline followed, which was attributed to improved treatment of infectious tonsillitis with antibiotics.(1) However, tonsillectomy rates have been increasing over the past 35 years due to more frequent identification of sleep disordered breathing (SDB) in young children.(3) With the high volume of tonsillectomies in children performed each year, it is important for the pediatric otolaryngologist—and others who care for children—to become familiar with appropriate indications for surgery and to determine which patients can undergo surgery safely in the ambulatory setting.

Guidelines for Tonsillectomy

The case presented offers an opportunity to first review whether the 6-year-old child had clear indications for tonsillectomy. The American Academy of Otolaryngology-Head and Neck Surgery (AAOHNS) published updated clinical guidelines in 2011 providing evidence-based recommendations for perioperative management of children between the ages of 1 to 18 undergoing tonsillectomy.(1)

In these guidelines, tonsillectomy is recommended for children with at least 7 documented throat infections in the past year, 5 per year for 2 years, or 3 per year for 3 years. In addition, each episode must be associated with temperature ? 38.3° C, cervical adenopathy, tonsillar exudates, or a positive group A beta-hemolytic streptococcal test.(1) Tonsillectomy may also be considered in children with recurrent infections that do not meet the above criteria but have modifying factors that include intolerance of multiple antibiotics, PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and adenitis), or a history of peritonsillar abscess.(1) Because adenotonsillar hypertrophy has been recognized as the most common cause of sleep disturbance in children, SDB has become the most common indication for pediatric adenotonsillectomy. Growth retardation, behavioral problems, enuresis, and poor school performance may be associated with SDB.(1) Newer studies support a link between SDB and attention deficit hyperactivity disorder (ADHD) and have found that even mild SDB, if untreated, can be associated with permanent effects on neurocognitive development.(4)

Potential Complications and Outcomes from Surgery

Adenotonsillectomy, like all surgeries, is associated with potential risks and complications. The most commonly cited preoperative risk is bleeding, which occurs in up to 3% of patients. The highest risk of return to the operating room to control hemorrhage occurs one week postoperatively.(1) Multiple instruments and techniques have been used to remove tonsils over the years ranging from sharp "cold" dissection to monopolar electrocautery. However, there are no evidence-based reviews demonstrating superior recovery or bleeding rates by any single method. Therefore, surgical technique continues to differ based on individual surgeon preference and experience, and the updated guidelines do not include technique recommendations. However, there are reports of airway fires related to electrocautery technique in the setting of 100% oxygen delivery. To avoid this adverse event, reducing the fraction of inspired oxygen to 25% during these cases is recommended.(5)

Dehydration is another potential complication after adenotonsillectomy related to inadequate oral intake from poorly controlled postoperative throat pain. Airway obstruction is a much less common complication but is more likely to occur in certain populations of children, including those with neurologic delay, craniofacial abnormalities, lower airway disease (i.e., asthma), children younger than 3 years, and those with moderate or severe SDB documented by preoperative sleep study.(1,6) Though death is rare from the procedure, mortality rates from tonsillectomy are quoted at a rate of 1 in 16,000 to 1 in 35,000 procedures.(1)

Other complications to note include temporary ear pain (due to referred throat pain), halitosis due to moist scabs in tonsil beds, temporary (rarely permanent) velopharyngeal insufficiency (VPI) that may manifest as hypernasal voice or leakage of food or liquid from the nose during oral intake, and voice changes due to changes in the resonance of the oropharynx. The majority of these complications will resolve with time, but not all; it is important to describe them and their self-limited time course during pre- and perioperative

counseling sessions to parents and family members.

Tonsillectomy and adenoidectomy for SDB has a greater than 90% success rate although it can be lower for children with associated comorbidities such as craniofacial syndromes, Down syndrome, and neurologic delay/cerebral palsy. The most common complication is postoperative bleeding, which occurs in less than 10% of patients.

Safety of Adenotonsillectomy in the Ambulatory Setting

Over the past two decades, most pediatric adenotonsillectomies have moved from the inpatient to the ambulatory setting.(2) Proponents of this shift point to improved efficiency, cost containment, and better utilization of surgical resources. However, critics cite potential life-threatening airway and hemorrhage risks as justification for inpatient surgery.(2) In 1996, the AAOHNS published criteria that stated otherwise healthy children who are older than age 3, are in American Society of Anesthesiologists Classification (ASA, an overall health ranking) Class I or II without evidence of SDB, whose homes are close to a major medical center, and who are undergoing adenotonsillectomy for routine indications are suitable for outpatient tonsillectomy.(7) A 2006 systematic literature review supported this criteria for outpatient tonsillectomy, but the authors tempered their review with a recommendation to discuss the risk of readmission as part of the consent process.(7)

A separate report reviewed all pediatric otolaryngology procedures performed at a single institution's ambulatory surgery center over a 7-year period. Of the 4,979 procedures performed, 880 (17.7%) were tonsillectomies. There were nine unanticipated outcomes in these patients: four patients developed postoperative bleeding; two had low pseudocholinesterase levels and required additional anesthetic recovery time; one with a history of asthma required overnight hospital observation; and one had an undiagnosed upper airway mass.(8) The authors concluded that outpatient ambulatory pediatric otolaryngology is extremely safe, with a low rate of unanticipated outcomes.

Reflections on the Case

Without all of the details presented, we will assume the child met criteria for surgery due to chronic throat infections. There was no specific comment on the presence or absence of SDB symptoms, and as mentioned earlier, the severity of SDB may influence the appropriate setting for surgery. It's also important to screen this patient with a history of asthma to assess the severity of possible reactive airway disease. Helpful questions may include whether the child is on daily bronchodilator or inhaled corticosteroid therapy and how frequently these medications are used; whether the child required treatment in the emergency room setting for asthma; and whether the child was hospitalized or intubated for asthma in the past. In a study of more than 9,000 children in Australia, a positive respiratory history was predictive of perioperative respiratory complications including laryngospasm, airway obstruction, and oxygen desaturation. In addition, patients undergoing otolaryngology procedures were identified at higher risk of postoperative respiratory complications.(9) Children with poorly controlled asthma should generally not have their adenotonsillectomy performed in the ambulatory setting.

While the cause of respiratory distress in this case was unclear, it perhaps could be related to perioperative sedation and analgesia. The immediate postoperative period after pediatric adenotonsillectomy can be

challenging to manage due to pain and edema of the operative site, nausea, secretions, and residual systemic anesthetic affecting respiratory rate and oxygenation. Balancing pain control and respiratory depression can be difficult with narcotic administration. Adding intraoperative dexmedetomidine may reduce the postoperative opiate requirement.(10)

Take-Home Points

- Evidence-based guidelines exist to help providers determine indications for pediatric tonsillectomy and adenotonsillectomy.
- Pediatric tonsillectomy or adenotonsillectomy is a common surgical procedure performed in either inpatient or ambulatory settings with low complication rates.
- Patient should undergo preoperative evaluation to determine the appropriate surgical setting for the procedure and screen for potential risk factors.
- Despite low rates of complications, serious risks do exist and parents should be counseled on potential adverse outcomes.

Kevin C. Huoh, MD Resident, Department of Otolaryngology-Head & Neck Surgery, University of California, San Francisco

Kristina W. Rosbe, MD

Professor of Otolaryngology and Pediatrics

Director, Division of Pediatric Otolaryngology, Department of Otolaryngology, Head & Neck Surgery

University of California, San Francisco

References

1. Baugh RF, Archer SM, Mitchell RB, et al. Clinical practice guideline: tonsillectomy in children. Otolaryngol Head Neck Surg. 2011;144(suppl 1):S1-S30. [go to PubMed]

2. Bhattacharyya N. Ambulatory pediatric otolaryngologic procedures in the United States: characteristics and perioperative safety. Laryngoscope. 2010;120:821-825. [go to PubMed]

3. Erickson BK, Larson DR, St Sauver JL, Meverden RA, Orvidas LJ. Changes in incidence and indications of tonsillectomy and adenotonsillectomy, 1970–2005. Otolaryngol Head Neck Surg. 2009;140:894-901. [go to PubMed]

4. Gozal D, Kheirandish-Gozal L. Neurocognitive and behavioral morbidity in children with sleep disorders. Curr Opin Pulm Med. 2007;13:505-509. [go to PubMed]

5. Kaddoum RN, Chidiac EJ, Zestos MM, Ahmed Z. Electrocautery-induced fire during adenotonsillectomy: report of two cases. J Clin Anesth. 2006;18:129-131. [go to PubMed]

6. Statham MM, Myer CM III. Complications of adenotonsillectomy. Curr Opin Otolaryngol Head Neck Surg. 2010;18:539-543. [go to PubMed]

7. Brigger MT, Brietzke SE. Outpatient tonsillectomy in children: a systematic review. Otolaryngol Head Neck Surg. 2006;135:1-7. [go to PubMed]

8. Shah RK, Welborn L, Ashktorab S, Stringer E, Zalzal GH. Safety and outcomes of outpatient pediatric otolaryngology procedures at an ambulatory surgery center. Laryngoscope. 2008;118:1937-1940. [go to PubMed]

9. von Ungern-Sternberg BS, Boda K, Chambers NA, et al. Risk assessment for respiratory complications in paediatric anaesthesia: a prospective cohort study. Lancet. 2010;376:773-783. [go to PubMed]

10. Olutoye OA, Glover CD, Diefenderfer JW, et al. The effect of intraoperative dexmedetomidine on postoperative analgesia and sedation in pediatric patients undergoing tonsillectomy and adenoidectomy. Anesth Analg. 2010;111:490-495. [go to PubMed]

This project was funded under contract number 75Q80119C00004 from the Agency for Healthcare Research and Quality (AHRQ), U.S. Department of Health and Human Services. The authors are solely responsible for this report's contents, findings, and conclusions, which do not necessarily represent the views of AHRQ. Readers should not interpret any statement in this report as an official position of AHRQ or of the U.S. Department of Health and Human Services. None of the authors has any affiliation or financial involvement that conflicts with the material presented in this report. View AHRQ Disclaimers