abstract

Pediatricians play an important role in the perioperative care of hospitalized children after tonsillectomy and are often called upon to manage posttonsillectomy problems in the outpatient setting. The tonsillectomy operation has changed in recent years. More children are operated upon for sleep disordered breathing and fewer for recurrent pharyngitis. New instruments now permit less invasive surgery. Systematic reviews by the Cochrane Collaboration and others have helped define best practices for preoperative assessment and postoperative care. This article will outline these practices as defined in the 2011 American Academy of Otolaryngology–Head and Neck Surgery Foundation clinical practice guideline “Tonsillectomy in Children.” It will describe the different tonsillectomy operations, discuss patterns of normal healing, and review management of pain and posttonsillectomy hemorrhage to form a foundation for improved pediatric care. Pediatrics 2012;130:324–334

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KEY WORDS
adenotonsillectomy, complications, pain management, tonsillectomy, wound healing

ABBREVIATION
AAO-HNS—American Academy of Otolaryngology–Head and Neck Surgery Foundation

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Whether in the PICU, emergency department, or office, the pediatrician is often called on to care for children after tonsillectomy. Today, most tonsillectomies in otherwise healthy children are performed in the outpatient setting. This means that those who are hospitalized are more likely to be young or to have significant comorbidities (obesity, severe obstructive sleep apnea, coagulopathies, hemoglobinopathies) than in the past. It also means the general pediatrician often becomes the de facto caregiver for children sent home soon after surgery. An appreciation of recent changes in the tonsillectomy operation, its complications, and evidence-based protocols for posttonsillectomy care would be helpful when fielding calls from concerned parents and easing the misery that follows this surgery (Table 1).

**OVERVIEW**

This brief review of the indications for tonsillectomy and technical variations available for the procedure will focus on postoperative medical management, taking advantage of the 2011 American Academy of Otolaryngology–Head and Neck Surgery Foundation (AAO-HNS) clinical practice guideline “Tonsillectomy in Children.” Patterns of normal healing and management of pain and posttonsillectomy hemorrhage will be discussed.

**ADVANCES**

**Reasons to Perform a Tonsillectomy**

Tonsillectomy, when performed for the right reasons, can decrease upper airway resistance, ameliorate or cure obstructive sleep apnea and sleep disordered breathing, decrease the incidence of recurrent pharyngitis, and improve child health status and quality of life. Debate rages about what constitutes the “right reasons.” For each child, the potential benefits of tonsillectomy (usually in combination with adenoidectomy) must be weighed against its substantial discomforts and occasional, but real, risks. Adenotonsillar hypertrophy is most pronounced between ages 3 and 6 years. Tonsils involute in most children after age 8 years. This sequence accounts for the appearance and natural resolution of snoring and sleep disordered breathing in many children. There is little doubt that for children with true obstructive sleep apnea secondary to adenotonsillar enlargement, the negative aspects of surgery are far outweighed by its benefits to health and function. As the severity of the sleep disordered breathing spectrum decreases, the risk-benefit balance shifts. Most pediatricians and pediatric otolaryngologists would not recommend an adenotonsillectomy for a well child troubled only by snoring. By the same token, the child with suspected sleep disordered breathing who also suffers from growth retardation, poor school performance, enuresis, or certain behavioral problems may derive greater benefit from surgery. When uncertainty exists, formal polysomnography can help to quantitate the severity of disease and correlate sleep disruption with symptoms.

Obese children are at special risk (BMI ≥95th percentile). Nighttime airway obstruction is more severe in this population and is less often cured by adenotonsillectomy. Preoperative pulmonary consultation and polysomnography help to quantitate the extent of disease and aid in postoperative management. Follow-up polysomnography and support with continuous positive airway pressure are required more often in overweight children.

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Similarly, one must weigh the pros and cons of tonsillectomy versus continued medical management for recurrent sore throats. It is clear that a child undergoing tonsillectomy for frequent severe sore throats will experience fewer sore throats in years to come. It is less clear that the tonsillectomy is the reason for the improvement. For most children, recurrent severe sore throats (characterized by temperature >38.3°C, cervical adenopathy, tonsilar exudate, or positive test for group A β-hemolytic streptococci) resolve spontaneously within a few years. In a prospective randomized trial of adenotonsillectomy for severe recurrent sore throats (7 episodes in a year, or 5 episodes in 2 consecutive years, or 3 episodes in 3 consecutive years, also known as “the Paradise criteria”), children derived benefit from surgery for at least 2 years compared with nonoperative controls.10 In a second, similar trial of moderately affected children (number of episodes, severity, or documentation relaxed), surgery slightly decreased the frequency of sore throats compared with controls. The subsequent number of sore throats was so low in both arms as to mute the clinical impact of tonsillectomy.11 There is likely a subgroup of children with recurrent sore throats who do not improve over time and who might receive greater benefit from surgery.12 Unfortunately, there is no way to distinguish such patients in advance.

Other relative indications for tonsillectomy include peritonsillar cellulitis or abscess, pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections, “chronic” tonsillitis, febrile seizures, halitosis, dental malocclusion, cryptic tonsils, hemorrhagic tonsillitis, prevention of recurrences of rheumatic fever, or chronic pharyngeal carriage of group A β-hemolytic streptococci. The role of tonsillectomy in the management of these disorders has not undergone rigorous scientific study.3

**Reasons Not to Perform a Tonsillectomy**

It is likely many more tonsillectomies would be performed were it not such a morbid procedure. To reach the oropharynx and overcome strong protective reflexes requires deep general anesthesia in nearly all children. Such anesthetics often lead to transient postoperative disorientation, nausea, and vomiting.15 The operation itself causes local tissue trauma from cutting and heat. It produces 2 open wounds that hurt severely at first, but continuously for almost 2 weeks.

Even in the best of hands, classic tonsillectomy is complicated by immediate (0.2%–2%) and delayed hemorrhage (1%–5%). Incomplete ligation or coagulation of peritonsillar arteries or veins can lead to bleeding immediately after surgery. Delayed bleeding occurs during the inflammatory phase of healing, usually 7 to 10 days after surgery.14,15 Bleeding can be controlled safely in most cases but usually requires a second, potentially more dangerous, general anesthetic.16 If bleeding is severe or the child is far from a medical facility, exsanguination may occur, requiring transfusion or leading to death.17 Other less common tonsillectomy sequelae include facial burns, airway fires, airway edema, postobstructive pulmonary edema, sepsis, disorders of taste, velopharyngeal insufficiency, and nasopharyngeal stenosis.18

**Tonsillectomy, Tonsillotomy, and Things in Between**

*Extracapsular Tonsillectomy*

Standard extracapsular tonsillectomy consists of the en bloc excision of the palatine tonsil and its enveloping capsule, usually including a portion of the anterior tonsillar pillar for exposure19,20 (Fig 1). It removes the tonsil quickly and completely, leaving little chance of tonsillar regrowth or future peritonsillar abscess. Extracapsular tonsillectomy produces a relatively large oropharyngeal wound that exposes the superior and middle constrictor muscles, bridging tonsillar arteries and the tonsillar venous plexus.21 The glossopharyngeal nerve, peritonsillar fat, and tongue base muscles are nearby structures that are occasionally exposed during excision.22 This complete extracapsular procedure has been the gold standard operation since the early 20th century, used in all major studies of the effectiveness of tonsillectomy. Surgeons and engineers have devised dozens of instruments to facilitate tonsil removal and subsequent hemostasis. Each has its champions and detractors. In general, surgical methods are divided into “cold” and “hot” techniques. In cold tonsillectomy, sharp instruments are used to cut tonsillar tissue, while in hot techniques, heat is used to cauterize the tissues. Examples of cold techniques include cold knife tonsillectomy, diathermy, and laser tonsillectomy. Hot techniques, on the other hand, involve the use of heat to coagulate or cauterize the tissue, such as electrocautery or ultrasonic surgical aspiration. Each technique has its own advantages and disadvantages, and the choice of method depends on the surgeon’s preference, the patient’s condition, and the specific needs of the case.3
used to incise the anterior tonsillar pillar and blunt ones are used to separate the tonsillar capsule from the superior constrictor muscle. Bridging tonsillar vessels are interrupted and left to bleed. Thus, the extirpative phase must be achieved swiftly and hemostasis achieved separately. Bleeding is controlled with pressure from tonsil sponges, suture ligation of vessels, or chemical cautery. Hot techniques use electrosurgical or thermal instruments for incision, excision, and control of bleeding. These include monopolar electrosurgical (Bovie) tonsillectomy, bipolar electrosurgical scissors or forceps, and bipolar radiofrequency ionic dissociation (Coblation [ArthroCare Corporation, Austin, TX]). Various lasers, plasma knife, and ultrasound and molecular resonance technologies have all been tried. Each has advantages; none is consistently superior in terms of postoperative pain, wound healing, or posttonsillectomy hemorrhage. These instruments allow excision of the tonsils and simultaneous coagulation of bridging vessels, thus avoiding the intraoperative blood loss of cold techniques. These instruments seal blood vessels by heating and coagulating proteins in the vessel walls. They cause varying amounts of thermal damage to surrounding normal tissues in the process. The most effective coagulators tend to have the greatest thermal spread. Surgeons like these instruments despite their negative aspects as they permit rapid, controlled tonsil removal, usually without blood loss.

**Intracapsular Tonsillectomy and Tonsillotomy**

Tens of millions of American children have experienced extracapsular tonsillectomy in the past 100 years. En bloc tonsillectomy is an oncologically sound way to remove tonsillar cancer. It may be a more radical surgery than is required to relieve upper airway obstruction and to prevent recurrent tonsillar infection. Tonsillectomy evolved in the 1910s when pediatric anesthesia was dangerous and hemostatic devices were limited. At that time, the masters of surgery denounced existing partial tonsillectomy techniques (tonsillotomy), claiming they led to unacceptable rates of immediate posttonsillectomy hemorrhage and persistent pharyngeal infection. This dogma remains strongly ingrained in the collective memory of otolaryngologists despite advances in anesthesia and instrumentation that make controlled, graded tonsil excision feasible.

Several investigators have explored less radical approaches to tonsil surgery. In 2002, Peter Koltai published a series of 150 “intracapsular” tonsillectomies in children with sleep disordered breathing. In this technique, a microdebrider, bipolar electrosurgical scissors, or a Coblation (ArthroCare Corporation, Austin, TX) wand is used to debulk most of the tonsil. The residual tonsil parenchyma then undergoes electrosiccation while preserving the surrounding normal tissue (Fig 1). Prospective randomized trials and case series with long-term follow-up now reinforce the notion that partial tonsillectomy techniques are less morbid than extracapsular tonsillectomy. Moreover, there appears to be a correlation between the amount of tonsil left behind and the reduction in pain and posttonsillectomy hemorrhage. Surgeons who remove only the exophytic portion of the tonsil (tonsillotomy) report slightly better results in terms of pain and bleeding than those who remove all (intracapsular complete tonsillectomy) or most (intracapsular partial tonsillectomy) of the tonsil. Multicenter series describe a low incidence of peritonsillar abscess or need for revision surgery with intracapsular techniques. A few series have addressed the adequacy of intracapsular tonsillectomy for the control of recurrent sore throat. While small in scale, these reports suggest that intracapsular surgery is not inferior.

It is curious that the vast majority of tonsillectomies performed in the United States are still extracapsular given the growing body of evidence supporting less extensive surgery. A recent survey of pediatric otolaryngologists found that 73% always use extracapsular tonsillectomy for sleep disorders breathing and 97% choose it for control of recurrent sore throats. Lingering concerns about the effectiveness of intracapsular tonsillectomy and fear of liability (for “inadequate” resection) may drive this surgical inertia.

**HOW TO PREVENT AND MANAGE POSTTONSILLECTOMY PROBLEMS**

**Perioperative Care**

Perioperative tonsillectomy problems result from the disorders that necessitate surgery, as well as the anesthetic and surgical procedures. Children with obstructive sleep apnea as an indication for surgery often exhibit continued upper airway obstruction and respiratory drive abnormalities for some time after surgery. While most tonsillectomy patients are treated in an ambulatory setting (same-day discharge or inpatient observation for <24 hours), children <3 years of age, children with severe obstructive sleep apnea, or children with comorbid conditions (obesity, sickle cell disease, coagulopathies, congenital heart disease, arrhythmias, craniofacial abnormalities) may require more protracted inpatient care and/or ICU observation.

Balanced anesthesia techniques that minimize postoperative respiratory suppression are favored in children with significant obstructive sleep apnea. Placement of a nasopharyngeal airway and selective use of postoperative endotracheal intubation may decrease the risk of airway obstruction in the surgery.
immediate postoperative period. The AAO-HNS guideline recommends a single dose of intraoperative dexamethasone to decrease postoperative nausea and vomiting. A systematic review from the Cochrane Collaboration showed that children receiving dexamethasone were less likely to vomit in the first 24 hours than children receiving placebo and more likely to advance to a soft or solid diet on postoperative day 1.41 Selective serotonin-3 antagonists and other antiemetics are of little value in reducing pain or bleeding and have risk.43 They are best reserved for treatment of infections rather than for prophylaxis.

For children older than 4 years without severe upper airway obstruction or comorbidities, observational studies suggest no increased risk of complications with outpatient tonsillectomy.44 A minimum safe observational period after tonsillectomy has not been established,45 nor are there generally accepted discharge criteria. Intravenous hydration with isotonic solutions46 and administration of oral analgesics are recommended.47 Need to tolerate oral intake before discharge is controversial. Cessation of operative bleeding, absence of upper airway obstruction, and control of pain and nausea should be documented.48 In some series, stays as short as 1 to 2 hours were sufficient.49

**Postoperative Changes and Normal Healing**

Tonsillectomy is traumatic. Children respond to this trauma in a fairly consistent manner. Understanding the physiologic responses to this operation aids in postoperative management and counseling.

**Edema**

Edema of the uvula, tonsillar pillars, and tongue is common. The tonsillectomy retractor, necessary for surgical exposure, compresses the tongue, causing venous engorgement40 (Fig 2). This can lead to tongue swelling, grooves in the tongue from the retractor edges, and occasionally mucosal slough. Edema generally subsides within a day. Intermittent relaxation of the retractor and shorter retractor times may decrease edema.40 Swelling of the uvula and tonsillar pillars can produce an uncomfortable globus sensation in the hours and days after surgery (Fig 3A).

**Fibrin Clot**

Tonsillectomy produces an open wound in a grossly contaminated field. Secondary bacterial colonization is universal. Within 24 hours a clot composed of fibrin, inflammatory cells, and bacteria coats the tonsillar fossae50,51 (Fig 3A). This fibrin clot proliferates, forming a thick cake that often protrudes beyond the tonsillar pillars by the fifth day after surgery (Fig 3B). With ingrowth of healing mucosa from the periphery, the clot separates from underlying granulation tissue ∼1 week after surgery (Fig 3C). This sloughing coincides with the high-risk period for delayed hemorrhage. No well-performed studies support the use of systemic or topical antibiotics,52 gargles,53 or chemical coatings54,55 to control fibrin clot formation.

**Healing**

Experiments in animals56,57 and human observation suggest that the tonsillar fossa heals via ingrowth of surrounding oropharyngeal mucosa. Thermal injury to the tonsillar pillar mucosa may delay this process. Mucosal ingrowth continues for ∼2 weeks after surgery (Fig 3D). Some authors report increased time to complete healing with electrosurgical techniques.58,59 The most severe posttonsillectomy symptoms subside as the tonsillar fossa epithelializes, although stiffness and some halitosis may persist for weeks after surgery.

**Pain**

Pain after tonsillectomy is universal, stereotypic in pattern, and varies from child to child. Most studies describe intense pain on the day of surgery, gradually decreasing over the first week but not disappearing until the end of the second week (Fig 4). There is often a “bump” in discomfort on the 3rd to 5th postoperative days60 coinciding with the
intense inflammatory phase of healing. Referred ear pain is common during this same period and is significantly greater after monopolar electrosurgical tonsillectomy. Pain tends to be more intense in the morning. Anxiety, previous painful experience, and age affect the perception of pain.

Remarkably little is known of the mechanism of posttonsillectomy pain. By analogy to better-studied burn wounds, stimulation of pain fibers by hypotonic solutions, stretch during chewing and swallowing, and release of inflammatory mediators are all potential culprits. Several authors implicate spasm of pharyngeal muscles as a cause of pain, but this has never been proved. Neural plasticity may play as important a role as gradual healing in the stepwise resolution of pain.

Intraoperative injection of local anesthetics has been advocated to decrease posttonsillectomy pain. A Cochrane review found no evidence that perioperative infiltration of local anesthetic in the tonsillar fossae improves postoperative pain control. Intraoperative injection of local anesthetics has been advocated to decrease posttonsillectomy pain. A Cochrane review found no evidence that perioperative infiltration of local anesthetic in the tonsillar fossae improves postoperative pain control.

Oral analgesics form the cornerstone of posttonsillectomy pain control. Acetaminophen with codeine is most typically used. Recently, its value has been called into question. In a prospective randomized trial, acetaminophen with codeine did not provide superior control of pain compared with acetaminophen alone. Codeine analgesia is due to its metabolism to morphine by the cytochrome P450 enzyme CYP2D6, which may be reduced in a substantial proportion of children. Postoperative nausea, vomiting, and constipation are increased with narcotic use, but acetaminophen alone may provide inadequate analgesia.

Based on these observations and strong safety data, the AAO-HNS guideline now recommends the routine use of ibuprofen after tonsillectomy. A review from the Cochrane Collaboration with nearly 1000 children from 13 randomized controlled trials found that nonsteroidal

FIGURE 3
Sequential postoperative appearance of the oropharynx after tonsillectomy. A, Day 1. There is edema of uvula and blanching of the oropharyngeal mucosa from thermal injury. Fibrin clot coats the tonsillar fossae. B, Day 5. Thick fibrin clot fills the tonsillar fossae and projects beyond the tonsillar pillars. C, Day 7. The fibrin clot has sloughed leaving visible, healing mucosa on the posterior tonsillar pillars (arrow), and exposed granulation tissue in the fossae. D, Day 17. Mucosalization of the tonsillar fossae is complete.
anti-inflammatory drugs (other than ketorolac and aspirin) did not significantly alter postoperative bleeding compared with placebo or other analgesics. Ketorolac and aspirin may increase the incidence of posttonsillectomy hemorrhage. Dosing schedules for oral analgesics remain controversial. In a recent study of acetaminophen with codeine, time-contingent (straight order) dosing resulted in the administration of more medication and lower pain scores than as-needed dosing. Both good hydration and correction of dehydration are associated with decreased pain.

**Bleeding**

Posttonsillectomy hemorrhage is alarming to families, consumptive of health care resources, and occasionally lethal. Although most bleeding episodes can be handled with efficiency and safety, the sight of a child and parent arriving covered with blood is one otolaryngologists struggle to avoid. Busy pediatric hospitals expend a significant part of their emergency resources caring for bleeding tonsillectomy patients.

**Coagulopathies**

While children with significant coagulopathies are at increased risk for posttonsillectomy hemorrhage, routine coagulation testing in children with no personal or family history of such a disorder is not cost-effective. Despite this recommendation, a recent survey found that 35% of general otolaryngologists and 10% of pediatric otolaryngologists still order a partial thromboplastin time and a prothrombin time before tonsillectomy. Children with von Willebrand disease and other treatable disorders of coagulation benefit from perioperative hematologic consultation and intervention. Additional monitoring may be warranted in this population given the increased risk of early bleeding and of side effects from medication (eg, hyponatremia from desmopressin).

**Diet and Activity**

Most otolaryngologists limit diet and activity after tonsillectomy, hoping to decrease the risk of posttonsillectomy hemorrhage. Stories abound of teenagers starting to bleed while eating a prohibited corn chip or playing forbidden soccer. Prospective studies comparing restricted to unrestricted diet and activity fail to show a significant difference in bleeding incidence. This does not mean these activities are risk-free, as most posttonsillectomy patients, freed from restriction, voluntarily avoid rough foods and vigorous activity.

**Emergency Care**

Deaths associated with posttonsillectomy bleeding result from both exsanguination and anesthesia complications. Surgery in older children and for acute peritonsillar abscess is more likely to lead to bleeding. Several studies identify electrosurgery as a risk factor for both bleeding and severe bleeding.

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**FIGURE 4**

or mechanical injury to tongue base vessels can produce pseudoaneurysms that may bleed massively.85 There is considerable variation in the management of post tonsillectomy bleeding. Most major centers caring for small children advocate physical examination for any observed bleeding rather than reassurance given over the telephone.86 Minor bleeding rates may exceed 15%.87 This imposes a burden on families, physicians, and hospitals. Still, parents may tend to overestimate or minimize bleeding severity, necessitating impartial evaluation.

On arrival in the emergency department, the child is assessed for hemodynamic stability and for active bleeding. Most children are not actively bleeding on arrival.88 Those with evidence of significant bleeding or a visible clot in the tonsillar fossa are usually treated surgically.89 Those with no evidence of bleeding are observed. Patients with minor bleeding had a 41% rate of severe bleeding within 24 hours in 1 large prospective series.15

Adults and some teenagers may tolerate cautery (chemical or electrosurgical) under local anesthesia.89 Young children with significant bleeding require surgical management under general anesthesia.90 Fluid resuscitation with isotonic solutions (or blood products in cases of severe anemia) should precede general anesthesia.16 Rapid sequence induction with cricoid pressure is recommended given the risk of aspiration of swallowed blood.91

Once the airway is secured, the site of bleeding is identified and controlled, usually with monopolar electrocoagulation. Topical hemostatic agents can help with minor bleeding from granulation. Old blood should be evacuated from the stomach via warm saline lavage. Arterial bleeding from large vessels or ruptured pseudoaneurysms may require endovascular control or, rarely, major vessel ligation.

CRITICAL ASSESSMENT

Over the past 5 years, critical thinkers in the fields of pediatrics, pediatric otolaryngology, infectious disease, and public health have worked together to improve tonsillectomy, to better define its indications, and to standardize perioperative care based on best evidence and practices. Several systematic reviews from the Cochrane Collaboration and recent guidelines from the AAO-HNS have assessed the quality of available research and produced evidence-based recommendations. While some strong endorsements were possible (use steroids and avoid antibiotics postoperatively), many critical questions (best instruments for surgery, extent of surgery, diet and activity after surgery) lacked adequate support to permit consensus. This leaves pediatricians and surgeons in a quandary as they try to guide families. Beyond meta-analyses of existing work, future studies must be prospective and of sufficient scale and uniformity to allow definitive recommendations. This is not always feasible when assessing rare operations but is possible for tonsillectomy. A recently published Austrian study of posttonsillectomy bleeding is 1 such exemplary project. This nationwide research cooperation used a standardized reporting system to assess all of the 9405 tonsillectomies performed in that country during a 9-month period. It produced solid, interpretable data to guide future medical decision-making.15

CONCLUSIONS

Things We Believe (and May Well Be True)

1. Tonsillectomy is beneficial for children with severe recurrent sore throats who do not meet Paradise criteria if they have certain other conditions (eg, multiple antibiotic allergy/intolerance; periodic fever, aphthous stomatitis, pharyngitis, and adenitis; or history of peritonsillar abscess).

2. Adenotonsillar hypertrophy is most pronounced between ages 3 and 6 years. Tonsils involute in most children after age 8 years, so snoring and sleep disordered breathing may resolve with time.

3. Children with suspected hematologic disorders should be assessed and, when appropriate, treated before surgery.

4. Compared with cold surgical technique, hot techniques decrease operative time and immediate
bleeding but increase delayed hemorrhage rates and slow the healing process.

5. Intrascapular tonsillectomy is less painful and less frequently complicated by delayed hemorrhage than is extracapsular tonsillectomy.

6. Children younger than 3 years and those with severe obstructive sleep apnea, coagulopathy, or certain comorbid conditions (eg, neuromuscular disorders, prematurity, obesity, failure to thrive, craniofacial anomalies) benefit from in-hospital observation.

7. Time-contingent (straight-order) pain medication has advantages in controlling posttonsillectomy pain during the first week after surgery.

8. Children should be cautioned to avoid sharp-edged foods, to avoid vigorous activity, and to remain near a hospital equipped to treat posttonsillectomy bleeding during the healing phase.

9. Good hydration and appropriate rehydration in volume-depleted children improve recovery.

10. Children who bleed after tonsillectomy should undergo physical examination and prompt surgical care if there has been significant bleeding or if they are at risk for additional bleeding.

Things We Don’t Know (and Really Should)

1. Whether some children with recurrent sore throats benefit more from tonsillectomy than the general population (ie, would continue to have severe symptoms for years without surgery)

2. Whether tonsillectomy is the best choice for poorly validated indications (eg, pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections; periodic fever, aphthous stomatitis, pharyngitis, and adenitis; halitosis; febrile seizures; and dental malocclusion)

3. Whether partial tonsillectomy is equivalent to total tonsillectomy for long-term control of sore throat and upper airway obstruction and, if so, how much tonsil can be spared without compromising results

4. What tonsillectomy instruments result in best healing, least pain, and fewest bleeding complications

5. Whether some topical or injected agents can lessen pain after surgery

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I thank our patient, B.S., who enthusiastically tolerated daily serial photography to help pediatricians.

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# Tonsillectomy Care for the Pediatrician

Glenn Isaacson

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