EAR FOREIGN BODIES

Anatomy Matters

- The anatomy of the ear seems simple... an external portion, a tube, and the ear drum. Naturally, it is more complicated than that.
- The External Auditory Meatus can be divided into two portions:
  - The lateral third – cartilaginous portion.
  - The medial two thirds
    - Bony
    - More narrow than the lateral third.
    - Lined with a very vascular and highly sensitive thin layer of skin.
    - Prone to bleeding with even slight trauma.

Position Matters

- Naturally, the position of the patient can affect your ability to successfully remove the foreign body.
  - Make sure that the patient is in a comfortable position for him/her.
    - Sitting on a parent’s lap, sideways with the ear in question easily visible will often be the first position of choice.
      - This will allow the patient’s legs to be between the parent’s and offer security.
      - Also allows for the torso to be supported and arms kept safely out of the way.
      - Teaching the family member how to do this can save everyone some time and sweat.
  - Equally important is to make sure that the patient is in a position that allows you to be comfortable.
    - You may be very good a yoga, but there is no need to demonstrate your skills while attempting to remove a foreign body.
    - Anticipate that this will not be easy and may take a few minutes... so position your tools within easy reach.
- The position of the Foreign Body is also very important.
  - Foreign bodies that are in the medial two thirds of the canal are much more problematic and more difficult to remove.
  - In this area, the patient will be more uncomfortable and less likely to hold still.
  - You are also more apt to cause trauma (to the canal or TB) with foreign bodies that are in this region.
  - You need to have optimal circumstances and be very careful with foreign bodies in the medial two thirds of the canal.
Pain Management Matters

- Even the most cooperative child will lose the ability to calmly sit still as you scrape and claw at a foreign body, especially one in the medial two thirds of the canal.
- Be kind. Use some pain medications when appropriate.
- **A common trick is to use topical lidocaine.**
  - It is important to first make sure that there is no perforation of the TM before pouring any fluids into the canal.
  - This is very helpful with insects that are entrapped, as it will drown the insect and make everyone’s job easier.
- **Ketamine is great too!**
  - Ok, so this isn’t something to pull out right away, but occasionally, the child with an ear foreign body will need procedural sedation.
  - Short acting agents would be ideal (propofol). ENT would likely go to the OR for anesthetic gas.

The Object Matters

- An endless variety of foreign bodies have been removed from ears (from cotton to cheese; from bead to popcorn kernel; from eraser to putty).
- There are characteristics that can make the Foreign Body more difficult to deal with:
  - **Vegetable Matter** (food, beans, etc)
    - Do not use irrigation as this may cause the foreign body to swell and become more entrapped.
  - **Button batteries**
    - Cause liquefaction necrosis and need to be removed promptly.
  - **Sharp objects**
    - If not removed very carefully, may cause more injury and damage during the removal.
  - **Smooth, round objects**
    - Difficult to grasp.
    - Especially challenging when they are in the medial 2/3 of the canal.

The Tool Matters

- Having a wide array of tools can help you adapt to the various challenges that each foreign body offers.
- These can come in handy:
  - **Magnet**
  - **Forceps (alligator and Hartman)**
  - **Frazier suction**
  - **Cerumen loop**
  - **Right-angle ball hook**
  - **Schuknecht foreign body remover**
  - **Aural irrigation devise**
    - Can be made using a 60 ml syringe and an 18 gauge angiocath.
    - Ensure that the water is body temperature (so you don’t make the child vertiginous).
  - **Otomicroscope** would be quite handy.

Knowing Your Limits Matters

- Occasionally, you won’t be successful.
- When should you refer to the ENT doctors?
Unable to remove after multiple attempts.
  - Multiple attempts increases risk of complications, which can lead to other long term issues.

Tightly wedged objects
- Objects resting against the TM
- Sharp objects
- Button batteries
  - These, however, cannot wait until the next day in the ENT office.
  - If you can’t get it out, then the ENT needs to come in to get it out.

Reexamination Matters

- After you have successfully removed the Foreign Body, your job is not done.
- Ensure that all parts have been removed.
  - Especially important for insects.
  - Residual barbed insect legs can lead to inflammation and damage.
- Ensure that no other orifice has a Foreign Body.
  - Kids are tricky.
  - Check their other ear and the nostrils!!

Post-Care Matters

- Important to educate the patient and family about the hazard of the foreign body (this time it was the ear, next time it might be the airway).
- If there was some trauma to the canal (laceration, inflammation), then prescribe antibiotic otic drops and give water precautions. Follow-up examination will be important.

NASAL FOREIGN BODIES

Positive Pressure Technique

- One technique which is often over-looked and under-valued is the “positive-pressure technique” or “kissing technique.”
  - It has been demonstrated to be efficacious and has the advantage of not employing long hooks, foley-type devices, glue, or suction.
  - It is easy to do, less scary for the patient, and can be done even at home... a bonus if your own kids, or neighbors’ kids like to put things in places they don’t belong.
  - Its success rate has been demonstrated to be around 50%, which is excellent... ½ of the patients get less trauma and you get less nasal discharge on you.

- Personally, I bring a Katz Extractor (small foley-type device) in with me, but keep it out of sight.
- Then explain the “kissing technique: to the parent:
  - Have the child blow his/her nose (not usually successful given the age group you are usually dealing with.
  - Then the Parent (not you... another bonus) places his or her mouth over the child’s while the unaffected nostril is occluded.
• The parent exhales into the child’s mouth and 50% of the time, the foreign body will shoot out (along with snot). (It is nice to have a tissue ready for the parent- helps with service excellence scores.)

• If it doesn’t work, plans B-Z can be entertained. But if it works, you’ve just saved the child, the family and you a lot of time and trouble!
• It is a great method to remember when the neighbor calls you also... perhaps you can save them a trip to the ED (not that we wouldn’t welcome them with open arms).

**Button Battery Nasal Foreign Body**

**Button Batteries as Foreign Bodies**

• With our ever increasing number small electronic devices, button batteries are becoming more prevalent.
  o Toys & Electronic Games
  o TV Remote Controls & Key Fobs
  o Flashlights & Calculators
  o Watches & Hearing Aids
• They come in a variety of sizes, some that are rather large (>20mm).
  o A Button Battery that is smaller generally is able to pass uneventfully.
  o A Button Battery that is large (>20mm) is more likely to get stuck and lead to worse outcomes.

• During a 20 year period in the US, it was found that there was a significant increase in battery-related ED visits!
  o During this time, 65,788 patients <18 years visited EDs for battery-related issues equating to an average of **3,289 visits annually**!  
  o That works out to be **1 patient almost every 3 hours**!
• Unfortunately, in 2009, this number had increased (~6,000 children seen in US EDs for battery-related complaints).
• Worse outcomes associated with larger Lithium button batteries and younger children (< 4 years).

**The Problem with Button Batteries in the Nose**

• Button batteries can lead to serious tissue destruction in a relatively short amount of time.
• Alkaline batteries lead to liquefaction necrosis (so the more time they are exposed to the tissue the more damage the alkaline material will do... essentially eroding through mucosa, down to cartilage and eventually through the septum.
• They can cause devastating deformities.
• There is a plethora of ENT literature that document the potential destructive forces that are at play.
• “Batteries found in the nasal cavities should be removed IMMEDIATELY to prevent sequelae such as septal perforations or nasal meatus stenosis.” (Gomes, 1994)

“Time is Nose!”

• Ok, maybe that isn’t a real saying... but perhaps it should be.
• Of course, we are well versed with removing Nasal Foreign Bodies.
• The problem is that the tissue destruction is occurring and leading to edema and possibly entrapping the battery within the mucosa. The battery can then be difficult to remove.
Naturally, consulting an ENT / Plastic surgeon will be warranted to help manage the patients dissolving nasal passage... but, Time is Nose (as “they” say) and you don’t have time to wait for the ENT / Plastics arrive. You really need to get this battery out.

If all else fails, try a snare!

- Published in Journal of Emergency Medicine, there is a handy trick to know.
- I encourage you to read through the technique... but to not plagiarize, here is what they say:

A 24-guage wire “snare” loop was created, inserted into the nasal aperture, and used to dissect a plane between the battery and the septal, turbinate, and nasal floor mucosa until all sides were free. Once the posterior free edge of the battery was palpable with the loop, it was rotated 90 degrees and retracted outward, freeing the nasal foreign body and bringing it forward. At this point, the battery was visualized in the alar vestibule and removed with forceps.

Snare Technique

Naturally, this requires a very cooperative patient... perhaps chemically induced cooperation will be required.

**ESOPHAGEAL FOREIGN BODY**

**Button Battery Ingestion – Presentation**

- Most often will present as other Foreign Bodies.
  - Cough & Gagging
  - Drooling & Dysphagia
  - Increased Work of Breathing & Stridor
- But don’t forget **kids can be tricky** (and not tell you that they swallowed a FB).
  - Croup-like
    - Acute stridor without associated viral symptoms warrants concern.
    - Recurrent stridor warrants consideration for airway FB.
  - Wheeze
    - One great reason to check CXR in young child with first time episode of wheezing.
- May have symptoms that initially don’t seem related to a FB ingestion, but are related to the **evolution of tissue damage**.
  - Vomiting
  - Fever
  - Irritability
  - Listless
**Button Battery Ingestion – The Science**

- Tissue damage from Button Battery is due to *alkaline caustic exposure*.
  - Recall, *alkaline caustics lead to Liquefaction necrosis*.
  - When the battery is placed in a moist environment (e.g., mucous membranes, saliva), an electrical charge is generated.
    - The Lithium Button Batteries have twice the capacitance of other button batteries (3 volts vs 1.5 volts).
    - Lithium Button Batteries can generate more current and have been associated with worse outcomes.
    - Even used (spent) Lithium Button Batteries can still generate enough current to damage tissue!
  - The discharged current hydrolyzes water, generating *hydroxide ions* — leading to alkaline injury.

- **“Negative-Narrow-Necrotic” Mneumonic**
  - The current generates the hydroxide at the *negative terminal* of the battery.
  - The negative terminal is the more narrow side of the button battery when viewed laterally.
  - The anatomic orientation of the battery can predict where the *necrosis* will be and the subsequent injury.
  - The Esophagus (and *nostril*) are highly susceptible to this injury.
    - A button battery moving freely does not generate enough hydroxide ions in one location to produce focal damage.
    - The button battery lodged in the esophagus or nostril generates a focal collection of alkaline caustic material in a confined region that can cause tissue necrosis.

- **Serious damage can occur within 2 hours!**

- Damage can also occur from:
  - Leakage of alkaline material from the battery (usually, not the cause of the tissue damage that is seen to occur within 2 hours).
    - This is more of a problem with the non-lithium batteries.
  - Compression of local structures.

**Button Battery Ingestion – Imaging**

- Fortunately, we are looking for a radio-opaque coin-like object!
  - Plain films should be sufficient.
- Unfortunately, we can get fooled if we are not *vigilant* (common theme of the PedEM Morsels)!
  - *54% of fatalities due to a Button Battery FBs were misdiagnosed.*
    - Most of these had non-specific presentations.
    - Additionally, a large, round, coin-like object in the esophagus, may be easily misinterpreted as a coin which would be appropriate to initially observe and repeat film to see if it passes...
    - **If damage can occur within 2 hours, that period of observation can be very critical for your patient!!**
  - Look carefully at the foreign body.
    - Viewed “en face,” a button battery will have a “halo rim” – ring of radiolucency just inside the outer edge of the object.
    - Viewed on edge, a button battery may have a central bulge or “step-off”, although this can be difficult to appreciate if oblique or with newer, thinner Lithium batteries.
**Button Battery Ingestion – The Problem**

- Any button battery ingestion should be treated promptly as if an emergent condition is developing before your eyes!
- The button battery induced caustic tissue damage can lead to significant destruction of local structures:
  - Perforations
  - Fistulas
    - Tracheoesophageal Fistula
    - Fistulation of major blood vessels
  - Vocal cord damage and paralysis
  - Strictures
  - Spondylodiscitis
  - Massive Hemorrhage
  - Death
- Removal can be difficult.
  - The local tissue damage can lead to friable structures that can be further damaged by instrumentation.
  - Should be removed under direct visualization.

**Button Battery Ingestion – Management**

- Vigilance is required as the presentation may be non-specific and the outcomes severe!
- Button Batteries that are in the Esophagus need to be removed promptly – within 2 hours!
- Button Batteries that are in the stomach or beyond, in an **asymptomatic patient**, can be monitored and allowed to pass.
  - Repeat radiographs are reasonable.
    - Repeat in 4 days for < 6 years of age or for larger button batteries (> 15 mm).
    - Repeat in 10 – 14 days for older children if not large battery.
    - After that time, if battery still in stomach, endoscopic removal recommended.
  - Strict anticipatory guidance and return precautions should be given – emphasizing need to be evaluated for any abdominal pain, fever, or vomiting.
- **Co-ingestion of a magnet with the Button Battery necessitates removal.**
- After removal, some advocate for a delayed 2nd look endoscopy to ensure no damage occurred.
  - Perforations and fistulas may develop up to 18 days after removal.
  - Strictures can develop weeks and months after removal.

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