Laryngospasm & Aspiration

Larynx Anatomy

Larynx Anatomy: Innervation

<table>
<thead>
<tr>
<th>Nerve</th>
<th>Motor</th>
<th>Sensory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent Laryngeal (from CN X)</td>
<td>Thyroarytenoid (tensor)</td>
<td>Subglottic mucosa</td>
</tr>
<tr>
<td></td>
<td>Lateral Cricoarytenoid (adductor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transverse Arytenoid (adductor)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Posterior Cricoarytenoid (abductor, tensor)</td>
<td></td>
</tr>
<tr>
<td>Superior Laryngeal (from CN X)</td>
<td><strong>• Internal branch</strong> None</td>
<td>Epiglottis/BOT Supraglottic mucosa</td>
</tr>
<tr>
<td></td>
<td><strong>• External branch</strong> Cricothyroid (adductor)</td>
<td>Anterior subglottic mucosa</td>
</tr>
</tbody>
</table>

Does bilateral recurrent laryngeal nerve injury produce the same defect as succinylcholine?

Laryngospasm

Definition
– Occlusion of the glottis and laryngeal inlet by the action of the laryngeal muscles.

Predisposing Factors
– Stage 2 of anesthesia (excitement/delirium)
– Light anesthesia relative to surgical stimulation
– Mechanical irritants to the airway
  • Blood or secretions
  • Airway suctioning or instrumentation
– GERD
– Upper respiratory tract infection (0.85-5% incidence)
Laryngospasm

Prevention
– Ensure adequate anesthetic depth before manipulation
– Clear secretions before extubation
– Topicalize larynx with local anesthetic
– Muscle relaxants

Management
1. Jaw thrust, head tilt, oral or nasal airway
2. CPAP via bag-mask ventilation with 100% O₂
3. Suction oropharynx
4. Succinylcholine 10-20 mg IV, maintain airway with bag-mask or ETT until spontaneously breathing
5. Prepare for surgical airway
6. Monitor for postobstructive negative pressure pulmonary edema (NPPE)

Negative Pressure Pulmonary Edema

Causes
– Laryngospasm
– Upper airway obstruction/ETT obstruction
– Incidence of 0.1% of anesthetics

Risk Factors
– Laryngospasm
– Young (20-40 years), healthy (ASA I-II), male (80%)

Presentation
– Laryngospasm, chest wall retraction
– Frothy, serosanguinous or bloody airway secretions
– ↓S₂O₂, ↑ETCO₂, hypotension, large P(A-a) gradient
– CXR with pulmonary edema

Pathogenesis
– Negative intrathoracic pressure (up to 100 cmH₂O)
– ↑RV preload → ↑pulmonary hydrostatic pressure
– ↑RV preload → interventricular septum shift → LV diastolic dysfunction → ↑PCWP
– Hypoxia, hypercapnea, acidosis → HPV & ↑PVR
– Stress response → ↑SVR and ↑LV afterload
– Alveolar-capillary membrane leak → protein loss

Treatment
– Supportive care (O₂, IPPV, PEEP/CPAP)
– Conservative management until process reverses; consider volume and/or pressors PRN.
– Lasix is usually NOT helpful.

Pulmonary Aspiration

Predisposing Conditions
– Full stomach or unknown NPO status (e.g. trauma)
– Intra-abdominal process (bowel obstruction, ileus, inflammation)
– Gastroparesis (narcotics, DM, uremia, EtOH, infection)
– GE junction incompetence (GERD, hiatal hernia, scleroderma)
– Pregnancy, obesity
– Neuromuscular disease processes
– Difficult intubation and/or prolonged bag-mask ventilation
Pulmonary Aspiration

Prevention
- Follow NPO guidelines for routine elective cases
- Use metoclopramide, H₂-blockers, and antacids in high-risk patients
- Consider awake, regional anesthetic
- Consider awake, upright intubation and/or RSI
- If present, leave NGT to suction
- Apply cricoid pressure until ETT position confirmed
- Minimize bag-mask PPV and/or keep pressure <20 cmH₂O
- Extubate after recovery of protective reflexes

Pulmonary Aspiration

Aspiration Pneumonitis
- Sterile, chemical pneumonitis caused by aspiration of acidic and particulate material
- Highest risk in patients with gastric volume >25 ml and pH <2.5.
- Aspiration does NOT always cause pneumonia!

Management
- Place patient in head-down position
- Immediately suction pharynx and trachea before PPV
- 100% O₂, intubate, apply PEEP or CPAP
- Supportive care - monitor for chemical PNA/ARDS
- Possible bronchoscopy for removal of particulate matter, if suspected
- Antibiotics are not necessary unless subsequent infection develops
- Steroids are not indicated.

NPO Guidelines

<table>
<thead>
<tr>
<th>Ingested Material</th>
<th>Minimum Fasting Period</th>
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<tbody>
<tr>
<td>Clears</td>
<td>2 hours</td>
</tr>
<tr>
<td>Breast Milk</td>
<td>4 hours</td>
</tr>
<tr>
<td>Formula</td>
<td>6 hours</td>
</tr>
<tr>
<td>Non-human Milk</td>
<td>6 hours</td>
</tr>
<tr>
<td>Light Meal</td>
<td>6 hours</td>
</tr>
<tr>
<td>Fatty Meal</td>
<td>6-8 hours</td>
</tr>
</tbody>
</table>

• There is no evidence for the routine use of metoclopramide, H₂-blockers, proton pump inhibitors, antiemetics, or anticholinergics in preventing aspiration or in reducing its morbidity/mortality.
• If given preoperatively, only nonparticulate antacids should be used.

References