

Tonsil surgery includes **tonsillectomy** where the aim is complete removal of the tonsil, compared to **tonsillotomy** where the aim is to remove part of the tonsil in order to create more space in the oropharynx.

Indications for **tonsillotomy** are limited and include surgery for sleep disordered breathing in very young children where the aim is to limit morbidity associated with postoperative pain and bleeding.

Intracapsular tonsillectomy (IT) is now the preferred technique for many paediatric ENT surgeons. The aim of this procedure is to remove all tonsil tissue while preserving the deep part of the tonsil capsule and to avoid injury to the palatopharyngeus, palatoglossus and pharyngeal constrictor muscles.

Anatomy

The palatine tonsils are located in the tonsillar fossae which are bounded by the anterior and posterior faucal pillars. These comprise the palatoglossus and palatopharyngeus muscles respectively (*Figure 1*).

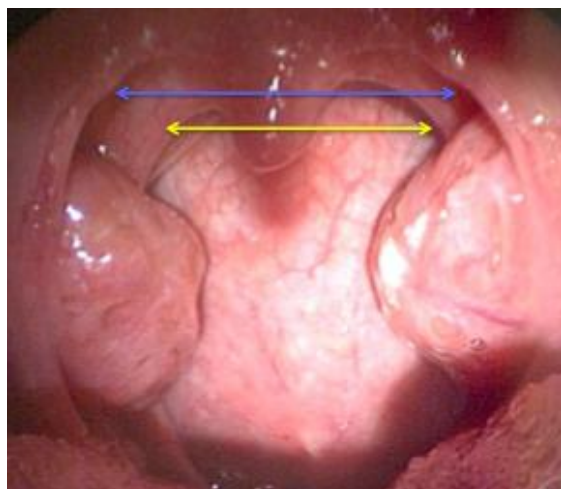


Figure 1: Anterior (blue) and posterior (yellow) faucal pillars

Laterally, the tonsil is surrounded by a fibrous capsule that separates the tonsil from the superior constrictor muscle and buccopharyngeal fascia. The glossopharyngeal nerve and facial artery lie in close proximity to the superior constrictor muscle. The tonsillar artery, a branch of the facial artery, is the main blood supply to the tonsil.

Whilst the superior aspect of the tonsil is usually well defined, inferiorly the tonsil often merges with lingual tonsil tissue at the base of the tongue.

Lymphatic drainage of the tonsil is to the jugulodigastric nodes and other upper deep cervical lymph nodes.

Physiology

The palatine tonsils are part of *Waldeyer's ring*, a ring of lymphoid tissue that forms an important first line of defence for the respiratory and digestive systems. *Waldeyer's ring* is part of the mucosa associated lymphoid tissue (MALT) and plays a role in the production of B cells following ingestion or inhalation of hazardous micro-organisms.

The palatine tonsils and adenoids form a significant component of this system. Yet, removal of the tonsils (and adenoids) does not have a significant impact on immunity with remaining lymphoid tissue in *Waldeyer's ring* and in other locations continuing to function and prevent immunity problems.

Indications for tonsillectomy

The most frequent indications for tonsillectomy in paediatric practice are:

- Recurrent tonsillitis and/or peritonsillar abscess
- Obstructive sleep apnoea syndrome (OSAS)

- Suspected malignancy
- Halitosis caused by debris in tonsillar crypts

Occasionally an "acute" or "hot tonsillectomy" may be indicated. This is reserved for patients requiring a general anaesthetic to drain a quinsy abscess who already qualify for tonsillectomy, or for patients who present with severe acute tonsillitis (usually glandular fever / infectious mononucleosis) causing acute airway obstruction and not responding to conservative management (*Figure 2*).



Figure 2: Enlarged tonsils secondary to glandular fever causing oropharyngeal obstruction

Recurrent tonsillitis

Recurrent tonsillitis can be a significant burden to child and family due to prolonged episodes of illness, poor school attendance and significant discomfort. Tonsillectomy nearly always causes complete resolution of recurrent acute tonsillitis. However, this comes at the risk of primary (with-

in 24 hours) and secondary (after 24 hours) haemorrhage which rarely can be fatal.

The decision when to perform a tonsillectomy for recurrent tonsillitis is controversial. Benefit of tonsillectomy increases with severity and frequency of sore throats. Yet evidence on exactly which children will benefit from tonsillectomy is not available.

Some healthcare systems aim to adopt an evidence-based approach to tonsillectomy for recurrent tonsillitis. Traditionally the *1999 Scottish Intercollegiate Guideline Network* (SIGN Guidelines) were used and advocated tonsillectomy for recurrent tonsillitis only in the following circumstances:

- Sore throats due to acute tonsillitis
- Episodes of sore throat that are disabling and prevent normal functioning
- Seven or more well documented, clinically significant, adequately treated sore throats in the preceding year, or
- Five or more such episodes in each of the preceding two years, or
- Three or more such episodes in each of the preceding three years

Paradise criteria for tonsillectomy include the frequency and timeframe mentioned above but also include evidence of clinical severity: fever $> 38.8^{\circ}\text{C}$ (100.9°F), tonsillar exudate, swollen or painful cervical lymph nodes or a positive Group A β -haemolytic streptococcus test.

A small proportion of patients with specific clinical conditions will also benefit from a tonsillectomy as part of their ongoing management strategy, who will not necessarily meet the SIGN guidance (psoriasis, nephritis PFAPA syndrome) [ENT UK 2021 Commissioning guide: Tonsillectomy](#)

Decisions to perform tonsillectomy should therefore be individualized taking into ac-

count severity of symptoms, recurrence rates and patient/parental preference.

Obstructive sleep apnoea syndrome

In obstructive sleep apnoea syndrome (OSAS), children have a variable degree of upper airway obstruction usually secondary to adenotonsillar hypertrophy. This may be evident during the day as stertorous mouth breathing but is usually more noticeable when the child is asleep. Reduced muscle tone during deep sleep combined with adenotonsillar hypertrophy causes upper airway obstruction and at times complete airway occlusion. Parents will observe snoring and then periodically obstructive apnoea evidenced by chest and abdominal movement but no airflow. These episodes can occur frequently throughout the night, and apnoea may last several seconds on each occasion. Obstruction results in a degree of arousal and the child then regains a patent yet still compromised upper airway.

These repeated episodes lead to disturbed sleep, poor quality sleep, daytime somnolence and poor school performance. If severe, OSAS can result in relatively prolonged episodes of hypoxaemia and hypercarbia, which may progress to pulmonary hypertension and *cor pulmonale*.

Other indications

Although ***malignancy*** of the tonsil in childhood is rare, consideration should be given to tonsillectomy to obtain a histological diagnosis in a child with significant tonsillar asymmetry. Malignancy is usually associated with cervical lymphadenopathy and/or haematological abnormalities.

Halitosis may occur from food debris collecting within tonsillar crypts, although halitosis is most commonly caused by gingival disease. Tonsillar halitosis can usually be managed with reassurance and mouth-

washes. However, if severe or the child is being affected socially, tonsillectomy may be considered.

Perioperative Evaluation

General health

No perioperative investigations are generally required in an otherwise fit and healthy child undergoing tonsillectomy for recurrent tonsillitis. Investigations should be directed at areas of concern, particularly bleeding diatheses. For most children a preoperative blood grouping is not required; however, this is largely dependent on local facilities and guidance.

OSAS as reason for tonsillectomy

Children undergoing tonsillectomy (with or without adenoidectomy) for OSAS are at increased risk of postoperative complications. Evaluation should consist of a measure of the severity of the OSAS. This may take the form of a clinical evaluation only in a low-risk child. Overnight oximetry or polysomnography should be considered when a child falls into one or more of the following categories:

- < 2 years of age
- <14kg
- Failure to thrive (weight <5th centile for age)
- Obesity (BMI > 98th centile)
- Significant comorbidity
 - Severe cerebral palsy
 - Moderate-to-severe neuromuscular disorders
 - Craniofacial abnormalities
 - Down's Syndrome
 - Achondroplasia
 - Storage diseases
 - Congenital cardiac disease
 - Chronic lung disease

Such children and those with proven severe OSAS or ECG changes are more likely to develop postoperative complications and to require admission to intensive care postoperatively.

Tonsillectomy procedure

There are several methods to do a tonsillectomy and to obtain haemostasis. Methods are generally divided into 'hot' (using some form of electrocautery) and 'cold' (using traditional instruments and ties) (*Figure 3*).



Figure 3: Basic set of instruments required to perform a tonsillectomy: Drafton rods (1); Bipolar forceps (2); Silk ties (3); Blades for Boyle Davis gag (4); Boyle Davis gag (5); Knot pusher (6); Pillar retractor (7); Tonsil dissector (8); Burkitt straight forceps (9); Curved Negus Forceps (10); Luc's tonsil holding forceps (11)

The literature suggests that "hot" techniques, using diathermy dissection may have a higher rate of postoperative haemorrhage although they may offer other benefits such as reduced intraoperative blood loss.

For the purposes of this description of tonsillectomy, a 'cold' technique is described using traditional dissection followed by haemostasis with ties.

- The procedure is done under general anaesthesia with an oral endotracheal tube or Supraglottic airway/Laryngeal mask
- Position the patient supine on the operating table with the neck slightly extended using a shoulder roll
- Select an appropriate length Boyle Davis blade
- The tonsil gag is fitted with rubber tooth protectors (can be made from sections of soft rubber tubing) which can be removed in edentulous patients to avoid the gag slipping off the gum (*Figure 4*)



Figure 4: Boyle Davis tonsil gag and tonsil swabs; the tonsil gag has been fitted with rubber tooth protectors

- Insert the gag to retract the tongue and to expose the oropharynx, with the endotracheal tube positioned in the mid-line (*Figure 3, 4, 5*)
- Place the Drafton rods to suspend and stabilise the gag (*Figures 3 and 6*)

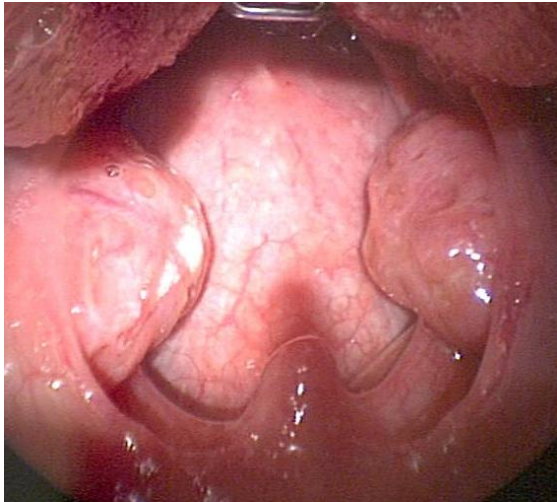


Figure 5: View of tonsils and oropharynx following insertion of Boyle Davis gag



Figure 7: Gripping the right tonsil with tonsil holding forceps



Figure 6: Boyle Davis gag in place suspended and held in place by Drafter rods



Figure 8: Pulling the tonsil medially to demonstrate the lateral border of the tonsil deep to the palatoglossal fold

- Grasp a tonsil with the tonsil holding forceps and pull it towards the midline (*Figures 7 and 8*)
- Use scissors to incise the mucosa of the anterior faucal pillar as shown (*Figures 9 and 10*). An incision placed too laterally will leave only a small residual anterior pillar and is likely to cause additional postoperative discomfort
- Identify the capsule of the tonsil (*Figure 10*)



Figure 9: Site of initial incision



Figure 10: Extend the initial incision and define the lateral border of the tonsil by spreading the blades of the scissors

- Use a tonsil dissector to strip the pharyngeal muscle fibres laterally away from the tonsil (*Figure 11*). This dissection usually starts superiorly and progresses inferiorly. Maintain medial traction on the tonsil to facilitate the dissection.

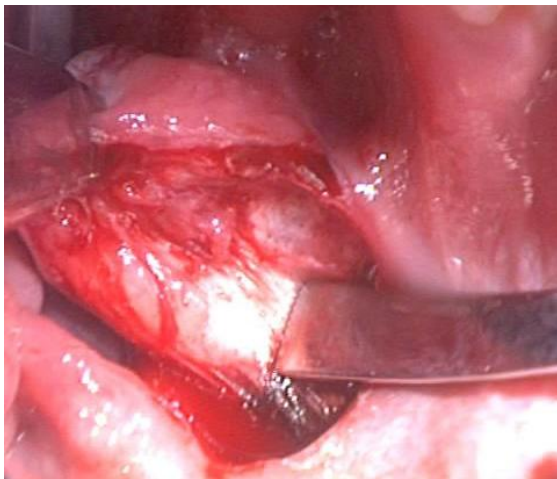


Figure 11: While maintaining medial traction, use the tonsil dissector to strip the pharyngeal muscle fibres laterally and away from the tonsil

- As this dissection continues inferiorly, the tonsil ends up being attached only by a vascular bundle at the tonsillolinguinal sulcus. Clamp across this vascular

bundle with curved vascular forceps and divide the pedicle with scissors (*Figure 12*)

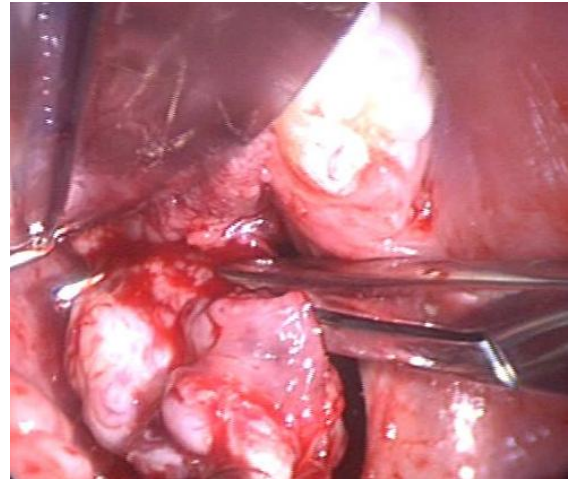


Figure 12: The vascular bundle is clamped inferiorly with curved vascular forceps (Curved Negus)

- Remove the tonsil
- Ligate the vascular bundle to reduce bleeding using a silk or linen ligature and knot-pusher (*Figure 13*)

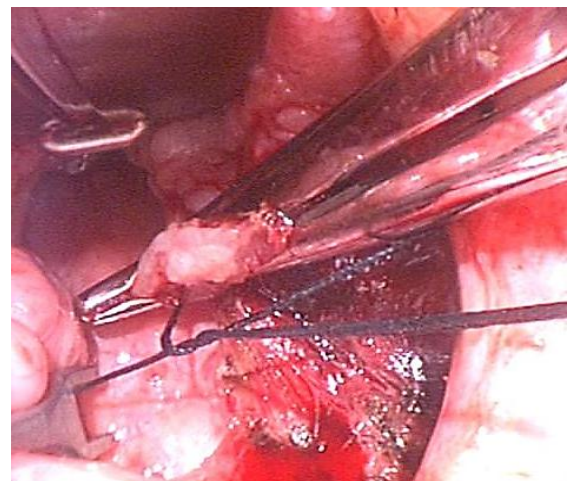


Figure 13: After the tonsil has been removed the vascular bundle is tied using a silk or linen ligature and knot-pusher (left lower corner of picture)

- Pack the tonsil fossa with a gauze swab (*Figure 14*)

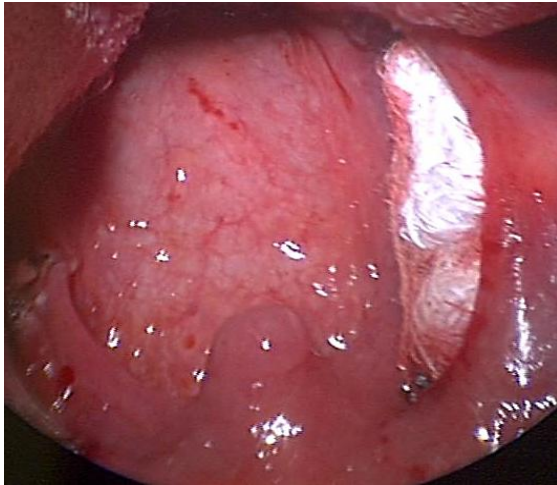


Figure 14: The tonsil fossa is packed with a gauze swab

- Repeat the process on the contralateral side
- After waiting a few minutes for haemostasis, remove the gauze packing and examine each tonsil fossa for bleeding
- Minor bleeding from muscle and small vessels will stop spontaneously
- Clip larger bleeding vessels with straight vascular forceps and apply gentle traction to elevate the vessel from the tonsil bed (*Figure 15*).

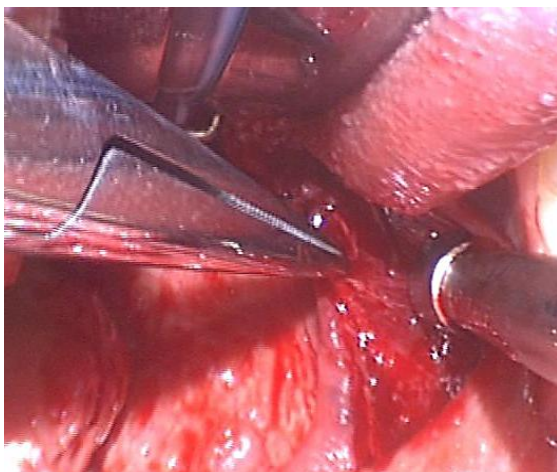


Figure 15: Clipping the vessel with straight vascular forceps

- Then cross-clamp the vessel with curved forceps placed below the tip of the straight vascular forceps (*Figure 16*)

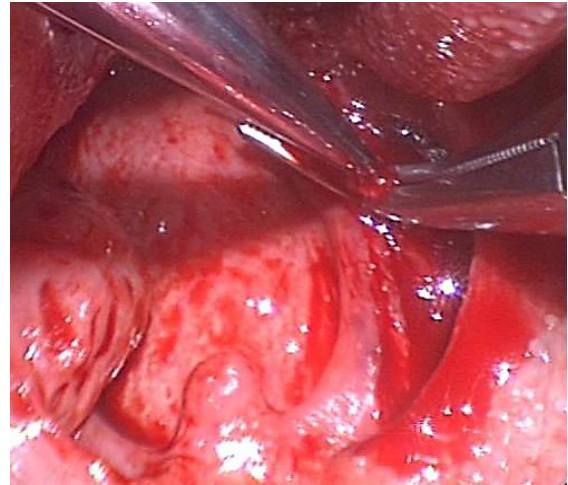


Figure 16: Gentle traction applied to the straight forceps elevates the vessel from the tonsil bed so that the vessel can be cross clamped with curved forceps

- Ligate the vessel using silk or linen ties and a knot pusher in a fashion similar to that employed for the vascular bundle at the inferior tonsillar pole
- This process is continued until haemostasis is achieved
- Bipolar diathermy can also be used to facilitate haemostasis. If monopolar diathermy is used, care must be taken to avoid burn injuries to the lips
- Release the tension on mouth gag for a short period as further bleeding points may become apparent
- Suction the postnasal space to clear blood clots that may be aspirated
- Prescribe postoperative analgesia
- Antibiotics are not usually indicated

Complications

Accidental extubation

Take care when removing the gag as the endotracheal tube can get trapped in the groove in the centre of the gag causing accidental extubation when the gag is removed (*Figure 17*). Entrapment of the tube in the tonsil blade can be avoided by initially wrapping adhesive tape around the blade to

cover the groove where the tube can get stuck



Figure 17: Picture illustrating endotracheal tube stuck in Boyle Davis gag causing accidental extubation when removing the gag at the end of the procedure

Uncontrolled bleeding

Failure to stem bleeding with ligatures or cautery may occur at the time of tonsillectomy, or as a primary or secondary postoperative haemorrhage.

Primary haemorrhage due to a bleeding disorder

Persistent bleeding during surgery may signal an unsuspected **bleeding disorder**. Treatment is directed at controlling bleeding and reversing the underlying cause.

- Pack the tonsil fossae with gauze
- Oversee the tonsil fossae to keep the gauze in place
- Give a fresh frozen plasma transfusion or coagulant drugs as required
- Return the patient to the operating room after a few days to remove the gauze once bleeding has stopped and the bleeding disorder has been controlled

Secondary postoperative haemorrhage

This occurs in approximately 5% of cases and may occur up to 14 days postoperatively. Poor postoperative oral intake due to pain and infection is likely to play a role. Antibiotics are usually administered due to a presumed element of infection. If bleeding settles spontaneously, admit and observe the child in hospital as the bleed may represent a 'herald bleed'.

If bleeding fails to settle:

- Resuscitate the child
- Order blood for transfusion if needed
- Return child to the operating room
- General anaesthetic technique
 - Risks of haemodynamic instability, anaemia and blood obscuring the airway
 - Working suction
 - Induction method = rapid sequence induction for presumed full stomach
- Identify and ligate major bleeders
- Pack the bleeding tonsil fossa with normal gauze or with haemostatic dissolvable gauze e.g. Surgicel
- Suture the tonsil pillars together over the gauze, passing the pillar sutures through the gauze to prevent it dislodging and being aspirated
- If a standard surgical gauze swab has been used, then return the child to the operating room after a few days to remove the gauze

Respiratory compromise

Children with OSAS are at higher risk of complications following tonsillectomy due to airway complications or comorbidities as described previously.

Postoperative airway obstruction may be managed with a nasopharyngeal airway (See chapter on [Paediatric Nasopharyngeal Airway](#)). Rarely, postoperative pulmonary

oedema may develop. The patient is then admitted to intensive care for supportive care with continuous positive airways pressure.

Sore throat and otalgia

Patients experience significant pain, odynophagia and referred otalgia. The most severe pain is experienced around Day 5-6. Regular analgesia in the form of paracetamol and anti-inflammatory drugs usually suffice.

Further Reading

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- *ENT UK 2021 Commissioning guide: Tonsillectomy*

Open Access Atlas chapter on Tonsillotomy

<https://vula.uct.ac.za/access/content/group/ba5fb1bd-be95-48e5-81be-586fbaeba29d/Tonsillotomy%20partial%20and%20complete%20tonsillectomy%20surgical%20technique.pdf>

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