



Infectious indications for tonsillectomy

Christopher M. Discolo, MD^a, David H. Darrow, MD, DDS^b,
Peter J. Koltai, MD, FACS, FAAP^{a,c,*}

^a*Department of Otolaryngology and Communicative Disorders, Desk A71,
Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195, USA*

^b*Department of Otolaryngology–Head & Neck Surgery and Pediatrics,
Eastern Virginia Medical School, Children's Hospital of The King's Daughters,
825 Fairfax Avenue, Norfolk, VA 23507, USA*

^c*Section of Pediatric Otolaryngology, Cleveland Clinic Foundation,
9500 Euclid Avenue, Cleveland, OH 44195, USA*

Tonsillectomy remains the most common major operation performed on children in the United States [1]. Tonsillectomy has the potential—when performed for the proper indications—to improve quality of life, and in certain patients, the surgery can be life saving. Recent studies looking at the infectious indications for tonsillectomy have better identified those patients who are most likely to benefit from surgery. Surgery, however, always is performed on an individual basis, and treating physicians need to consider many factors before recommending tonsillectomy. This article reviews the major infectious indications for tonsillectomy and presents recent data that helps to identify those patients who are most likely to benefit from surgery.

History of tonsillectomy

Surgical removal of the tonsils has a long and somewhat controversial history. In the first century AD, Cornelius Celsus described the removal of inflamed tonsils using a finger to dissect out the tonsil from its fossa [2]. After removal was complete the patient's oropharynx was washed with vinegar and medication was applied to help reduce bleeding. Two thousand years later, surgeons still face the prospects of postsurgical bleeding, which can be life threatening.

* Corresponding author. Department of Otolaryngology and Communicative Disorders, Desk A71, Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195.

E-mail address: koltai@ccf.org (P.J. Koltai).

As time went by, surgeons developed instruments to help facilitate removal of the tonsils. Surgical procedures were limited by a lack of anesthesia and thus surgeons had to operate as quickly as possible. Early instruments were modifications on tools used to perform surgery on the uvula. Eventually snares, forceps, and guillotine-type instruments were developed, which later became the basis for modern tonsil surgery.

Today, numerous techniques for tonsillectomy are available to the otolaryngologist. These include the traditional cold-knife technique as well as newer techniques, which include electrocautery, laser, and harmonic scalpel dissection among others. The basis for all of these procedures, when performed for infectious indications, is identification of the tonsil capsule and careful dissection in the plane between the capsule and the surrounding musculature of the pharynx with attention to meticulous hemostasis.

Although the techniques for removal of the tonsils have changed over the years, the indications for the performance of the surgery have not changed significantly, with some exceptions. Whereas infectious etiologies were the number one indication for tonsillectomy early in the twentieth century, today most tonsillectomies are performed to treat tonsillar hyperplasia causing upper airway obstruction. The number of tonsillectomies performed in the United States has decreased by half from the 1 to 2 million surgeries that were performed annually in the 1960s and 1970s [1,3]. The improved understanding of the appropriate indications for tonsillectomy that has emerged in the last 30 years is responsible for that decline.

Anatomy of the tonsils

The palatine or faucial tonsils are paired structures located on the lateral walls of the oropharynx. In general, the tonsils remain confined to the oropharynx; however, they can enlarge to the point where they encroach into the nasopharynx or, more commonly, they extend inferiorly to the region of the hypopharynx. Clinically significant tonsillar tissue may be missed easily on physical exam if the inferior pole of the tonsils is not visualized.

The tonsils sit within a fossa between the anterior (palatoglossus muscle) and posterior (palatopharyngeus muscle) tonsil pillars, which can be seen on physical exam. The tonsil possesses a capsule, which is attached at its deep surface to the fascia overlying the musculature of the pharynx. It is this superior constrictor muscle that is exposed following tonsillectomy and is believed to be responsible for a majority of the postoperative pain associated with this procedure. Sensation to the tonsil is supplied predominantly by the glossopharyngeal nerve and referred otalgia is not uncommon following tonsillectomy or during acute infections. The tonsils are rich in blood supply, with several branches of the external carotid artery supplying blood to the region.

The tonsils lack afferent lymphatics and, as a consequence, do not function as lymph nodes. Histologically, the tonsils have 10 to 30 invaginations, or crypts,

that are lined with specialized antigen-processing squamous epithelium [4]. Antigens that are inhaled or ingested will pass in proximity to, and be sampled by, the tonsils. In a sense the tonsils act as “immunologic radar” and as a site of antigen presentation. The jugular and deep cervical lymph node chains are the predominant source of lymphatic drainage for the tonsils, resulting in the propensity for tonsil infections to lead to cervical adenitis.

Acute pharyngotonsillitis

Symptoms of sore throat, dysphagia, and fever, along with tender cervical lymphadenopathy, are consistent with a diagnosis of acute pharyngotonsillitis, which is one of the most common reasons for a child to visit a primary care physician. Symptoms are usually sudden in onset and can include nausea, vomiting, headache, and abdominal pain [5]. Physical exam often will reveal tonsils that are erythematous and inflamed, and possibly may have exudates. Close inspection of the tonsillar crypts often will reveal obstruction in the form of inspissated secretions.

It is estimated that approximately 50% of cases of acute pharyngotonsillitis have a viral etiology. Common pathogens include rhinovirus, Epstein-Barr, adenovirus, parainfluenza, influenza type A and B, and others. In 15% to 20% of cases, a primary bacterial pathogen—most commonly a streptococcal organism—is recovered, but other pathogens, such as *Neisseria gonorrhoeae*, also can cause pharyngitis.

Group A streptococcal pharyngotonsillitis

The most common cause of bacterial pharyngitis in children is the group A beta-hemolytic streptococcus (GABHS). Most pharyngitis that is caused by GABHS is benign and self-limited, although the potential for suppurative and nonsuppurative complications exists. Thus, appropriate diagnosis and treatment is warranted when GABHS infection is suspected.

“Strep throat” is a very common disease among adolescents and children, with an incidence that peaks during the winter and spring months. It tends to be uncommon in children less than 3 years of age. Transmission generally occurs through droplet spread; thus, close contact between persons, such as in the military, college dormitories, or large families tends to increase risk. Fomites and household pets are not believed to be vectors of transmission [6]. The incubation period is generally about 2 to 5 days and people are most infectious early on in the course of the illness. Early antibiotic therapy will suppress rapidly the infection and lower the risk of transmission within 24 hours, allowing children to return to school. Untreated patients usually will improve in 3 to 5 days, unless a complication develops.

Certain individuals, “carriers,” will harbor the bacterium asymptotically, even following treatment, but are not likely to transmit the disease to others [7].

Because carriers will have a consistently positive throat culture, distinguishing an acute GABHS infection from a viral pharyngitis requires a rise in anti-streptolysin O titer. Given the uncertainty imposed by the carrier state, the American Academy of Pediatrics recommends that testing for the presence of GABHS not be performed in children with signs and symptoms highly suggestive of a viral illness such as cough, coryza, conjunctivitis, hoarseness, oral ulcerations, and diarrhea [6].

The presence of the carrier state alone is not a clear indication for treatment, especially if asymptomatic. There are certain circumstances in which treatment of the carrier state is desirable, including carriers in families with a history of rheumatic fever, a personal history of glomerulonephritis, carriers in schools experiencing GABHS epidemics, carriers who are hospital workers, and those who are present in families experiencing “ping-pong” spread of disease. In cases refractory to treatment, tonsillectomy should be considered.

Complications of GABHS infection

Complications of GABHS infections are classified as nonsuppurative and suppurative. Rheumatic fever and acute glomerulonephritis are the major non-suppurative complications, generally occurring 1 to 3 weeks after infection. The incidence of rheumatic fever has declined in the United States; nevertheless outbreaks in the last 10 to 15 years have emphasized the importance of treatment. The risk of these complications is highest in pharyngeal GABHS infections. The risk of rheumatic fever following GABHS infection is approximately 0.3% in endemic situations and 3% if there is an epidemic situation [5].

Recently, a clinical entity known as pediatric autoimmune neuropsychiatric disorder associated with group A streptococcal infection (PANDAS) has been described [8]. The pathophysiology of this condition is thought to be similar to that of Sydenham’s chorea, in which antineuronal antibodies are felt to cross-react with regions in the basal ganglia, producing behavioral and motor disturbances [9]. PANDAS is associated with the abrupt onset of severe exacerbations of obsessive-compulsive type behaviors or tics in children with GABHS infection. Children are relatively symptom free when no GABHS infection is present or when treated with appropriate antimicrobials and thus this condition has an episodic clinical course. Immunomodulatory treatments and the efficacy of GABHS antimicrobial prophylaxis and tonsillectomy are currently being investigated [10].

Suppurative complications of GABHS pharyngitis include peritonsillar abscess, retropharyngeal abscess, and cervical adenitis/abscess. Consequent to the risk of complications developing from untreated GABHS infection, early diagnosis and appropriate antimicrobial treatment is the standard of care. Attempts to study the predictive value of various signs and symptoms have not been particularly reliable [11]. In general, the signs and symptoms most consistent with a true GABHS infection are fever, pharyngeal exudates, and adenopathy.

Diagnostic testing

Obtaining a throat culture is still a widely accepted method of identifying GABHS infection, although some have questioned its cost effectiveness [12]. A proper throat culture is obtained by swabbing the region of both tonsils, tonsillar crypts, and the posterior pharyngeal wall. The swab is then placed on a plate that contains agar composed of 5% sheep's blood as well as a bacitracin disk, which will inhibit the growth of GABHS.

More rapid "office" diagnostic techniques have been developed over the last 20 years based on nitrous acid extraction of the group A carbohydrate antigen from the bacterium. These tests, as with formal throat cultures, hinge on the acquisition of a good-quality pharyngeal swab and have a specificity of 85% to 90% with a sensitivity of 60% to 90% [13,14]. Therefore, in a child with a negative rapid strep test and a high clinical suspicion for GABHS infection, a formal throat culture should be performed; on the other hand, a positive rapid test does not require throat culture confirmation.

The definitive tests to determine GABHS infection rely on serology. Streptolysin O and streptolysin S are two hemolysins produced by GABHS, but only the former is antigenic in humans. Antistreptolysin O (ASO) titers generally will rise within 1 week of infection. These titers will peak at approximately 3 to 6 weeks after infection, followed by a more variable decline in serum levels [15,16]. The comparison of acute and convalescent sera is the preferred method of serology; however, it is not always possible to obtain both samples. A single isolated elevated titer also can be assumed to represent a recent infection [17]. A chronic GABHS carrier will not experience a rise in streptococcal antibody titer when acute and convalescent sera are compared [7]. A patient with a suspected nonsuppurative complication of infection, such as acute rheumatic fever, may not have a positive throat culture due to the latent period from the actual acute infection. In these cases, serology is of paramount importance to confirm the diagnosis of the recent GABHS infection. The highest antibody levels generally are found in children from the ages of 6 to 15 years old, secondary to increased exposure among this age group, and in those geographic regions in which the disease is most common [18,19].

Treatment

Although a number of drugs have activity against GABHS, a 10-day course of penicillin V remains the regimen of choice to treat GABHS-induced pharyngotonsillitis [6]. Amoxicillin is commonly substituted for penicillin, although there is no microbiologic advantage to this medication. Although uncomfortable, intramuscular benzathine penicillin G given as one dose is effective treatment and will eliminate the compliance concerns associated with oral regimens. First-generation cephalosporins are alternatives to penicillin therapy and can be used in the penicillin-allergic patient, although there is up to 15% chance of a concom-

itant cephalosporin allergy [6]. Traditionally, erythromycin was used in patients who were allergic to penicillin; however, newer-generation macrolides, such as azithromycin and clarithromycin, now are available. There is some recent evidence of increasing GABHS resistance to macrolide antibiotics [20]. Oral clindamycin is effective against GABHS and often is used in cases of GABHS carrier states or antibiotic failures. Sulfonamides and tetracyclines are not recommended treatments for GABHS infection [6].

Although GABHS was traditionally thought of as the only bacterium associated with bacterial pharyngitis, newer research is demonstrating the importance of other organisms. Viruses, although not likely to be the sole etiologic factor in chronic tonsillar disease, most likely play a role in the development of tonsillar inflammation, crypt obstruction, and secondary bacterial infections.

There is contemporary concern that treatment failures with penicillin therapy have been increasing [21]. Some reports list failure rates as high as 25% to 30% [22–24], and a number of mechanisms have been proposed to explain this. Penicillin is not effective in eradicating GABHS from the pharynx of a chronic carrier. Therefore, giving a 10-day course of penicillin to a chronic carrier with a presumed acute GABHS infection will result in a positive throat culture posttreatment. The exact role that this mechanism plays in penicillin treatment failures needs to be elucidated. Another possible cause of penicillin failure is the inhibitory activity of normal pharyngeal flora, such as *Streptococcus salivarius*. These bacteria represent a natural defense against other, potentially dangerous, organisms. Children who become GABHS carriers seem to possess pharyngeal flora with less inhibitory action against GABHS than do children who do not become chronic carriers [25]. After treatment with penicillin, there is a quantitative decrease in the pharyngeal flora and a qualitative decrease in their anti-GABHS activity [26]. In addition, aerobic and anaerobic bacteria within the pharyngeal flora that produce beta-lactamase can make penicillin therapy ineffective [27,28].

Indications for tonsillectomy

Although recurrent episodes of pharyngotonsillitis generally are accepted as an appropriate indication for tonsillectomy, there is no consensus as to which children would benefit from such surgery. As mentioned earlier, tonsillectomy has gone through periods of enthusiasm as well as uncertainty with regard to its overall benefit in children. There is a natural decline in the frequency of upper respiratory infections as children age and many children will “outgrow” their recurrent throat infections. The development of antibiotic therapy has greatly influenced the ability to treat recurrent throat infections and prevent the serious sequelae that can arise from them. Historically, there was a mistaken concern that children who had their tonsils removed were at higher risk of developing poliomyelitis. Some published studies indicated that the removal of the tonsils was of little, if any, benefit in children [29].

Studies performed at the University of Pittsburgh have sought to answer many of the questions regarding the efficacy of tonsillectomy in children afflicted with recurrent pharyngotonsillitis. The first of these studies [30], completed in 1982, studied children severely affected by tonsillar disease. Children with histories that met entry criteria but lacked official documentation of recurrent infections were followed prospectively and only entered into treatment arms if they had two infections that matched or exceeded those described in their histories. A number of these children did not go on to develop the severity of infections necessary for entry into the study and the authors concluded that undocumented infections were not adequate predictors of future infections nor sufficient indication for tonsillectomy [31].

To be entered into the study [30], children were required to have had at least three episodes of tonsillitis in each of the prior 3 years, or five episodes in each of 2 years, or seven episodes in 1 year. Additionally, one or more of the following four criteria must have characterized each episode: fever, cervical adenopathy, tonsillar exudates, and positive culture for GABHS. Adequate antimicrobial treatment must have been administered for suspected or proven GABHS infections. Each episode was required to be confirmed by examination and described in a clinical record when it occurred. A total of 187 children were entered into the study and divided into surgical and nonsurgical arms. Of these children, 96 were assigned to a group based on strong family preference (nonrandom assignment) and the remaining 91 were randomly assigned. Patients could be transferred from one arm of the study to another based on familial preference. There were 13 postoperative complications (14%) in the surgical arm, all of which were self-limited and easily managed. Children were followed closely with careful documentation of the frequency and severity of any further throat infections. Quality of life issues, including time away from school and total days spent with a sore throat, were also monitored. In the first and second years of follow-up, those children who had received tonsillectomy had fewer episodes of throat infection when compared with the children in the nonsurgical arm; this difference was statistically significant. The third year of follow-up resulted in a trend (although not statistically significant [$P=0.001$]) toward improvement in the surgical arm. The nonsurgical group experienced a decline in the frequency of throat infections in each of the follow-up years. Those entered into the surgical arm tended to suffer from throat infections for a shorter duration than did those in the nonsurgical group, which could, in part, be responsible for an apparent benefit of surgery. Cases of infection defined as moderate or severe were rare in both groups and when the total number of days with a sore throat was analyzed, there was no significant difference between surgical and nonsurgical arms.

This study [30], although the best available, is somewhat limited and open to some inherent bias. Not all patients were randomly assigned to treatment arms. Families may have assumed that the surgical treatment arm would be efficacious and therefore may have had reduced awareness of any illnesses that developed postoperatively. Despite attempts to perform all surgeries as quickly as possible, some children in the surgical arm may have benefited from the seasonal

variations in pharyngitis. On the other hand, children who were switched into the surgical arm by their families after the study began tended to be more severely affected, and those children with milder disease who underwent surgery were more likely to be lost to follow-up—factors that would serve to underestimate the efficacy of tonsillectomy. The authors believed that the net effect of the bias in their study was to underestimate the efficacy of tonsillectomy to treat children severely affected by recurrent throat infections.

Despite statistically significant differences in frequency of throat infections between the surgical and nonsurgical arms for the first 2 years and a trend toward fewer infections in the third year, it remains controversial whether tonsillectomy is indicated in all children who meet the designated criteria. Pediatricians and surgeons should take into account factors such as the risks of surgery, the medical history of the child, school absences from illness, preferences of the parents and child, cost and access to health care services among others. It should be emphasized that all cases should be dealt with on an individual basis.

Entry criteria for the above trial were strict so as to enroll only those children who were severely affected by recurrent throat infections. Because these children seemed to benefit from surgery, the authors conducted a second trial [32], the results of which were recently published, to assess the role of tonsillectomy and adenotonsillectomy in the treatment of children who were moderately affected by recurrent throat infections. In this study, inclusion criteria were less stringent with regard to the frequency, severity, and documentation of previous infections. A total of 328 children were enrolled in the study. Those without indication for adenoidectomy were assigned to receive adenotonsillectomy, tonsillectomy, or no surgery (control). Children with indications for adenoidectomy were assigned to receive adenotonsillectomy or nonsurgical management (control). The results of this study once again demonstrated a benefit obtained in the surgical group with regard to the frequency of infections, although the benefit was only marginal—about one episode per year. Once again, subjects who were managed nonsurgically only rarely developed severe cases of pharyngitis during the study. In this study [32], the authors did not believe that the benefits of tonsillectomy were significant enough to justify the cost and risks of surgery.

Although many articles have been published about the efficacy of tonsillectomy for recurrent tonsillitis, the two studies described above [30,32] are the only ones that methodologically have been the most sound; however, both were imperfect and the results were less than conclusive. We are thus left with little real guidance and many questions. The American Academy of Otolaryngology–Head and Neck Surgery states that children with three or more infections of the tonsils or adenoids per year, despite adequate medical therapy, are candidates for tonsillectomy [33]. In our own practice, we use the following criteria: seven documented tonsil infections in any 1 year, five documented tonsil infections in each of 2 consecutive years, and three documented tonsil infections in each of 3 consecutive years. Tonsil infections are defined by three of the following criteria: fever ($>101^{\circ}\text{F}$), dysphagia, cervical adenopathy, positive GABHS

culture, and tonsillar exudates. We have noted that few children actually meet these criteria, but when they do, tonsillectomy appears to be efficacious.

Peritonsillar abscess

Located between the capsule of the tonsil and the musculature of the lateral pharyngeal wall is the peritonsillar space, which contains loose connective tissue. Infection within this space can lead to peritonsillar cellulitis or peritonsillar abscess (PTA), a complication of tonsillitis [34]. Children with PTA almost invariably will have severe sore throat with associated odynophagia, dysphagia, and a corresponding decrease in oral intake and possible dehydration. Some will have trouble handling their own secretions and will be seen drooling, a sign that should be taken seriously because of the possibility of impending airway obstruction. The voice is often muffled, and the patient will often have trismus, secondary to inflammation, in the region of the pterygoid muscles, making examination and potential treatment difficult. Physical examination reveals tonsillar asymmetry, generally with a bulge seen on the side of the abscess. Classically, the tonsil is pushed medially and rotated inferiorly; however, the appearance of the tonsil itself may be rather normal. The uvula is edematous and generally pushed to the side opposite that of the abscess. Although usually a clinical diagnosis, a CT scan of the neck with intravenous contrast will demonstrate a phlegmon or, more commonly, a ring-enhancing abscess in patients in whom clinical diagnosis is not possible or there is suspicion of other neck space involvement. The status of the airway is of paramount importance in the decision to send a patient to the CT scanner. Intraoral ultrasound techniques have been reported to be helpful in identifying the abscess and guiding needle aspiration; however, the use of intraoral ultrasound is not widely in practice today [35,36].

Medical aspects of treatment should be supportive with intravenous hydration and pain control. An antibiotic with activity against *Staphylococcus aureus*, GABHS, and oral anaerobic organisms should be chosen.

Definitive treatment requires drainage of the abscess. Options for children with PTA include needle aspiration, formal incision, and drainage or immediate tonsillectomy (“quinsy” or “hot” tonsillectomy). Following needle aspiration or incision and drainage, an “interval” tonsillectomy may be considered several weeks later. The type of initial treatment depends on several factors including the child’s age and level of cooperativeness, past medical history, a history of recurrent tonsillitis, a history of PTA in the past, and the status of the airway. In a cooperative child, even as young as 6 years of age, a needle aspiration is the least invasive option and has been shown to be 75% effective as the first line treatment for PTA [37].

The role of tonsillectomy in the treatment of PTA is somewhat controversial. Historically, PTA was considered an absolute indication for tonsillectomy. In a study of 29 children with PTA, however, only 7% of children developed a second abscess [38]. In another study (a meta-analysis), the average recurrence rate among the 526 patients studied was 17% [29]. Based on these reports,

contemporary thinking is that for a child with only one episode of PTA, tonsillectomy should be held unless there is a history of recurrent tonsillitis of a frequency that warrants the surgery. In a child with PTA and chronic tonsillar disease that would warrant tonsillectomy on its own, a quinsy tonsillectomy can be considered to reduce the number of invasive procedures. If the child has significant airway obstruction or if the abscess has spread to other neck spaces (lateral pharyngeal space) and less invasive methods have failed, then quinsy tonsillectomy may be performed. Recurrence of PTA may be predicted based on a history of two to three episodes of acute tonsillitis in the year before the initial episode. Such a history has been elicited in 20% to 30% of patients with PTA; it is recommended that these individuals be considered for tonsillectomy following management of PTA [39].

Chronic tonsillitis

Although somewhat poorly defined, most would consider a sore throat of at least 3 months' duration that is associated with tonsillar inflammation to be the definition of chronic tonsillitis [40]. This condition also may be associated with halitosis and persistent tender cervical adenopathy. Other clinical entities, such as gastroesophageal reflux or lingual tonsillitis, can cause similar symptoms and may need to be ruled out. The clinical examination of the tonsils of patients with chronic tonsillitis often is unremarkable. Subtle signs—such as a decrease in the number of crypts or a smooth, glistening tonsillar capsule—can be a clue to this condition. A 3-week to 6-week therapeutic trial of an antibiotic effective against anaerobes and beta-lactamase producing organisms, such as clindamycin or amoxicillin clavulanate, has been reported to be effective in treating this condition. No prospective randomized clinical trials have evaluated the efficacy and safety of tonsillectomy in chronic tonsillitis. In patients with chronic sore throat who also experience recurrent acute episodes that meet current clinical criteria, the performance of a tonsillectomy is a reasonable option [41]. The American Academy of Otolaryngology–Head and Neck Surgery considers chronic tonsillitis unresponsive to medical therapy that results in persistent foul taste or halitosis or recurrent tonsillitis associated with the GABHS carrier state that has not responded to appropriate antimicrobial therapy to be indications for surgery [33]. Also, if there is symptomatic airway obstruction in the face of chronic tonsillitis, then tonsillectomy is indicated. In the case of chronic tonsillitis without recurrent infection or obstruction, the physician must assess each individual patient's illness when making a decision regarding potential surgery.

Epstein-Barr virus infection

Epstein-Barr virus (EBV) is a member of the herpes family of viruses that may cause acute tonsillitis and adenotonsillar hyperplasia in children. It is the

organism responsible for all heterophil-positive and most heterophil-negative cases of infectious mononucleosis. Progressive infection by EBV resulting from inherited or acquired disorders of immunity also may lead to lymphoma and other lymphoproliferative disorders.

Among populations studied around the world, serologic reactivity to EBV antigens has been demonstrated in 80% to 95% of adults [42]. Primary infection by EBV occurs during the second and third decade in developed nations and regions of high socioeconomic status; however, young children are more commonly affected in developing countries and regions of low socioeconomic status. When the virus is acquired at a younger age, symptoms generally are less severe. Infected individuals transmit EBV by way of saliva exchanged during kissing or other close contact.

EBV preferentially infects and transforms human B lymphocytes. The virus enters the cell by attaching to a receptor designed for proteins of the complement chain. Its genetic material is transported by vesicles to the nucleus, where it exists as a plasmid and maintains a “latent” state of replication. An incubation period of 2 to 7 weeks follows initial exposure, during which EBV induces a proliferation of infected B cells. This process subsequently is countered by a potent cellular immune response, characterized by the appearance of “atypical” cytotoxic T lymphocytes in the blood. In immunosuppressed hosts, this T-lymphocyte response is limited, and the resulting uncontrolled proliferation of B cells may result in hyperplasia of Waldeyer’s ring and other lymphoid tissues, as well as a variety of other lymphoproliferative disorders.

Infectious mononucleosis is characterized by a prodrome of malaise and fatigue, followed by the acute onset of fever and sore throat. Physical examination typically reveals enlarged, erythematous palatine tonsils that, in most cases, have yellow-white exudate on the surface and within the crypts. Cervical adenopathy is present in nearly all patients, and involvement of the posterior cervical nodes often helps to distinguish EBV infection from that caused by streptococcus or other organisms. Between the second and fourth weeks of illness, approximately 50% of patients develop splenomegaly, and 30% to 50% develop hepatomegaly [43]. Rash, palatal petechiae, and abdominal pain may also be present in some cases. The fever and pharyngitis generally subside within about 2 weeks, whereas the adenopathy, organomegaly, and malaise may last as long as 6 weeks. It has been suggested that infection by EBV may predispose to future bouts of recurrent tonsillitis and peritonsillar abscess [43]. The virus may persist in the pharynx for months or years as a potential source of reinfection or transmission.

Patients with inherited or acquired immunodeficiency such as AIDS, X-linked lymphoproliferative disorder, and posttransplant immunosuppression may develop serious sequelae as a result of unchecked B-cell proliferation. Hodgkins and non-Hodgkins lymphomas, Burkitt’s lymphoma, and nasopharyngeal carcinoma have been linked to such disorders. There also is growing evidence that immunosuppression may lead to significant airway obstruction due to adenotonsillar hyperplasia in a large number of EBV-infected individuals [44].

Diagnosis of acute infectious mononucleosis usually can be made on the basis of clinical presentation, absolute lymphocytosis, the presence of atypical lymphocytes in the peripheral smear, and detection of Paul-Bunnell heterophil antibodies. The latter is the basis of the monospot test, and the Mono-Diff and Mono-Test assays (Wampole Laboratories, Princeton, NJ), which test for agglutination of horse erythrocytes. Children under 5 years of age may not develop a detectable heterophil antibody titer; in these patients, titers of IgM and IgG antibodies to the viral capsid antigen (VCA) will be elevated, and antibody titer to the “early antigen” complex begins to rise. Antibodies to EBV nuclear antigen appear late in the course of the disease and, like VCA-IgG, remain elevated for life.

In most cases, rest, fluids, and analgesics are adequate to manage the symptoms of infectious mononucleosis. In more symptomatic patients, particularly those with respiratory compromise due to severe tonsillar enlargement and those with hematologic or neurologic complications, a course of systemic steroids may hasten resolution of the acute symptoms. Placement of a nasopharyngeal trumpet or endotracheal intubation may be necessary on rare occasions when complete airway obstruction is imminent. The use of antiviral agents in infectious mononucleosis has yielded disappointing results [45,46].

Adenotonsillectomy may play an important role in the management of individuals with chronic EBV infection. In patients severely affected by recurrent pharyngotonsillitis, adenotonsillectomy may provide symptomatic relief by eliminating the target organs. In immunosuppressed patients with adenotonsillar hyperplasia, the procedure reduces obstruction of the upper airway and also provides biopsy material for the diagnosis of occult malignancy and disorders such as posttransplantation lymphoproliferative disorder, in which early intervention may affect the course of the disease.

Summary

Tonsillectomy is the most common major surgery performed on children in the United States. Recurrent throat infections of either bacterial or viral etiology can cause significant morbidity and decreased quality of life, and potentially lead to life-threatening complications.

When performed in the proper patient, tonsillectomy can be a highly effective procedure. Recent clinical trials have sought to better define the appropriate infectious indications for surgery. Despite the improved understanding gained from these studies, the decision to operate always must be made on an individual basis with the primary care physician, surgeon, patient, and family all involved in the decision-making process.

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