

## REVIEW ARTICLE

# Anesthesia Management of Adenotonsillectomy

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## ABSTRACT

Tonsillectomy is one of the most common pediatric surgeries done. Anesthesia for tonsillectomy and adenoidectomy is one of the most challenging to administer even in modern times. The types of anesthesia and drugs are usually dictated by the patient's own pathophysiology and the anesthesiologist's experience. The restricted space for working in these surgeries mandates an understanding and cooperation between the surgeon and anesthesiologist. Postoperative bleeding and airway obstruction have been leading causes of death in the postoperative period. Mortality though overall low may increase with reoperations. Most of these surgeries are carried out on ambulatory basis in modern times thus greater care has to be taken by the anesthesiologist to ensure street fitness in these patients. Even seemingly trivial issues like postoperative nausea vomiting may be of significant importance in these patients.

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## INTRODUCTION

Tonsillectomy is one of the most common pediatric surgeries done.<sup>1</sup> Tonsillectomy and adenoidectomy are also performed in adult patients to treat sleep apnea along with uvuloplasty. Anesthesia for tonsillectomy and adenoidectomy is one of the most challenging to administer even in modern times. The types of anesthesia and drugs are usually dictated by the patient's own pathophysiology and the anesthesiologist's experience. The restricted space for working in these surgeries mandates an understanding and co-operation between the surgeon and anesthesiologist. Postoperative bleeding and airway obstruction have been leading causes of death in the postoperative period. Mortality though overall low may

increase with reoperations.<sup>2</sup> Most of these surgeries are carried out on ambulatory basis in modern times thus greater care has to be taken by the anesthesiologist to ensure street fitness in these patients. Even seemingly trivial issues like postoperative nausea vomiting may be of significant importance in these patients.

## ANATOMY OF THE TONSILS (FIG. 1)

Palatine tonsils are lymphatic tissues of the digestive tract epithelium and are present on the lateral wall of the throat that composes the bulk of the so called Waldeyer's lymphatic ring. They are covered by stratified nonkeratinous epithelium which is an extension of the oral pharyngeal tissues. The epithelium forms about 30 deep crypts that invaginate into the parenchyma in which the lymph nodes are found with the germ centers responsible for B-lymphocyte production. Also found are debris of epithelial cells desquamations alive and dead lymphocytes as well as bacterium may be present in the crypts. The tonsils are enclosed by fibrous and dense capsule, separating them from the deeper connective tissue. Tonsils arise from the second pair of pharyngeal pouches, where the endodermis bears the covering epithelium and the mesenchymal structures give origin to the lymphoid tissue.

## INDICATIONS FOR SURGERY<sup>3-5</sup>

- Chronic or recurrent acute tonsillitis
- Peritonsillar abscess
- Tonsillar hyperplasia
- Obstructive sleep apnea

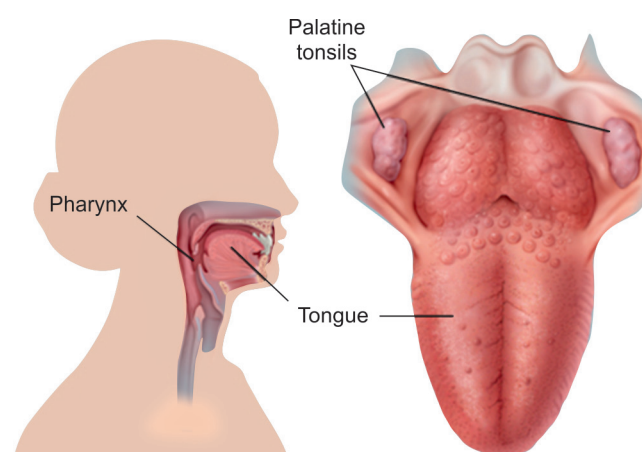


Fig. 1: The tonsils

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- In patients with valvular heart disease and are at risk of endocarditis due to recurrent tonsillitis.

Surgical removal of the adenoids is usually accompanied by tonsillectomy; however purulent adenitis, despite adequate medical therapy and recurrent otitis media with effusion secondary to adenoidal hyperplasia are improved with adenoidectomy alone.

## TONSILLECTOMY

Tonsils are removed by dissection. Either local or general anesthesia can be employed. The mouth is kept open and the tongue depressed with a Davis' gag (The original Davis' gag was invented by Dr Davis, of Boston, Mass. Henry Edmund Gaskin Boyle, 1875 to 1941, anesthetist, St Bartholomew's Hospital, London, improved it). The tonsil is seized with vulsellum forceps. An incision is made through the mucous membrane, and the capsule of the tonsil is exposed. The tonsil is removed by dissection, starting at the upper (palatal) pole. When the pedicle is defined, it is severed by a wire snare. Bleeding can be accurately stopped by ligating any bleeding vessels, arteries or veins.

## ADENOIDECTOMY

Adenoids are removed with a guarded curette pressed against the roof of the nasopharynx and then carried backward and downward with a firm sweeping movement.

## LOCAL NERVE BLOCKS

The use of local anesthetic for tonsillectomy is not new. Many approaches have been described like the peritonsillar infiltration or injection at the base of the tongue.

The patient is positioned in a sitting or semi sitting position. Two to three milliliter of 1 or 2% xylocaine is infiltrated in upper pole near the anterior and posterior pillar junction submucosally and along anterior pillars ballooning the infiltrated region another 2 ml is infiltrated in the lower pole. The 1 to 2 ml injected beneath the tonsillar capsule using the dental syringe by holding and reflecting the anterior pillar with long (Hughes) pens intending to block the sensory supply of Lesser palatine nerve and glossopharyngeal nerve.

The glossopharyngeal nerve supplies most of the sensation responsible for pain transmission following tonsillectomy or uvulopalatopharyngoplasty. It can also be blocked using an intraoral approach with a single point injection where the nerve lies just deep to the tonsil bed (Fig. 2). A standard 21 gauge, 4 cm needle is attached to a Luer locked 3 ml syringe containing

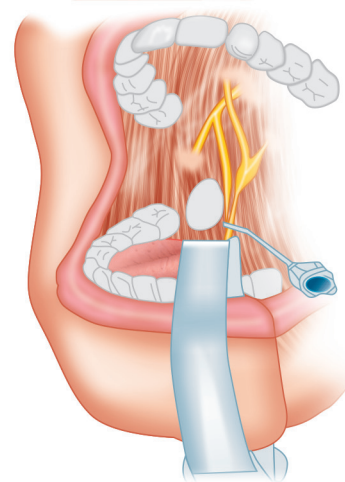


Fig. 2: Glossopharyngeal nerve block

bupivacaine 0.5% with epinephrine. The distal 1.5 cm is bent to 90°. An assistant retracts the tonsil laterally with the suction apparatus and the tongue is retracted with a tongue depressor. The tip of the needle is directed laterally behind the posterior arch so that it lies deep to the tonsil bed. The point of entry is anywhere behind the posterior arch. The 90° angle allows for safe contact with the retropharyngeal mucosa. The needle tip will pierce the retropharyngeal mucosa laterally and can be safely directed behind the tonsil blindly. After aspiration to avoid intravascular injection, 3 ml local anesthetic are injected in an adult. For a small child the dose is 1 to 2 ml. Combined with general anesthesia, glossopharyngeal nerve block improves operative conditions and provides excellent postoperative analgesia. Adult patients report pain-free periods of more than 6 hours postoperatively. Although children still often cry on awakening their recovery from anesthesia appears to be much smoother.

## PREOPERATIVE ASSESSMENT

A thorough history taking is important. Note for history of recurrent respiratory infection and use of antibiotics, antihistaminics or other medications (may be blood thinners). In patients with obstructive sleep apnea syndrome (OSAS) long-standing hypoxia and hypercarbia leads to increased airway resistance which in turn causes pulmonary vasoconstriction. Thus, these patients can have a higher pulmonary pressure which causes a right sided heart failure (cor pulmonale). Facial features and size of tonsils noted to judge the difficulty of intubation. Presence of wheezing or rales on auscultation of the chest may be sign of lower respiratory tract infection. Any teeth missing must be noted preoperatively. Teeth can be dislodged while performing laryngoscopy by the anesthesiologist or the application of mouth gag by the surgeon.

Preoperative investigations required are:

1. Complete hemogram
2. Coagulation parameter
3. X-ray chest and electrocardiogram are not required unless the patient has recurrent pneumonia, bronchitis, upper respiratory infection and history of Cor pulmonale.
4. 2D Echo may be needed in patients with OSAS.

## ANESTHESIA MANAGEMENT

Standard monitoring includes a chest stethoscope, pulse oximeter, electrocardiogram, end tidal capnography, automated blood pressure and temperature monitoring (especially in children). When tonsils are excessively hypertrophied the heavy preoperative sedation may be unwarranted. Premedication should include an antisialagogue agent. One can use either an inhalational or intravenous induction depending upon the need to secure intravenous access. Anesthesia may be induced with propofol (2–3 mg/kg) mixed with lidocaine (1–2 mg/ml). Inhalational or intravenous agents can be used for

maintenance of anesthesia. Desflurane leads to a lower amount of intraoperative bleeding and better awakening than sevoflurane during tonsillectomy and adenoidectomy operations. Insertion of oral airway may be necessary to ventilate the patient due to nasal obstruction. Tracheal intubation is facilitated using a depolarizing or non-depolarizing muscle relaxant taking the duration of surgery into consideration. Cuffed endotracheal tubes are preferred for obvious reasons, being it prevents aspiration of blood and dislodgement of the tube. Many authors have preferentially used ring-adair-elwyn (RAE) (south pole) tube or the Oxford tube. Blood in the pharynx may enter the trachea during the surgical procedure. For this reason, the supraglottic area may be packed with a wet gauze. Check for endotracheal cuff pressures to prevent postextubation croup. Bain's circuit is useful as it is light weight, universal circuit and helps to keep away from surgical field. The surgeons make use of various mouth gags like the Boyle-Davis or Crowe-Davis gag where the endotracheal tube position need not be changed while shifting the side of surgery (Figs 3 to 5). With Jennings or Doyens mouth gag the endotracheal tube has to be moved every time the side of surgery changes thus increasing the risk of accidental extubation or endobronchial displacement. Most of these patients due to their age or pathophysiological condition may desaturate rapidly. There are three cornerstones of pain management in these patients which include use of potent intravenous opioid analgesics, local anesthetic blocks and non-steroidal anti-inflammatory drugs (NSAIDs). Ear, nose and throat surgeon can be asked to infiltrate the tonsillar bed with 0.25% bupivacaine solution. This ensures a constant and long-lasting analgesia. Accumulation of blood in the mouth or nasopharynx is one of the leading causes of immediate causes of airway obstruction. At the conclusion of surgery oropharynx should be suctioned under vision.

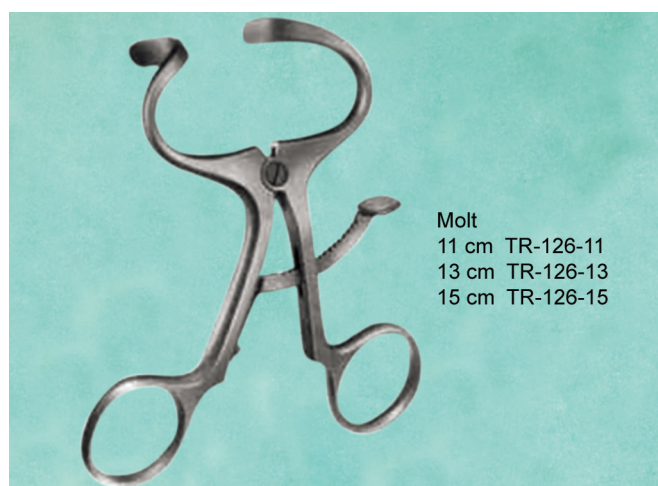


Fig. 3: Doyens mouth gag

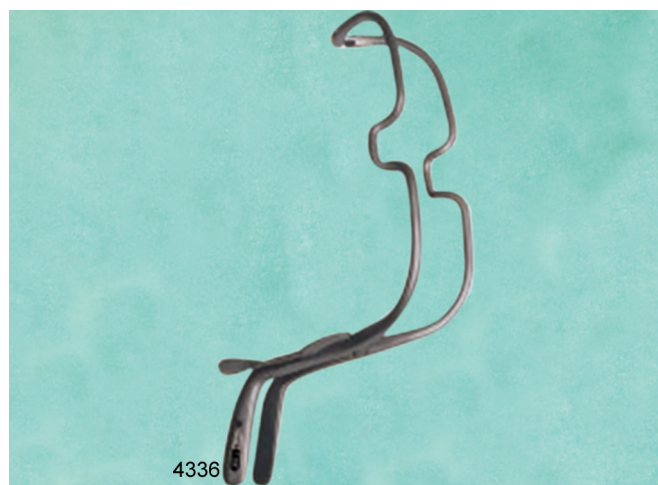


Fig. 4: Jennings mouth gag

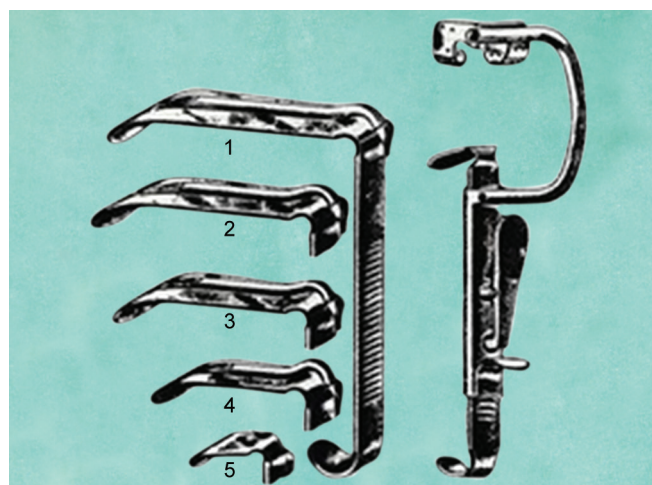


Fig. 5: Boyle-Davis mouth gag



Flexible laryngeal mask airways (LMA) can be also used for tonsillectomies. They are advantageous as they decrease the incidence of postoperative stridor and laryngospasm. Gentle assisted ventilation is both safe and effective while using LMAs if peak inspiratory pressures kept below 20 cm of water. Tonsillar enlargement could make placement of LMA difficult<sup>6</sup> for which maneuvers like head extension, lateral insertion of LMA, anterior displacement of the tongue, pressure on the tip of the LMA using the index finger or the use of laryngoscope may be used. The opinions vary when it comes to extubating these patients. Some authors believe in deep extubation as it will prevent postextubation laryngospasm. This author recommends awake extubation once the protective reflexes have returned after thorough oral and nasopharyngeal suctioning.

### Adrenaline and ENT Anesthesia

Arrhythmia by injection of adrenaline in a patient receiving inhalational anesthetic is a major and well known drug interaction. Modern inhalational anesthetics are less prone to arrhythmias. Guidelines for the use of adrenaline are as follows:<sup>7,8</sup>

- Maximal concentration of adrenaline solutions should be 1:100000 to 1:200000 (10.0–5.0 µg/kg)
- The dose in adults should not exceed more than 10 ml (100 µg) of 1:100000 given over 10 minutes
- The dose in adults should not exceed 30 ml of 1:100000 of adrenaline solution given during any 60 minutes period
- Avoid hypoxia and hypercapnia.

### Clinical Pearls

- Hypercapnia facilitates dysrhythmias
- Pediatric patients seem to be somewhat less sensitive to this effect, but caution should still be used.
- Hypertension seems to provoke the dysrhythmias.

Several alternative vasoconstrictors like phenylephrine and ephedrine can be used by mutual consultation with the surgeon. These drugs are less arrhythmogenic.

## POSTANESTHESIA COMPLICATION

### Postoperative Nausea Vomiting

Postoperative emesis may occur due to pharyngeal mucosal irritation and swallowed bloody secretion from surgery. Antiemetics like metoclopramide or ondansetron may be given. Dexamethasone helps in reducing swelling and avoiding postoperative nausea vomiting (PONV). Dehydration secondary to reduced intake and PONV should be aggressively treated with intravenous fluids.<sup>9</sup>

## Considerations for Post-tonsillectomy Bleed

Bleeding tonsils are one of the most difficult problems to be tackled even for an experienced anesthesiologist. It is evident from literature that most post-tonsillectomy bleeding occurred within the first 6 hours after surgery. Secondary bleeding usually occurs from 24 hours to 5 to 10 days after surgery due to sloughing of the eschar. Many a times these children may be extremely hypovolemic and display tachycardia and pallor. It is difficult to estimate the amount of blood swallowed by the patient hence this patient to be treated as full stomach. A large bore intravenous line must be immediately established and blood to be sent for cross match. Blood transfusion may be needed most of the times. Maintain volume status with adequate fluid and blood transfusion before induction of anesthesia. Definitive airway has to be established once the patient is back in the OR. Well functioning large bore suction tubes (disposable Yankur suction tips) are necessary to evacuate clots from the oropharynx. After preoxygenation, atropine (0.02 mg/kg) administered. Induction agent is guided by the patient's hemodynamic status. Care must be taken to prevent airway obstruction and regurgitation by applying cricoid pressure. Ketamine 1 to 2 mg/kg or etomidate 0.2 to 0.4 mg/kg can be used as induction agents. In some conditions if necessary awake intubation may be done. Once the bleeding is controlled oral or nasogastric tube is placed to empty the clots from the stomach prior to extubation. Patient is allowed to regain full consciousness before extubation.

### Acute Postoperative Pulmonary Edema

Presence of pink frothy fluid in the endotracheal tube of an intubated patient or decreased oxygen saturation with increased respiratory rate, wheezing and dyspnea in extubated patient are all tell tale signs of negative pressure pulmonary edema. The rapid relief of airway obstruction→decreased airway pressure→increase venous return→increase in pulmonary hydrostatic pressure→hyperemia→pulmonary edema. Moderate continuous positive airway pressure (CPAP) allows circulatory adaptation time. Treatment is generally supportive with maintaining a patent airway, oxygenation and diuretics. Positive end-expiratory pressure (PEEP) may be required in some cases. Patients resolve within 24 hours.

## OUTPATIENT TONSILLECTOMY

Outpatient tonsillectomies have been always controversial. The major concerns for nonadvocates have been unrecognized delayed blood loss, nausea/vomiting and dehydration. Advances in anesthetic agents

have enabled us to conduct outpatient tonsillectomies. Successful ambulatory anesthesia includes correct patient selection and meticulous preoperative evaluation. An assessment prior to day of surgery prevents last minute cancellations and gives us enough time to optimize the patients. Patients with history of bleeding disorders or deranged coagulation profile, patient on blood thinning medications, children <3 years of age are not suitable for ambulatory tonsillectomies.<sup>10</sup> In day care surgery the responsibility of postoperative care lies with patient and his relatives hence clear instructions must be written down. Amnestic agents (midazolam) must be carefully administered in these patients as it could lead to patient forgetting his postoperative instructions. Patient may therefore be discharged only with a responsible accompanying person.

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