Caustic Ingestion and Foreign Bodies of the Aerodigestive Tract

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Caustic Ingestion

- Esophagus, pharynx, larynx
- Bases
  - Drain cleaners
  - Electric dishwasher soap
  - Hair relaxant
- Acids
- Bleaches
Caustic Ingestion

- Late 19th century - lye commercially available
- Early 20th century – Chevalier Jackson
- Federal Caustic Act of 1927
- 1970 – Poison Prevention Packaging Act
- 1972 – Federal Hazardous Substances Act
Caustic Ingestion

- 5,000 lye ingestions in children < 5 years
- Most in kitchen
- High family stress
- Suicide attempts in adults
Caustic Ingestion

- Alkalis – pH > 7
  - Liquefaction necrosis
- Acids – pH < 7
  - Coagulation necrosis
- Bleaches – pH = 7
  - Irritants
Caustic Ingestion

- Amount
- Type
- Concentration
- Time of contact

- Acute phase
- Latent period
- Stricture formation
Caustic Ingestion

- Initial management requires diagnosis
- History
- Obtain container
- Poison control
- Emesis?
Caustic Ingestion

- Laryngeal injury?
  - Hoarseness, stridor, dyspnea
- Severe injury?
  - Odynophagia, drooling, refusal of food
- Perforation?
  - Chest pain, abdominal pain, rigidity
Caustic Ingestion

- Neighboring injury
  - Examination of lips, chin, hands, chest, clothing
- Oropharynx
  - Suction, lighting, restraint
- Larynx/hypopharynx
  - Flexible fiberoptic scope, mirror
Caustic Ingestion

- Radiologic exam
  - Chest & neck radiographs
- Barium swallow
  - Will not reveal 1\textsuperscript{st} and 2\textsuperscript{nd} degree injuries
Caustic Ingestion

- Esophagoscopy in virtually all patients at 24-48 hours post-ingestion
- < 24 hours – underestimation of injury
- > 48-72 hours with risk of iatrogenic perforation – barium swallow
- Rigid vs. flexible debatable
- Endoscopy to upper limit of severe burn
Caustic Ingestion

- Grade 1 - superficial injury
- Grade 2 – transmucosal injury
- Grade 3 – transmural injury
- Circumferential vs. localized injury
Caustic Ingestion

- Bleach ingestion
  - 5-6% sodium hypochlorite
  - Produce ulceration
  - Normal oropharynx – barium swallow
  - Burned oropharynx - esophagoscopy
Caustic Ingestion

Goal
- Preventing permanent injury or stricture in esophagus

FIG. 81-4. Esophageal stricture formation following caustic ingestion may occur slowly over years. This stricture developed within 1 month of a lye ingestion.
Caustic Ingestion

- Dilution
  - Water or milk
- Neutralizing substances contraindicated
  - Exothermic reaction
- Analgesics
Caustic Ingestion

**Antibiotics**

- **Pro**
  - Decrease bacterial counts
  - Reduction in granulation

- **Con**
  - Influx of gram negatives
  - Mask infection
  - No reduction in strictures

- Ampicillin – 50 mg/kg/day
Caustic Ingestion

- **Steroids**
- Prednisone – 2 mg/kg/day x 21 days then taper
- Most effective for grade 2 injuries
- Strictures easier to manage
- Anderson – no benefit
Caustic Ingestion

- Prevention of acid reflux
  - H2 blockers
  - Proton pump inhibitors
  - Carafate slurries
Caustic Ingestion

- Lathyrogens
- Prevent covalent cross-linking of collagen
  - Pencillamine
  - N-acetylcysteine
Caustic Ingestion

- Nasogastric tube
- Esophageal stent
- Prevent adherence of anterior and posterior walls of esophagus
Caustic Ingestion

- Strictures develop in 10-15%
- Dilation
  - Prograde
  - Retrograde
  - Balloon catheters
- Esophageal replacement
Caustic Ingestion

- Prograde dilation
  - Jackson silk-woven bougies
  - Hurst dilators
  - Maloney dilators
Caustic Ingestion

- Retrograde dilation
  - Safer?
  - Tucker dilators
Caustic Ingestion

- Gruntzig balloon catheter
- Radial direction of dilation
Caustic Ingestion
Caustic Ingestion

- Esophageal replacement
- Colonic interposition
- Jejunal interposition
- Gastric pull-ups
Caustic Ingestion

- Esophageal carcinoma
- 1,000x increased risk
- 13 to 71 years after injury
- Better prognosis than usual esophageal cancer
Caustic Ingestion
Foreign Bodies

- Foreign body ingestion
- Foreign body aspiration
- Toddlers
  - Oral exploration
  - Lack posterior dentition
  - Easy distractibility
  - Cognitive development (edible?)
Foreign Body Ingestion

- Coins – 75%
- Meat
- Vegetable matter
- Less than 24 hours in most
Foreign Body Ingestion

- Parental suspicion
- Symptoms
  - Choking, coughing, dysphagia, odynophagia
- Physical exam
  - Drooling, refuses p.o., fussy child
- Respiratory compromise
Foreign Body Ingestion

- Common locations
  - Cricopharyngeus
  - Aorta/left mainstem bronchus
  - Gastroesophageal junction
Foreign Body Ingestion

- Radiopaque
  - Coins
  - Cartilage/bones
- Radiolucent
  - Hot dogs
- Barium swallow
Foreign Body Ingestion

- Barium Swallow
Foreign Body Ingestion

- Observation
  - Recent ingestion
  - Blunt object

- Endoscopy
  - Complete obstruction
  - Airway compromise
  - Impacted
  - Caustics
  - Anomalies
Foreign Body Ingestion

- Removal
  - General anesthesia
  - Intubated
  - Esophagoscopy
  - Examine for ulceration/perforation
Foreign Body Ingestion

- Disc batteries
  - Emergency
  - NaOH, KOH, mercury
    - 1 hour – mucosal damage
    - 2 to 4 hours – muscular layers
    - 8 to 12 hours – perforation
  - Esophagoscopy
  - Observation for gastric location for 4-7 days
  - Laparotomy for bowel perforation
Foreign Body Ingestion

- Postoperative management
- NPO for 4-12 hours

Perforation
- Tachycardia
- Tachypnea
- Fever
- Chest pain
Foreign Body Ingestion

- Balloon Catheter Extraction
  - Effective in 90%
  - Endoscopy for failures
- Complications
  - Emesis
  - Epistaxis
  - Tracheal placement
  - Laryngospasm
  - Airway compromise
Foreign Body Aspiration

- Frequently resulted in death prior to 20th century
- Gross “bronchotomy in all cases”
- Killian – 1897 – 1st bronchoscopic removal of foreign body
- Early 1900s – distal illumination
- Jackson – revolutionized field of bronchoesophagology
- 1970s – rod lens telescopes
Foreign Body Aspiration

- Vegetable matter in 70-80%
  - Peanuts & other nuts (35%)
  - Carrot pieces, beans, sunflower & watermelon seeds
- Metallic objects
- Plastic objects
Foreign Body Aspiration

- **Bronchi** – 80-90%
  - Right mainstem most common
    - Carina
    - Less divergent angle
    - Greater diameter

- **Trachea**

- **Larynx**
  - Larger objects, irregular edges
  - Conforming objects
Foreign Body Aspiration

- History
  - Choking
  - Gagging
  - Wheezing
  - Hoarseness
  - Dysphonia

- Can mimic asthma, croup, pneumonia

- “A positive history must never be ignored, while a negative history may be misleading”
Foreign Body Aspiration

- Choking episode with coughing, gagging or wheezing
- Asymptomatic interval
  - 20-50% not detected for one week
- Complications
  - Cough
  - Hemoptysis
  - Pneumonia
  - Lung abscess
  - Fever
Foreign Body Aspiration

- Physical exam
  - Larynx/cervical trachea
    - Inspiratory or biphasic stridor
  - Intrathoracic trachea
    - Prolonged expiratory wheeze
  - Bronchi
    - Unequal breath sounds
    - Diagnostic triad - <50%
      - Unilateral wheeze
      - Cough
      - Ipsilaterally diminished breath sounds
- Fiberoptic laryngoscopy
Foreign Body Aspiration

- Radiography
  - PA & lateral views of chest & neck
  - Inspiration & expiration
  - Lateral decubitus views
  - Airway fluoroscopy

- 25% have normal radiography
Foreign Body Aspiration
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Foreign Body Aspiration

Goal

Prompt endoscopic removal under conditions of maximal safety and minimal trauma
Foreign Body Aspiration

- Complete airway obstruction
  - Respiratory distress
  - Inability to speak or cough

- Partial airway obstruction
  - Coughing
  - Gagging
  - Throat clearing
  - Back blows/probing hypopharynx not recommended
Foreign Body Aspiration

- Complete airway obstruction
  - < one year
    - Back blows
  - > one year
    - Gentle abdominal thrusts while supine
  - Older children/adults
    - Heimlich maneuver
### TABLE 88–1. FIRST AID FOR THE CHOKING CHILD: RECOMMENDATIONS OF THE AMERICAN ACADEMY OF PEDIATRICS

For Victims under 1 Year of Age
1. Infant is placed face down on rescuer's forearm with head down 60 degrees and stabilized.
2. Four back blows are administered rapidly with heel of hand high between shoulder blades.
3. If obstruction is not relieved, infant is turned supine on firm surface and four rapid chest thrusts are administered over sternum using two fingers.
4. If breathing is not resumed, tongue-jaw lift is performed and mouth examined for foreign body. Visualized foreign body may be removed by finger sweep.
5. If no spontaneous breathing occurs, ventilation is attempted with two breaths by mouth-to-mouth or mouth-to-nose technique.
6. Steps 1 to 5 are repeated as needed.

For Small Children
1. Child is placed on firm surface. With rescuer kneeling at child's feet, abdominal thrusts are performed with heel of one hand in midline between navel and rib cage, and second hand on top of first and pressed into abdomen with upward thrust. Six to ten abdominal thrusts are performed until the foreign body is expelled.
2. If obstruction is not relieved, tongue-jaw lift is performed and mouth examined for foreign body. Visualized foreign body may be removed by finger sweep.
3. If no spontaneous breathing occurs, ventilation is attempted with two breaths by mouth-to-mouth or mouth-to-nose technique.
4. Steps 1 to 3 are repeated as needed.

For Older Children
Treat as an adult, with abdominal thrusts performed in standing, sitting, or supine position.

Foreign Body Aspiration

- Usually NOT A DIRE EMERGENCY
  - Trained personnel
  - Instruments assembled and checked
  - Await for emptying of stomach
  - Find duplicate FB to test instruments and techniques
Foreign Body Aspiration

- General anesthesia
- Spontaneous ventilation
- Laryngoscopes
- Bronchoscopes
- Suction
- Forceps
- Rod-lens telescopes
Foreign Body Aspiration

- Ready to assume airway during induction
- Laryngoscopy
  - Examination of upper airway
  - Atraumatic insertion of bronchoscope
  - Topical anesthesia
- Bronchoscopy
  - Attached to ventilating circuit
Foreign Body Aspiration

- Bronchoscopy
  - Suction opposite bronchus
  - Advance to foreign body
  - Atraumatically grasp foreign body
  - Repeat bronchoscopy
    - Suction bronchus
    - Multiple foreign bodies in 5-19%
  - Remove granulation tissue
  - Topical vasoconstrictors for bleeding
Foreign Body Aspiration

- Slipped foreign body
  - Push back into bronchus
- Sharp foreign body
  - Advance bronchoscope over FB
Foreign Body Aspiration

Complications

- Pneumonia
  - Antibiotics, physiotherapy
- Atelectasis
  - Expectant management, physiotherapy
- Pneumothorax
- Pneumomediastinum
Foreign Body Aspiration

- Postoperative Care
  - Chest physiotherapy for retained secretions
  - Antibiotics
    - Not routinely used
  - Steroids
    - Not routinely used
    - Traumatic insertion or removal