Airway Foreign Bodies: Bronchoscopy

- Difficult peripheral and upper lobe FBs:
  - Fluoroscopic guidance maybe helpful.
  - Flexible bronchoscopy can also be helpful.
- Repeat bronchoscopy once FB removed.
- Must perform complete endoscopic evaluation to rule out multiple FBs (incidence 5-19%).
- Consider esophagoscopy to evaluate for accompanying esophageal FBs if symptoms of dysphagia or vomiting.

Airway Foreign Bodies: Bronchoscopy

- If initial attempt at removal unsuccessful:
  - Consider delay for few days to permit improvement in inflammation
  - Antibiotics and steroids
- Bronchoscopy not successful <1%
  - Thoracotomy or thoracoscopy may be necessary.
Foreign Body Aspiration Requiring Thoracotomy
Airway Foreign Bodies: Anesthesia

- Most airway FBs are removed under general anesthesia
  - Careful monitoring.
  - Spontaneous ventilation preferred to apneic technique.
  - Avoid preoperative sedation.
  - 100% oxygen after induction with inhalational agents.
  - Avoid too much positive pressure through bronchoscope.
  - Laryngoscopy should be performed by endoscopist.

Airway Foreign Bodies: Complications

- Laryngeal edema, traumatic laryngitis, pneumonia, postobstructive pulmonary edema, laryngotracheal stenosis, pneumothorax, pneumomediastinum, broncho-pleural fistula, lung abscess.
- Delay in diagnosis increases risk of complications.
- Complications have decreased over the past several decades.
  - Improved equipment.
  - Development of Hopkins rod ➔ decreased missed or incompletely removed FBs
  - Overall complication rate ➔ 15% (44% 20 years earlier)
  - Minor complications ➔ 12%
    - Postop atelectasis, wheezing, stridor
  - Major complications ➔ 3%
    - >1 week hospitalization or open surgery required

Esophageal Foreign Bodies

- FB ingestion very common in children.
- FB ingestion more common than FB aspiration.
- 1500 deaths per year from complications of FB ingestion.
- 75%-80% in children (usually < age 5)
- Most common FB ➔ coin (75%)
  - 92,166 cases reported to poison centers in 2003.
- Most common FB causing fatality ➔ piece of hotdog leading to airway compression

Esophageal Foreign Bodies

- Patients at risk for esophageal foreign bodies:
  - Children < age 5
  - Psychiatric patients
  - Patients with underlying esophageal disease
  - Edentulous adults
Esophageal Foreign Bodies

- Common locations for FB to lodge:
  - Upper esophageal sphincter/cricopharyngeus (63-84%)
  - Gastroesophageal junction (5-20%)
  - Crossing of aorta (10-17%)
  - Crossing of left mainstem bronchus

- When foreign bodies lodge in other areas, must consider congenital esophageal stricture or stenosis.

- 3-5% have initially unsuspected 2nd FB.

References:
Esophageal Foreign Bodies: Presentation

- Can present after brief symptoms or with chronic dysphagia.
- Can present with mild-to-moderate respiratory distress ➔ compliance of wall between trachea and esophagus (10%).
- **Acute symptoms** ➔ coughing, choking, gagging, dysphagia, drooling, neck/chest pain, airway symptoms
- **Chronic symptoms** ➔ change in eating habits, weight loss, dysphagia, wheezing, SOB
- Suspect that any choking event with cyanosis/LOC is due to airway FB until proven otherwise!
Esophageal Foreign Bodies: Evaluation and Treatment

- History and physical exam
- Often not witnessed.
- Radiologic imaging
  - Radiographs
    - Frequently radioopaque
    - PA/Lat CXR
    - PA/Lat neck films
  - Contrast studies
- Esophagoscopy
Esophageal Foreign Bodies: Esophagoscopy

- Safest method of esophageal FB removal is under general anesthesia with a protected airway and esophagoscopy.
- Removal of esophageal FBs in radiology suite with fluoroscopy and balloon catheter can be very dangerous!
- Should have variety of instruments available for endoscopic removal of FB:
  - Forceps
  - Balloon catheters
  - Baskets
- Proper preparation.
- Practice on duplicate FB.
Esophageal Foreign Bodies: Esophagoscopy

- Repeat esophagoscopy once FB is removed to assess for injury and look for 2\textsuperscript{nd} FBs.
- A small percentage of FBs cannot be removed endoscopically and require cervical esophagotomy and/or thoracotomy.
Esophageal Foreign Bodies: Esophagoscopy
Esophageal Foreign Bodies: Evaluation and Treatment

- Coins
  - 30% rate of spontaneous passage into stomach within first 24 hours.
  - Option for expectant management for 12-24 hours in asymptomatic patients.
  - Repeat CXR shortly before removal procedure.
  - Chance of passing into stomach related to location in esophagus:
    - Upper third: 14%
    - Middle third: 43%
    - Lower third: 67%

Esophageal Foreign Bodies: Evaluation and Treatment

- Coins
  - Rigid esophagoscopy techniques.
  - Flexible endoscopy techniques.
  - Blind balloon catheter technique ➔ dangerous!
  - Esophageal bougienage.

Esophageal FB: 2 Coins
Esophageal FB: 2 Coins
Esophageal FB: 2 Coins
Esophageal Foreign Bodies: Evaluation and Treatment

- **Food Impaction**
  - Up to 70% of patients have underlying esophageal abnormality.
  - Repeated esophageal food impaction must consider possibility of eosinophilic esophagitis.
  - Can consider pushing bolus into stomach.
  - Glucagon injections to help bolus pass into stomach.

Esophageal Foreign Bodies: Evaluation and Treatment

- **Sharp/Pointed Objects**
  - “Advancing points perforate; trailing points do not.”
  - “Search not for the foreign body, but for the point of the foreign body.” C. Jackson 1914

- **Techniques for removing safety pin**
  - Straightening
  - Point sheathing
  - Endogastric version
  - Closing (Clerf-Arrowsmith safety pin closer)

Esophageal FB: Piece of Glass
Esophageal FB: Upholstery Staple
Esophageal FB: Light Bulb
Esophageal FB: Hair Clip
Esophageal FB: Guitar Pick
Esophageal FB: Crucifix
Esophageal Foreign Bodies: Follow-Up

- Esophagram when concern for perforation.
- Patients with significant esophageal injury should undergo repeat esophagram to evaluate for stricture.
- Recurrent FBs:
  - Eosinophilic esophagitis
  - Stricture/stenosis
  - Degenerative or neuromuscular disease of esophagus
  - Negligence/abuse
- Persistent dysphagia after FB removal despite normal anatomic studies:
  - Degenerative or neuromuscular disease of esophagus
Disk Battery Ingestion

- <2% FB ingestions.
- Can cause mucosal injury <1 hour after ingestion.
- Very high pH liquid leaks out of battery (45% NaOH or KOH).
- Caustic injury, absorption of toxins, pressure necrosis, electrical tissue damage (cell death).
- Can result on severe esophageal injury, perforation, stricture formation, and death.
Disk Battery Ingestion

- Larger diameter batteries ➔ more severe injuries; less likely to pass
- Rapid FB removal is crucial.
- If battery passes into stomach, it will likely pass safely into stool.
- If battery remains in stomach more than 48 hours, should consider endoscopic removal.
Disk Battery Ingestion
Disk Battery Ingestion
Disk Battery Ingestion
Disk Battery Ingestion
Disk Battery Ingestion
Prevention of Foreign Bodies and Caustic Ingestions

- Best approach
- Legal commercial/policy modification
- Public education
Prevention of Foreign Bodies and Caustic Ingestions

- Chevalier Jackson

- “The work of physicians in prevention equals their work in curing disease.”

- 1927 ➔ Federal Caustic Poison Law
  - Signed by President Coolidge.
  - Required special labeling of caustic agents with “Poison. Dangerous”
Prevention of Foreign Bodies and Caustic Ingestions

Carelessness is obvious when children are allowed to put hardware in the mouth. The need of preventive education is manifest.
Prevention of Foreign Bodies and Caustic Ingestions

- “Each specimen is evidence that a child’s life is in danger when he plays with toys smaller than his fist. Teaching prevention of foreign-body accidents has been a lifetime’s work.”

- “Nuts, shells, seeds, and pits; each one put a child’s life in jeopardy. Peanut candy has killed many babies.”

- “Evidence of the filthy and careless habit of putting coins in the mouth. A child’s life was avoidably endangered by each coin. Such accidents are preventable by the simple expedient of keeping such things out of the mouth.”

- “Each pin needlessly endangered the life of a child. Safety pins are really danger pins; they should be kept closed and out of reach of children.”
CHAPTER XII

FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

The air and food passages may be invaded by any foreign substance of solid, liquid or gaseous nature, from the animal, vegetable, or mineral kingdoms. Its origin may be from within the body (blood, pus, secretion, broncholiths, sequestra, worms); introduced from without by way of the natural passages (aspirated or swallowed objects); or it may enter by penetration (bullet, dart, drainage tube from the neck).

Prophylaxis.—If one put into his mouth nothing but food, foreign body accidents would be rare. The habit of holding tacks, pins and whatnot in the mouth is quite universal and deplorable. Children are prone to follow the bad example of their elders. No small objects such as safety pins, buttons, and coins should be left within a baby’s reach; children should be watched and taught not to place things in their mouths. Mothers should be specially cautioned not to give nuts or nut candy of any kind to a child whose powers of mastication are imperfect, because the molar teeth are not erupted. It might be made a dictum that: “No child under 3 years of age should be allowed to eat nuts, unless ground finely as in peanut butter.” Digital efforts at removal of foreign bodies frequently force the object downward, or may hook it forward into the larynx, whereas if not meddled with digitally the intruder might be spat out. Before general anesthesia the mouth should be searched for loose teeth, removable dentures, etc., and all unconscious individuals should be likewise examined. When working in the mouth precautions should be taken against the possible inhalation or swallowing of loose objects or instruments.
Prevention of Foreign Bodies and Caustic Ingestions

- Consumer Product Safety Commission
  - 1960 Federal Hazardous Substance Act (FHSA)
  - 1994 Child Safety Protection Act (CSPA)
    - Requires choking-hazard warning labels on packaging for small balls, marbles, and toys/games with small parts.
    - Bans any toys with small parts for children < age 3.
- 2008 Consumer Product Safety Improvement Act
  - Choking hazard safety warnings must be displayed on advertisements, catalogs, websites, etc.
Prevention of Foreign Bodies and Caustic Ingestions

- Consumer Product Safety Commission
  - 1979-minimum size criteria for toys used by children <3 y.o.
  - 31.7 mm diameter; 25.4-57.1 mm length
  - Small Parts Test Fixture ➔ cylinder into which products or parts must not fit

Prevention of Foreign Bodies and Caustic Ingestions

- Food-Related Choking
  - FDA Office of Choking Hazard Evaluation
Prevention of Foreign Bodies and Caustic Ingestions

  - FDA should establish a systematic process for evaluating and addressing food-related choking.
  - Health care professionals should intensify choking-prevention counseling and provide guidance to caregivers on appropriate food and toy selection.
  - Food manufacturers should design new foods and redesign existing foods to minimize choking hazards.
  - CPSC should evaluate current gaps in choking hazard standards.
  - CPR and choking first aid should be taught to all parents, teachers, and child care providers.
Prevention of Foreign Bodies and Caustic Ingestions

- Instruct parents to avoid feeding seeds and nuts to small children.
- Instruct parents to keep small objects out of reach of children.
- Emphasize careful child supervision.
- Emphasize danger of latex balloons.
Summary

- Upper aerodigestive tract foreign bodies are not uncommon.
- Careful history and physical examination.
- Appropriate selection of radiographic studies.
- Low threshold for endoscopy.
- Important to have proper preparation, equipment, and an experienced team.
- Emphasize prevention!