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Question 1

A concerned parent brings his 3-month-old son to the emergency department for a fever and runny nose that has been present for 2 days. The child has a temperature of 38.0 °C (100.4 °F). All other vital signs are within normal limits. Physical examination reveals an active child without any abnormal physical examination findings. What is the most appropriate next step?

- A. Obtain CBC, chemistry, and urinalysis
- B. Obtain CBC, chemistry, urinalysis, and lumbar puncture
- C. Obtain chest x-ray
- D. Provide nasal decongestants and recheck temperature
- E. Provide oral hydration and antipyretics

Correct Answer: E. Provide oral hydration and antipyretics

Critique

Nasopharyngitis, or the common cold, is caused by a viral illness of the upper respiratory tract. Rhinovirus and corona virus are the most com-

monly isolated organisms; however, multiple viral etiologies exist. Mild conjunctivitis, coryza, fever, and pharyngitis may be present. Recommendations for therapy include rest, adequate hydration, and antipyretic agents. Antibiotics, antivirals, nasal decongestants, immunomodulatory therapy are not recommended treatments for nasopharyngitis. A septic workup is not indicated as the risk of serious bacterial infection is low among infants greater than 90 days old unlike infants 0–28 days (20%) and infants 29–56 days (9%). Decongestant and cough preparations should be avoided in young children due to the concerns of side effects. Many cough and cold products for children have more than one ingredient, and may increase the risk of accidental overdose if combined with another product.

Take-Home Message

Treatment of nasopharyngitis is supportive that includes rest, hydration, and antipyretic agents.

ABP Content Specification

- Plan the management of acute nasopharyngitis.

Question 2

A 5-year-old child presents to your emergency department complaining of sore throat. He has a low-grade fever, cough, and rhinorrhea. Physical examination demonstrates the pharyngeal erythema, tonsillar enlargement, oral ulcers and no

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cervical lymphadenopathy. The next best step for this patient includes which of the following?

- A. Antibiotics
- B. Corticosteroids
- C. Decongestants
- D. NSAIDs
- E. Rapid antigen detection test

Correct Answer: D. NSAIDs

Critique

Pharyngitis is a common infection in the pediatric population. The predominant etiology of acute pharyngitis is viral, approximately 80–90%. Patients often present with sore throat, cough, low-grade fever, and runny nose. This child likely has viral pharyngitis. Treatment with antibiotics should be reserved for those with clear group A streptococcal infections. This patient's presentation strongly suggests viral etiology (rhinorrhea, oral ulcers, cough, and no exudates) and thus does not warrant the use of antibiotics. Several studies have demonstrated the efficacy of corticosteroids for the treatment of moderate to severe pharyngitis. Steroids have been found to provide earlier onset of pain relief as well as shorter duration of symptoms. However, current Infectious Diseases Society of America (IDSA) guidelines do not advocate for their routine use in the treatment of acute pharyngitis. IDSA guidelines do recommend NSAIDs (strong, high recommendation) as an adjunctive therapy. Rapid antigen detection test should be reserved for patients presenting with clinical features that suggest bacterial group A streptococcal infection. These include high fever, exudates, and absence of cough.

Take-Home Message

Treatment of viral pharyngitis includes NSAIDs. Antibiotics should be reserved for those with clear clinical evidence of group A streptococcal infections.

ABP Content Specification

- Plan the management of acute pharyngitis.

Question 3

Which of the following clinical examination findings is most indicative of a bacterial cause of pharyngitis?

- A. Abrupt Onset
- B. Cough
- C. Coryza
- D. Conjunctivitis
- E. Lymphadenopathy

Correct Answer: A. Abrupt Onset

Critique

Acute pharyngitis is most commonly caused by a virus such as adenovirus, influenza virus, and enteroviruses. Approximately 10–20% of pharyngitis is caused by group A β -hemolytic streptococcus (GABHS). Certain clinical features favor a bacterial cause. An abrupt onset is consistent with GABHS pharyngitis. The typical presentation is sore throat, fever, tonsillar exudates, tender anterior cervical adenopathy, and absence of cough (Centor criteria). It is rare in children <2 years of age and primarily affects children age 5–15 years old. It usually occurs in winter and early spring. Comparatively, cough, coryza, conjunctivitis, and hoarseness are associated with a viral etiology. Lymphadenopathy may be seen in both viral and bacterial pharyngitis. A severe sore throat with minimal physical findings on examination of oropharynx may suggest a serious soft tissue infection such as epiglottitis or retropharyngeal infection.

Rapid streptococcal tests (RSTs) have a reported specificity and sensitivity of up to 95%.

Antibiotics should be reserved for patients with a positive antigen test or culture, or those meeting clinical criteria for diagnosis. Penicillin remains the treatment of choice and is effective in reducing the rheumatic fever. For those with penicillin allergy clindamycin is preferred over macrolides.

Take-Home Message

An abrupt onset, fever, and tonsillar exudates favor a bacterial cause of acute pharyngitis.

ABP Content Specification

- Know the etiology of acute pharyngitis.

Question 4

A 4-year-old child presents to the emergency department with fever and pulling on his left ear. When you examine the tympanic membrane, you find it to be erythematous, bulging, and with purulent fluid behind it. What is the most common causative bacterial organism?

- A. *Haemophilus influenzae*
- B. *Moraxella catarrhalis*
- C. Parainfluenza virus
- D. *Staphylococcus aureus*
- E. *Streptococcus pneumoniae*

Correct Answer: E. *Streptococcus pneumoniae*

Critique

Overall, viruses are responsible for a majority of acute otitis media in children. *Streptococcus pneumoniae* is the most common bacterial cause of acute otitis media for all ages. The other organisms include nontypeable *Haemophilus influenzae* and *Moraxella catarrhalis*. *S. aureus* and Gram-negative organisms are found commonly in neonates and very young infants who are hospitalized.

Take-Home Message

Streptococcus pneumoniae is the most common bacterial cause of acute otitis media for all ages.

ABP Content Specification

- Differentiate the etiology and pathophysiology of otitis media.

Question 5

A 3-year-old child presents to the emergency department complaining of 1 day of pain in her right ear. She is afebrile, well appearing, and acting appropriately. The pinna, lobule, and external auditory canal are normal. However,

the tympanic membrane is erythematous and bulging and does not move when pneumatic otoscopy is utilized. What is the appropriate treatment?

- A. Oral antibiotics and antihistamines
- B. Broad-spectrum IV antibiotics and hospital admission
- C. Oral and topical antibiotics and follow up with pediatrician
- D. Oral antibiotics and follow up with pediatrician
- E. Oral antibiotics only if the child does not improve with analgesics or is worse in 48 hours

Correct Answer: E. Oral antibiotics only if the child does not improve with analgesics or is worse in 48 hours

Critique

Acute otitis media (AOM) is the most common diagnosis associated with antibiotic prescriptions in children. Concern about increasing bacterial resistance has prompted this recommendation to withhold antimicrobial treatment in some cases unless symptoms persist for 2 or 3 days, or worsen. Watchful waiting or “wait-and-see” for 48 hours has been found to substantially reduce the unnecessary use of antibiotics in children with acute otitis media and may offer an alternative to the routine use of antimicrobials. Patients suspected of having acute otitis media are provided a prescription for oral antibiotics and encouraged to only fill the prescription if the child is not better or becomes worse within 48 hours. The decision to choose observation in lieu of antibiotics should be based upon the age of the patient (typically >2 years), severity of the illness, reliability of caregivers, and the ability for close follow-up. However, antibiotics continue to be recommended in the following:

- Children aged 6 months and younger
- Severe signs or symptoms, such as moderate or severe otalgia, or otalgia for at least 48 hours and fever of 102.2 °F or higher
- Ruptured tympanic membrane

Take-Home Message

Watchful waiting for 48 hours has been found to substantially reduce the unnecessary use of antibiotics in children with acute otitis media and may offer an alternative to the routine use of antimicrobials.

ABP Content Specification

- Recognize signs and symptoms and management of otitis media.

Question 6

A 16-year-old child presents with sore throat, muffled voice, and an inability to completely open his mouth. Examination reveals erythema and fullness of the posterior lateral left soft palate. The child is cooperative and appropriately protecting his airway. What is your initial approach for needle aspiration of the suspected abscess?

- Anterior pole of the tonsil
- Inferior pole of the tonsil
- Lateral pole of the tonsil
- Middle pole of the tonsil
- Superior pole of the tonsil

Correct Answer: E. Superior pole of the tonsil

Critique

Peritonsillar abscess (PTA) is a deep oropharyngeal infection which is more common in teenagers. It commonly presents with sore throat, fever, trismus, muffled or hot potato voice, drooling, and odynophagia. Patients may report this as the worst sore throat of their life. Physical findings include limited opening of the mouth, erythematous tonsil which may appear full, asymmetry of the soft palate, tonsillar exudates, and contralateral deviation of the uvula. Peritonsillar cellulitis is an inflammatory reaction but without localized abscess formation. This often precedes formation of abscess.

Although most are polymicrobial, the predominant organisms include group A hemolytic streptococcus (*S. pyogenes*) *S. aureus*, and *H. influenzae*. Other organisms include anaerobes such as

Bacteroides, and aerobes, including Gram-positive cocci and Gram-negative rods. Diagnosis is clinical and based upon history and physical examination findings. Intraoral or transcutaneous ultrasound scan of the neck will be helpful in establishing the diagnosis. Plain radiographs may not be able to identify a peritonsillar abscess.

A CT scan of the neck with IV contrast may be obtained if the diagnosis is not certain but it is not required in uncomplicated cases. Ultrasound may be helpful in verifying landmarks before aspiration.

Needle aspiration followed by antibiotics is the treatment of choice. Needle aspiration has been found to be superior to incision and drainage. Several studies have demonstrated that needle aspiration causes less trauma and pain than incision with an applicable cure rate. The technique involves using a long 18–20-gauge needle on a 10–20-mL syringe. A needle guard should be modified so that only 1 cm of the needle is exposed. After anesthetizing the area with topical lidocaine spray, the needle is advanced into the superior pole in a sagittal plane to avoid the carotid artery. If pus is not obtained at a 1-cm depth, deeper penetration is not recommended.

It is important to advance the needle in the sagittal plane only and not to angle to the side toward the carotid artery. One should not penetrate deeper than 1 cm and stay medial to avoid the more lateral-positioned carotid artery. Also, not to aspirate the tonsil itself because the abscess develops in the peritonsillar space surrounding the tonsil. If no pus is aspirated, the middle pole, followed by the inferior pole may be attempted. Beware that a negative aspirate does not exclude a PTA. Initial IV antibiotic therapy should include ampicillin/sulbactam or clindamycin. The recurrence rate is up to 10% after drainage. The potential complications include airway obstruction, extension to the retropharyngeal space, and spontaneous rupture and aspiration of pus.

Take-Home Message

The appropriate location for draining a PTA is to slowly advance the needle into the superior pole of the tonsil to avoid injury of the carotid artery.

ABP Content Specification

- Know the etiology pathophysiology, signs, symptoms, and management of peritonsillar abscesses.

Question 7

A previously healthy 7-year-old girl presents with painful and itchy left ear. She recently returned from a weeklong swimming camp. Inspection of the ear reveals pain with palpation of the pinna, purulent material adhering to an edematous external auditory canal, you cannot visualize the tympanic membrane. What is best treatment for this condition?

- Acetic acid solution alone
- Topical antibiotic and steroid drops
- Oral antibiotics and topical antibiotic solution
- Oral antibiotics and topical antibiotic suspension
- Acetic acid solution and ear wick

Correct Answer: B. Topical antibiotic and steroid drops

Critique

Otitis externa, also known as swimmer's ear, is an infection of the external ear canal. The diagnosis is based on the clinical findings. The presentation includes pruritus, ear pain, and ear discharge. There may be foul-smelling discharge, and reduced hearing. Physical findings include tenderness over the tragus or pinna and diffuse ear canal edema or erythema. Beware that it can be very painful and adequate analgesia is required.

The common organisms are *Pseudomonas aeruginosa* and *Staphylococcus aureus* but can also be polymicrobial. Beware that *Pseudomonas* can be severely virulent in immunocompromised individuals, particularly those with diabetes or HIV infection.

Treatment includes removing the inflammatory debris and a topical antibiotic drop with or without steroid, although the addition of a steroid appears to increase cure rates. Traditionally, the combination of polymyxin B, neomycin, and hydrocortisone has been used. Topical fluoroquinolone drops,

such as ofloxacin or ciprofloxacin, are preferred as they have a better safety profile than neomycin-containing drops. Also, neomycin should not be used if there is concern of tympanic membrane perforation. There is no evidence that systemic antibiotics alone or in combination with topical antibiotics improve outcomes but systemic medications may be indicated in immunocompromised patients. Beware that acidifying agents, such as 2% acetic acid drops should be avoided if there is a suspicion of tympanic membrane perforation, if the tympanic membrane cannot be visualized or if there are tympanostomy tubes. Acetic acid alone may be used for fungal otitis externa or in mild cases. Although ear wick is often placed by ENT, it may not be required in the ED. The wick usually falls out, or if left in place, may become a foreign body in the ear. If an ear wick is placed, follow-up should be arranged with a pediatrician within 48 hours for reevaluation and possible removal.

Take-Home Message

Treatment of acute otitis externa includes removing the inflammatory debris and topical antibiotics and steroid drops.

ABP Content Specification

- Plan the evaluation and management of acute otitis externa.

Question 8

A 12-year-old boy presents to the emergency department complaining of a frontal headache with associated mucopurulent discharge that has worsened over the course of 8 days. Examination reveals tenderness to the frontal sinuses and nasal discharge. Vital signs are normal except for a temperature of 38 °C (100.4 °F). What features make you suspect a bacterial as opposed to viral etiology?

- Age of the patient
- Progression of symptoms
- Fever <39 °C (102.2 °F)
- Frontal headache
- Duration of his symptoms

Correct Answer: B. Progression of symptoms

Critique

Sinusitis is the inflammation of the paranasal sinuses (frontal, maxillary, ethmoid, and sphenoid). Sinusitis can be classified as acute (<4 weeks), subacute (4–12 weeks), or chronic (>12 weeks).

The diagnosis of sinusitis is clinical and is made when a child with an acute upper respiratory tract infection (URI) presents with:

1. Persistent illness (nasal discharge [of any quality] or daytime cough or both lasting more than 10 days without improvement).
2. A worsening course (worsening or new onset of nasal discharge, daytime cough, or fever after initial improvement).
3. Severe symptoms (concurrent fever [temperature $\geq 39^\circ\text{C}/102.2^\circ\text{F}$] and purulent nasal discharge for at least 3 consecutive days is also suggestive of bacterial component).

Physicians should not obtain imaging studies to distinguish acute bacterial sinusitis from upper respiratory tract infection, because they do not contribute to the diagnosis. However, imaging studies may be obtained if orbital and intracranial complications are suspected. In such situations, contrast-enhanced computed tomography (CT) imaging of the orbits, sinuses, and brain should be performed.

Acute sinusitis signs and symptoms most often resolve without antibiotic treatment and can be treated with analgesics, antipyretics, and decongestants. Patients with a persistent illness (>10 days), worsening course, or with severe symptoms (described above) should be treated with antibiotics. First-line therapy is amoxicillin. Amoxicillin–clavulanic acid may be preferred. Beware that high rates of resistance among *Streptococcus pneumoniae* are reported with macrolides such as clarithromycin or azithromycin and trimethoprim-sulfamethoxazole.

Patients should be advised to return to their pediatrician if there is:

- Failure of symptoms to resolve after 3–5 days of antibiotic therapy
- Worsening of symptoms after 48–72 hours of antibiotics

Take-Home Message

Symptoms of acute bacterial sinusitis include persistent nasal discharge lasting more than 10 days without improvement, a worsening clinical course, and fever [temperature $\geq 39^\circ\text{C}/102.2^\circ\text{F}$].

ABP Content Specification

- Differentiate the etiology and understand the pathophysiology of sinusitis.

Question 9

A 4-year-old child presents complaining of a sore throat, fever, and chills that have been developing over 1 week. Physical examination reveals, cervical lymphadenopathy, and pain with extension of the neck. The oral cavity and posterior pharynx are normal in appearance. What imaging could you obtain to better aid in your diagnosis?

- A. Anteroposterior chest radiograph
- B. Anteroposterior neck radiograph
- C. Expiratory lateral neck radiograph, head in extension
- D. Inspiratory lateral neck radiograph, head in extension
- E. Inspiratory lateral neck radiograph, head in flexion

Correct Answer: D. Inspiratory lateral neck radiograph, head in extension

Critique

Retropharyngeal abscess (RPA) is an infection and subsequent inflammation of the space between the anterior border for the cervical vertebrae and the posterior wall of the epiglottis. It is predominately a disease of childhood with most occurs in children under 4 years. Usually after this age, the retropharyngeal nodes atrophy.

The retropharyngeal space communicates with the lateral pharyngeal space, which contains the carotid artery and jugular vein. A danger space is situated behind the retropharyngeal space, which extends from the base of the skull to the superior mediastinum at the level of T2. Once the retropharyngeal space is involved, the infection spreads rapidly and an abscess develops.

The predominant organisms are *Streptococcus pyogenes* (group A β -hemolytic streptococcus [GABHS]), *Staphylococcus aureus* (such as methicillin-resistant *S. aureus* [MRSA]), and anaerobes.

Children with retropharyngeal abscess are ill appearing. The clinical presentation of high fever, drooling, and stridor is similar to that of epiglottitis, with the exception that symptoms develop gradually in retropharyngeal abscess. These children often present with neck pain and/or refusal to extend the neck due to compression of the prevertebral space with this maneuver.

If the diagnosis of RPA is suspected and the airway is stable, the provider may choose to obtain an inspiratory lateral x-ray of the neck. A pathologic process is suggestive if the retropharyngeal space at C2 is greater than 7 mm and at C6 is greater than 14 mm in children. A lateral inspiratory view obtained when the neck held in normal extension may be helpful to avoid a false thickening of the retropharyngeal space. This is not a definitive study for the diagnosis of retropharyngeal abscess; computed tomography (CT) of the neck with intravenous contrast is the modality of choice for the diagnosis.

All children with suspected retropharyngeal infection should be hospitalized. The management plan should be developed in consultation with pediatric otolaryngologist.

Antibiotic coverage should include group A *Streptococcus*, *S. aureus*, and anaerobes. The initial antibiotics such as Ampicillin-sulbactam or clindamycin should be given. Surgical drainage should be considered if the following occurs:

- Airway compromise
- Large abscess ≥ 2.5 cm
- Failure to improve with parenteral antibiotic treatment

Take-Home Message

If the diagnosis of retropharyngeal abscess is suspected and the patient's airway is stable an inspiratory lateral x-ray of the neck with the head in extension may assist in diagnosis.

ABP Content Specification

- Recognize and interpret relevant imaging studies.

Question 10

A father brings his 6-month-old son to the emergency department for evaluation. He states that the child has not been eating and has become increasingly fussy. Inspection of the oral cavity reveals several small mucosal ulcers on the soft palate of 2–3 mm in size with a white center. The lesions do not involve the gingiva, tongue, or buccal mucosa. Several additional vesicles are found on the dorsal surface of the child's hands and lateral borders of the feet. What is the appropriate treatment?

- Acyclovir
- Amoxicillin
- Ceftriaxone
- Nystatin
- Oral analgesics

Correct Answer: E. Oral analgesics

Critique

Hand, foot, and mouth disease (HFMD) is characterized by an oral enanthem and vesicular rash of the hands and feet. Two of the most common viral pathogens causing stomatitis in children are Coxsackievirus A16 and enterovirus A71. Usually the disease due to enterovirus 71 is more severe than Coxsackievirus A16 disease, with high risk of neurologic and cardiopulmonary involvement.

This primarily occurs in the spring and summer season. It is highly contagious and spreads by the oral-oral or fecal–oral route. In this, vesicles or red papules are found on the tongue, oral mucosa, hands, and feet. The lesions may resemble those caused by herpes simplex or varicella-zoster virus. Usually the associated fever, sore throat, and malaise are mild.

Treatment is symptomatic with topical analgesic medications such as 2% viscous xylocaine for children older than 2 years and analgesia. However, this should be avoided in young children. Thus, oral analgesics are the mainstay of treatment in younger children.

Take-Home Message

Management of acute stomatitis is mainly supportive care with analgesics for pain and fever,

fluid intake to ensure adequate hydration, and vigilance to recognize cardiac or neurological complications.

ABP Content Specification

- Plan the management of acute stomatitis.

Question 11

A 2-year-old child presents with a barking cough, fever, and coryza that have developed over the past week. What is the most common cause of this illness?

- A. Adenovirus
- B. *H. influenza*
- C. Parainfluenza
- D. *S. aureus*
- E. *S. pneumoniae*

Correct Answer: C. Parainfluenza

Critique

Croup or laryngotracheitis is the most common cause of upper airway obstruction. It is characterized by inspiratory stridor, barking cough, and hoarseness. It causes inflammation in the larynx and subglottic airway.

It is most common in winter season and typically affects children ages 6 months to 6 years old. Parainfluenza is the most common cause. Other viruses that can cause croup are respiratory syncytial virus, adenoviruses, and human coronavirus. *H. influenza* is most commonly associated with epiglottitis. *S. aureus* is commonly found in bacterial tracheitis.

Croup is a clinical diagnosis, and radiograph is not required but may be considered in the following circumstances:

- Uncertain diagnosis
- Atypical course
- Suspected foreign body

A posteroanterior view may show subglottic narrowing or steeple sign. However, this may be absent in children with croup, may be present in

children without croup as a normal variant. Beware that radiographs do not correlate well with disease severity. The severity of croup is often determined by clinical scoring systems such as the Westley croup score. This includes the following variables:

- Stridor at rest
- Degree of chest wall retractions
- Air entry
- Cyanosis
- Mental status

Croup is a disease of the upper airway, and alveolar gas exchange is usually normal. Usually, these children do not require hospitalization. However, one should consider admission in the following conditions:

- Severe respiratory distress
- Persistence of stridor at rest after aerosolized epinephrine and steroids
- Significant medical history such as prematurity and pulmonary or cardiac disease

Take-Home Message

Parainfluenza is the most common cause of croup (laryngotracheobronchitis).

ABP Content Specification

- Understand the etiology, signs, symptoms, and pathophysiology of croup.

Question 12

A 4-year-old boy presents to the emergency department complaining of cough, coryza, and a hoarse voice that have developed over the past several days. Physical examination reveals an alert child with inspiratory stridor and intercostal retractions. Vital signs reveal low-grade fever, tachypnea, and tachycardia. What is the mainstay of treatment for this disease process?

- A. Antibiotics
- B. Antivirals
- C. Emergent intubation

- D. Glucocorticoids
- E. Racemic epinephrine

Correct Answer: D. Glucocorticoids

Critique

Glucocorticoids are the mainstay of treatment for croup. Several studies have demonstrated glucocorticoids ability to reduce the need for aerosolized epinephrine, intubation, and readmission to the emergency department. Dexamethasone 0.6 mg/kg (maximum 10 mg) is one of the several options for glucocorticoid use. Since it is equally effective both parenterally or orally, oral route is preferred.

Racemic epinephrine can be used in moderate to severe croup, patients with stridor at rest, and especially in those for whom admission is being considered. Epinephrine reduces airway edema via its vasoconstrictive alpha effects. It decreases need for intubation and disease severity.

Side effects of aerosolized epinephrine are rare, most commonly tachycardia, but there may be a risk of cardiac arrhythmias. Since the action of nebulized epinephrine is short-lived, these children should be observed for at least 2 hours after aerosolized epinephrine is administered. Repeated doses may be warranted for persisting severe croup but may require admission. Patients can only be discharged home if there is resolution of stridor and respiratory distress in the ED. Parental antibiotics are not indicated in croup as the etiology is predominantly viral.

Take-Home Message

Glucocorticoids are the mainstay of treatment for croup.

ABP Content Specification

- Plan management of acute croup.

Question 13

A mother brings her 5-year-old child into the emergency department and states that today he developed a severe sore throat and high fever. The child appears anxious and is drooling and leaning forward in a tripod position. Examination

reveals stridor and intercostal retractions. What is the next best step?

- A. Direct visualization of the pharynx
- B. Lateral radiograph of the neck
- C. Prepare for intubation
- D. Glucocorticoids
- E. Racemic epinephrine

Correct Answer: C. Prepare for intubation

Critique

Epiglottitis is a life-threatening condition. The clinical features of epiglottitis such as acute onset, stridor, drooling, high fever, and toxic appearance are usually sufficient to make the diagnosis without the need for further imaging or laboratory analysis. It involves supraglottic region and can lead to rapid airway obstruction.

The classic triad includes three Ds drooling, dysphagia, and distress. Stridor is primarily inspiratory, and a late finding and its presence may suggest near-complete airway obstruction. In this condition, the child may assume the tripod position, sitting upright and leaning forward with the chin up and mouth open while bracing on the arms.

Classic radiograph may show the thumb sign; however, it requires adequate hyperextension of the head and neck. This is referred to the lateral view of the swollen epiglottis resembling a lateral view of one's thumb. The radiographs alone should not be used to diagnose epiglottitis. One should not obtain radiograph if the clinical suspicion is high. In such situation, direct visualization of the airway under controlled circumstances should be performed. This may reveal a large, cherry red, swollen epiglottis. However, this should occur in controlled environment such as an operating room or intensive care unit. A skilled physician who has expertise in advanced airway management should be available at all times.

Take-Home Message

A patient with suspected epiglottitis and in respiratory distress requires a definitive airway and the preferred setting for intubation is the operating room.

ABP Content Specification

- Plan management of acute epiglottitis.

Question 14

Although both croup and epiglottitis can manifest with stridor in a febrile child, what clinical feature can be used to make the diagnosis of croup more likely than epiglottitis?

- A. Cough
- B. Drooling
- C. Leukocytosis
- D. Lymphadenopathy
- E. Odynophagia

Correct Answer: A. Cough

Critique

Clinical features can be helpful in distinguishing between the diagnosis of croup and epiglottitis. Both disease processes may cause stridor and fever. A subglottic narrowing of the upper airway leads to the stridor present in croup. In the case of epiglottitis, stridor is the result of supraglottic narrowing. Patients with epiglottitis are more likely to present ill appearing and with an acute onset of symptoms, drooling, and respiratory distress. Patients presenting with croup more often present with cough and a more insidious onset. A recent study demonstrated that the additional presence of drooling had a high sensitivity and specificity for epiglottitis while coughing had a high sensitivity and high specificity for croup.

Take-Home Message

Patients with both croup and epiglottitis present with stridor, but croup is characterized by barking cough whereas patients with epiglottitis are toxic appearing, have drooling and have rapidly progressive respiratory distress.

ABP Content Specification

- Recognize the signs and symptoms for croup and epiglottitis.

Question 15

A 4-year-old child presents to your emergency department in obvious distress. He was diagnosed with viral croup 5 days ago. Since that time, he has developed a worsening fever and a brassy cough. Examination reveals a toxic appearing child with both inspiratory and expiratory stridor. What organism is most likely the cause of this patient's condition?

- A. Group A streptococcus
- B. Parainfluenza virus
- C. *Mycoplasma pneumoniae*
- D. *Staphylococcus aureus*
- E. *Streptococcus pneumoniae*

Correct Answer: D. *Staphylococcus aureus*

Critique

Bacterial tracheitis is a rare but serious cause of stridor and airway obstruction in children. The typical presentation is a toxic child with high fever and rapidly worsening stridor that fails to improve with racemic epinephrine and glucocorticoids. Since the clinical presentation of bacterial tracheitis is nearly indistinguishable from that of severe croup, one should suspect bacterial tracheitis when URI symptoms progress to acute toxicity, respiratory distress, and stridor.

S. aureus is the organism primarily responsible for this disease. *Moraxella catarrhalis* infection is also prevalent and may potentially be more severe. Bacteria invade the tracheal epithelium producing inflammation and thick mucopurulent secretions. Patients presenting with symptoms suggestive of bacterial tracheitis require immediate airway assessment, supplemental oxygen, fluid resuscitation, broad-spectrum antibiotics, and hospital admission. Currently bacterial tracheitis might be more common than epiglottitis likely due to the impact of vaccination against *Haemophilus influenzae*.

Initial antibiotic coverage should include an anti-staphylococcal agent such as vancomycin or clindamycin plus a third-generation cephalosporin such as cefotaxime, or ceftriaxone.

Although neck radiographs are not needed to establish the diagnosis but when obtained it may show subglottic narrowing of the trachea and irregular tracheal margins. Bronchoscopy is both diagnostic and therapeutic. It allows visualization of the supraglottic structures and larynx, exclusion of other disease, suctioning of tracheal secretions and debris, and establishment of an airway.

Take-Home Message

Staphylococcus aureus is the most common cause of bacterial tracheitis, a rare but serious condition often presenting with fever, stridor, and airway obstruction in children.

ABP Content Specification

- Understand the etiology and pathophysiology of tracheitis.

Question 16

A father is concerned that his 3-year-old child may have swallowed a watch battery. An anteroposterior chest radiograph reveals a circular halo-like structure seen midway between the mouth and diaphragm. The child is well appearing, able to speak in full sentences, and showing no signs of respiratory distress. What is the next best step?

- Attempt removal with forceps
- Emergent bronchoscopy
- Emergent endoscopy
- Oral fluid challenge
- Provide reassurance and follow up in 24 hours for repeat radiograph

Correct Answer: C. Emergency endoscopy

Critique

Foreign bodies may lodge in both the trachea and esophagus. In the esophagus, it occurs in areas of physiologic narrowing, such as at the level of the cricopharyngeus muscle, followed by the lower esophageal sphincter and the level of the aortic arch.

Button batteries can be differentiated from the coin by the presence of a bilaminar structure, making them appear as a double ring or halo on plain radiographs.

Radiographic imaging may be helpful in determining the location of radio-opaque foreign bodies, such as coins or metal objects. On an anteroposterior chest radiograph, a coin or button battery present in the esophagus appear as a round structure in the coronal plane. This circular structure is actually a battery since it has a double rim or halo. If the object has not passed into the stomach, as is the case with this patient, emergent endoscopy should be obtained for prompt removal as batteries can corrode adjacent tissues in as little as 2 hours. The battery causes damage by pressure necrosis, leakage of alkaline contents, and the generation of an electrical current. The flow of electric current causes hydrolysis and hydroxide buildup and subsequently local corrosive injury. Beware that discharged batteries may have enough voltage and storage capability to generate an external current.

Batteries lodged in the airway or esophagus require expeditious removal. However, Gastric or intestinal batteries may be treated with watchful waiting. Use of forceps and balloon catheters should be avoided as they can further impact the foreign body or potentially cause aspiration. The use of glucagon to facilitate esophageal motility may not be appropriate for a battery.

Take-Home Message

On an anteroposterior chest radiograph, a coin or button battery present in the esophagus will appear as a round structure in the coronal plane.

ABP Content Specification

- Know the indications and contraindications for acute upper airway foreign body removal.

Question 17

While performing a physical examination on a child you notice an object lodged in the patient's external auditory canal. The tympanic membrane

can be visualized and appears intact. Which of the following objects represent a contraindication to removal with irrigation?

- A. Eraser
- B. Marble
- C. Metal ball
- D. Plastic bead
- E. Sponge

Correct Answer: E. Sponge

Critique

Foreign bodies in the external auditory canal are common in young children and should be removed as soon as safely possible. Many objects can be removed by gentle irrigation of the canal with room-temperature water or saline. The stream of water should be directed toward the side of the foreign body so that it accumulates behind it, therefore moving it out toward the external meatus. Materials such as food or sponges may expand when exposed to water and therefore irrigation should not be employed.

The patient may report feeling motion or hearing buzzing in the ear if the foreign body is an insect. A small amount of lidocaine or mineral oil instilled into the ear may be helpful in anesthetizing or immobilizing most insects. Disk batteries may corrode adjacent tissues and should generally not be removed via irrigation.

In order to have an adequate view, grasp the pinna of the ear and retract it in a posterosuperior direction to straighten the canal. A complete visualization of TM is required before irrigation. Irrigation should not be performed unless the TM is completely visualized and free of perforation. Document if the tympanic membrane has been ruptured by the foreign object or by prior removal attempts. Irrigation should not be attempted if the tympanic membrane perforation is suspected or if tympanostomy tubes are present. A complete examination of the canal should be performed to ensure the lack of retained material and to evaluate ear anatomy

Take-Home Message

Absorbent materials in the auditory canal such as food or sponges may expand when exposed to water and therefore irrigation should not be employed.

ABP Content Specification

- Foreign body removal from the external auditory canal: Know the indications and contraindications for foreign body removal.

Question 18

A 10-year-old presents to the emergency department after falling off his bike and striking his face on the pavement. He has mild bleeding coming from the left nostril that is controlled after 15 minutes of direct pressure. Upon closer inspection of the nasal passage, you identify a bluish discolored bulging adjacent to the nasal septum. What is the correct technique to manage this clinical finding?

- A. Bilateral nasal packing and ENT follow-up
- B. Chemical cautery and bilateral nasal packing
- C. Horizontal incision, drainage, and nasal packing
- D. Needle aspiration, drainage, and nasal packing
- E. Vertical incision, drainage, and nasal packing

Correct Answer: C. Horizontal incision, drainage, and nasal packing

Critique

Trauma to the anterior part of the nasal septum may result in a hematoma formation. In this blood accumulates between the mucoperichondrium and the septal cartilage. Since vascular supply to the septal cartilage is provided through the perichondrium, septal hematoma potentially disrupts blood supply to the cartilage. This blood accumulation also serves as a medium for bacterial growth and the formation of an abscess. Common organisms include *S. aureus*, *Streptococcus pneumoniae*, and group A β -hemolytic streptococci.

They appear as a bulging or cherrylike swelling of the nasal septum on one or both sides of the nasal cavity. The presence of septal asymmetry with a bluish or reddish hue of the mucosa may suggest a septal hematoma. Since newly formed hematomas may not be ecchymotic, these may be missed on inspection, and direct palpation is required. Palpate the entire septum for swelling, fluctuance, or widening of the septal space.

Since no alternative blood supply is available, immediate drainage of the hematoma to restore blood flow from the perichondrium is necessary. This is best accomplished with a horizontal incision through the nasal mucosa and perichondrium covering the hematoma. Many perform L-shaped incision in the most inferior and dependent portion of the hematoma. This incision should be superficial through the mucosa, making sure not to incise the cartilaginous septum. This should be performed in consultation with otolaryngology service.

The nasal cavity should be packed to prevent reaccumulation of the hematoma, a broad-spectrum antibiotic should be provided, and the septum should be reevaluated in 24 hours with the ENT service. The most common complication is septal abscess. The other complications are due to spread and include meningitis, cavernous sinus thrombosis, intracranial abscess, and orbital cellulitis. Avascular necrosis of the septal cartilage may occur due to a large or rapidly expanding hematoma.

Needle aspiration may not be adequate and is less efficient in evacuating a nasal septal hematoma. There is a high risk of reaccumulation of blood in the septum.

Take-Home Message

Draining a septal hematoma is best accomplished with a horizontal incision through the nasal mucosa and perichondrium covering the hematoma.

ABP Content Specification

- Nasal septal hematoma: Know the indications and contraindications for drainage and packing of a nasal septal hematoma.

Question 19

A 12-year-old child presents with a laceration involving her upper lip. The laceration requires repair. What is the preferred nerve block for providing anesthesia to this region of the face?

- A. Infraorbital nerve
- B. Inferior alveolar nerve
- C. Mental nerve
- D. Supraorbital nerve
- E. Superior alveolar nerve

Correct Answer: A. Infraorbital nerve

Critique

Regional nerve blocks of the face can be used to aid in repairing facial lacerations. It can provide anesthesia of a larger area with less discomfort and fewer needle sticks.

The *infraorbital nerve* exits the infraorbital foramen at a point that is medial of the mid-pupillary line and 6–10 mm below the inferior orbital rim. The infraorbital nerve block can be accomplished via an extraoral or an intraoral approach. Anesthetizing this nerve provides anesthesia to the lateral nose, upper lip, upper teeth, lower eyelid, most of medial cheek.

The inferior alveolar nerve block provides anesthesia to the ipsilateral mandibular teeth, lower lip, and chin. The *mental nerve* is a continuation of the inferior alveolar nerve with similar anesthetizing properties. It exits the mental foramen approximately 2 cm inferior to the alveolar ridge below the second premolar. This anesthetizes lower lip and chin. The mental foramen is located near the mid-point of a line from the oral commissure and the mandibular border.

The *superior alveolar nerve* has three branches, anterior, middle, and posterior.

- The anterior superior alveolar nerve supplies sensation to the ipsilateral central and lateral incisors, as well as the canine tooth and half the upper lip.
- The middle superior alveolar nerve provides sensation to the ipsilateral premolars and sometimes the first maxillary molars.

- The posterior superior alveolar nerve provides sensation to the ipsilateral maxillary molars.

The supraorbital nerve exits the supraorbital notch along the supraorbital rim. It supplies sensation to the forehead with the supratrochlear and infratrochlear nerves.

Also, remember not to exceed the maximum dose of the agent. The maximum dose of lidocaine is 4.5 mg/kg/dose (maximum dose 300 mg) and lidocaine with epinephrine 7 mg/kg/dose (maximum dose 500 mg).

Take-Home Message

- Supraorbital nerve = forehead
- Mental nerve = lower lip and chin
- Infraorbital nerve = upper lip, upper teeth, and lower eyelid

ABP Content Specification

- Regional local anesthesia of the head and neck.

Question 20

A 4-year-old child presents to your emergency department in severe respiratory distress. You make the decision to intubate the child via direct laryngoscopy. What size cuffed endotracheal tube should you use?

- A. 2 mm
- B. 3 mm
- C. 4 mm
- D. 5 mm
- E. 6 mm

Correct Answer: C. 4 mm

Critique

The American Heart Association and the Pediatric Advanced Life Support course have endorsed the use of cuffed endotracheal tubes in children with the advent of high-volume, low-pressure cuffed endotracheal tubes.

Endotracheal tube size estimation in children is based on the age of the child.

The formula for cuffed tube is as follows:

$$\begin{aligned} \text{Cuffed tube} &= \text{Diameter in mm} \\ &= ((\text{age in years}) / 4) + 3 \end{aligned}$$

A cuffed tube is preferred in children with decreased lung compliance and in those who may require prolonged mechanical ventilation. If an uncuffed tube is to be used, you can add 0.5 to the above formula to adjust the diameter size. The internal diameter of the endotracheal tube for a child will roughly equal the size of that child's little finger, but this estimation is unreliable and should not be employed. A cuffed tube is not recommended for neonates. Beware that cuff inflation pressure should not exceed 20–25 cm H₂O.

The formula for uncuffed tube is as follows:

$$\begin{aligned} \text{Uncuffed tube: diameter in mm} \\ &= ((\text{age in years}) / 4) + 4 \end{aligned}$$

$$\begin{aligned} \text{Cuffed tube: diameter in mm} \\ &= ((\text{age in years}) / 4) + 3 \end{aligned}$$

Take-Home Message

Cuffed endotracheal tubes are preferred in children. The formula for estimating ETT size is diameter in mm = (age in years)/4 + 3

ABP Content Specification

- Direct and indirect diagnostic laryngoscopic procedures.

Question 21

You have successfully intubated an 8-year-old child with a cuffed endotracheal tube. What is the approximate proper depth of tube placement?

- A. 10 cm
- B. 12 cm
- C. 15 cm
- D. 18 cm
- E. 20 cm

Correct Answer: C. 15 cm

Critique

The following formula can be used to estimate the proper depth of the endotracheal tube in children prior to radiographic confirmation. This is a two-step process. The first is used to determine the tube diameter. The second uses that value to estimate the tube depth.

Step 1

- **The internal diameter of the cuffed tube (mm) = (age/4) + 3**
- Internal diameter = $(8/4) + 3$
- Internal diameter = $(2) + 3$
- Internal diameter = 5 mm

Step 2

- **Pediatric endotracheal tube depth (cm) = (internal diameter of the tube) × 3**
- Pediatric endotracheal tube depth (cm) = $(5) × 3$
- Pediatric endotracheal tube depth (cm) = 15 cm

Keep in mind that the length represents the distance from the tube tip to the upper teeth incisors in children.

Take-Home Message

Pediatric endotracheal tube depth (cm) = internal diameter of the tube × 3

ABP Content Specification

- Direct and indirect diagnostic laryngoscopic procedures.

Question 22

A 5-year-old child presents with a nose bleed. The mother states that he is a constant nose picker and that their home has forced-air heat making the air in their apartment very dry. All of the following techniques for epistaxis management are appropriate with the *exception* of:

- A. Direct pressure
- B. Cautery

- C. Oral nasal decongestant
- D. Nasal packing
- E. Topical nasal decongestant

Correct Answer: C. Oral nasal decongestant

Critique

The most common cause of epistaxis in children is digital trauma such as nose picking. The usual age is 2–10 years. The common site is the mucocutaneous junction on the septum. The anterior bleeding most commonly originates from Kiesselbach plexus, a venous vascular plexus on the anterior nasal septum.

Epistaxis in children can be managed in a similar fashion to the way it is managed in adults with a few exceptions. Direct pressure for 10–15 minutes is often the simplest and most effective way of controlling hemorrhage. The child should be sitting up with his or her head slightly forward. Cautery may be employed. However, it should be noted that cautery will not work on an actively bleeding source. A topical decongestant (vasoconstrictor) like neosynephrine or epinephrine may be used to control the bleeding. Packing may be used to tamponade the bleeding. However, packing poses the risk of toxic shock syndrome and necessitates careful patient follow-up. In dry environments placing petroleum jelly or Vaseline over the nasal mucosa helps prevent erosion and bleeding. Oral decongestants do are not recommended in children due to the side effects, and do not play a role in the acute management of epistaxis. Beware that up to 5–10% of children with recurrent nosebleeds may have von Willebrand disease.

Take-Home Message

Oral decongestants should not be used in children younger than 6 years of age due to their potential side effects.

ABP Content Specification

- Know the indications and contraindications for the management of epistaxis.

Question 23

A mother brings her 2-year-old child into the emergency department. She is concerned that her daughter may have put a plastic bead up her nose. The child is pleasant and exhibiting no signs of respiratory distress. You visualize a small plastic bead present in the middle third of the nose. All of the following techniques for removal are appropriate with the *exception* of:

- A. Alligator forceps
- B. Balloon catheter
- C. Blowing air into the child's mouth
- D. Plastic curette
- E. Irrigation

Correct Answer: E. Irrigation

Critique

Nasal foreign bodies are a common presentation in children. It is not unusual for young children to put beads, paper, pieces of sponge, plastic toys, eraser, or other foreign objects into their nares. This should be considered in a young child if there is a unilateral nasal discharge and/or a foul smell. It is the most common cause of unilateral foul-smelling nasal discharge in children.

Several techniques can be employed to remove these items. Forceps, balloon catheters, and mouth-to-mouth air blowing, also known as a “mother’s kiss” can be employed. In older and cooperative patients, “blow the nose” while blocking the opposite nostril is effective.

Irrigation is a good technique for removal of aural foreign bodies, but should be avoided for nasal foreign bodies due to risk of aspiration.

Possible concern during an attempted removal of a deeply situated foreign body is dislodgement into the nasopharynx and aspiration. Consider ENT consultation if the objects are located more posteriorly or could not be removed in the ED. Button batteries may cause liquefaction necrosis of surrounding tissue which may result in nasal septal perforation; therefore urgent consultation should be obtained.

Take-Home Message

Unilateral foul-smelling nasal discharge is strongly suggestive of nasal foreign body and should be carefully removed to avoid aspiration into the lungs.

ABP Content Specification

- Removal techniques and potential complications.

Question 24

A 2-year-old child presents with a chief complaint of right ear pain. A thorough history and physical examination is performed that includes otoscopy. What is the most reliable clinical sign of acute otitis media?

- A. Concave tympanic membrane
- B. Convex tympanic membrane
- C. Erythematous tympanic membrane
- D. Loss of mobility of tympanic membrane on pneumatic otoscopy
- E. Retracted and opaque tympanic membrane

Correct Answer: D. Loss of mobility of tympanic membrane on pneumatic otoscopy

Critique

Acute otitis media is primarily a disease of children. Young children are susceptible because

- the eustachian tubes are not angled downward and do not drain well
- relatively small tube size
- higher frequency of URI

The three criteria have been stipulated from the AAP guidelines

- Acute, abrupt onset of signs and symptoms such as otalgia, otorrhea, irritability, and fever
- Evidence of middle ear fluid such as bulging tympanic membrane (TM), an air-fluid level or air bubbles behind the TM, otorrhea, or limited TM mobility on tympanometry, pneumatic otoscopy, or acoustic reflectometry
- Signs or symptoms of inflammation in the ME, such as distinct erythema of the TM

Otoscope examination is important for the diagnosis of otitis media. A bulging, nonmobile tympanic membrane on pneumatic otoscopy is characteristic for acute otitis media. Beware that crying and/or fever can both result in an erythematous TM and are therefore unreliable. A retracted and opaque tympanic membrane may represent an effusion.

Take-Home Message

A tympanic membrane with impaired mobility is diagnostic for acute otitis media.

ABP Content Specification

- Know the anatomy and pathophysiology relevant to otoscopic examination.

Question 25

A 7-year-old child is bitten by a dog and sustains a 1-cm laceration to the superior aspect of his right pinna. The wound includes the skin as well as the cartilage. After properly anesthetizing the area, what is the preferred method of closure for this laceration?

- Approximate and suture skin only carefully avoiding manipulation of the cartilage
- Approximate wound without sutures and employ a compressive dressing
- Approximate cartilage and skin together at the same time with sutures
- Approximate cartilage with sutures first, then approximate and suture skin
- Animal bites to the face should be left to heal via secondary intention

Correct Answer: D. Approximate cartilage with sutures first, then approximate and suture skin.

Critique

The primary goals are coverage of exposed cartilage and prevention of wound hematoma. Ear laceration repair is accomplished by first approximating the exposed cartilage and suturing with 4-0 or 5-0 absorbable sutures. The anterior and

posterior perichondrium should be included in the sutures. Next, the posterior skin surface should be approximated using 5-0 or 6-0 nonabsorbable sutures. Cartilage is an avascular tissue and receives nutrients via the skin. Therefore, all exposed cartilage should be covered. Finally, all ear lacerations should be enclosed with a compression dressing to prevent hematoma formation. Many recommend antibiotic prophylaxis including *Pseudomonas*. Beware that ear injuries are rare in children under 1 year of age and one should consider evaluation for nonaccidental trauma.

Take-Home Message

When suturing a laceration of the ear that involves the ear cartilage, approximate cartilage with sutures first, then approximate and suture skin.

ABP Content Specification

- Plan the key steps and know the potential pitfalls in performing external ear procedures.

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