

TONSILLITIS, TONSILLECTOMY AND ADENOIDECTOMY

ANATOMY

Adenoids

formed during 3rd-7th months of embryogenesis

functional and mechanical obstruction of ET with adenoid inflammation play significant role in development of middle ear disease

blood supply:

- o pharyngeal branches of external carotid artery
- o minor branches from internal maxillary and facial arteries

sensation: CN IX and X

three types of surface epithelium:

- o ciliated pseudostratified columnar
- o stratified squamous
- o transitional

at the roof and posterior wall of the nasopharynx

Function in the production of antibodies (IgA, IgG and IgM).

Tonsils

- o situated on the side of the oropharynx between the palatoglossal (anterior tonsil pillar) and palatopharyngeal folds (posterior tonsil pillar).
- o part of Waldeyer's ring (a ring of lymphoid tissue consisting of the adenoids, the palatine tonsils and the lingual tonsils (which are embedded in the posterior third of the tongue). The ring as a whole is thought to have some protective function as a barrier against infection in the first few years of life.
- o The tonsil is enclosed by a fibrous capsule, outside of which is a layer of areolar tissue. This separates the capsule from the pharyngobasilar fascia covering the superior constrictor muscle that forms the tonsil bed
- o may extend down to hypopharynx
- o hyperplasia: abnormal tongue position, tongue-thrust habit, aberrant speech patterns, altered orofacial growth
- o blood supply: **FAIL**: facial, ascending pharyngeal, internal maxillary, lingual arteries
 - upper pole:
 1. internal maxillary artery _ palatine branches _ ascending/descending palatine arteries
 2. ascending pharyngeal artery
 - lower pole:
 1. facial artery _ tonsillar branch (most important) *
 2. dorsal lingual artery
 3. ascending pharyngeal artery
- o Lymphatic drainage:
 - superior deep cervical and jugular lymph nodes
- o No afferent lymphatics: Crypts lined by specialized antigen processing squamous epithelium
- o Sensation: CN IX and branches of lesser palatine nerve via sphenopalatine ganglion
- o histology:
 - Reticular cell epithelium
 - squamous layer
 - antigen presenting cells (M-cells)
 - extrafollicular area
 - T-cells
 - lymphoid follicle
 - Mantle zone (mature B-cells)
 - germinal center (active B cells)

MICROBIOLOGY AND IMMUNOLOGY

Microbiology

acute tonsillitis:

- o classically GABHS (strep. pyogenes)
- o other aerobic and anaerobic bacteria and viruses also implicated
- o H. influenzae, S. aureus, S. pneumoniae, polymicrobial infection, BLPO, anaerobes
- o viruses: initiators of mucosal inflammation, crypt obstruction and ulceration with secondary bacterial infection (e.g. influenza, para-influenza, adenoviruses, enteroviruses and rhinoviruses) may be responsible for tonsillitis in up to 50% of occasions

Immunology

- o tonsils and adenoids involved in both local immunity and in immune surveillance
- o no specific adverse effects with T+A; but still provide immune function
- o tonsils and adenoids should be removed only for clearly defined clinical disease

PATHOGENESIS OF ADENOTONSILLAR DISEASE

- o various theories
- o viral infection with secondary bacterial invasion

- o inflammation and loss of integrity of crypt epithelium (chronic cryptitis and crypt obstruction) stasis of crypt debris and antigen persistence
- o other factors: environment, host factors, widespread use of antibiotics, ecological considerations and diet

CLINICAL CLASSIFICATION OF ADENOIDS AND TONSILS

Adenoids

Acute Adenoiditis:

- o purulent rhinorrhea, nasal obstruction, fever, +/- otitis media or otitis media with effusion (glue ear).
- o loud snoring after episode of acute infection

Recurrent Acute Adenoiditis:

- o 4 or more episodes during 6 month period
- o prophylactic Abx controversial
- o daily low-dose (one half to one third full dose) or episodic prophylaxis (short course with onset of URI)

Chronic Adenoiditis:

- o nasal discharge, malodorous breath, PND, chronic congestion
- o ? role of extraesophageal reflux

Obstructive Adenoid Hyperplasia:

- o chronic nasal obstruction (snoring and obligate mouth breathing), rhinorrhea, hyponasal voice, Intermittent sucking

Tonsils

Acute Tonsillitis:

- o sore throat, fever, dysphagia, tender cervical nodes particularly the jugulodigastric nodes.
- o erythematous tonsils with exudates
- o Pain may radiate to the ears or may occur in the neck due to cervical lymphadenopathy.
- o Swallowing may be painful (odynophagia)
- o voice may sound muffled.
- o There may be trismus and dribbling.
- o Some children may have abdominal pain and occasionally vomiting.
- o The tonsils are found to be hyperaemic on examination with pus and debris in the crypts.
- o Glandular fever, agranulocytosis, leukaemia and diphtheria must always be borne in mind.

Recurrent Acute Tonsillitis:

- o 4-7 episodes in 1 year
- o 5 episodes/year for 2 consecutive years
- o 3 episodes/year for 3 consecutive years

Chronic Tonsillitis

- o no true consensus on definition
- o symptoms > 4 weeks

Obstructive Tonsillar Hyperplasia

- o snoring, dysphagia, voice changes (muffling or hyponasality)
- o unilateral tonsillar hyperplasia should raise suspicion of malignancy

CLINICAL EVALUATION

Adenoids

- o Rare adenoid facies appearance (an open lip posture, prominent upper incisors, a short upper lip a thin nose and a hypoplastic maxilla with a high arched palate)
- o when medical therapy fails, adenoidectomy is the first step in controlling infection in the nose/nasopharynx; about 67% of children show resolution
- o sinusitis may take 2-3 months to clear after adenoidectomy
- o nasality of speech:
 - o sounds that emphasize nasal emission: milkman, Mickey Mouse
 - o loss of appropriate nasality further supports obstructive adenoid hyperplasia
- o lateral x-rays of limited use
- o examination of the nasopharynx with a postnasal mirror
- o allergy evaluation
- o r/o reflux
- o r/o occult or overt submucous cleft palate _ risk of VPI with surgery
 - o occult cleft:
 - o bifid uvula
 - o abnormal movement of palate
 - o midline diastasis of muscles
 - o history of fluid regurgitation through nose
 - o nasopharyngoscopy: if tolerated
 - o loss of midline bulge signifies absence of musculus uvulae _associated with higher risk of development of VPI postop.

The only reliable means of assessing the size of the adenoid is examination under general anaesthetic,

Tonsils

significant rare complications of GABHS: poststreptococcal glomerulonephritis, rheumatic fever
obstructive tonsillar hyperplasia: snoring, choking and coughing, frequent awakenings, restless sleep, dysphagia, daytime hypersomnolence, behavioural changes, FTT, CHF (rare)
unless significant (+3 or +4) hyperplasia, tonsils should be left in situ (if no history of recurrent or chronic infection)
polysomnography:
important to measure peak end-tidal CO₂ _if elevated then hypoventilation is present
used mostly in child where diagnosis is unclear or who has an unusual risk for surgery

MANAGEMENT OF DISEASES OF THE ADENOIDS AND TONSILS

Adenoids

recurrent or chronic cases treated with antibiotics effective against B-lactamase-producing organisms
hyperplasia _ 6-8 wk course of intranasal steroids
indications for adenoidectomy: AH with chronic nasal obstruction or obligate mouth breathing, OSA, FTT, cor pulmonale, swallowing abnormalities, speech abnormalities, severe orofacial/dental abnormalities, infection, recurrent/chronic Chronic rhinosinusitis, recurrent/chronic otitis media with effusion (glue ear), chronic otitis media, neoplasia
contraindications for adenoidectomy:
Recent upper respiratory tract infection.
Cleft palate. The adenoids assist in closure of the nasopharynx from the oropharynx during speech and deglutition. They should be avoided to be removed in a child who has had a cleft palate repair or a congenitally short palate. All children who have a bifid uvula should have a submucous cleft excluded.
overt or submucous cleft palate (relative contraindications)
lateral or superior adenoidectomy may suffice if severe OSA present
neurologic or neuromuscular abnormalities with impaired palatal function
Anemia, disorders of hemostasis (uncontrolled bleeding disorder).

Complications

1. Immediate.

- o Anaesthetic complications.
- o Soft palate damage.
- o Dislocation of the cervical spine. C-spine subluxations from hyperextension
- o Reactionary haemorrhage.

1. Intermediate.

- Secondary haemorrhage.
- Subluxation of the atlanto-occipital joint (secondary to infection).

1. Late.

- Eustachian tube stenosis.
- Hypernasal speech (rhinolalia aperta). often improves with time and speech therapy but may be sufficiently severe to require a pharyngoplasty to correct the problem. It is less likely to occur if children with palatal abnormalities are excluded from operation. Some surgeons advocate removal of the upper part of the adenoid mass leaving a lower ridge of adenoid tissue against which the defective palate may continue to make contact.
- Persistence of symptoms.
- nasopharyngeal stenosis
- torticollis (**Grisel's syndrome**)

vertebral body decalcification and anterior transverse ligament laxity from infection/inflammation causes pain and torticollis

non-traumatic subluxation of the atlanto-axial joint caused by inflammation of the adjacent tissues. This is a rare disease that usually affects children.

Progressive throat and neck pain and neck stiffness can be followed by neurologic symptoms such as pain or numbness radiating to arms (radiculopathies).

In extreme cases, the condition can lead to quadriplegia and even death from acute respiratory failure. The condition often follows soft tissue inflammation in the neck such as in cases of upper respiratory tract infections, peritonsillar or retropharyngeal abscesses.

Post-operative inflammation after certain procedures such as adenoidectomy can also lead to this condition in susceptible individuals such as those with Down's syndrome

Diagnosis can be established using plain film x-rays as well as CT scan of the neck/cervical spine. Children with Down's syndrome have inherently lax ligaments making them susceptible to this condition. In select cases, these children may require pre-operative imaging to assess the risk for complications after procedures such as adenoidectomy.

Treatment includes anti-inflammatories medications and immobilization of the neck in addition to treatment of the offending infectious cause (if any) with appropriate antibiotics. Early treatment is crucial to prevent long-term sequelae. Surgical fusion may maybe required for residual instability of the joint.

- o The most serious complication is reactionary haemorrhage. This is treated in the same manner as posttonsillectomy haemorrhage. The child should be returned to theatre and an attempt made to localize and

diathermy the bleeding point. A postnasal pack should be inserted if necessary.

Tonsils

- acute tonsillitis: first line antibiotics: penicillin

Complications of acute tonsillitis

1. Local.

- Severe swelling causing respiratory obstruction.
- Abscess formation: Peritonsillar (quinsy), Parapharyngeal, Retropharyngeal.
- Acute otitis media.
- Recurrent acute tonsillitis (chronic tonsillitis).

2. General. Septicaemia, Meningitis, Acute rheumatic fever., Acute glomerulonephritis.

- chronic tonsillitis: clavulin or clindamycin for 3-6 weeks obviates need for tonsillectomy in 15% of children
- indications for surgery:
 - o obstruction, TH with chronic nasal obstruction, OSA, FTT, cor pulmonale, swallowing abnormalities, speech abnormalities, severe orofacial/dental abnormalities, infection, recurrent/chronic disease, tonsilolithiasis, recurrent/chronic otitis media, neoplasia
 - o tonsillitis with: -peritonsillar abscess, abscessed cervical nodes, acute airway obstruction, cardiac valve disease persistent
 - o tonsillitis with: persistent sore throat, tender cervical nodes, halitosis,
 - o Previous episodes of peritonsillar abscess (quinsy).
 - o Part of another procedure (UVPP, access to glossopharyngeal nerve or styloid process).
- post-tonsillectomy: 10-day course of amoxicillin to help reduce pain and malodorous breath

PERITONSILLAR ABSCESS

- secondary to infection of peritonsillar salivary gland (**Weber gland**) located between tonsil capsule and muscles of tonsillar fossa
- tx: hydration, pain relief and antibiotics effective against Staph. aureus and oral anaerobes

LINGUAL TONSILS

- extraesophageal reflux is a prime contributor to chronic lingual tonsillitis
- surgical excision rarely necessary

UNILATERAL TONSIL HYPERPLASIA

- suspect unusual infection (Mycobacterium tuberculosis, atypical mycobacteria, fungal organism, or actinomycosis) or neoplasia (squamous cell carcinoma or lymphoma).
- Asymmetry in a patient with recurrent bouts of acute tonsillitis.
- Apparent enlargement (peritonsillar abscess or parapharyngeal mass).

Contraindications for tonsillectomy:

- o Recent episode of tonsillitis or upper respiratory tract infection (within 2 weeks).
- o Bleeding disorder.
- o Oral contraceptives.
- o Cleft palate.
- o During certain epidemics (e.g. polio).

Differential diagnosis of ulceration of the tonsil

A working diagnosis can usually be determined from the history and clinical examination. Investigations include a full blood count, chest radiograph, serological tests and biopsy. Possible causes include:

1. Infection.

- Acute streptococcal tonsillitis.
- Diphtheria.
- Infectious mononucleosis.
- Vincent's angina.

2. Neoplasm.

- Squamous cell carcinoma.
- Lymphoma.
- Salivary gland tumours (adenoid cystic carcinoma or mucoepidermoid tumour).

3. Blood diseases.

- Agranulocytosis.
 - Leukaemia.
4. **Other causes.**
- Aphthous ulceration.
 - Behçet's syndrome.
 - Acquired immunodeficiency syndrome (AIDS).

CONTROVERSIES IN TONSILLECTOMY, ADENOIDECTOMY, AND TYMPANOSTOMY TUBES

Absolute Indications for Tonsillectomy/Adenoidectomy

- o obstruction unresponsive to antimicrobial therapy and causing FTT
- o suspected malignancy
- o persistent/recurrent tonsillar haemorrhage

obstruction that result in OSA

Relative Indications for Tonsillectomy

- o recurrent acute tonsillitis
- o chronic tonsillitis
- o obstructive tonsils
- o peritonsillar abscess

AAO-HNS - Indications for tonsillectomy

- o 3 or more episodes per year
- o hypertrophy causing malocclusion
- o upper airway obstruction
- o peritonsillar abscess unresponsive to nonsurgical treatment
- o halitosis not responsive to medical management
- o suspected neoplasm

Indications for observation post op

- o age < 3
- o OSA
- o significant associated medical problems
- o neurologic delay
- o craniofacial abnormalities
- o living long distance from hospital
- o questionable caregiver at home
- o known coagulopathy
- o emesis or hemorrhage
- o poor oral intake

Techniques for tonsillectomy :

- o electrocautery, dissection snare
- o intracapsular partial tonsillectomy
 - o uses microdebrider
 - o advantages: effective, less pain, quicker return to normal diet
 - o disadvantages: tonsillar regrowth, increased intraoperative blood loss

Adjuvant treatment

perioperative antibiotics

- fewer episodes of fever, offensive odour
- improved oral intake
- less pain, fewer days to return to normal activity

perioperative steroids

- decreased post-op emesis
- decreased post-op pulmonary distress, subglottic edema
- pain reduction

Complications

1. Immediate

- o pulmonary edema
- o atlantoaxial subluxations, Anaesthetic reaction, death, Haemorrhage.
 - o Damage to teeth, endotracheal tube injury
 - o Trauma to the posterior pharyngeal wall (careless insertion of the tongue blade).
 - o Dislocation of the temporomandibular joint by over-opening the mouth gag.

2. Early.

- Secondary haemorrhage.
- Haematoma and oedema of the uvula.
- Infection (may lead to secondary haemorrhage).
- Earache (referred pain or acute otitis media).
- Pulmonary complications (pneumonia and lung abscess are rare).
- Subacute bacterial endocarditis (if the patient has a cardiac defect).

3. Late.

- Scarring of the soft palate (limiting mobility and possibly affecting voice).
- Tonsillar remnants (which may be the site of recurrent acute infection).

hemorrhage:

- primary bleeding: < 24H (the vast majority occur within the first 8 hours)
Blood must be cross-matched and an intravenous infusion started. The tonsillar fossae should be inspected to identify a bleeding point. Any clot should be removed if possible and a gauze swab soaked in 1:1000 adrenaline applied to the fossa. If the bleeding continues, or there is any doubt, the patient should be prepared for a second anaesthetic and the bleeding point ligated under general anaesthesia. The second anaesthetic is hazardous and should only be administered by an experienced anaesthetist.
- secondary bleeding: 7-10 days post-op
The infection and haemorrhage will usually settle after treatment with antibiotics (i.v. penicillin and metronidazole or erythromycin). It is unusual for such a patient to have to go back to theatre and when this is necessary the tonsillar fossae are found to be sloughy and friable and it is difficult to locate and ligate any specific bleeding point. It may be necessary to suture the faucial pillars together, or over Kaltostat or a gauze swab which is removed the next day.

- o **The most significant complication is haemorrhage, which occurs in approximately 2% of cases.**

Most of the deaths associated with tonsillectomy are directly or indirectly associated with this complication.

It is essential to ensure adequate haemostasis at the end of the tonsillectomy procedure as blood in the airway at this time may cause laryngeal spasm or can occlude the airway.

The postnasal space should always be checked for a blood clot (the so-called 'coroner's clot').

Patients are nursed in the reverse Trendelenburg position (head down) so that blood trickles out of the mouth rather than being swallowed or aspirated.

Elective Indications for Adenoidectomy

- o obstructive adenoids
- o recurrent/chronic adenoiditis
- o recurrent/chronic sinusitis
- o recurrent acute otitis media and recurrent/chronic otitis media with effusion

Indications for Myringotomy and Placement of Tympanostomy Tubes

- o chronic otitis media with effusion unresponsive to medical management for 3 or more months bilateral or for 6 months or longer unilateral; earlier when significant hearing loss (eg. > 25 dB), speech/language delay, severe retraction pocket, disequilibrium/vertigo, or tinnitus is present
- o recurrent episodes of OME not meeting criteria for chronic disease, but cumulative duration excessive (eg 6 of 12 months)
- o recurrent AOM, especially when ABx prophylaxis fails to reduce the frequency, severity and duration of attacks; minimum frequency of three or more episodes in 6 months or four or more episodes in 12 months with one being recent
- o ETD, when persistent or recurrent signs and symptoms, disequilibrium/vertigo, tinnitus, or a severe retraction pocket, unrelieved by medical treatment; patulous eustachian tube; and during hypobaric treatment in patients with a prior history of otitis media/eustachian tube dysfunction, or when eustachian tube dysfunction develops during treatments
- o tympanoplasty when eustachian tube function is poor
- o suppurative complication, present or suspected

Tubes Only vs Tubes and Adenoidectomy

- o Recommendations (Bluestone): first surgical procedure for chronic OME unresponsive to medical treatment is only tubes and withhold adenoidectomy unless child meets criteria for this procedure.
- o if COME recurs following spontaneous extrusion of tubes, then recommend adenoidectomy irrespective of size of the adenoids and a myringotomy and aspiration of the middle-ear effusion

RANDOMIZED CONTROL TRIALS FOR TONSILLECTOMY, ADENOIDECTOMY AND TYMPANOSTOMY TUBES

Evidence from RCTs

- o tonsillectomy in children who meet the frequency severity and characteristics of episodes will be more effective than not performing this operation
- o adenoidectomy can reduce the frequency of recurrent acute otitis media in children who had had tympanostomy tubes previously inserted, but continued to experience recurrent attacks after the tubes had extruded
- o lack of efficacy of adenoidectomy, +/- tonsillectomy, for children who had never received tympanostomy tubes in the past
- o adenoidectomy is efficacious in children who had COME, whether or not tympanostomy tubes had been previously placed
- o tympanostomy tube placement without addition of adenoidectomy is effective in the management of both COME and recurrent AOM
- o myringotomy alone for COME no more effective than no surgery

No RCT trials to date

- o addressing efficacy and safety of tonsillectomy for chronic tonsillitis
 - o current recommendations:
 - o trial of antimicrobial agent may be beneficial in some children prior to recommending surgical interventions, especially in infants and very young children, when the operation has come increased risk; the clinician may be able to delay surgery until child grows older, if the antibiotic treatment is successful
- o peritonsillar abscess as an indication for tonsillectomy also has not been evaluated by a prospective randomized clinical trial
- o no prospective randomized clinical trials have demonstrated that adenoidectomy is effective in reducing the morbidity of sinusitis in children. Benefit of adenoidectomy remains uncertain
- o even though these studies are not available, adenoidectomy should still be considered on an individualized basis for chronic sinusitis