The Tonsils and Adenoids in Pediatric Patients

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Introduction

- 1994 140,000 U.S. children under the age of 15 had adenoidectomies and 286,000 had adenotonsillectomies
- This is down from a peak of over 1 million in the 1970’s
- These are the most common major surgical procedures in children.
Celsius first described tonsillectomy in 30 A.D.

Paul of Aegina wrote his description in 625 A.D.

1867 Wilhelm Meyer reports removal of “adenoid vegetations” through the nose with a ring knife.

1917 Samuel J. Crowe published his report on 1000 tonsillectomies, used Crowe-Davis mouth gag

Part of Waldeyer’s ring after the German anatomist who described them
Embryology

- Adenoids begin forming in the 3rd month of fetal development.
- Glandular primordia on the posterior pharynx are infiltrated by lymphocytes.
- Covered by pseudostratified ciliated epithelium.
- Fully formed by the 7th month.
Palatine tonsils begin development in 3rd month of fetal development

- From ventral second pharyngeal pouches
- 8-10 buds of epithelium grow into pharyngeal walls, form crypts
- Lymphocytes infiltrate
- Branching of crypts occurs last trimester
Anatomy of the adenoids

- Single pyramidal mass of tissue based on posterior-superior nasopharynx
- Surface folded without true crypts
- Blood supply – ascending palatine branch of facial artery, ascending pharyngeal artery, pharyngeal branch of internal maxillary artery
- Innervation – glossopharyngeal and vagus
- No afferent lymphatics, efferents drain to retropharyngeal and upper deep cervical nodes
Anatomy of the Tonsils

- Paired, sit in tonsillar sinus
- Limited anteriorly by palatoglossal arch, posteriorly by palatopharyngeal arch, laterally by superior pharyngeal constrictor
- Enclosed in a fibrous capsule
- Blood supply from tonsillar and ascending palatine branches of facial artery, ascending pharyngeal artery, dorsal lingual branch of the lingual artery and the palatine branch of maxillary artery
Pharyngeal mucosa removed

- Cartilaginous part of pharyngotympanic (auditory) tube
- Medial pterygoid plate
- Tensor veli palatini muscle and tendon
- Levator veli palatini muscle
- Ascending palatine artery
- Pharyngeal branch of ascending pharyngeal artery
- Lesser palatine artery
- Salpingopharyngeus muscle
- Pterygoid hamulus
- Pterygomandibular raphe
- Tonsillar branch of lesser palatine artery
- Superior pharyngeal constrictor muscle
- Tonsillar branch of ascending pharyngeal artery
- Palatoglossus muscle
- Palatopharyngeus muscle
- Tonsillar branch of ascending palatine artery
- Tonsillar branch of facial artery
- Tonsillar branch of dorsal lingual artery
- Glossopharyngeal nerve (IX) and tonsillar branch
- Stylohyoid ligament
- Hyoglossus muscle
- Middle pharyngeal constrictor muscle
- Stylopharyngeus muscle
- 10-30 crypts
- Innervation from sphenopalatine ganglion via lesser palatine and glossopharyngeal nerves
- No afferent lymphatics, efferents drain to upper deep cervical lymph nodes
Immunology and Function

- Part of secondary immune system
- No afferent lymphatics
- Exposed to ingested or inspired antigens passed through the epithelial layer
- Immunologic structure is divided into 4 compartments: reticular crypt epithelium, extra follicular area, mantle zone of the lymphoid follicle, and the germinal center of the lymphoid follicle
Membrane cells and antigen presenting cells are involved in transport of antigen from the surface to the lymphoid follicle.

- Antigen is presented to T-helper cells.
- T-helper cells induce B cells in germinal center to produce antibody.
- Secretory IgA is primary antibody produced.
- Involved in local immunity.
Microbiology of adenotonsillitis

- Group A beta-hemolytic is most recognized pathogen
- Associated with a risk of rheumatic fever and glomerulonephritis
- Many other organisms are involved
Of particular importance are beta-lactamase producing organisms like Staphylococcus aureus, Moraxella catarrhalis, and Hemophilus influenzae.

In polymicrobial infections beta-lactamase producing organisms can protect Group A strep from eradication with penicillins.

39% of all cultured organisms in one study.
## Infectious Organisms

### TABLE 81.2. BACTERIA AND VIRUSES COMMONLY CULTURED FROM THE TONSILS AND ADENOIDS

<table>
<thead>
<tr>
<th>Bacteria</th>
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<tbody>
<tr>
<td><strong>Aerobic</strong></td>
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<tr>
<td>Group A beta-hemolytic streptococci</td>
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<tr>
<td>Groups B, C, G streptococcus</td>
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<tr>
<td><em>Haemophilus influenzae</em> (type b and nontypeable)</td>
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<td><em>Streptococcus pneumoniae</em></td>
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<td><em>Moraxella catarrhalis</em></td>
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<td><em>Staphylococcus aureus</em></td>
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<tr>
<td><em>Haemophilus parainfluenzae</em></td>
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<tr>
<td><em>Neisseria</em> species</td>
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<tr>
<td><em>Mycobacteria</em> species</td>
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<tr>
<td><strong>Anaerobic</strong></td>
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<tr>
<td><em>Bacteroides</em> species</td>
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<tr>
<td><em>Peptococcus</em> species</td>
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<tr>
<td><em>Peptostreptococcus</em> species</td>
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<tr>
<td><em>Actinomyces</em> species</td>
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<tr>
<td><strong>Viruses</strong></td>
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<tr>
<td>Epstein-Barr</td>
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<td>Adenovirus</td>
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<td>Influenza A and B</td>
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<td>Herpes simplex</td>
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<td>Respiratory syncytial</td>
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<td>Parainfluenza</td>
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Adenotonsillar disease

Major divisions are:
- Infection/inflammation
- Obstructive
- Neoplasm
Acute adenoiditis

- Symptoms include:
  - Purulent rhinorrhea
  - Nasal obstruction
  - Fever
  - Associated Otitis Media
Recurrent Acute Adenoiditis

- 4 or more episodes of acute adenoiditis in a 6 month period
- Similar presentation as recurrent acute rhinosinusitis
- In older children nasal endoscopy can help
Chronic adenoiditis

Symptoms include:
- Persistent rhinorrhea
- Postnasal drip
- Malodorous breath
- Associated otitis media >3 months
- Think of reflux
Acute Tonsillitis

Signs and symptoms:
- Fever
- Sore throat
- Tender cervical lymphadenopathy
- Dysphagia
- Erythematous tonsils with exudates
Recurrent Acute Tonsillitis

- Same signs and symptoms as acute
- Occurring in 4-7 separate episodes per year
- 5 episodes per year for 2 years
- 3 episodes per year for 3 years
Chronic Tonsillitis

- Chronic sore throat
- Malodorous breath
- Presence of tonsilloliths
- Peritonsillar erythema
- Persistent tender cervical lymphadenopathy
- Lasting at least 3 months
Peritonsillar abscess

- Abscess formation outside tonsillar capsule
- Signs and symptoms:
  - Fever
  - Sore throat
  - Dysphagia/odynophagia
  - Drooling
  - Trismus
  - Unilateral swelling of soft palate/pharynx with uvula deviation
Thought to be extension of tonsillitis to involve surrounding tissue with abscess formation

Recently described to be an infection of small salivary glands in the supratonsillar fossa called Weber’s glands

Would explain superior pole involvement and the usual absence of tonsillar erythema/exudates
Obstructive Adenoid Hyperplasia

- Signs and Symptoms
  - Obligate mouth breathing
  - Hyponasal voice
  - Snoring and other signs of sleep disturbance
Obstructive Tonsillar Hyperplasia

- Snoring and other symptoms of sleep disturbance
- Muffled voice
- Dysphagia
Congenital tonsillar masses

- Teratoma
- Hemangioma
- Lymphangioma
- Cystic hygroma
Malignant Neoplasms

- Most common is lymphoma
- Non-Hodgkin’s lymphoma
- Rapid unilateral tonsillar enlargement associated with cervical lymphadenopathy and systemic symptoms
Medical Management

- Penicillin is first line treatment
- Recurrent or unresponsive infections require treatment with beta-lactamase resistant antibiotics such as
  - Clindamycin
  - Augmentin
  - Penicillin plus rifampin

Adenotonsillar hyperplasia may respond to one month of therapy with beta-lactamase resistant antibiotics
Tonsillectomy

Current clinical indicators of AAO-HNS:

- 3 or more infections per year despite adequate medical therapy
- Hypertrophy causing dental malocclusion or adversely affecting orofacial growth documented by orthodontist
- Hypertrophy causing upper airway obstruction, severe dysphagia, sleep disorder, cardiopulmonary complications
- Peritonsillar abscess unresponsive to medical management and drainage documented by surgeon, unless surgery performed during acute stage
- Persistent foul taste or breath due to chronic tonsillitis not responsive to medical therapy
- Chronic or recurrent tonsillitis associated with streptococcal carrier state and not responding to beta-lactamase resistant antibiotics
- Unilateral tonsil hypertrophy presumed neoplastic
Adenoidectomy

Current clinical indicators from AAO-HNS:

- 4 or more episodes of recurrent purulent rhinorrhea in prior 12 months in a child <12. One episode documented by intranasal examination or diagnostic imaging.
- Persisting symptoms of adenoiditis after 2 courses of antibiotic therapy. One course of antibiotics should be with a beta-lactamase stable antibiotic for at least 2 weeks.
- Sleep disturbance with nasal airway obstruction persisting for at least 3 months
- Hyponasal or hypernasal speech
- Otitis media with effusion >3 months or second set of tubes
- Dental malocclusion or orofacial growth disturbance documented by orthodontist
- Cardiopulmonary complications including cor pulmonale, pulmonary hypertension, right ventricular hypertrophy associated with upper airway obstruction
- Otitis media with effusion over age 4
Surgical methods

- Adenoidectomy
  - Adenotome
  - Curettes
  - Hemostasis with packing and/or electrocautery
Tonsillectomy

- Tonsillotome
- Cold dissection with snare
- Monopolar/bipolar electrocautery
- CO2 or KTP laser
- Hemostasis with packing, electrocautery, sutures
Complications

- Incidence of mortality reported between 1 in 16,000 and 1 in 35,000 cases
- Anesthetic complications and hemorrhage cause majority of deaths
- Depending on threshold for recording hemorrhage ranges from 0.1% to 8.1%
Hemorrhage is divided into primary bleeding, in the first 24 hours.
Secondary bleeding 7-10 days post op.
Dehydration.
Airway obstruction from edema.
Pulmonary edema.
- Fever
- Velopharyngeal insufficiency
- Dental injury
- Burns
- Nasopharyngeal stenosis
- Atlantoaxial subluxation with Down’s syndrome or Grisel’s syndrome (vertebral body decalcification and anterior transverse ligament laxity from infection/inflammation)
Indications for Observation

- Age <3
- Obstructive sleep apnea
- Significant associated medical problems
- Neurological delay
- Craniofacial abnormalities
- Living a long distance from the hospital
- Questionable caregiver at home
- Known coagulopathy
Controversies

- Tonsillectomy for recurrent tonsillitis
- Adenoidectomy for otitis media
- Obstructive sleep apnea
- Coagulation studies
Tonsillectomy for Recurrent tonsillitis

Paradise et al 1984
- Reported on 187 severely affected children
- 7 episodes/one year, 5 per year for 2 years, or 3 per year for 3 years
- Children who had tonsillectomy had fewer throat infections in the first 2 years postoperatively
Tonsillectomy/Adenoidectomy for Otitis Media

Gates et al reported on 578 children with chronic some benefit of adenoidectomy with or without myringotomy tube placement versus myringotomy or tubes alone.
Paradise et al 461 children who had recurrent otitis media and no prior tubes for benefit from adenoidectomy or T&A

- No benefit in rate of infections from adenoidectomy 1.8 vs. 2.1, mild lowering of time with effusion 22.4% vs. 18.6%
- T&A 1.4 vs. 2.1 mean annual rate of episodes, 18.6% vs. 29.9% time spent with effusion
- Concluded that neither surgical procedure should be first line treatment for recurrent otitis media
Obstructive Sleep Apnea

- Rising indication for adenotonsillectomy
- When is polysomnography indicated?
  - Of benefit in establishing those children with OSA however parameters for abnormal results are not standardized in children RDI > 1 or 5
  - Number of centers equipped to handle children is limited, may delay treatment, expensive
  - Is of most use in questionable cases or in those with persistent obstructive symptoms after T&A
PTA in young Children

- Estimated 13,500 cases of PTA per year
- Most common in teenagers and young adults
- PE may be difficult in uncooperative child
- CT scan can help with diagnosis
In a cooperative patient needle aspiration or incision and drainage is effective 80-100%.

This may be difficult in younger children.

Dodds and Manglia recommended surgery in all patients 79% I&D, 21% tonsillectomy.

Blotter et al: series 102 patients 8mos-19 years, 51% responded to medical therapy, 49% underwent tonsillectomy.
Preoperative Coagulation Studies

- PT/PTT, CBC, bleeding time
  - Tami et al found 24% patients with abnormal PT/PTT experienced postoperative bleeding, only 10% normal PT/PTT
  - Bolger et al found that despite a history without evidence of bleeding tendency 11.5% had abnormal PT/PTT or BT
Manning et al 994 patients, perioperative bleeding, sensitivity 5.5% specificity 94% PPV 3.4%: concluded unjustifiable test

Zwack and Derkay 4373 patients, examined those with postoperative bleeding (0.98%), 1 had elevated PTT by 0.1

AAO-HNS recommends coagulation and bleeding workup only if indicated by history or genetic information is unavailable.
Case Study

- A 3 yo boy presents to your office whose parents complain that he snores loudly and stops breathing sometimes while sleeping. The child’s pediatrician told the parents that his tonsils were “big” and that the child is under weight for his age.
- Also has dysphagia and daytime somnolence
- Apneic spells last >10 seconds
- PMH: otherwise healthy
- Meds: none
- No allergies
PE:

- Dark circles under eyes
- Breathing with mouth open
- Small amount of clear rhinorrhea
- Tonsils are almost touching in the midline
- Adenotonsillar hypertrophy
- Sleep disturbance