

Foreign Body Ingestions in Infants and Children

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Foreign bodies

Incidence and epidemiology

- Primarily a pediatric problem
 - > 80% of cases occurring in children
 - Majority of cases patients < three years of age.
- Ingestion witnessed most cases that come to medical attention
- Incidental or unanticipated finding
 - Radiologic evaluation for dysphagia, wheezing, recurrent pneumonia or asthma
 - passed foreign body detected in stool/ diaper

Foreign bodies

Incidence and epidemiology

- Exact incidence unknown in U.S.
- In 2008 > than 127,345 cases of foreign body ingestion in U.S.
 - 112,831 \leq age 19
 - 94,792 \leq age 6
 - 9,923 \geq age 19
- 98% cases unintentional
- Types reported
 - 4124 coins
 - 9898 batteries (all types of exposure)
 - 9910+ toys
- Incidence and type varies by geographic region / specialty reporting authors
- Only fraction of FB ingestions reported to this database
 - American Association of Poison Control Centers National Poison Data System; Clinical Toxicology 2009

Types of FB-Children

North America and Europe

- **Coins most common foreign body ingested**
- Other frequent ingestions
 - each 5-30%
- Toys & toy parts
- Sharp objects (needles and pins)
- Batteries
- Chicken or fish bones
- Food impactions

Types of FB-Children- Asia

- In countries where fish important part of diet
- **Fish bones ingestions** and impaction common
- **Greater percentage of foreign body** obstructions than coins
 - *children and adults.*
- Coins- 2nd most common FB ingested by children
 - up to 40% of cases

Adults-FB

- Without psychiatric disturbances
 - Meat impaction most common cause in U.S.
- Anorexics and bulimics
 - Toothbrushes & instruments used to induce vomiting
- Prisoners, intoxicated individuals, psychiatrically impaired
 - variety of sharp or large foreign bodies
- Intoxication accounts for >1000 cases of FB ingestion/year in U.S.

Adult FB ingestion- Asia

- 1090 FB in 988 patients 1/80-1/05 single center Shanghai China
 - 9% patient no FB at endoscopy
- 685 men, 403 women
- Age range 1 day-96 yr. (19% < 15 years)
- Type
 - Food bolus 17%, coins 16%, dental prostheses 8.6%, chicken bones 6%, iron slices 4%, lighters 4%, misc etc.
 - Unique frequent FB in Chinese series: **lighters, chopsticks, chinaware fragments**
- Fish & chicken bones common
 - custom eating fish, chicken, duck, other meat w/o prior removal of bones
 - Esp. common in middle-aged
- 94% removed endoscopically
- Challenging FB- most in esophagus
 - impacted dental prosthesis, length > 10cm, comorbid condition

» Li et al Gastrointest Endosc 2006

Chicken & fish bone ingestion

- 136 adults: single center Taiwan 1997-2006
- 67% female; 48% fish bones, 46% chicken bones, 5% meat
- 84 % upper esophagus; < 2% surgical extraction required
 - Images & results from Lin HH et al Am J Emerg Med 2007

Symptoms of foreign body ingestion- important variables

- Type of foreign body
- Location
- Relative patient size
- Duration of impaction

- Foreign bodies -oropharynx
 - Almost universally symptomatic
 - Prolonged impaction may result in retropharyngeal abscess

Foreign bodies- esophagus

- Young children Sx are nonspecific
 - Choking, drooling poor feeding
 - May alter their diet- liquids or soft diet
 - Compensate for decreased esophageal caliber
- Older children and teenagers
 - Dysphagia, odynophagia, and chest pain
- Location of the pain does not correlate with site
- Long latency possible between ingestion and Sx

Foreign bodies- esophagus- Respiratory symptoms

- May be the only symptom
- Wheezing, stridor, and speech impairment
- Direct tracheal impingement or paraesophageal soft tissue swelling
 - prolonged retention
- Isolated respiratory symptoms more common infants and toddlers
 - Smaller tracheal radius and tracheal composition
 - More susceptible to extrinsic compression

Foreign bodies located in the stomach or small intestine

- Coins and most other foreign bodies usually asymptomatic
- obstruction and Sx may occur
 - ball valve phenomenon
 - perforation

Location of foreign bodies- Initial presentation

- Oropharynx : 5-10%
 - higher % w/ fish bone impaction
- Esophagus-20%
- Stomach-60 %
- Distal to the stomach- 10%
- usually in the small intestine.
- 60-90% of ingested foreign bodies: radiopaque
- **recommend obtaining an x-ray every case FB ingestion**
 - esophageal foreign bodies may cause injury in asymptomatic patient

Natural History- foreign bodies that come to medical attention

- 80-90% pass spontaneously
- 10-20% require endoscopic removal
- <1% require surgical intervention

Coins- Evaluation and Management

- > 21,000 emergency room visits by children -1997
- Obtain radiograph neck (AP & lateral), chest and abdomen every suspected coin ingestion
 - In esophagus assume an en face on AP view
 - the edge of coin seen lateral x-ray
 - Tracheal coins -opposite configuration.
 - On occasion esophageal coins demonstrate lateral edge on AP x-ray.
- Tracheal compression -respiratory symptoms
 - prolonged retention

Sites- esophageal coins

- 60-70%: proximal esophagus
 - UES or thoracic inlet
- 10-20%: mid esophagus
 - Aortic notch
- 20%: LES
- Increased risk esophageal location:
 - Underlying esophageal disease
 - Previous injury
 - Esophageal surgery or gastric fundoplication
 - Simultaneous ingestion multiple coins

Esophageal Coins- Management

- *“Back in the dark ages when I worked in a bush hospital in West Africa, we fed kids with esophageal lodged coins gobs of the center of fresh white bread... with great success. I thought that was the derivation of “wonder bread”- Catherine D. DeAngelis, M.D., Editor*
 - Arch Pediatr Adolesc Med 1999;1073

Esophageal Coins- Management

(Also true for non battery, non sharps)

- **Symptomatic patients unable to swallow their secretions or those who are experiencing acute respiratory symptoms require emergent endoscopic removal**
 - Higher risk of aspiration of gastric contents
 - Anesthesia to take appropriate precautions
 - Delayed endoscopy associated w/ risk of aspiration pneumonia

Esophageal Coins

Symptomatic patients able to handle their secretions

- Endoscopy within 12-24 hours
 - Age appropriate pre-anesthetic fasting
 - Chance for the object to pass spontaneously
- Repeat chest x-ray immediately prior to the endoscopy if the procedure is delayed
 - Up to 1/3 of cases coin pass to stomach
 - More likely for distal esophageal coins

Asymptomatic patient with esophageal coin

- Remove within 12-24 hours
- Potential complications retained esophageal coin or foreign body
 - Stricture
 - Tracheal compression & respiratory symptoms
 - Aortoesophageal fistula - erosion of the coin
 - Diverticula or pseudodiverticula of the esophagus
 - Mediastinitis
 - Tracheoesophageal or bronchoesophageal fistula

Other management issues-

Coin ingestions

- Carbonated beverages or intravenous glucagon
 - Used in adults to dilate the esophagus to facilitate coin passage
 - Not reported to be effective in pediatric patients
- Do not currently recommend

Gastric or distally located coins

- Do not routinely recommend endoscopic removal unless symptomatic or retained for several weeks.
- Regular diet, strain the stool
- Majority cases gastric coin or similar foreign body will pass the GI tract 4-6 days
 - 40% coin will be missed by parents despite absence on KUB
- Do not recommend prokinetic
- Asymptomatic patient- Follow up KUB at 2-3 and 4-6 weeks
- Defer endoscopy until 4 to 6 weeks
- Multiple coins- management same
 - adherence of one coin to another may impede passage

Symptomatic patients with gastric coins

- Prompt endoscopic removal
- Gastric outlet obstruction- coin overlies pylorus
- Gastric pennies
 - 1982 change to a zinc predominant coin
 - Potential development of zinc toxicity with prolonged gastric retention “modern copper” pennies
 - If patient is asymptomatic do not differentiate management of gastric pennies from other gastric coins

Equipment

Alligator & Rat Tooth

Pentapod and Talon Forceps

V shaped / Rubber tipped (for pins)

Endoscopic Technique- Esophageal Coins

- Air insufflation may dislodge especially at LES
- Retract the forceps as far back as possible into the endoscope
 - remove the coin & endoscope as a single unit.
- Prolonged impaction esophageal coins
 - erode into the esophageal wall
 - Coin may be located outside the esophageal lumen
 - not always apparent on x-ray
 - Rigid esophagoscope with forceps better suited for grasping - ENT or pediatric surgery

Endoscopic Technique-

Coins past the pylorus

- Most successfully negotiate GI tract w/o complication
- Potential sites of obstruction of coins / foreign bodies
 - Congenital malformations- Meckel's diverticulum
 - Site of prior surgery
 - IC valve

Batteries-Epidemiology

- Ingestions common -young children in U.S.
 - 2009 11.1 cases/ million
- Button > cylindrical
- Source frequently child's own hearing aid
- **6.7 fold increase % ingestions w/ major or fatal outcomes (1985-2009)**
 - Correlate w/ emergence 20 mm lithium coin cell
- children age < 6
 - 62% from product
 - 30% loose
 - 8% from battery pkg.
 - < 1% in swallowed hearing aid
- age < 6yr w/ 20-25 mm lithium ingestion
 - 12.6% serious complication or death

Batteries: Sx & Mechanism of injury

- Sx uncommon post ingestion (3-10%)
 - Correlate poorly w/ clinical outcome
- Significant morbidity from esophageal batteries
 - Even in Asx
 - concentrated solutions NaOH or KOH (alkaline)
 - Leakage may result in burns
- Current discharge
- Lithium- non alkaline (CR20...)
 - 2x voltage generates increased current & more hydroxide
 - increased local damage
 - “3 N” mnemonic - Negative, Narrow, Necrotic

2 hours is the new standard- “Get in the car management”

- Immediate x-ray to locate the battery essential in every case
- Management based on location/ size
- All esophageal batteries should be removed emergently
 - Increased anesthetic risk-patients not NPO
 - **Risk of significant esophageal injury outweighs the anesthetic risk**
- **New suggested “standard” w/in 2 hours of ingestion**

» Pediatrics 2010

5 y.o. female- penny ingested 3 day prior

abdominal pain & dysphagia- penny in distal esophagus on outside x-ray

Complications: retained esophageal batteries

- Esophageal perforation
 - Reported within 6 hours
- Tracheoesophageal fistula
- Esophageal stricture
 - Stenosis developed from a battery in place for 10 hours
- Erosion into vessel/ exsanguination
- Death
- Majority patients w/ significant esophageal complications swallowed a large battery (20-23 mm diameter)
 - Significant esophageal injury w/ small diameter batteries (8-11mm)
- 20 mm lithium battery significantly associated with poor outcome
 - Responsible for increased rate fatal/ major outcomes last 10 years

Button Battery- Esophageal Burn

from Jones A.J. Tech Gastro Endosc 2002

Gastric Batteries

- Asymptomatic patient -Observation
 - Usually traverse GI tract without incident
 - $> 80\%$ of batteries passing ≤ 48 hours
 - 5% - may take a week to pass
 - Parents strain stools to locate the battery
- Battery >15 mm in size in an adolescent and does not pass the pylorus by 48 hrs-endoscopic retrieval
 - Decreased likelihood spontaneous passage
 - Modifications size criteria smaller patients.
- Symptomatic patient- Immediate endoscopy

Complications & Technique Gastric batteries

- Gastric ulceration
- Mercury poisoning
 - theoretical but unreported
 - Mercury batteries banned in U.S. 1996, no ingestions post 2004
- Lithium
 - One case increased serum lithium level
 - no clinical toxicity: gastric battery >96 hours* (UK)
 - Serum lithium undetectable 24hr post removal
- Technique endoscopic removal- Similar to coins
 - Cylindrical batteries
 - Tripod or Pentapod forceps
 - polypectomy snare
 - basket
 - Roth retrieval net -useful for round or smooth foreign bodies

Meat Impaction

Epidemiology & Evaluation

- Older children, adolescents and adults
- Most common foreign body ingestion in adults
- Majority of cases- 95% underlying esophageal pathology
- can occur due to inadequate chewing or intoxication
- Evaluation
 - Plain chest x-ray
 - No oral contrast
 - Pool above the impaction / aspiration pneumonia

Pediatric patients & younger adults may be Eosinophilic Esophagitis (EE)

- Part of spectrum Eosinophilic Gastroenteritis
- Reported in last 30 years
 - Confused with GER, achalasia, esophageal stricture
- Chronic inflammatory disorder
 - Etiology not known
 - related to food allergy in fraction of patients
 - May also present with pill impaction

Pill impaction-new case EE

Eosinophilic Esophagitis: Dx & Rx

- Findings
 - Ringed esophagus or vertical lines
 - Small caliber esophagus
 - Fragile mucosa
 - Esophageal strictures
 - White flecks esophageal mucosa
- Therapy
 - Corticosteroids- oral, topical
 - Mast cell stabilizers
 - top image from Gupta- Tech Gastrointest Endosc 2002

Meat Impaction-Management

- Symptomatic patients unable to handle their secretions
 - Emergent endoscopy to relieve the obstruction and avoid aspiration
- Symptomatic patients able to handle their secretions
 - Endoscopy within twelve hours
- Meat tenderizers contraindicated
 - “tenderize” the esophagus
 - Esophageal perforation
 - Hypernatremia

Endoscopic Technique- Meat Impaction

- Located in any portion of the esophagus
- Avoid pushing meat into the stomach
 - may cause perforation
 - significant esophageal pathology may be distal to the impaction
 - Strictures
 - Rings -eosinophilic esophagitis
 - Stenosis
 - congenital may have increased risk perforation w/ dilatation
- Air insufflation alone may be sufficient

Endoscopic Technique- Meat Impaction

- Remove the meat in fragments/
piecemeal
 - Pentapod or tripod forceps
 - Friction fit adaptor
 - 9.0 mm OD endoscope
 - Apply suction as the meat is removed
 - Roth net platinum- food
 - Octagonal shape
 - springs open
 - Mesh issue
- Once part of the meat bolus has been removed, remainder may spontaneously pass

Sharp objects-Epidemiology

- Relatively small fraction in children
- Significant fraction of non- meat f.b. ingestions in adults who intentionally ingest
 - Psychiatric conditions
 - Intoxication / dare
 - Correctional facility
 - Individual may ingest “thousands” of sharp objects – 2533
 - Often succumb to complications -perforation

Sharp objects-Epidemiology

- Associated with significant increase in complication rate
 - Increases from 1% to 15-35%
 - Depends on #, type & contact time
- Common objects
 - Toothpicks
 - Nails
 - Needles
 - Straight pins
 - Safety pins- incidence decreasing
 - Cultural variation
 - Fish bones
 - Glass- intussusception
 - Jewelry- some

Sharp objects-Epidemiology- continued

- May be intentional- prisoners, etc.
- Gastrointestinal Crosses
 - Standard paper clip straightened (9cm) & divided
 - Tied crosswise w/ elastic band
 - Branches pulled to lie parallel
 - Wrapped in paper and swallowed
 - Wrapper digested, cross returns to “open” position
 - arrests passage of cross
 - All reported cases have resulted in perforation
 - Stomach, duodenum, ileum and rectum
 - » Losanoff et al. J Clin Gastro 2001

Sharp objects- Management

- Fishbone
 - Visualize by exam oropharynx
 - Impacted bones- McGill's forceps
- For all other cases of a sharp ingestion
 - CXR and KUB
- Management based on location
- Once identified, straight pins are an exception to the rule- Jackson's axiom

Straight pins- Management
a little Philadelphia history Jackson's axiom

- **“advancing points perforate and trailing points don’t”-1936**
- **Chevalier Jackson & colleagues retrieved over 3000 foreign bodies from children 1920-1932 (ENT)**
- **Housed in Mutter Museum- Philadelphia College of Physicians**
- **Jackson's 6 most common FB (in order):**
 - **Food, safety pins, nails, coins, buttons, jewelry**
- **Detailed writing basis for US small parts test fixture**

Straight pins- Management

a little Philadelphia history

- Jackson’s axiom- “ **advancing points perforate and trailing points don’t**”
 - Usually pass uneventfully
 - Blunt ended head usually passes first and the sharp end trails
- Defer endoscopy
- Gastric impaction with penetration reported
- Ingestion large # straight pins- higher % perforation

Non-straight pin sharps- Management

- Require careful endoscopic removal
- If not removed perforation is likely
- Extra-luminal migration of the foreign body
- Majority of perforations: region of the IC valve

Endoscopic Technique- Sharps

- Consider esophageal overtube in larger patient
- Initial diagnostic endoscopy without the overtube
 - Endoscope is passed w/ overtube preloaded
 - Well-lubricated overtube advanced w/rotational movement
- Sharp foreign body (safety pin) is closed as it is retracted into the overtube
- Remove sharp & endoscope as a unit
- Sharp objects lodged in the esophagus (safety pin)
 - consider bringing the object into stomach with forceps invert and try to close & withdraw

Endoscopic Technique- Sharps cont.

- Most sharp objects removed w/ forceps
 - Allows the endoscopist greater control
 - Minimize further mucosal injury
- Latex Foreign body hood
 - Daveproject.org- video

Long or large objects-Epidemiology

- Intentional or accidental
- Common objects
 - Dental instruments-accidental
 - Toothbrushes -swallowed
 - after induction of vomiting or if bumped
 - Knife swallowing
 - Jewelry \pm sharp
 - Earrings, tongue studs
 - Chopsticks
 - Dentures
 - Toys
 - Pens & pencils
 - Eyeliner pencil perforate stomach into lung near pericardium- 12 y.o.
 - Spoons- to assist w/ seizure

Long or large objects- Primary areas of impaction & size criteria

- Esophagus
- Pylorus
 - **May not permit passage objects > 15 mm diameter**
 - Smaller diameter prohibitive in younger patients
- Duodenal C loop
 - Primary impediment to passage of long objects
 - Fixed retroperitoneal location
 - **Will not allow passage of objects longer than 10 cm**
- Ileocecal valve

Long or large objects size criteria

- Combination length and caliber may preclude passage
- **Ovoid object >5 centimeters length or with a thickness > 2 cm**
 - unlikely to pass the pylorus in an adolescent
 - Should be removed
- No specific recommendations for smaller patients
 - Retrieve ovoid objects >2 cm in diameter in young children

Long or large objects- Diagnosis & Management

- Patients w/o neurologic impairment
 - typically report
- Plain x-ray helpful
- Contrast study- occasionally
 - Non-radiopaque object
 - May interfere with visualization at endoscopy
- Management
 - Asymptomatic
 - Endoscopy after appropriate preanesthetic fasting
 - Symptomatic- more urgent endoscopy

Long or large objects

Endoscopic Technique

- Polypectomy snares
 - long objects if they do not slip out
 - Small diameter mini snares-dental instruments
- Long objects such as toothbrushes or dental instruments
 - Removal parallel to axis of esophagus
- **All standard toothbrushes require removal**
- Complications retained long FB stomach
 - Pressure necrosis
 - Gastric perforation
- Suture removal- Toothbrushes with holes

Magnets

- Increasingly reported pediatric patients
- # ingested critical
- >1 exceedingly hazardous- attract
 - Fistulization
 - Obstruction
 - Perforation
- Ubiquitous and not perceived to be harmful
 - Jewelry, household objects, toys
 - Asian drug stores- therapeutic- muscle stiffness
 - Place over affected areas, secure w/ adhesive plaster

An interesting case from friends in
Philadelphia- Liu S. et al JPGN 2005
the **best NASPGHAN clinical vignette ever**

- 7 year old male neurologically impaired
- persistent abdominal pain despite treatment for a UTI –
- KUB: 10 pieces of a magnetic construction toy
 - Magnets attached
 - Ingestion unwitnessed
 - EGD for removal
 - Liu, Blacam, Lim, Mattei, Mamula- CHOP

Magnet case continued

- 6 of 10 pieces removed from pylorus to D2, only one piece seen embedded in duodenum
- intra-op radiograph showed 4 pieces connected in tandem-
- Surgery consult
- Pre-laparotomy endoscope reinserted
 - Foreign body no longer present
 - Perforation suspected in duodenum
- laparotomy 4 pieces palpated and removed from ascending colon
 - duodenocolic fistula

Management magnet ingestion

- Radiography to localize
- Early endoscopic intervention if > 1 present
- If beyond endoscope reach:
 - Monitoring- serial radiograph
 - Surgery

Why is the case the **best** NASPGHAN clinical vignette ever? (at least best yet of the current millennium)

- Previously reported only outside of the US
- From a poster to a published case report rapidly- 2005
- 2006: 2 toy companies issue voluntary recall products w/ magnets
- 2007- 2008 literature review: at least 8 articles specifically on magnet ingestion
 - includes proposed management algorithm
 - Arch Pediatr, J Pediatr, J Pediatr Surg, Pediatr Radiol
- CNN, Chicago Tribune
- CPSC, Illinois State AG Office

CPSC Winter 2008

Since 2005

One reported death

86 reported injuries

8 million magnetic toys
recalled

“In several hundred incidents, magnets have fallen out of various toys and in several cases have been swallowed by children. Small intact pieces of building sets that contain magnets have also been swallowed by children.”

CPSC

Things got better and then... things
got worse

Neodymium magnets (Rare earth)

- Re-Entered U.S market in 2008
- Sold under many names
 - Sets of 100 magnets or more
- Children are attracted
 - Curious toddler
 - Put anything in their mouth
 - Teen
 - Mimics piercing
 - Tongue, lip

Magnet Ball Ingestion – 2 y.o.

Feb 2012

- Swallowed 37 magnet balls
- Emergency surgery to repair a gastric fistula and 3 intestinal fistulas
- Look like candy (“dragées”), but they’re not

Magnets-parent used for alleviating stiffness due to arthritis
Sx 6 days prior to presentation
SBO & perforation at surgery

Recent Magnet Developments

- Early 2012 increasing recognition by Ped GI MDs several centers re: increasing prevalence of problem, especially related to “Buckyballs”
 - Imported from China
 - Rare earth neodymium magnets
 - Sets often contain ≥ 200 or more BB-sized magnets.
- 2009- 2011 1.5 million units of Buckyballs sold
 - Combined w/ production other manufacturers, literally billions of high powered magnet balls “around”
- 123 Cases reported in informal Ped GI survey
 - 102/123 cases between 1/2011-early 2012
 - 89 % required endoscopy \pm surgery to address
 - >25% required surgery

Actions by NASPGHAN, CPSC, AAP & others

- June 2012 Testimony before CPSC & lobbying on the Hill
- July 2012, 11/13 manufacturers agreed to voluntarily cease online sales & remove from retail shelves based on CPSC action.
 - Buckyball manufacturer pledged to aggressively fight CPSC action

Actions by NASPGHAN, CPSC, AAP & others

- September 4, 2012, the U.S. CPSC issued a “notice of proposed rule making” **banning the sale of high-powered magnets that are part of magnet sets**
- The proposed rule in response to growing # ingestions by children and teenagers.
- 10/31/12, Maxfield and Oberton announced it was discontinuing sales of Buckyballs & Buckycubes
 - encouraged consumers to “buy up” remaining stock from web
- Current recall actions are voluntary
- Regulations are needed to permanently keep these products from being sold and to prevent new manufacturers from entering the market
- CPSC testimony 2013 & ongoing action

Narcotic ingestions “Body bagger/body packer syndrome” Epidemiology

- Until recently primarily adolescents and young adults
- Increasingly common in young children “mule”
- Cocaine filled condoms, balloons, and finger cots
- Each condom contains 3-5 grams of cocaine
- Absorption 1-3 grams of cocaine following condom rupture- fatal
- Other drugs
 - Heroin
 - Amphetamines
 - Ecstasy
- 1997-2001 U.S. customs service arrest/ detained 3000 juveniles for possession illegal drugs (all methods)

- CAT scan released by Brazilian Federal Police
- unidentified man arrested Congonhas airport Sao Paulo, Brazil
- young Irish male, tried to board a flight to Brussels after swallowing 72 capsules with a total of 830 grams (1.82 pounds) cocaine.

Body packing- Animals

- 6/10 puppies implanted w/ 1 lb liquid heroin in abdomen
- Pure bred dogs flown to US to enter dog shows
 - People Magazine February 20, 2006

Management- “Body bagger/body packer syndrome”

- **Endoscopy is contraindicated- time to call the surgeon**
 - Rupture the condoms with contact
- Asymptomatic patient
 - Observed for condom passage
 - Some use cathartics or activated charcoal
 - Some centers advocate surgical removal
- Symptomatic patients
 - Stabilization & surgical removal

ARS Question1

- In the United States, the most common foreign body ingestion in children is?
 - A. Meat
 - B. Fish
 - C. Batteries
 - D. Coins
 - E. Toys

ARS Question 2

- In the United States, the most common foreign body ingestion in Adults is?
 - A. Meat
 - B. Fish
 - C. Batteries
 - D. Coins
 - E. Toys

ARS Question 3

- Regarding battery ingestions, which of the following are true?
 - A. The size of the battery is the primary determinant of the need to remove it
 - B. The location of the battery is the primary determinant of the need to remove it
 - C. Retained gastric batteries are associated with a high risk of lithium toxicity
 - D. Endoscopy to remove small batteries in the distal esophagus can be deferred for up to 6 hours if the patient is not NPO

ARS Question 4

- Regarding magnet ingestions in children, all of the following are true except?
 - A. an x-ray should be obtained in every suspected case of magnet ingestion
 - B. The timing of endoscopy is primarily determined by magnet size.
 - C. The majority of patients who reach medical attention require endoscopy, surgery or both to address.
 - D. Patients with evidence of bowel obstruction on imaging require prompt surgical intervention