ADENOTONSILLECTOMY COMPLICATIONS
PALATINE TONSILS

• Component of Waldeyer’s tonsillar ring.

Consists of
• Lingual tonsil
• Palatine tonsils (2)
• Adenoids (NF tonsil)
• Lymphoid tissue on the posterior pharyngeal wall
PALATINE TONSILS

• The PT are the largest component of the ring.
• Defense against infection. Development of the **immune system**.
• PT grow throughout childhood until the age of **11 years**.
• **Decrease** spontaneously.
• Placed in the space between the palatopharyngeal and palatoglossus muscles.
• **Hyperplasia** of the tonsils → breathing and swallowing problems.
PALATINE TONSILS

SPECIALIZED HISTOLOGIC STRUCTURE:

- Matrix: lymphoid tissue with crypts.
- Cells organized in lymphoid follicles.
- Adherent to a capsule → limited inflammation.
- Stratified squamous epithelium.
ADENOIDs

• Median mass of mucosa situated in the **posterior wall of nasopharynx**.
• Composed of vertical ridges of lymphoid tissue separated by deep clefts.
• **Pseudostratified ciliated columnar epithelium.**
ADENOIDs

- Prominent in children up to 6 years of age.
- Gradually undergo atrophy.

- Hyperplasia of the adenoids:
  - Nasal obstruction
  - Epistaxis
  - Voice change
  - Tubal obstruction
  - Otitis media
**TONSILS AND ADENOID BLOOD SUPPLY**

- **Tonsillar branch** of the facial artery is the main supply of the entire tonsil.
  - Facial artery:
    - Tonsillar art
      - Ascending palatine art
  - Lingual art
    - dorsal lingual branch
  - Internal maxillary art
    - Descending palatine
    - Greater palatine
  - **Ascending pharyngeal (ECA)**

- **Adenoids**:
  - Ascending palatine,
  - Ascending pharyngeal
  - Pharyngeal branch of IMA
  - Ascending cervical branch of thyrocervical trunk.
INNERVATION AND LYMPHATIC DRAIN

ADENOIDs

• Innervation:
  ✓ Glossopharyngeal nerve
  ✓ Vagus nerve
• Lymphatic drain:
  ✓ Upper jugular lymph nodes.

PALATINE TONSILS

• Innervation
  ✓ Tonsillar branch of the glossopharyngeal nerve.
• Lymphatic drain:
  ✓ Tonsillar lymph node ➔ upper jugular digastric lymph nodes.
INTRODUCTION

- Although the number of tonsillectomy and adenoidectomy procedures have declined over the past 50 to 60 years, these surgeries continue to be among the procedures most commonly performed in the US.
- 400,000 cases performed annually in the US.
- Reports suggest that the decline has mainly involved tonsillectomies performed for infectious indications (30%), while the number of tonsillectomies performed for obstructive indications may have actually increased (70%).

| Infection- older children | Obstruction–younger children |

Upper airway obstruction as an indication increased from 12% in 1970 to 77% in 2005.
INTRODUCTION

- **Tonsillectomy alone** is performed **infrequently** in children younger than three years of age, whereas **adenoidectomy alone** is performed **infrequently** in individuals older than 14 years of age.

- The rate of adenoidectomy is:
  - 1.5 times B > G

- Rate of tonsillectomy is:
  - 33% G > B
• **ABSOLUTE** indications

- Minimum frequency of *sore throat episodes*
  - 7 or more in the preceding year, or
  - 5 or more in each of the preceding 2 years, or
  - 3 or more in each of the preceding 3 years

- **Extreme obstruction** of the nasopharyngeal or oropharyngeal airways by adenoids, tonsils, or both.

- Tonsillar obstruction of the oropharynx that interferes with *swallowing*

- Malignant *tumor* of the tonsil (or suspicion of malignancy)

- Uncontrollable *hemorrhage* from tonsillar blood vessels.
• **CONDITIONAL** indications:

  - **Recurrent** acute throat *infections*.
  - **Chronic tonsillitis** unresponsive to antimicrobial treatment.
  - Tonsillar obstruction that alters *voice quality*.
  - **Halitosis**, refractory to other measures.
  - More than one episode of **peritonsillar abscess** or peritonsillar abscess in child with substantial history of recurrent throat infection.
● Chronic pharyngeal carriage of group A beta-hemolytic Streptococci if infection occurs frequently and eradication has been refractory to other measures.

● Syndrome of periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis (PFAPA syndrome).
TECHNIQUES

- Guillotine
- Tonsillotome
- Dissection with snare
  (Scissor dissection, Fisher’s knife dissection, Finger dissection)
- Laser dissection (CO$_2$, KTP)
- Coblation
  
- ELECTRODISSECTION
COMPLICATIONS

• During surgery:
  • Bleeding
  • Laryngospasm
  • Foreign bodies aspiration such as extracted teeth, gauze or lymphatic tissues
  • Trauma of the anterior and posterior pillars
  • Soft tissue Trauma

• After Surgery
  • Acute (<24hrs):
    • Pulmonary edema
    • Pain
    • Fever
    • Odynophagia
    • Otalgia
    • Hyponatremia
> 24hrs complications

- **BLEEDING**
- Uvulo-pharyngeal insufficiency
- Grisel’s Syndrome
- Eagle syndrome
- Nasopharynx stenosis
- Lung abscess
- Horner’s syndrome
- Taste Impairment
- Optic neuritis
- Meningitis
- Septicemia
- Cerebral abscess
- Peripheral facial palsy
- Glossopharyngeal nerve palsy, recurrent laryngeal nerve palsy
- Salivary fistula from the submaxillary gland to the tonsillar fossa
- Mediastinitis
- Subcutaneous emphysema
- Pulmonary emphysema
- Necrotizing fascitis
COMPLICATIONS OF ADENOTONSILLECTOMY

- Low morbimortality 0-1%.

- Recent mortality rates vary between 1/16,000 – 1/50,000.

- The anesthetic risk for ambulatory surgery is low, reported to be 1/50,000.

- Most deaths are related to bleeding and anesthetic complications.

- The most common immediate complications are bleeding and respiratory distress.
HEMORRHAGE

- Mortality rates vary between 1/15.996 – 1/16.381 adenotonsillectomies (0.002%)
- Transfusion 0.04%
- Adults > children

**Classification**
- < 24hrs: Primary hemorrhage (0.2 - 2.2 %)
  - S. technique – Hematological abnormality
- > 24hrs: Secondary hemorrhage (0.1 – 3.7 %) 6-10th day
  - When the scabs came off - multifactorial
HEMORRHAGE

• Causes
  • Residual tissue
  • Damage of the vessels in the tonsillar fossa
  • Aberrant vessels trauma (Pseudoaneurysm or aberrant ICA).

◆ Cold dissection ➔ > intraoperative and primary hemorrhage
◆ Hot dissection ➔ > secondary hemorrhage
# HEMORRHAGE

## TABLE I.

Classification of Postoperative Bleeding Episodes.

<table>
<thead>
<tr>
<th>Day of bleeding episode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>Day of surgery until midnight</td>
</tr>
<tr>
<td>T1</td>
<td>Midnight of day of surgery until next midnight (24 hr)</td>
</tr>
<tr>
<td>T2</td>
<td>Second day after surgery from midnight to midnight</td>
</tr>
<tr>
<td>T3</td>
<td>Third day after surgery from midnight to midnight</td>
</tr>
<tr>
<td>Tx</td>
<td>Analogue</td>
</tr>
<tr>
<td>T21</td>
<td>21st day after surgery from midnight to midnight</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Severity of bleeding episode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Anamnestically recorded blood-tinged sputum</td>
</tr>
<tr>
<td>A1</td>
<td>Wound is and stays dry, no coagulum upon inspection</td>
</tr>
<tr>
<td>A2</td>
<td>Coagulum upon inspection, dry wound after removal</td>
</tr>
<tr>
<td>B</td>
<td>Bleeding actively under examination, treatment necessary, dry wound afterwards, blood count in normal range, no shock</td>
</tr>
<tr>
<td>B1</td>
<td>Minimal hemorrhage, stops after noninvasive treatment (e.g., adrenalin sponge)</td>
</tr>
<tr>
<td>B2</td>
<td>Hemorrhage requiring treatment in local anesthesia</td>
</tr>
<tr>
<td>C</td>
<td>Surgical treatment in general anesthesia, blood count still in normal range, no shock</td>
</tr>
<tr>
<td>D</td>
<td>Dramatic hemorrhage, hemoglobin decreased, blood transfusion required, difficult surgical treatment, intensive care may be necessary</td>
</tr>
<tr>
<td>E</td>
<td>Exitus due to hemorrhage or hemorrhage-related complications</td>
</tr>
</tbody>
</table>

**Examples**

| T1A2                     | Coagulum upon inspection without hemorrhage on the first postoperative day, dry wound after removal |
| T2A2 and T5C             | Coagulum upon inspection without hemorrhage on the second postoperative day, dry wound after removal. Second postoperative hemorrhage on day 5 requiring surgical treatment in general anesthesia |
ADENOIDECTOMY HEMORRHAGE TREATMENT

- Compression with dry gauze
- Cauterization of the adenoids
- Endoscopic examination
- Posterior Nasal Packing
- Arteriography
TONSILECTOMY HEMORRHAGE TREATMENT

Digital pressure – Oral Packing

Cauterization of the bleeding vessels

Deep transoral sutures

Arteriography to locate the origin of the hemorrhage and if possible perform a selective embolisation.

Ligation of the ACE
PRE-SURGERY EVALUATION

• Good clinical history

Rule out hematological abnormalities:
• VWD, Haemophilia, Sickle cell disease, Thalassemia, etc.

• Diseases

• Family medical background

• Medications (NSAIDs / AAS)

• Coagulation profile

Patients with coagulation disorders may not have an increased risk of post-tonsillectomy hemorrhage when evaluated and corrected pre-operatively.
IATROGENIC HYponatREMIA

- Potentially lethal complication.
- Can lead to catastrophic neurological sequelae.
- Post surgery HypoNa incidence: 0.34%.
- It’s not related to surgical technique.

- **Children** are at higher risk for hyponatremic encephalopathy because their **brain-to-skull ratio is greater than that of adults** and thus they have less space available to accommodate brain expansion.

- Hyponatremia: Na < 134mEq/L.
- Hyponatremic encephalopathy: Na < 120mEq/L (Adults)
IATROGENIC HYPONATREMIA

Excessive amount of hypotonic fluid

Holliday formula
Hypotonic fluids
Glucose 5% + ClNa 0.2% (51mEq/L)

ADH Inappropriate secretion Syndrome

HYPONATREMIA

Non osmotic reasons:
- Pain
- Hypovolemia
- Anxiety
- Postsurgery
- Nausea
- Pharmacologic agents such as narcotics and inhaled anesthetics
IATROGENIC HYPONATREMIA

Symptoms:

• **Nausea** and **vomits**, headache, **confusion**, lethargy, fatigue, loss of appetite, restlessness and **irritability**, muscle weakness, spasms.

Signs:

• Fixe and **dilate pupils**
• Seizures, decreased consciousness and **coma** because of the cerebral edema.

DG:

**Symptoms + Signs + Plasma Na levels < 134mEq/L. + Urine osmolality >100mOsm/kg + Urine Na concentration >40 mEq/L**
HYponatremia

Prevention of ADH ISS:
- Administate Isotonic Fluids (154mEq/L)

TREATMENT
- Mild symptoms and Na > 125mEq/L. ---- Fluid restriction and monitorization
- Severe symptoms and Na < 125mEq/L. ---- Hypertonic solution 3% ClNa (50 mEq of Na/100 ml)

\[
\text{Wish Na} - \text{Actual Na} \times 0.6 \times \text{Weight (kg)}: \text{mEq of Na to give}
\]

\(\rightarrow\) Central pontine myelinolysis
VOMITING AND DEHYDRATION

• Severe Vomits: 0.7-7.5%

• Dehydration: 0.3-1.9%

• Management
  • Small sips of water
  • Administration of isotonic i.v. fluids during and after the surgery.
GRISEL’S SYNDROME

- **Subluxation of the atlantoaxial joint**, not associated with trauma or bone disease.

- Found primarily in children between 5-12 years of age.

- In association with rhinopharyngitis, cervical osteomyelitis, rheumatic conditions, and **following surgical procedures such as tonsillectomy or adenoidectomy**, choanal atresia repair, and mastoidectomy.

- **Cause**: “Pathological relaxation of the ligaments surrounding the joint following an inflammatory process or otolaryngological surgical procedures”.
GRISEL’S SYNDROME

Symptoms:
Spontaneous torticollis: Head is flexed and rotated, with a severely limited range of movement and pain on attempted reduction.

Signs:
Spasm of the longer contralateral SCM. Naso-pharyngeal examination may show a reduction in size of the nasopharynx due to anterior displacement of the arch of the atlas.

Fig. 1. CT scan showing rotatory atlanto-axial subluxation with anterior displacement of atlas relative to axis corresponding to Fielding Type II subluxation.
GRISEL’S SYNDROME

• Neurological complications have been reported to occur in 15%, with outcome ranging from mild parasthesias, exaggerated reflex, clonus, or bladder dysfunction to *quadriplegia or acute respiratory failure and death.*

• **Dg:** Clinical features + Images (XR-CT)

• **Treatment:**
  • Type I and II subluxations may be treated with antibiotics and a cervical collar.
  • Type III and IV subluxations generally need bed rest with cervical traction.
  Failure: Sx and arthrodesis.
GRISEL’S SYNDROME

PREVENTION

- Excessive passive rotation and hyperextension of the head, in children under general anaesthesia, should be avoided.

- When the child wakes up after surgery, a rollboard should be used to transfer the patient from the operating table to the hospital bed, to avoid a cervical trauma.
VELOPHARYNGEAL INSUFFICIENCY

• Mainly caused by adenoidectomy and is due to incomplete closure of the palate to the posterior and lateral wall of the nasopharynx.

• Transient in most cases.

• Estimated incidence is between 1/1.500 and 1/10.000 adenoidectomies.

• **Symptoms**: hypernasal speech, nasal emission and turbulence, and in some cases nasal regurgitation of fluids.
VELOPHARYNGEAL INSUFFICIENCY

• Risk Factors:
  • Submucous cleft palate ++
  • Anterior dimpling of the soft palate
  • History of nasal regurgitation of fluids
  • Neurological disorders
  • Pre-existing hypernasality of speech
  • Family history of cleft palate or VPI

Table 1. Aetiologies of velopharyngeal insufficiency

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Occult submucous cleft palate</td>
<td>5 (25)</td>
<td>20 (17)</td>
</tr>
<tr>
<td>Neuromuscular disorder</td>
<td>3 (15)</td>
<td>17 (14)</td>
</tr>
<tr>
<td>Residual adenoid tissue</td>
<td>2 (10)</td>
<td>–</td>
</tr>
<tr>
<td>Classical submucous cleft palate</td>
<td>2 (10)</td>
<td>35 (29)</td>
</tr>
<tr>
<td>Poor palatal mobility</td>
<td>2 (10)</td>
<td>–</td>
</tr>
<tr>
<td>Behavioural disorder</td>
<td>2 (10)</td>
<td>–</td>
</tr>
<tr>
<td>Normal palate, 22q11 deletion</td>
<td>2 (10)</td>
<td>–</td>
</tr>
<tr>
<td>Postoperative nasopharyngitis</td>
<td>1 (5)</td>
<td>–</td>
</tr>
<tr>
<td>Scarring from tonsillectomy</td>
<td>1 (5)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>Unknown</td>
<td>–</td>
<td>36 (30)</td>
</tr>
</tbody>
</table>
SUBMUCOUS CLEFT OF THE PALATE should be suspected when:

- A bifid uvula or widening and attenuation of the median raphe of the soft palate are observed.
- Palpation of a V-shaped midline notch (rather than the normal rounded curve) along the junction of the hard and soft palates.

If VPI is suspected following adenoidectomy, the child should initially be assessed by an appropriately experienced speech therapist and then referred as indicated.

Approximately 50% of such children will require some form of surgical intervention, which is successful in the majority of cases.
EAGLE SYNDROME

- **Elongated temporal Styloid process** (> 30mm).

- The irritation is due to the scarring and fibrotic contraction in the tonsillar fossa over the styloid process.

- **Symptoms**: unilateral sore throat, dysphagia, unilateral facial and neck pain and otalgia.
- **Dg**: X-Ray/CT scan
- **T**: Pain killers, corticosteroids injections.
CHILDREN WITH DOWN SYNDROME

• Prone to obstructive sleep apnea syndrome

• 10% have atlantoaxial laxity

• Obtain lateral cervical x-rays (flexion/extension) when positive findings on history.

• If unstable, need neurosurgical evaluation preoperatively

• Large tongue and small mandible--- difficult intubation

• Prone to cardiac arrhythmias/hypotension during induction
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