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PAEDIATRIC TONSILLECTOMY

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

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)*.

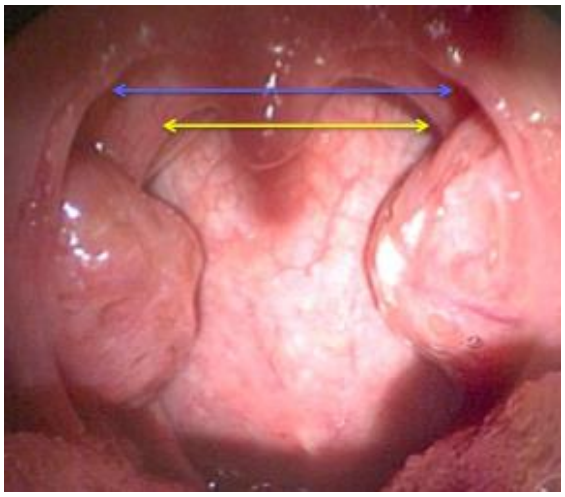

Figure 1: Anterior (blue) and posterior (yellow) faucal pillars

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, provides the main blood to the tonsil.

Whilst the superior aspect of the tonsil is usually well defined, inferiorly the tonsil often merges with lingual tonsil tissue around 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 the ingestion or inhalation of hazardous microorganisms.

Whilst the palatine tonsils and adenoids form a significant component of this system, removal of the tonsils (and adenoids) does not seem to have a significant impact on immunity; remaining lymphoid tissue in *Waldeyer's ring* and in other locations continue 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 the tonsillar crypts

Occasionally an "acute" or "hot tonsillectomy" might be indicated. This is reserved for patients requiring a general anaesthetic to drain a quinsy abscess who already qualify for tonsillectomy or patients who present with severe acute tonsillitis (usually glandular fever / infectious mononucleosis) causing acute airway obstruction and requiring airway intervention 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 (within 24 hours) and secondary (after 24 hours) haemorrhage which in some cases can be fatal.

The decision when to perform a tonsillectomy for recurrent tonsillitis is controversial. Some healthcare systems adopt an evidence based approach to tonsillectomy for recurrent tonsillitis. *The Scottish Intercollegiate Guideline Network* advocates 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

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 sleep quality, 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 mouthwashes. 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.

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 performed when the child falls into one or more of the following categories:

- < 2 years of age
- <15kg
- Failure to thrive (weight <5th centile for age)
- Obesity
- Significant comorbidity
  - Severe cerebral palsy
  - Moderate to severe neuromuscular disorders
  - Craniofacial abnormalities
  - 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)*.

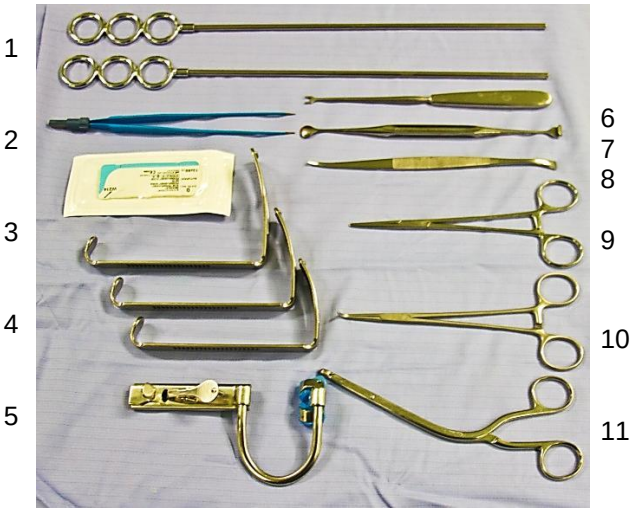

Figure 3: Basic set of instruments required to perform a tonsillectomy: Drafton rods (1); Bipolar forceps (2); Silk ties (3); Blades for Boyle Davis gag (4); Boyle Davis gag (5); Knot pusher (6); Pillar retractor (7); Tonsil dissector (8); Burkitt straight forceps (9); Curved Negus

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 intra-operative blood loss.

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

- Following induction of general anaesthesia, the patient is positioned supine on the operating table with the neck slightly extended using a shoulder roll
- Select an appropriate length Boyle Davis blade and insert the gag to retract the tongue and expose the oropharynx *(Figure 3, 4, 5)*

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

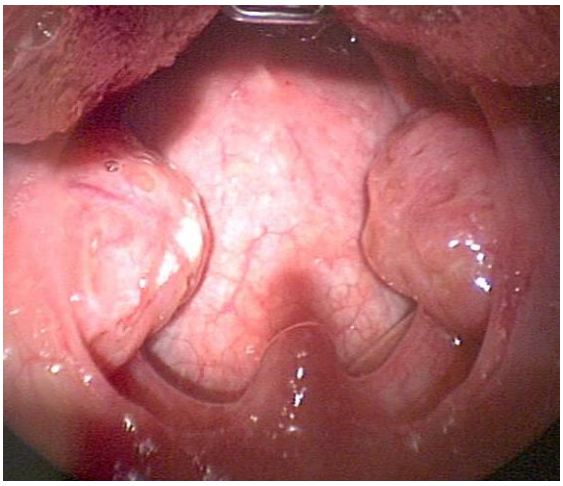

Figure 5: View of tonsils and oropharynx following insertion of Boyle Davis gag

- 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)*
- Drafton rods are then placed to suspend and stabilise the gag *(Figures 3 and 6)*

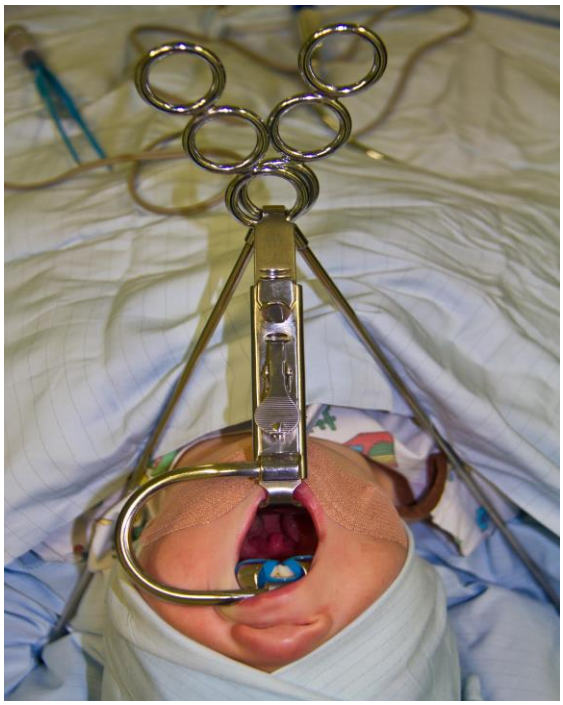

Figure 6: Boyle Davis gag in place suspended and held in place by Drafton rods

- The tonsil is grasped with tonsil holding forceps and pulled towards the midline *(Figures 7 and 8)*

Figure 7: Gripping the right tonsil with tonsil holding forceps

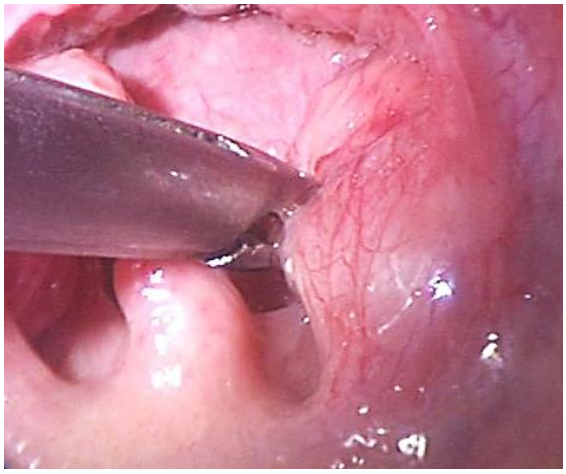

Figure 8: Pulling the tonsil medially to demonstrate the lateral border of the tonsil deep to the palatoglossal fold

- Scissors are used 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

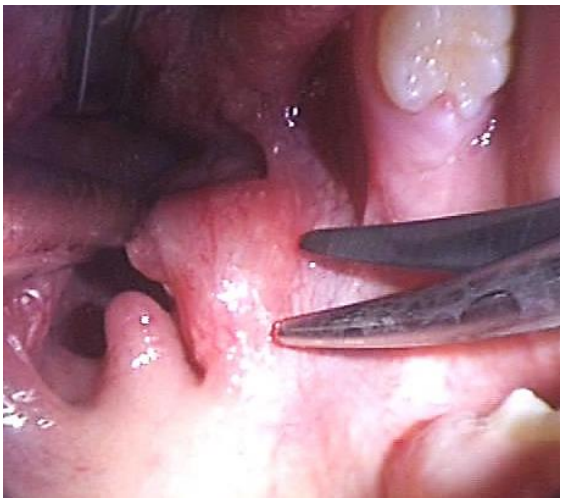

Figure 9: Site of initial incision

- The capsule of the tonsil is identified *(Figure 10)*

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

- A tonsil dissector is used to strip the pharyngeal muscle fibres laterally away from the tonsil *(Figure 11)*. This process usually commences superiorly and progresses inferiorly. Medial traction should be maintained on the tonsil at all times to facilitate this

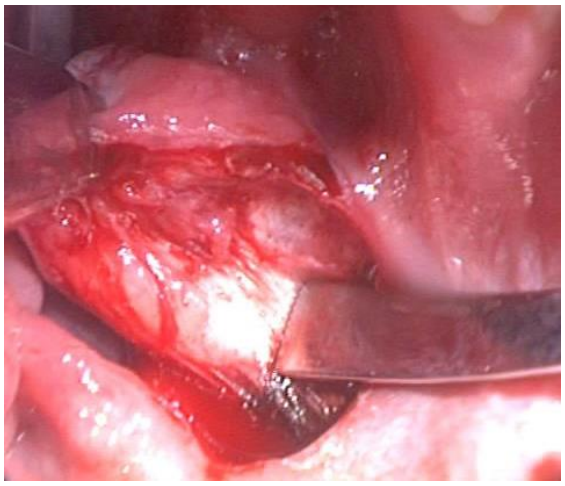

Figure 11: While maintaining medial traction, the tonsil dissector is used to strip the pharyngeal muscle fibres laterally and away from the tonsil

- As this dissection process continues inferiorly, the tonsil ends up being attached only by a vascular bundle at the tonsillolingual sulcus. This vascular bundle is clamped with curved vascular forceps *(Figure 12)*

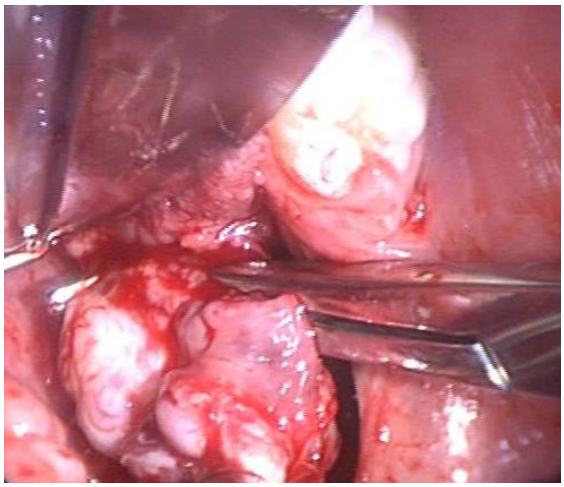

Figure 12: The vascular bundle is clamped inferiorly with curved vascular forceps (Curved Negus)

- The vascular bundle is tied to reduce bleeding using a silk or linen ligature and knot-pusher, and the tonsil is removed *(Figure 13).*

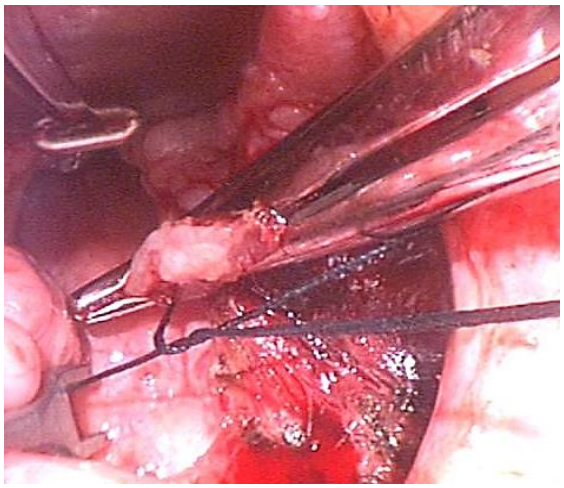

Figure 13: After the tonsil has been removed the vascular bundle is tied using a silk or linen ligature and knot-pusher (left lower corner of picture)

- The tonsil fossa is packed with a gauze swab *(Figure 14)*
- The process is repeated on the contralateral side

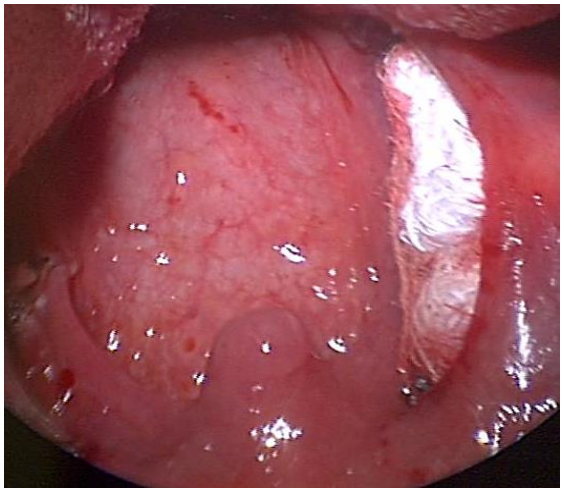

Figure 14: The tonsil fossa is packed with a gauze swab

- Each tonsil fossa is revisited, the gauze packing removed, and inspected for bleeding. Minor bleeding from muscle and small vessels will stop sponta-neously. Larger bleeding vessels are clipped with straight vascular forceps, and gentle traction is applied to elevate

the vessel from the tonsil bed *(Figure 15).*

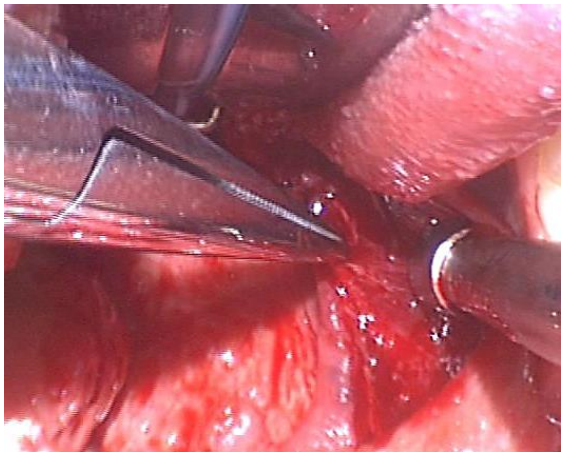

Figure 15: The vessel is clipped with straight vascular forceps

- The vessel is then cross-clamped with curved forceps placed below the tip of the straight vascular forceps *(Figure 16).* This technique facilitates the use of ligatures in a fashion similar to that employed for the vascular bundle at the inferior tonsillar pole

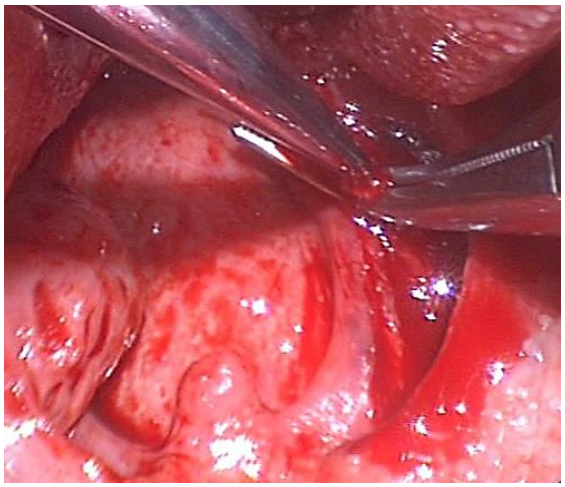

Figure 16: Gentle traction applied to the straight forceps elevates the vessel from the tonsil bed so that the vessel can be cross-clamped with curved forceps

- This process is continued until haemostasis is achieved. Bipolar diathermy, if available, can be used to facilitate haemostasis. If monopolar diathermy is used care must be taken to avoid burn injuries to the lips
- The tension on mouth gag is then released for a short period as further bleeding points may then become apparent
- The postnasal space is suctioned clear of blood clots
- Postoperative analgesia is prescribed
- Antibiotics are not usually indicated

Complications

Accidental extubation

Care must be taken when the gag is removed as the endotracheal tube can get trapped in the groove in the centre of the gag hence 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 with a primary or secondary postoperative haemorrhage. This necessitate one to suture the tonsil pillars together after packing the tonsil fossa with surgicel haemostatic dissolvable gauze. It is important to place the pillar sutures through the surgicel to prevent it dislodging and being aspirated. If surgicel haemostatic dissolvable gauze is not available, then a standard surgical gauze swab can be packed and sutured into the tonsil fossa for a few days before removing it.

Primary postoperative haemorrhage

This may occur at the time of surgery when a ***bleeding disorder*** has not been identified. Treatment should be directed at the underlying cause; fresh frozen plasma transfusion or coagulant drugs may be required. Fluid replacement should be initiated and packing of the tonsil fossae may be required for a prolonged period.

Secondary postoperative haemorrhage

This occurs more commonly (approx. 5% of children) and can occur up to 10 days postoperatively. Poor postoperative oral intake due to pain and infection is likely to play a role. If bleeding settles spontaneously, children should be observed in hospital as the bleed may represent a 'herald bleed'. If bleeding fails to settle following fluid resuscitation, the child should be returned to the operating room. Antibiotics are usually administered due to a presumed element of infection.

Respiratory compromise

Children with OSAS are at higher risk of complications following tonsillectomy. Postoperative airway obstruction may be managed with a nasopharyngeal airway. Rarely, postoperative pulmonary oedema may develop. The patient is then admitted to intensive care and supportive management instituted 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 will usually be sufficient.

Further Reading

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Open Access Atlas chapter on Tonsillotomy:
https://vula.uct.ac.za/access/content/group/ba5fb1bd-be95-48e5-81be-586fbaeba29d/Tonsillotomy%20_partial_%20and%20complete%20tonsillectomy%20surgical%20technique.pdf

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