Pediatric Otolaryngology Case-Based Boards/In-Service Review

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- No disclosures

1. 3yo M swallowed drain cleaner. What type of tissue injury is expected?
   a) Liquefaction necrosis, superficial tissue penetration
   b) Liquefaction necrosis, deep tissue penetration
   c) Coagulation necrosis, superficial tissue penetration
   d) Coagulation necrosis, deep tissue penetration

Caustic Ingestion: Presentation

- Epidemiology
  - 50% under age 4
  - Accidental vs. intended ingestion
- History
  - Hoarseness, stridor, dyspnea, odynophagia, drooling, anorexia, substernal pain, rigidity, n/v, irritable crying, hematemesis
  - Brand name, type, amount of caustic agent ingested

Pathophysiology

- Alkali
  - 85%
  - Odorless, tasteless
  - **Liquefaction necrosis**
  - **Deep** penetration of tissue
  - Esophagus
  - Absorption may lead to thrombosis

- Acid
  - 15%
  - Bitter taste
  - Coagulation necrosis
  - Limited extent of penetration
  - Rapid transit to stomach
  - Gastric outlet obstruction or perforation may lead to multivisceral organ injury

Kay. *Curr Opin Pediatr*. 2009

Diagnosis

- Physical exam
  - Signs of burns or spillage (face, oc/op, larynx, extremities, chest, clothing)
- Radiology
  - CXR
  - MBSS / esophagram

Classification

I. Hyperemia or edema without ulcer formation
II. Submucosal burns, ulcerations, exudates
   a) Noncircumferential
   b) Circumferential
III. Deep ulcers and necrosis or periesophageal tissues
IV. Perforation

Fulton. *Clin Toxicol.* 2007.
Kay. *Curr Opin Pediatr.* 2009.
Riffat. *Diseases of the Esophagus.* 2009.

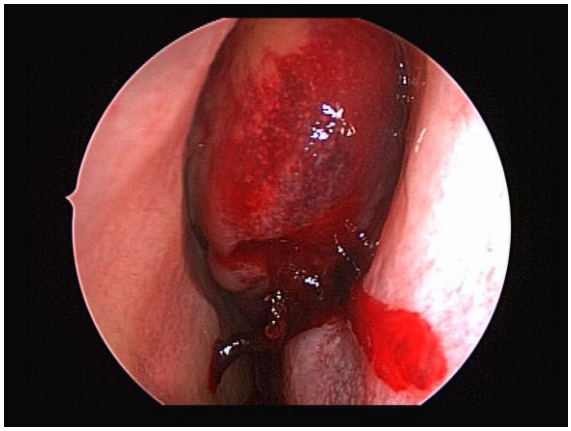
2. 4yo F with history of polycystic kidney disease s/p renal transplant 2 years ago presents with decreased hearing and speech delay. What pattern of hearing loss is most likely?
   a) Unilateral high frequency sensorineural hearing loss
   b) Bilateral high frequency sensorineural hearing loss
   c) Unilateral low frequency conductive hearing loss
   d) Bilateral low frequency conductive hearing loss
   e) Bilateral mixed hearing loss

Ototoxic medications

Drug class	Examples
Loop diuretics	Furosemide, bumetanide, ethacrynic acid
Antibiotics	
Aminoglycosides	Cochleotoxic- neomycin, amikacin, kanamycin, vancomycin; Vestibulotoxic- streptomycin; Both- gentamicin, tobramycin
Macrolides	Azithromycin
NSAIDs	Aspirin (high-dose), indomethacin, ibuprofen, phenylbutazone
Chemotherapeutic / anti-neoplastic agents	Cisplatin, carboplatin
Immunosuppressants	**Tacrolimus**
Antivirals	Interferon, ribavirin
ACE-inhibitors	Ramipril
Other	Quinine

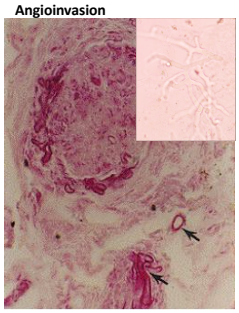
https://www.merckmanuals.com/professional/ear,-nose,-and-throat-disorders/inner-ear-disorders/drug-induced-ototoxicity
https://www.asha.org/public/hearing/Ototoxic-Medications/

3. 13yo F with relapsed AML, neutropenia, DM presents with left facial numbness and nasal obstruction x 1 day. Which histopathologic findings are most likely?
   a) Non-septate hyphae with 90° branching
   b) Septate hyphae with 90° branching
   c) Non-septate hyphae with 45° branching
   d) Septate hyphae with 45° branching

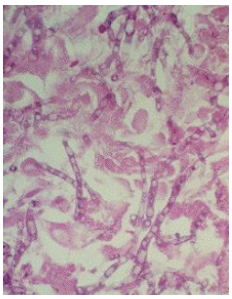


Mucormycosis vs Aspergillus

Broad, non-septate hyphae
90° branching
Angioinvasion



Septate
45° branching



4. Which of the following statements is TRUE regarding invasive fungal sinusitis?
   a) The disease process commonly involves the palate
   b) Mortality is low if amphotericin is administered early
   c) Survival is determined by correction of the underlying disorder
   d) Patients with HIV, leukemia, and uncontrolled diabetes are equally vulnerable

5. 5yo M with asthma, allergic rhinitis undergoes bronchoscopy and esophagogastroduodenoscopy (distal esophagus shown in figure) for chronic cough and dysphagia. Select all appropriate treatment options:
   a) Inhaled steroids
   b) Swallowed steroids
   c) Elimination diet
   d) Proton pump inhibitor

Eosinophilic esophagitis

Symptoms
- Dysphagia
- Globus / something "stuck"
- Washing food down with water
- Taking a long time to finish meals

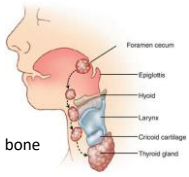
EGD findings
- Exudates
- Ruggae
- Trachealization of the esophagus

Path: ≥ 15 eos/hpf

6. The most common type of congenital midline neck mass is closely associated with
   a) The thyroid gland
   b) The larynx
   c) The hyoid bone
   d) The base of tongue

Thyroglossal duct cyst

- The median thyroid anlage is pulled caudally from the foramen cecum with descent of the aortic sac.
  Its pharyngeal connection elongates as the thyroglossal duct.
- Location
  - 2% intralingual
  - 20% suprahyoid
  - 15% juxtahyoid
  - 65% infrahyoid
- Preoperative ultrasound neck/thyroid to confirm normal thyroid gland
- Sistrunk procedure:
  excision of cyst with mid-portion of hyoid bone to decrease recurrence risk



2yo M presents to ED with fever x 2 days, drooling, muffled voice, tachypnea. Lateral neck x-ray was performed prior to urgent otolaryngology consultation

7. What x-ray finding do you expect
a) Prevertebral soft tissue widening
b) Thumbprint sign
c) Steeple sign

xray

thumbprint sign

laryngoscopy

8. 13yo M presents with left-sided nasal obstruction and epistaxis x 3 months. Nasal endoscopy findings are as shown. Next step?
   a) Interventional radiology consultation
   b) MRI
   c) Hematology consultation
   d) Office biopsy

Juvenile Nasopharyngeal Angiofibroma (JNA)

- Benign
- Adolescent males
- ↑ VEGF and hormonal receptors
- Originates at sphenopalatine foramen
- Do not biopsy in office!
- Imaging (CT and MRI) to evaluate extent
- Preoperative embolization
- Endoscopic excision (skull base otolaryngology-neurosurgery team)

9. 9mo M with hypertelorism, mass over nasal bridge that enlarges with crying. What is the most likely diagnosis?
   a) Glioma
   b) Encephalocele
   c) Dermoid
   d) Sebaceous cyst

What is the classic physical exam sign?

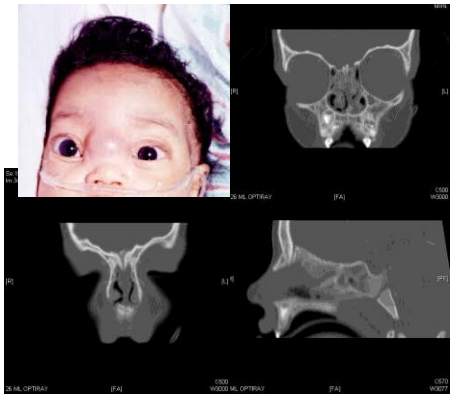
What is the classic physical exam sign?

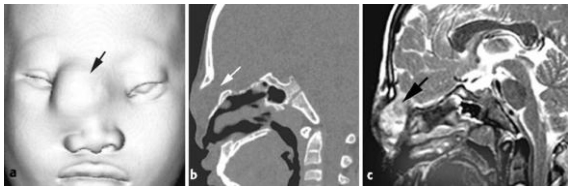
Furstenburg sign (expansion with IJ compression)

Congenital Midline Nasal Masses

	Encephalocele	Glioma	Dermoid
Age	Infants, children	Infants, children	Usually children, rarely adults
Location of mass	Intranasal and extranasal	Intranasal and extranasal	Intranasal and extranasal
Appearance	Soft, bluish, compressible	Reddish blue, solid, noncompressible	Solid, dimple with hair follicle
Pulsation	Y	N	N
Transillumination	Y	N	N
CSF leak	Y	Rarely	Rarely
Furstenburg sign	+	–	–
Cranial defect	Y	Rarely	Rarely
Previous history	Meningitis	Rarely meningitis	Local infection

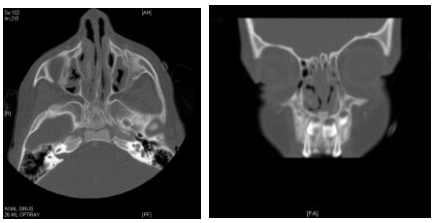
Adapted from Bluestone Ped Otolaryngol *Table 42-1.*





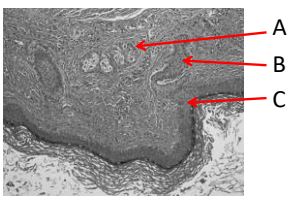
- **a** Surface-rendered 3-D CT demonstrates a large nasofrontal mass. Note the associated hypertelorism.
- **b** Sagittal CT reformation shows a bony defect through which the encephalocele herniates (arrow). The encephalocele expands the prenasal space.
- **c** Sagittal T2-W image shows protrusion of brain tissue into the prenasal space (arrow)

Dermoid of nasal tip

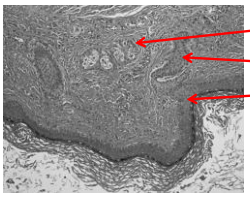


Open rhinoplasty approach

Nasal dermoid histopath



Nasal dermoid histopath



A: sebaceous glands
B: hair follicle
C: stratified squamous epithelium

10. 10 month-old M presents to your office with a lip mass. Which of the following statements is FALSE?

a) Lesions involving the lower face can be associated with subglottic lesions
b) Observation is indicated for high-risk areas and ulceration
c) Propranolol side effects include bradycardia and gastroesophageal reflux
d) These lesions tend to present a few weeks after birth

Hemangiomas

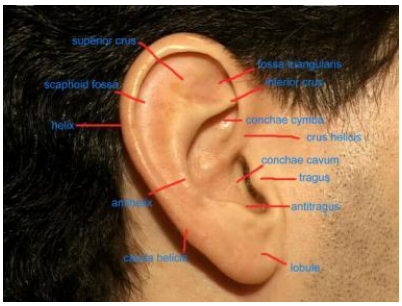
- Hemangiomas present after birth
  - Growth, plateau, and involution phases
- Vascular malformations present at birth
  - Grow in proportion to child
- Treatments
  - Observation, steroids, excision
  - Propranolol, timolol

V3 (beard) distribution -> evaluate for subglottic hemangioma

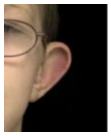
- PHACES syndrome
  - Posterior fossa malformations
  - Hemangiomas
  - Arterial anomalies
  - Coarctation of the aorta, cardiac defects
  - Eye abnormalities
  - Sternal abnormalities or ventral developmental defects
- Kasabach-Merritt Phenomenon
  - profound thrombocytopenia,
  - microangiopathic hemolytic anemia
  - consumptive coagulopathy,
  - enlarging vascular lesion (either a kaposiform hemangioendothelioma or a tufted angioma, or a mixture of both)
  - 30% mortality

11. 4mo M with “funny looking ears.” Which structure is flattened in the cup ear deformity?

a) Helix
b) Antihelix
c) Cavum concha
d) Tragus

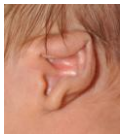


https://emedicine.medscape.com/article/839886-overview#a12



Cup ear

Stahl's ear



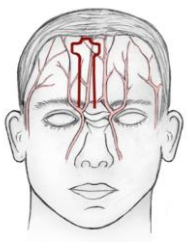
Lop ear

Cryptotia

Mustarde technique

- Mattress sutures from the scaphoid fossa to the concha to create an antihelical fold

12. Commonly used for full-thickness nasal reconstruction, the paramedian forehead flap
    a) Receives its blood supply from the supratrochlear artery and the terminal branch of the angular artery
    b) Receives its blood supply from imbibition
    c) Is based on a 3cm pedicle
    d) Pedicle is usually divided and inset at 6 weeks



https://maxfacts.uk/treatment/surgery/cancer/facial-skin-cancer/detailed

13. Which of the following is NOT a triggering agent for malignant hyperthermia?
    a) Sevoflurane
    b) Desflurane
    c) Succinylcholine
    d) Propofol

Malignant Hyperthermia

- Signs

Early	Late
↑ E_TCO_2	Hyperthermia
↑ HR	Trunk/limb rigidity
↑ RR	Myoglobinuria
Acidosis	
Masseter spasm/trismus	

- Abort case
- D/c triggers (volatile agents, succinylcholine)
- Convert to total intravenous anesthesia (TIVA)
- Hyperventilate
- ↑ FiO_2
- Dantrolene

14. Also known as Ondine's curse, congenital central hypoventilation syndrome is caused by a mutation in the PHOX2B gene with this pattern of inheritance
    a) Autosomal Dominant
    b) Autosomal Recessive
    c) X-linked Dominant
    d) X-linked Recessive

Thank you!

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Bonus Case 1

- 10mo F with stridor

Case

- 10mo F with stridor
  - Acute (croup, foreign body) vs chronic (laryngomalacia, bilateral vocal fold immobility, subglottic stenosis)
  - Recurrent vs constant
  - Associated symptoms
  - Alleviating and aggravating factors

Bonus Case 2

- 2yo with cough x 1 week

Bonus Case 2

- 2yo with cough x 1 week… after eating cashews

Bonus Case 2

- 2yo with cough x 1 week after eating cashews
- PE: right-sided wheezing

Epidemiology

- 2.5 million U.S. children / year
- Male predominance
- 55% under age 4, 75% 10-24 months
- Common cause of accidental death < 1 yo (2000 deaths / year)
- Esophageal > Airway FB

Shah, R. et al. *Arch OtoHNS.* 2010;136(4):373-379.

History

- Acute phase
  - **Choking**, coughing, gagging, throat clearing, then tachypnea and wheezing
- Asymptomatic phase
  - FB becomes dislodged, cough reflexes fatigue, immediate irritating symptoms subside
- Chronic or recurrent symptoms, complications
  - Persistent cough, dyspnea, fever… drooling, dysphagia, vomiting, hoarse cry… complete airway obstruction, cyanosis, apnea, change in mental status
  - Delayed diagnosis 12-26%

Foreign Body Types

Organic:
•62% airway FB in children < 5y
•8% children > 5y

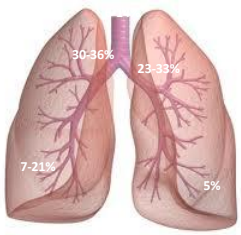
Nonorganic:
50% airway FB
in children > 5y

Coins:
55% esophageal FB
•76% children < 5y
•53% children > 5y

Lemberg. *Ann Otol Rhinol Laryngol.* 1996
Reilly. *Ann Otol Rhinol Laryngol.* 1992.

Physical

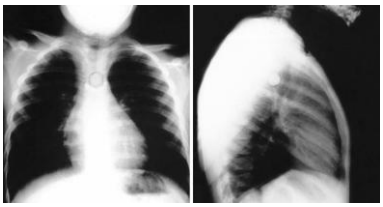
- **Cough**, fever, tachypnea, hypoxemia, ↓lung sounds, wheezes, crackles, stridor, dyspnea
- Tracheal FB:
  - Audible slap
  - Palpable thud
  - Asthmatoid wheeze



Lemberg. *Ann Otol Rhinol Laryngol.* 1996.
Silva. *Ann Otol Rhinol Laryngol*. 1998.

Radiology

- X-ray
  - PA/lat neck and chest
- CT
- Fluoroscopy



Management

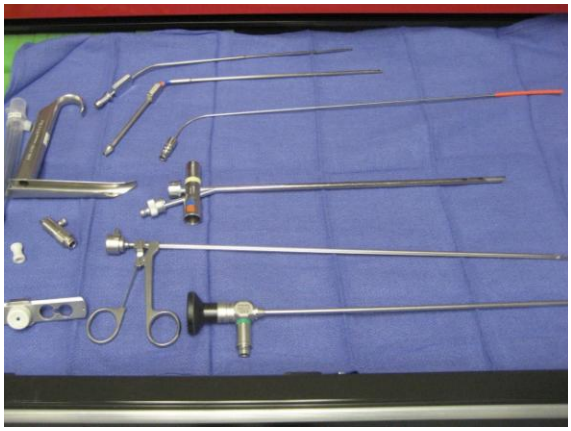
- ABC's / First Aid
- Endoscopy: urgent for
  - Actual or potential airway obstruction
  - Actual or imminent esophageal perforation
  - Button Battery
    - 3 "N's": Negative – Narrow – Necrotic
  - Dried beans or peas
- Timing: repeat x-ray for esophageal coins (delay > 4h)
- Not recommended
  - Blind finger sweep
  - Chest physical therapy, Heimlich / back blows in responsive child
  - Bronchodilators
  - Fogarty catheter use
  - Papain

Bronchoscopy Setup

Age	Size	Length (cm)	ID (mm)	OD (mm)
6 mo – 1 yr	3.0-3.5	20, 26, 30 26, 30	5.7	6.4
1 – 2 yr	3.5	26, 30	6.0	6.7

- 3.5 bronchoscope
  - 3.0 bronchoscope does not accommodate optical forceps
- Preop huddle with anesthesiology, OR team
- Maintain spontaneous ventilation

Adapted from *Bluestone* Tables 76-1 and 90-1



Complications

- Stripping off
- Granulation tissue
- Atelectasis
- Lung abscess
- Esophagoscopy: also esophageal perforation, stricture, extraluminal migration

Prevention

- Supervision
- Education
- Appropriate diet
  - Avoid nuts, seeds, popcorn, spherical candies in children < 5 y
- Keeping potential hazards out of reach and properly labeled
  - Consumer Protection
  - Battery labeling and packaging

Thank you!

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