

# TONSILLECTOMY/ADENOIDECTOMY: INDICATIONS, COMPLICATIONS, POST-TONSILLECTOMY BLEEDING, MORBIDITY AND MORTALITY

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## **SUMMARY:**

*Tonsillectomy is one of the most frequently performed surgical procedures. In many countries, it is performed mainly as an out-patient procedure in order to reduce costs and for the patient's convenience. The rate of post-tonsillectomy bleeding is about 3 percent. Death in children following adenoidtonsillectomy is very rare. Its main causes are hemorrhage and aspiration. However, since the procedure is usually performed to improve the quality of life of health, mostly at youngsters, individuals, any mortality is unacceptable. Bleeding and death are usually sudden and unpredictable.*

**Key Words:** adenoidtonsillectomy, indications, mortality

## **AMIGDALECTOMIE/ADENOIDECTOMIE: INDICAȚII, COMPLICAȚII, HEMORAGIE POST-AMIGDALECTOMIE, MORBIDITATE ȘI MORTALITATE**

### **Rezumat:**

*Amigdalectomia (tonsilectomia) este una din cele mai frecvente proceduri chirurgicale efectuate. In multe țări această intervenție se efectuează la persoane nespitalizate ordonanță pentru a reduce cheltuielile și pentru pacienți convenienți. Incidența hemoragiei post-amigdalectomie este în jur de 3%. Incidența deceselor la copii după denoidamigdalectomie este foarte rară. Cauzele principale sunt hemoragia și aspirația. Totuși, de când procedura este realizată de regulă de a îmbunătăți calitatea vieții de sănătate, mai ales la tineri, individuali, oricare mortalitate este inacceptabilă. Hemoragia și decesul sunt de regulă subite și neprevizibile.*

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Palatine and nasopharyngeal tonsils are lymphatic flesh clusters of tissue of the respiratory and digestive tract's epithelium (1). Classification by site includes palatine, lingual and pharyngeal tonsils. They have important role in the body's immune system, once they are near the entrance to the breathing passages where incoming antigens may be aspirated or ingested (2).

1. The palatine tonsils are the lateral walls that compose the bulk of the so-called Waldeyer's ring of lymphatic tissue (1). They are coated by non-keratinous stratified epithelium, as an extension of the oral pharyngeal tissue, including 30 deep crypts that invaginate into the parenchyma, in which lymph nodes

are found with the germ centers responsible for b-lymphocyte production (3). In addition to nodes, debris of epithelial cells desquamations, alive and dead lymphocytes, as well as bacterium may be present in the crypts. In cases of acute tonsillitis, collection of pus may be observed (4). They are coated by fibrous and dense capsule, separating them from a deeper consecutive tissue (2). This type of tonsils originated from the second pair of pharyngeal pouches, where endodermis bears the covering epithelium and mesenchymal structure gives origin to the lymphoid tissue (1).

Palatine tonsils has classified scheme proposed by Brodsky (5): grade 0 – tonsils inside the tonsillar fossa

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with no air obstruction; 1+ – tonsils slightly out of the tonsillar fossa presenting 25% air obstruction; 2+ – tonsils presenting 25-50% air obstruction; 3+ – tonsils presenting 50-75% air obstruction; 4+ – tonsils presenting > 75% obstruction.

**2. Pharyngeal tonsil** (Luschka's tonsil) is a single entity and is located in the upper posterior pharynx; it consists of flat longitudinal folds, with sero-mucous glandular ducts opening on the base. They don't present crypts and their capsule is finer and incomplete (1). They are covered by two types of epithelium: ciliated columnar pseudostratified with goblet cells and non-keratinous stratified epithelium. This may appear alone or as an associated condition, the latter being the most frequent (2).

**3. Lingual tonsils** are located within the base of the tongue and are formed by numerous and small structure. They are similar to palatine tonsils, however they do not present capsular involvement (1).

During life, palatine and tongue tonsils may go through morphological alterations, becoming enlarged due to lymph follicles of the germ center; or histological changes resulting from recurrent infections, among which some are indicative of tonsillectomy (4).

Tonsillectomy and adenoidectomy are among the most commonly performed major operations in the United States with the more than 400 000 procedures performed annually (6). When it is performed by proper indications, these operations improve quality of life and are sometimes life saving (7).

Indications for adenotonsillectomy involve a relative excess for pharyngeal lymphoid tissue. In most cases, the tissue is hyperplastic (not hypertrophic) and occupies a disproportionate amount of space in the upper airway, especially in preschool children (8).

### **Indications of tonsillectomy are complex.**

#### **1. Recurrent pharyngotonsillitis.**

Removal of the tonsils to prevent infection has been popular for decades. Throat infection was defined to include one of the following: temperature above 38.5°C, cervical adenopathy greater than 2 cm, presence of tonsillar exudate, or positive culture for group A b-hemolytic streptococcus. No other attempts were made to determine the causes of infections (7). Actinomyces sp. colonies are a common agent in the tonsillar tissue; it may not be routinely analyzed in the pathological specimens (9).

#### **2. Chronic tonsillitis.**

Chronic tonsillitis is poorly defined but may be the appropriate term for sore throat of a least 3 month's

duration accompanied by tonsillar inflammation. Such cases are unusual and no clinical trial that would help guide their medical management have been performed. Tonsillectomy is a reasonable consideration in patients with no response to aggressive antibiotic therapy (7).

#### **3. Peritonsillar abscess.**

One episode of peritonsillar abscess can managed effectively by needle aspiration (10,11), incision, and drainage or quinsy tonsillectomy. However, in young or poorly cooperative patients or those in whom an abscess has been inadequately drained, tonsillectomy is curative and eliminates any chance of recurrence. Although the efficacy of tonsillectomy in preventing recurrent peritonsillar abscess has not been compared with close monitoring in a prospective, controlled trial, it has been addressed retrospectively (12,13). The recurrence rate of peritonsillar abscess is 10-15% (12), which suggest that tonsillectomy is not indicated after aspiration or incision and drainage in most cases. Twenty percent to 30% of patients with peritonsillar abscess have such a history and they should be considered for tonsillectomy after the abscess has been treated (12).

#### **4. Streptococcal carriage.**

Patients who have been exposed to group A b-hemolytic Streptococcus may carry the organism asymptotically, even after adequate antimicrobial therapy. Reported carriage rates range from 5% to 40% (14). However, James et al. (15) found that infection spread to family members from carriers only 9% of the time and only 40% of those infected developed clinical disease. Thus, only 3.5% of carriers are responsible for spreading clinical disease in their families. Treatment of an asymptomatic carrier is desirable when the carrier's family have a history of rheumatic fever. Administration of an additional antibiotic, has shown some efficacy. In refractory cases, tonsillectomy should be considered (7).

#### **5. Hemorrhagic tonsillitis.**

Recurrent bleeding from prominent tonsil vessel can be controlled by cautery in most patients. However, patients who have recurrent bleeding or cannot be treated in the office setting because of poor cooperation may require tonsillectomy if bleeding becomes a nuisance or causes a marked reduction in hemoglobin or hematocrit level (7).

Indications for an adenoidectomy include:

- a. Recurrent or chronic rhinosinusitis or adenoiditis. The relations among chronic rhinorrhea, chronic adenoiditis, and recurrent rhinosinusitis are poorly understood. In some patients with obstructive adenoid tissue, stasis of secretions in the nasal cavity probably predisposes them to sino-nasal

infection (7). However, Lee and Rosenfeld (16) found a correlation of sinus-symptom scores with quantitative bacteriological findings in the adenoid core and not by adenoid size. Some data indicate that adenoidectomy may be effective in children with persistent and recurrent sino-nasal problems and most clinicals favor adenoidectomy before consideration of endoscopic sinus surgery (17,18). Weinberg et al. (19) suggested that children with recurrent acute symptoms may benefit more from adenoidectomy than those with chronic sino-nasal disease.

- b. Otitis media. The proximity of the adenoidpad to the eustachian tube has prompted several studies of the possible benefits of adenoidectomy and adenoidtonsillectomy in managing otitis media. The effect of the adenoid on the eustachian tube is more likely to be regional inflammation or infection than direct compression (7). Since 1980, an increasing amount of evidence has indicated that adenoidectomy (20,21) and perhaps, adenoidtonsillectomy (22) have a role in the management of both recurrent acute and chronic otitis media. It was suggested that adenoidectomy to be considered with placement of the first set of tubes in children with nasal obstruction or recurrent rhinorrhea or when a second set of tubes is necessary (7). In children with cleft palate, adenoidectomy should be performed only when the otitis is relentless in such cases, an inferior strip of adenoid tissue should be preserved to avoid velopharyngeal insufficiency (VPI). Adenoidtonsillectomy has additional morbidity and less support. Tonsillectomy is a reasonable additional procedure in patients with airway obstruction or recurrent pharyngitis (7).

### **Complications of tonsillectomy**

Tonsillectomy with or without adenoidectomy is one of the most commonly performed surgical procedures in the United States. Approximately 250 000 adenoidtonsillectomies are performed in the US each year (23). The technique of performing tonsillectomy, dissection of all tonsillar tissue free of the underlying pharyngeal constrictor muscle, has not been changed significantly in 60 years. The most common serious complication of tonsillectomy is delayed hemorrhage, which occur in 2-4% of all patients (24). In addition, an expected sequela of the procedure is pain, which typically lasts from 7 to 10 days and it can be moderate to severe in intensity (25). It is generally accepted that

some patients will require readmission to the hospital for control of their pain and management of dehydration owing to poor oral intake of fluids secondary to this pain.

In attempt to mitigate these unwanted consequences, various modifications of standard tonsillectomy have been promoted over the years. These include dissection of the tonsil using monopolar or bipolar electrocautery, laser, harmonic scalpel and bipolar radiofrequency. When first introduced, all of these techniques were touted to cause less pain or have a lower incidence of bleeding than traditional sharp dissection. In most cases, as the techniques became more widely used, these promises were not fulfilled.

The intracapsular tonsillectomy (IT) was first described by Koltai et al (26) in 2002. This technique involves the use of microdebrider to remove at least 90% of the tonsillar tissue, sparing the capsule.

The Roman physician Celsus is credited with the first written report of tonsillectomy nearly 2000 years ago. In reading his description, it becomes apparent that, even at that time, the significance of postoperative bleeding was appreciated (27). Since then, physicians performing tonsillectomies have looked for ways to decrease intraoperative bleeding and postoperative hemorrhage. Intraoperative blood loss and the incidence of primary hemorrhage seem to have decreased with the use of monopolar electrocautery (28). This may explain why the rate of primary hemorrhage is lower than the rate of secondary hemorrhage in studies in which suction cautery is frequently used for hemostasis even in "cold knife" tonsillectomies (29,30). The opposite appears to be true when suture ligation is used for hemostasis during tonsillectomy (31,32).

The rate of secondary hemorrhage is generally between 2-4%. In a recent multi-institutional retrospective review, Solares et al. (33) noted a secondary hemorrhage rate of 3.3% in 1121 pediatric patients undergoing traditional tonsillectomies. An audit of tonsillectomies performed in England and Northern Ireland conducted in 2003-2004 found an overall delayed hemorrhage rate of 2.9% (34). This is similar to rate of 3.4% in 1212 cases (25). The incidence of 1.0% bleeding for intracapsular tonsillectomy compares favorably with these figures (25) and is similar to the rates noted in smaller series of intracapsular tonsillectomy (IT) (34,35). Intracapsular tonsillectomy (IT) has a lower incidence of postoperative hemorrhage and pain leading to hospital-based evaluation compared with traditional electrodissection tonsillectomy (25).

Pain, by its very nature, is subjective and difficult to quantify (25). Prospective studies often use pain scales

to quantify pain other measures include time until return to normal diet or activity and the amount of pain mediators needed. Using these latter criteria, Nunez et al. (36) found that patients treated with electrocautery tonsillectomy had a statistically significant ( $p < 0.05$ ) increase in the amount of time taken to return to normal diet and in the number of analgesics consumed than those treated with cold dissection. Koltai et al. (26) looked at the incidence of readmission for dehydration after intracapsular tonsillectomy compared with traditional tonsillectomy (TT) and found a trend towards an increased incidence in the TT group that did not reach statistical significance. In a larger series, Solares et al. (33) found a significantly decreased incidence of readmission for dehydration in an IT group compared with a TT group.

### **Post-tonsillectomy hyponatremia**

Post-tonsillectomy hyponatremia is a possible lethal complication (37). Hyponatremia is defined as a concentration of serum sodium of less than 134 mEq/L (normal range: 135-145 mEq/L). It is the most common electrolytic alteration in the hospital environment and affects 2% of hospitalized patients. It has been described following many surgical procedures, above all kidney transplants, and abdominal, orthopedic and cardiovascular surgery (38). If the drop in serum sodium is moderate there are normally no symptoms and treatment is not required, the complication consequently goes unnoticed in the majority of cases and is not suspected. However, when the serum sodium drops below 120 mEq/L, a hyponatremic encephalopathy occurs. This begins with migraine, lethargy, nausea, vomiting, convulsions, and ends with coma and death within a few hours owing to a transteritorial herniation (38). This is all provoked by a cerebral edema due to osmotic gradient, caused in turn by an acute drop in the concentration of sodium in the blood (37).

The seriousness of the pathology lies in the fact that initial symptoms (migraine, drowsiness, nausea, and vomiting) are non-specific and are normally attributed to the side effects of surgery, which can fatally delay the diagnosis. The majority of the authors reviewed (39,40,41) attribute severe post-tonsillectomy hyponatremia to a combination of two factors: the excessive administration of hypotonic fluids (low sodium content) during surgery aggravated by a syndrome of inappropriate antidiuretic hormone (ADH) secretion (SIADH) due to non-osmotic causes (hypovolemia, pain, stress) which causes water retention.

The incidence of post-operative hyponatremia in children has been evaluated at 0.34% and the mortality rate is significant; in the last ten years around 50 cases have been published which include 26 fatalities among previously healthy children following minor surgery (41). The initial and most constant symptoms are migraine, nausea, vomiting, lethargy, and asthma and can be attributed to the after affects of surgery, from which they should be distinguished by the levels of sodium in the blood (39). The advanced symptoms, because of cerebral edema, are convulsions, mydriasis, coma, and respiratory arrest (39,40,41). Therefore electrolytes in the blood and urine are measured in order to reach a diagnosis, since sodium in urine (natriuria) is typically greater than 40 mEq/L (42). The suspected diagnosis is important if the diagnosis is not borne in mind and corrective measures are not taken opportunely the symptoms can be worse because the normal volumes of fluids will continue to be administrated (37).

### **Morbidity and mortality of post-tonsillectomy bleeding**

Tonsillectomy is one of the most frequently performed surgical procedures (43). In many countries it is performed mainly as an out-patient procedure in order to reduce cost and for the patient's convenience (44,45). The rate of posttonsillectomy bleeding is about 3% (46). In recent years, the post-tonsillectomy mortality rate in Israel has been 1 to 12 000. The causes of death have been severe haemorrhagic shock and airway obstruction (43). The mortality rate for this procedure is very low (47). However, since the procedure is usually performed to improve the quality of life of health, mostly at youngsters, individuals, any mortality is unacceptable. Bleeding and death are usually sudden and unpredictable (48,49,50).

Death from post-tonsillectomy bleeding in dramatic is sudden especially in the resuscitation process (52). Very little has been written in detail about the difficulties faced during such resuscitation. Early discharge of patients following surgery is supported by the rarity of deaths following tonsillectomy, by patients' desire to leave the surgical unit, and by other statistical findings (45). When severe bleeding occurs at home, patients frequently cannot get appropriate medical help in time.

Predicting bleeding is impossible. A short stay has been recommended for children (45,46,53) and a longer stay for patients younger than three years (44,54) for adults and for cases with bleeding (9,13,17). In post-operative instructions given to the patient,

concerning diet and physical activity, vary greatly between surgeons (54).

In cases of minor, active bleeding, it is always preferable to examine the surgical area in the operating room, or to have one on standby, in cases of sudden massive bleeding. Treatment of active bleeding is preferable rather than waiting for spontaneous resolution, since sudden, massive bleeding may follow (43).

In cases of severe bleeding, two main difficulties arise airway maintenance and hypovolaemic shock. It should be stressed that it is not only the airway obstruction that endangers the patient but also the hypovolaemic shock. Hypovolaemic shock occurred in all the above cases but was especially demonstrated in some cases (43).

The patient should be kept in a sitting position or on their side, with spontaneous respiration. No muscular relaxants should be given.

The anaesthetist should organize the team and should decide on airway management and the timing of cricothyroidotomy. It is recommended to limit intubation trials to a maximum of two, or to within two minutes, in order to allow enough time for cricothyroidotomy and to avoid severe hypoxia.

Vasopressors should be with when severe hypotension occurs, unless given intravenously.

Blood clots should be immediately cleared from the hypopharynx using a finger, sponge, or suction, and awake-intubation should be preferred. In case of hypoxia, intubation attempts should cease and the airway should be established by cricothyroidotomy. The use of forced, high-pressure respiration (through mask or endotracheal tube) should be avoided in order to prevent blood being pushed into the tracheo-bronchial tree and the prevent pneumothorax (43).

Blood transfusion should be rushed in high volumes to overcome hypovolemic shock.

Distance of patient to hospital may be a critical factor in cases of sudden bleeding. Surgeons should consider recommending that patients stay near the hospital, always with a responsible adult during the first sever 10 days after tonsillectomy (43).

The two main causes of death were severe: hemorrhagic shock and airway obstruction. Sudden post-tonsillectomy bleeding may be fatal. Active bleeding should be treated rather than waiting for spontaneous resolution. An efficient airway should be established early during resuscitation, either by intubation (within two minutes) or by cricothyroidotomy (43).

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