A History of Tonsillectomy: Three Millenia of Trauma, Hæmorrhage and Controversy

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mybigfattonsillectomy.com

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PEDIATRIC SURGERY
PLASTIC SURGERY
TRAUMA & ORTHOPAEDIC SURGERY
UROLOGY
**Tonsils and Adenoids**

**History**

- **Tonsillectomy**
  - 3000 years ago in Hindu writings
  - 2000 years ago by Cornelius Celsus and Paul of Aegina
  - 1828 - Philip Syng Physick MD, FRCS (1791), of Philadelphia
    - Described the tonsilotome
    - 1828 - Philip Syng Physick MD, FRCS (1791), of Philadelphia
      - Described the tonsilotome
  - 1917 - Samuel J. Crowe published his report on 1000 tonsillectomies
  - Popularized the use of the Crowe-Davis mouth gag and sharp dissection

- **Adenoidectomy**
  - October 26, 1867 by Wilhelm Meyer, Copenhagen
  - 20 year old woman, for reduced hearing and nasal obstruction
  - Ring forceps through the nose

**What do the tonsils do?**

- Part of secondary immune system
- Exposed to ingested or inspired antigens passed through the epithelial layer
- 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;
  - → induce B cells in germinal center to produce antibody (sIgA)

**Early 20th century indications**

- "Focus of infection" theory:
  - circumscribed and confined infections could lead to local disease or systemic disease
  - rheumatic fever, tuberculosis, mycoplasma, pneumonia, nephritis, pancreatitis, cholera, pericarditis, appendicitis, and arthritis
  - Tonsils were identified as "a portal of entry"
- Anorexia
- Mental retardation
- General measure to promote good health

"The doctors had coolly descended on the school, taken possession, lined the children up, marched them past, taken one look down each child's throat, and then two strong arms seized and held the child while the doctor used his instruments to reach down into the throat and rip out whatever came nearest to hand, leaving the boy or girl frightened out of a year's growth and bleeding savagely."

Tonsils and Adenoids

Epidemiology

- Number of tonsillectomies
  - Between 1915 and 1960, T&A was the most frequently performed surgical procedure in the USA
  - 1959: 1.4 million
  - 1979: 500,000
  - 1985: 340,000
  - 1996: 287,000
  - Number has declined by 50% since then
- Most frequent major pediatric surgery in USA
- 1950's
  - Primary indication: infection
  - Proportion removed for obstructive symptoms has increased dramatically
  - Proportion removed for infectious symptoms has declined
- Public and professional opinion concerning tonsillectomy and adenoidectomy continues to swing between enthusiasm and condemnation

Tonsillectomy or Tonsillotomy

Definitions

- **Tonsillectomy**
  - Complete removal of the tonsil and its capsule
  - Painful
- **Tonsillotomy**
  - Partial removal of the tonsil sparing the capsule
  - Less painful

Methods

- **Tonsillectomy**
  - Dissection and snare, traditional method
  - Diathermy/Electrocautery
    - Monopolar
    - Bipolar forceps or scissors
  - Coblation
  - Bipolar radiofrequency ablation
  - Harmonic scalpel
  - Thermal welding
  - CO2 laser
    - Surface laser tonsil ablation
- **Tonsillotomy**
  - Microdebrider
    - Powered suction dissection aspirator
  - Less painful

Tonsils

Anatomy

- Palatine tonsils
  - Remain in oropharynx
  - May encroach on hypopharynx
- Tonsil fossa
  - Anterior pillar
  - Palatoglossus muscle
  - Posterior pillar
  - Palatopharyngeus muscle
- Tonsil capsule
  - Attached to superior constrictor of the pharynx
  - Muscle pain fibers responsible for postoperative pain

**Tonsillectomy and Adenoidectomy**

**Definite Indications**

<table>
<thead>
<tr>
<th>Indications</th>
<th>Tonsillectomy</th>
<th>Adenoidectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malignancy</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>OSA</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Adenotonsillar hypertrophy with upper airway obstruction</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>FTT</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Speech abnormalities</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Dental malocclusion</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Eating and swallowing disorders</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Hemorrhagic tonsillitis</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Sinusitis Possible</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Otitis media</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

**Relative Indications**

<table>
<thead>
<tr>
<th>Indications</th>
<th>Tonsillectomy</th>
<th>Adenoidectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent infections</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Streptococcus carrier</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Petentonsillar abscess</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Chronic infection</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Halitosis</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

The indications for adeno/tonsillectomy are controversial.

**Tonsils and Adenoids**

**Adenoid hypertrophy**

- Long face
- Noisy breathing
- Lack of lip seal
- Mouth breathing
- Nasal obstruction
- High arched palate
- Rhinorrhea
- Hyponasal speech
- Enuresis
- Poor school performance

**Tonsils and Adenoids**

**Lateral neck x-ray & adenoid hypertrophy**

- Obtain while child is awake and upright
- Identifies tonsil and adenoid tissue
- Does not reliably predict presence or severity of obstruction when the child is asleep or supine
- May be useful to determine if adenoid regrowth has occurred

**Tonsils and Adenoids**

**Recurrent Throat Infections**

- **American Academy of Pediatrics**
  - adenotonsillectomy is a reasonable option for children with “many severe sore throats”

- **American Academy of Otolaryngology**
  - surgery indicated for 3 or more infections per year

No absolute consensus as to how many infections constitute too many infections


Tonsils and Adenoids

Chronic Tonsillitis and Adenoiditis

- Symptoms lasting more than 3 months
  - Associated with:
    - Halitosis
    - Persistent cervical lymphadenopathy
    - Postnasal drainage
    - Chronic cough
- No randomized trial of surgery and antibiotic treatment

Tonsils and Adenoids

Recommendations for diagnosis of OSA

- American Academy of Pediatrics Guidelines
  - All children should be screened for snoring as part of routine health maintenance
  - Complex high-risk patients should be referred to a specialist
  - Patients with cardiopulmonary failure cannot await elective evaluation
  - Diagnostic evaluation is useful in discriminating between primary snoring and OSA, the gold standard being polysomnography

Tonsils and Adenoids

Recommendations for diagnosis of OSA (cont)

- Adenotonsillectomy is the first line of treatment for most children and CPAP is an option for those who are not candidates for surgery or who do not respond to surgery
  - High-risk patients should be monitored as inpatient postoperatively
  - Patients should be reevaluated postoperatively to determine whether additional treatment is required

Tonsils and Adenoids

Sleep Related Breathing Disorders

- Normal UAW resistance no snoring
- Increased UAW resistance causing only asymptomatic snoring
- Increased UAW resistance sufficient to cause symptoms
- Increased UAW resistance sufficient to elevate PaCO2 or lower SpO2
- Intermittent UAW complete obstruction

Increasing upper airway resistance

None
Primary Snoring
Upper Airway Resistance Syndrome
Obstructive Hypoventilation or Obstructive Hypopnea
Obstructive Sleep Apnea

Diagnostic Classification of Pediatric Sleep-Disordered Breathing

<table>
<thead>
<tr>
<th>Diagnosis*</th>
<th>AHI</th>
<th>SpO2 Min</th>
<th>Pa2 CO2 Peak</th>
<th>Pa2 CO2 &gt; 30% TST</th>
<th>EEG Arousal (events/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Snoring</td>
<td>≤1</td>
<td>&gt; 92</td>
<td>≤ 53</td>
<td>&lt; 10</td>
<td>≤ 11</td>
</tr>
<tr>
<td>UARS</td>
<td>≤ 1.5</td>
<td>&gt; 92</td>
<td>≤ 53</td>
<td>&lt; 10</td>
<td>&gt; 11</td>
</tr>
<tr>
<td>Mild OSA</td>
<td>1.5-4</td>
<td>36-91</td>
<td>≤ 53</td>
<td>10-24</td>
<td>≤ 11</td>
</tr>
<tr>
<td>Mod OSA</td>
<td>5-10</td>
<td>76-85</td>
<td>&gt; 60</td>
<td>25-49</td>
<td>&gt; 11</td>
</tr>
<tr>
<td>Severe OSA</td>
<td>&gt; 10</td>
<td>≤ 72</td>
<td>≤ 64</td>
<td>≥ 50</td>
<td>&gt; 11</td>
</tr>
</tbody>
</table>

*Diagnosis requires one or more of the measures to the right

Tonsils and Adenoids

Primary Snoring

- 10% of children snore on all or most nights
- Most of these have primary snoring
- Usually considered benign
- PS does not appear to progress
- Treatment is not recommended presently
Tonsils and Adenoids

Sleep Disordered Breathing - Symptoms

- Noisy breathing
- Lack of lip seal
- Mouth breathing
- Nasal obstruction
- Rhinorrhea
- Hyponasal speech
- Enuresis
- Snoring
- Nocturnal cough
- Nocturnal choking
- Restless sleeper
- Daytime hypersomnolence
- Poor school performance
- ADHD

Upper Airway Resistance Syndrome

- Snore and have partial upper airway obstruction
- Repetitive episodes of increased respiratory effort
- Arousals
- Disrupted sleep patterns
- Daytime symptoms similar to OSA
- No evidence of hypopnea or gas exchange abnormalities on polysomnography
- Incidence unknown, possibly higher incidence than OSA
- Treatment is identical to OSA

Obstructive Hypoventilation/Hypopnea

- Persistent partial upper airway obstruction
- Gas exchange abnormalities
  - Hypoxia and hypercarbia
- No discrete apneic episodes (by definition)
- Do not manifest pauses and gasps in snoring
- May be misdiagnosed as primary snoring on basis of history alone
- Treatment is identical to OSA

Obstructive Sleep Apnea

- 1% to 3% of all children
- 40% of children referred to otolaryngologists
- Diagnosis is made on a high index of suspicion based on history and physical examination
- Definitive criteria for pediatric apnea exist
- Usually associated with hypoxia or hypercarbia
- Diagnosis is confirmed by polysomnography

OSA Differences - Pediatric and Adult

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Children</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Peak 2-6 y</td>
<td>Increases in elderly</td>
</tr>
<tr>
<td>Gender</td>
<td>M:F</td>
<td>M:F = 2:1</td>
</tr>
<tr>
<td>Obesity</td>
<td>Minority</td>
<td>Majority</td>
</tr>
<tr>
<td>Underweight/FTT</td>
<td>Frequent</td>
<td>Not seen</td>
</tr>
<tr>
<td>T&amp;A hypertrophy</td>
<td>Frequent</td>
<td>Not seen</td>
</tr>
<tr>
<td>Daytime somnolence</td>
<td>Infrequent</td>
<td>Frequent &amp; severe</td>
</tr>
<tr>
<td>Irritability</td>
<td>Frequent</td>
<td>Infrequent</td>
</tr>
<tr>
<td>Avoid going to bed</td>
<td>Frequent</td>
<td>Infrequent</td>
</tr>
</tbody>
</table>

No absolute correlation between size of adenoids and tonsils and OSA

Associated with craniofacial abnormalities
  - Apert’s syndrome, Pierre Robin, Achondroplasia
  - Post nasal space stenosis

Neurological dysfunction
  - Cerebral palsy, down syndrome
  - Decreased upper airway muscle tone

Follow children in high risk groups closely
## Tonsils and Adenoids

### OSA Differences - Pediatric and Adult

<table>
<thead>
<tr>
<th>Sleep</th>
<th>Children</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstruction</td>
<td>Obstructive apnea or</td>
<td>Obstructive apnea</td>
</tr>
<tr>
<td>Sleep architecture</td>
<td>Normal</td>
<td>Decreased delta and REM</td>
</tr>
<tr>
<td>Arousals</td>
<td>May not be seen</td>
<td>End of each apnea</td>
</tr>
<tr>
<td>Enuresis</td>
<td>Frequent</td>
<td>Frequent</td>
</tr>
<tr>
<td>Restless</td>
<td>Frequent</td>
<td>Infrequent</td>
</tr>
</tbody>
</table>

### OSA – Pediatric Polysomnography

- Interpret by a pediatric sleep specialist
- Snoring
- Paradoxical movement or labored respiratory efforts
- Decreased or absent nasal airflow with switch to mouth breathing
- Relative obstructive apnea
  - Children have shorter apneas (< 10 s) than adults (>10 s)
- Cyclical oxygen desaturations, hypercapnia
- Apnea index of more than 1 is rare in children
- Cortical arousals
  - Common after spontaneous movements
  - Terminate the apneic event
  - Rare after apneic events in comparison with adults

### Obstructive Sleep Apnea - Complications

- Growth
  - FTT rarely seen now
  - Improved growth after adenotonsillectomy
  - FTT probably related to increased WOB during sleep
  - Nocturnal growth hormone decreased
  - Include OSA in differential diagnosis of idiopathic FTT

- Cardiopulmonary – severe untreated OSA
  - Pulmonary hypertension
    - Secondary to severe recurrent nocturnal hypoxemia, hypercapnia and acidosis
  - Cardiomegaly
    - Right and left ventricular hypertrophy
    - Constrictive heart failure
  - Cor pulmonale
  - Pulmonary edema
    - Readily reversible by treatment
  - Systemic hypertension
    - Reported in pediatric and adult OSA

- Neurocognitive deficits
  - Poor learning
  - Behavioral problems
  - Inattentivity
  - Attention Deficit/Hyperactivity Disorder

- Death
  - Sudden
  - If untreated
  - Described in early OSAS literature
Tonsils and Adenoids

OSA – Nonsurgical treatment

- Reserved for children with contraindications to surgery
  - Allergy management in atopic patients
  - Intranasal steroids*
    - Fluticasone (Flonase) ameliorates symptoms
  - Many patients still go on to surgery
  - Supplemental nocturnal oxygen
    - Temporary Tx for hypoxemia until definitive Tx provided
  - Positive pressure breathing
    - CPAP or BiPAP
  - Antimicrobial management
  - Nasopharyngeal intubation
  - Systemic steroids

*Broilette RT et al J Pediatr 2001;138:838-44

Tonsils and Adenoids

Neurocognitive deficits

- Compared top 25% and bottom 25% of class
  - 297 1st Grade Children
- Bottom 25%
  - Loud and frequent snoring in 13%
  - Adenotonsillectomy in 3%
- Top 25%
  - Loud and frequent snoring in 5%
  - Adenotonsillectomy in 1%

- Snoring during early childhood and academic performance at ages thirteen to fourteen years
  - Gozal, Pediatrics 2001;107(6):1394-9

Tonsils and Adenoids

Contraindications to Surgery

- Absolute
  - Uncorrected coagulopathy
- Relative
  - Malignant hyperthermia
  - Palatal abnormalities
    - Overt or submucous cleft palate
    - Velopharyngeal incompetence
    - Bifid uvula

Tonsils and Adenoids

OSA Additional Treatment

- Weight management
  - Result is less optimal in obese children
- CPAP/BiPAP
  - Severe OSA
  - Surgery failure
- Other surgical procedures
  - Tongue reduction, Tongue base suspension, Maxillomandibular advancement, etc.

Tonsils and Adenoids

Complications

- Dehydration
- Bleeding
  - Primary, 1st 24 hours
  - Secondary, After 24 hours
- Death
  - 0.012%
- Dental damage
- Cervical spine
**Tonsils and Adenoids**

**Intraoperative Complications**

- Hemorrhage
  - Primary, first 24 hours including intraoperatively
- Anesthesia
  - Dislodging of loose teeth
  - Dislocation of the TMJ
  - Accidental extubation
  - Kinking of the endotracheal tube
  - Atlantoaxial instability
  - Endotracheal tube fire

**Immediate Postoperative Complications**

- Hemorrhage
- Nausea and vomiting, oropharyngeal pain
- Referred otalgia
- Otitis media with effusion
  - Surgical edema obstructing the eustachian tube orifice
- Pulmonary edema
  - Removal of obstruction superimposed on baseline increase in intrathoracic pressure causes transudation of fluid into the pulmonary interstitium

**Delayed Complications**

- Hemorrhage
- Dehydration
- Pneumonia
  - Atelectasis
  - Aspiration of teeth, blood or tissue
- Velopharyngeal insufficiency
  - Submucous cleft palate

**Long-Term Complications**

- Velopharyngeal insufficiency
  - Reassure for eight weeks
  - Speech therapy for 12 months
  - Surgical intervention if no improvement
- Nasopharyngeal stenosis
  - 1 in 30,000
- Eagle syndrome
  - Ossification of the stylohyoid ligament

**Complications**

- See all bleeds
- Come straight to hospital
- Start IV’s
- Competent anesthesia
- Rapid sequence induction
- Control the ONE bleeder
- Observe for 24 hours
Tonsillectomy or adeno-tonsillectomy versus non-surgical treatment for chronic/recurrent acute tonsillitis

- Review (5 studies): 4 pediatric (719 participants), 1 adult (70 participants).
- Good information about the effects of tonsillectomy is only available for children and for effects in the first year following surgery.
- Children were divided into two subgroups: those who are severely affected (based on specific criteria which are often referred to as the "Paradise criteria") and those less severely affected.
- For more severely affected children adeno-/tonsillectomy will avoid three unpredictable episodes of any type of sore throat, including one episode of moderate or severe sore throat in the next year. The cost of this is a predictable episode of pain in the immediate postoperative period.
- Less severely affected children may never have had another severe sore throat anyway and the chance of them so doing is modestly reduced by adeno-tonsillectomy. For them, surgery will mean having an average of two rather than three unpredictable episodes of any type of sore throat. The cost of this reduction is one inevitable and predictable episode of postoperative pain.
Adenotonsillectomy or adeno-tonsillectomy versus non-surgical treatment for chronic/recurrent acute tonsillitis

- Adeno-tonsillectomy is effective in reducing the number of episodes of sore throat and days with sore throats in children.
- The gain is more marked in those most severely affected.
- It is clear that some children get better without any surgery, and that whilst removing the tonsils will always prevent 'tonsillitis', the impact of the procedure on 'sore throats' due to pharyngitis is much less predictable.

AUTHORS' CONCLUSIONS: One small study failed to find a difference between two surgical techniques, although return to normal diet was more frequent in the group treated by temperature controlled radiofrequency ablation. More children in the TCFR&A group were able to return to normal diet at 7 days compared with complete T&A. No significant complications were observed in the study.

Adenotonsillectomy for obstructive sleep apnoea in children

- BACKGROUND: Current treatment of sleep apnoea in children consists of simple surgical based treatments. Adenotonsillectomy is the most commonly used intervention to treat sleep apnoea in children.
- OBJECTIVES: To determine the efficacy of adenotonsillectomy in the treatment of obstructive sleep apnoea in children.
- SEARCH STRATEGY: The Cochrane Airways Group Specialised Register was searched from its inception to May 2008. The PEDro (Physiotherapy Evidence Database) Register and the National Health Service Research Database were searched for trials recruiting children with a diagnosis of obstructive sleep apnoea.
- DATA COLLECTION AND ANALYSIS: Two reviewers examined the search results and collected data from the studies in terms of their characteristics before deciding which ones would be included in the review.
- MAIN RESULTS: One study met the review entry criteria. This study addressed the relative merits of two surgical techniques in treating OSA in children (temperature controlled radiofrequency ablation and adenotonsillectomy, and complete adenotonsillectomy and adenoidectomy). No significant difference was apparent for either symptom or respiratory disturbance index. More children in the TCFR&A group were able to return to normal diet at 7 days compared with complete T&A. No significant complications were observed in the study.

Stepwise approach to managing Recurrent Acute Otitis Media

<table>
<thead>
<tr>
<th>Step</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Confirm the diagnosis: Distinct pain from true OM, refuses ME by tympanometry or pneumatic otoscope.</td>
</tr>
<tr>
<td>2</td>
<td>Put no fluids in ear (if present).</td>
</tr>
<tr>
<td>3</td>
<td>Practice prevention: Encourage hand washing, control allergies, instillo preevac薄膜 vaccine (2 yrs or later), minimise rhinovirus infection.</td>
</tr>
<tr>
<td>4</td>
<td>Use prophylaxis with caution: Risk of aseptic meningitis, otitis: some experts recommend benefit of prophylactic antibiotic prophylaxis.</td>
</tr>
<tr>
<td>5</td>
<td>Explore surgery: Antibiotics are not a long-term cure for some, consider adenoids, homolateral mastoidectomy.</td>
</tr>
<tr>
<td>6</td>
<td>Fill the punishment to the crime: Recurrence AOM with repeated symptoms can be managed especially: consider surgery, is accompanied by high fever, antibiotics resistance, hearing loss or chronic OME. Take this step carefully.</td>
</tr>
</tbody>
</table>

Adenoids

Recurrent Acute Otitis Media

- Risk of accelerated bacterial resistance often outweighs minimal benefit of prolonged antibiotic prophylaxis.
- Risk of aseptic meningitis, otitis: some experts recommend benefit of prophylactic antibiotic prophylaxis.
- Consider surgery: Antibiotics are not a long-term cure for some, consider adenoids, homolateral mastoidectomy.
- Recurrence AOM with repeated symptoms can be managed especially: consider surgery, is accompanied by high fever, antibiotics resistance, hearing loss or chronic OME. Take this step carefully.