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Item 19 of 40 Question Id: 20020

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Which of the following historical details is most relevant in establishing this patient's diagnosis?

- A. Family history of seizures (5%)
- B. History of diarrheal illness (10%)
- C. Maternal history of perinatal infection (35%)
- D. Previous recurrent gingival bleeding (6%)
- E. Recent episode of otitis media (42%)

Omitted
Correct answer
E

42%
Answered correctly

06 secs
Time Spent

2023
Version

Explanation

Risk factors for brain abscess



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Risk factors for brain abscess

The diagram shows a central figure of a human torso with a heart illustration. Four callout boxes point to specific anatomical areas:

- Otitis media (ear infection) - points to a cross-section of the ear and mastoid air cells.
- Mastoiditis (inflammation of the mastoid bone) - points to a cross-section of the mastoid air cells.
- Sinusitis (inflammation of the sinuses) - points to the nasal and paranasal sinuses.
- Dental infection - points to a cross-section of a tooth and its root canal.
- Cyanotic heart disease (e.g., tetralogy of Fallot) - points to the heart.

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This patient's head imaging reveals a ring-enhancing lesion with surrounding edema, findings concerning for a

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This patient's head imaging reveals a ring-enhancing lesion with surrounding edema, findings concerning for a

brain abscess

fever or focal neurologic findings in a young girl.

A brain abscess is a collection of pus within the brain parenchyma. It usually occurs as a complication of a primary infection within the head and neck, such as sinusitis, otitis media, or mastoiditis.

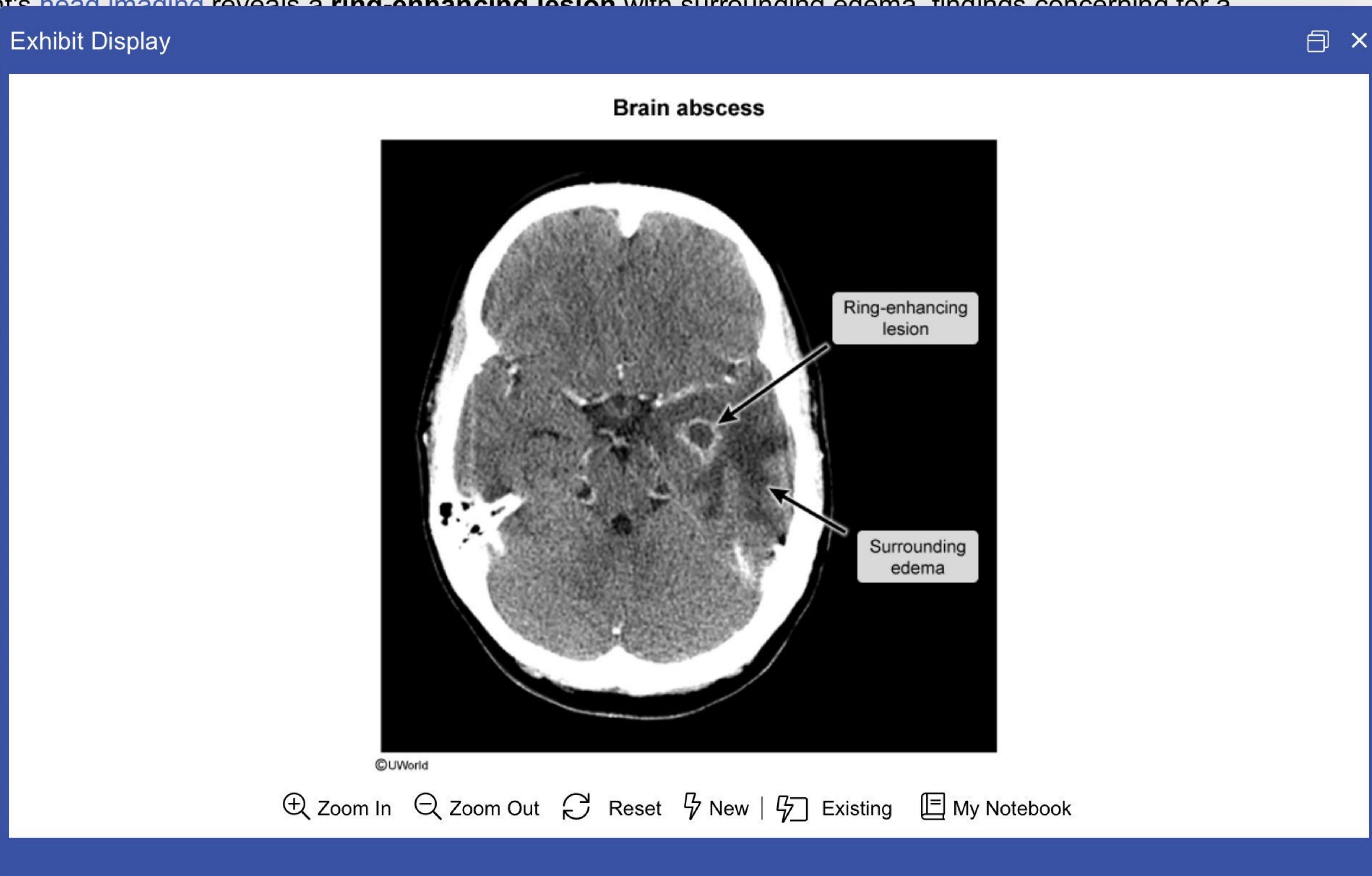
Because of the lack of a normal blood-brain barrier, brain abscesses develop as a result of a breach in the meningeal or pial membranes. The thickened meningeal membrane reflects the presence of the abscess.

(Choice A) A brain abscess is associated with increased intracranial pressure, which is indicated by headache.

(Choice B) A brain abscess is associated with meningitis and encephalitis.

(Choice C) A brain abscess is a ring-enhancing lesion on head imaging typically located in the cerebral cortex. It is often present in the posterior fossa.

(Choice D) Immune thrombocytopenia can cause petechiae/bruising, recurrent minor bleeding (eg, gingival



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This patient's [head imaging](#) reveals a **ring-enhancing lesion** with surrounding edema, findings concerning for a **brain abscess**. Presentation of a brain abscess is often nonspecific and can include **headache** with or without fever or focal neurologic deficits. **Seizure** may also be the initial manifestation in some patients, as seen in this girl.

A brain abscess can be due to the **hematogenous spread** of bacteria from a distant location (eg, pulmonary infection with bacteremia) or the **direct extension** of a head and neck space infection, such as [otitis media](#), sinusitis, or mastoiditis.

Because of its anatomic proximity to the middle ear, a temporal lobe abscess, as seen in this patient, can develop as a rare [complication](#) of **acute otitis media**; a recent history of fever, ear pain, and bulging tympanic membrane in this patient would support this diagnosis. Microbiologic examination of the abscess generally reflects the primary site of infection, such as *Streptococcus pneumoniae* from middle ear infections.

(Choice A) The risk of certain epilepsy syndromes (eg, absence seizures, juvenile myoclonic epilepsy) is increased with a positive family history. This patient's seizure was provoked by a focal intraparenchymal lesion, which is inconsistent with epilepsy.

(Choice B) *Shigella* infection classically causes fever and bloody diarrhea and can be associated with seizure and encephalopathy, particularly in children. However, brain abscesses are not associated with this infection.

(Choice C) Congenital toxoplasmosis can cause long-term neurologic sequelae (eg, seizures, hearing loss), but imaging typically reveals intracranial calcifications, which are not seen here. In addition, although [multiple ring-enhancing lesions](#) are classic for CNS toxoplasmosis in immunocompromised adults, these are not typically present in patients with congenital infection. Moreover, this patient has a single lesion.

(Choice D) Immune thrombocytopenia can cause petechiae/bruising, recurrent minor bleeding (eg, gingival

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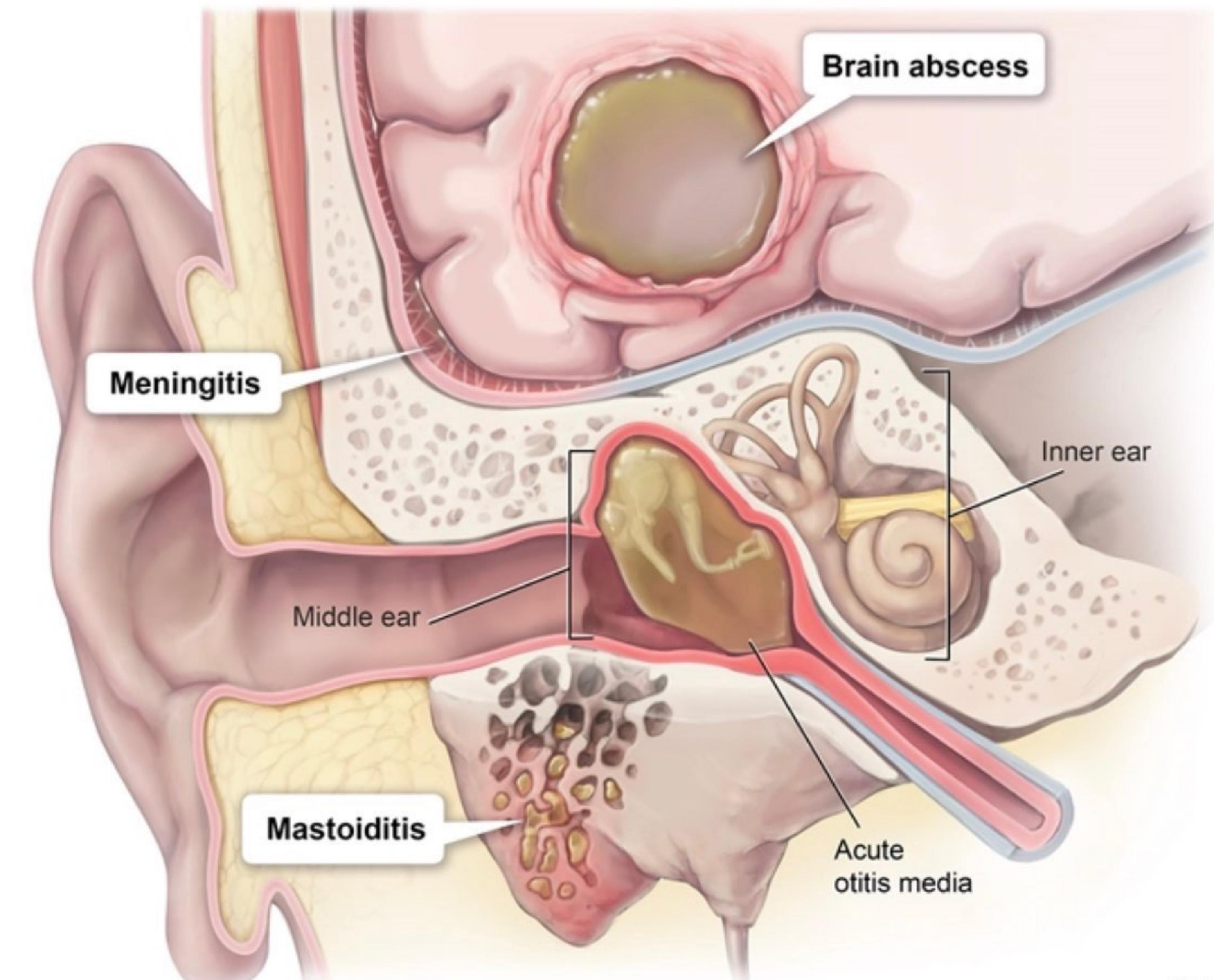
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This patient's head imaging reveals a ring-enhancing lesion with surrounding edema, findings concerning for a brain abscess.

Exhibit Display

Suppurative complications of acute otitis media



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(Choice D) Immune thrombocytopenia can cause petechiae/bruising, recurrent minor bleeding (eg, gingival bleeding), or severe hemorrhage (eg, gastrointestinal, intracranial). Seizure may be a presenting sign of an acute intracranial bleed, but CT scan typically reveals a [hyperdense fluid collection](#), not a ring-enhancing lesion.

Educational objective:

A brain abscess appears as a ring-enhancing lesion on imaging and typically causes headache with or without fever and neurologic symptoms (eg, seizure). Pathogenesis often involves direct spread from head and neck space infections, such as acute otitis media.

References

- Brain abscess.
- Acute otitis media and associated complications in United States emergency departments.
- Otogenic brain abscesses: a systematic review.

Pathophysiology

Subject

Ear, Nose & Throat (ENT)

System

Otitis media

Topic

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A 4-hour-old girl is examined in the newborn nursery. The patient was born vaginally after an uncomplicated pregnancy and delivery. She began breastfeeding after delivery. Physical examination shows a unilateral cleft lip on the left side with an intact palate. The rest of the physical examination is unremarkable. This patient's abnormal findings most likely resulted from which of the following intrauterine processes?

- A. Failed fusion of the medial nasal prominences (36%)
- B. Failed fusion of the maxillary prominence and intermaxillary segment (55%)
- C. Failed fusion of the palatine shelves (6%)
- D. Hyperplasia of the frontonasal prominence (1%)
- E. Hypoplasia of the mandibular prominence (1%)

Omitted
Correct answer
B

55%
Answered correctly

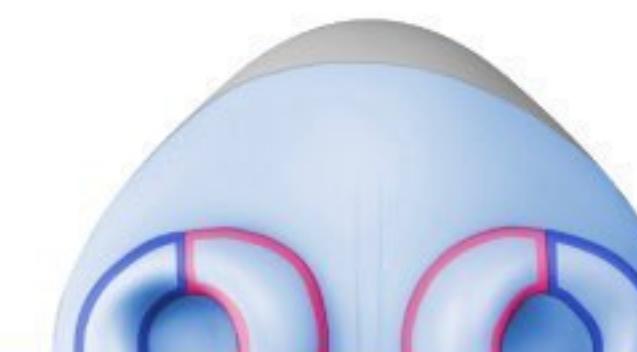
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Explanation

Development of the face

Week 3



Week 6



Week 8



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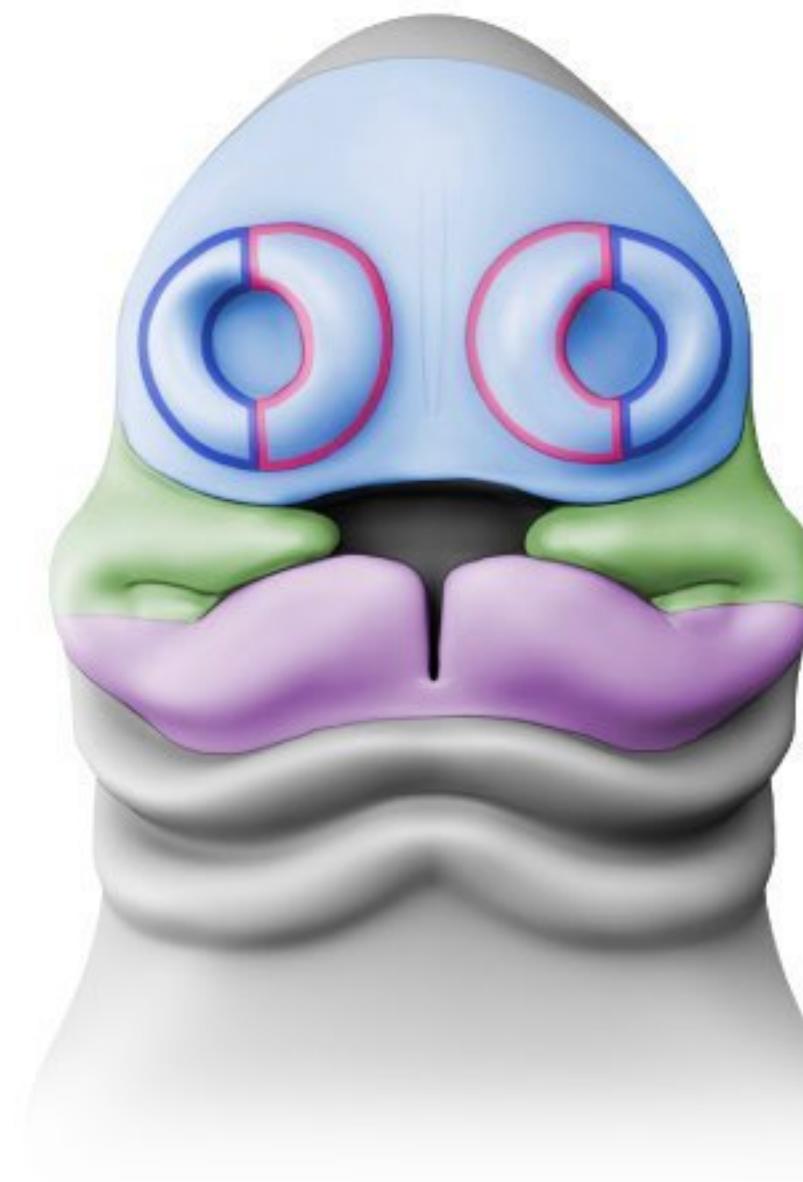
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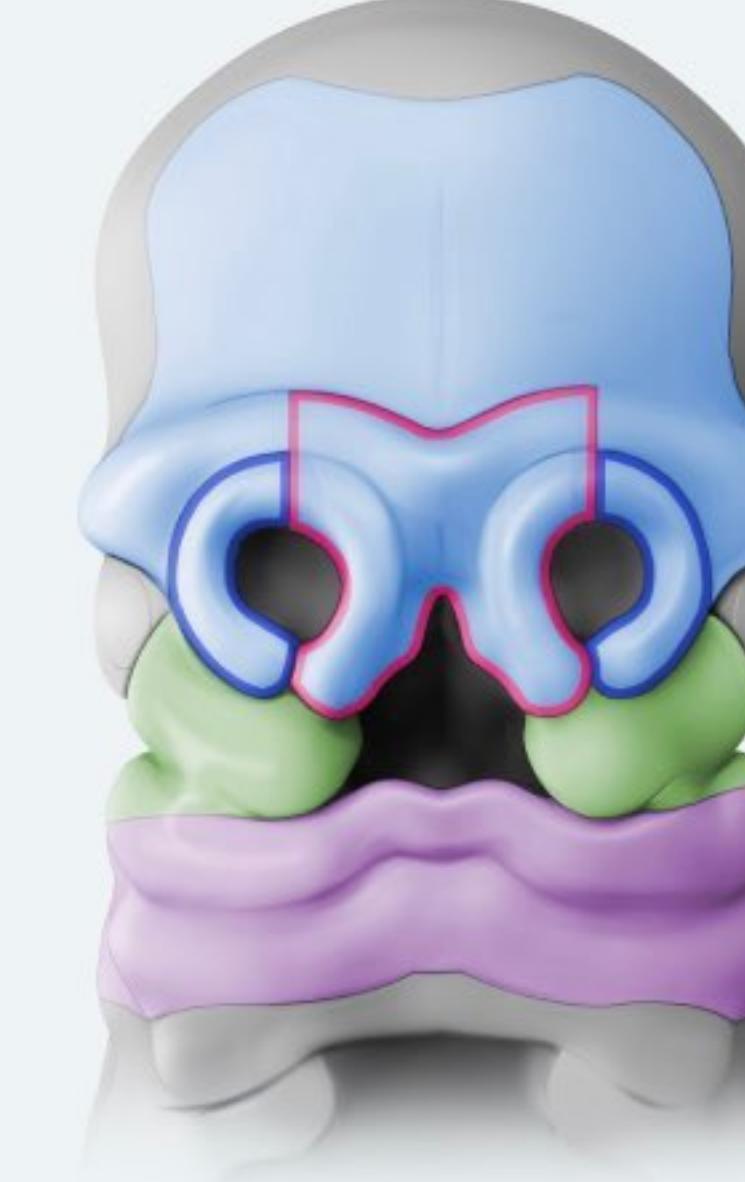
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Development of the face

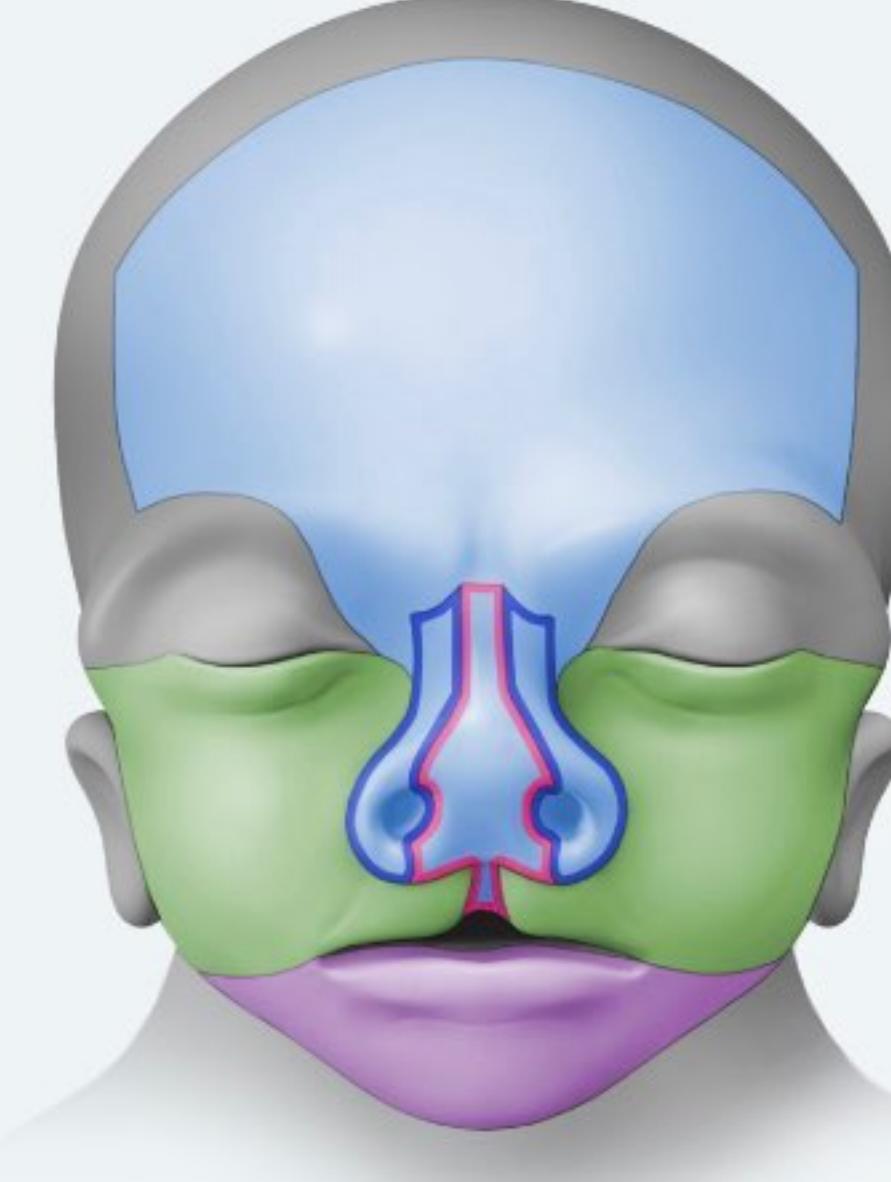
Week 3



Week 6



Week 8



Intermaxillary segment*

Nasal septum

Palatine shelf

Fused palatine shelf

Uvula

- Frontonasal prominence
- Lateral nasal prominence
- Medial nasal prominence
- Maxillary prominence
- Mandibular prominence

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The lip and palate form during early gestation through a series of structural changes and fusions involving 5 structures: frontonasal prominence, paired maxillary prominences, and paired mandibular prominences. **Upper lip** development involves the following steps:

- The frontonasal prominence (overlies the forebrain) gives rise to the lateral and medial nasal prominences. The medial nasal prominences fuse and give rise to a **midline** structure, the **intermaxillary segment**.
- The intermaxillary segment **fuses** with the left and right **maxillary prominences** beneath the nose to form the upper lip. Failed fusion on either side leads to a **unilateral cleft lip**, as seen in this patient; failed fusion of both sides creates a **bilateral cleft lip**.

Although cleft lip can occur in isolation, as in this child, the presence of a cleft lip increases the risk for cleft palate. For example, fusion of the intermaxillary segment and maxillary prominences also contributes to the development of the anterior portion of the hard palate (**primary palate**), and an anterior cleft palate may be an associated finding in some patients. A cleft palate can also develop from failed fusion of the palatine shelves, which are thin sheets of tissue derived from the maxillary prominences that grow medially, fuse, and form the posterior (secondary) palate (**Choice C**).

(Choice A) Failed fusion of the medial nasal prominences to form the intermaxillary segment is associated with severe midline defects, such as holoprosencephaly.

(Choice D) The orbits normally arise from the sides of the face and rotate medially. Hyperplasia of the frontonasal prominence can result in hypertelorism (wide-set eyes), in addition to a broad forehead and wide nasal bridge.

(Choice E) Hypoplasia of the mandibular prominence causes micrognathia. In **Pierre Robin sequence**, severe micrognathia results in posterior displacement of the tongue, which can prevent fusion of the palatine shelves

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(Choice E) Hypoplasia of the mandibular prominence causes micrognathia. In [Pierre Robin sequence](#), severe micrognathia results in posterior displacement of the tongue, which can prevent fusion of the palatine shelves due to mechanical obstruction, causing cleft palate. Mandibular hypoplasia does not contribute to cleft lip development.

Educational objective:

Cleft lip occurs due to failed fusion of the left or right maxillary prominence with the intermaxillary segment in early gestation. Cleft palate occurs primarily when the palatine shelves fail to fuse. Cleft lip and palate can occur together or in isolation.

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A 6-year-old asthmatic has the finding shown in the image below on routine examination.



Which of the following is the most appropriate pharmacotherapy for the lesions on this patient's oral mucosa?



AA

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Which of the following is the most appropriate pharmacotherapy for the lesions on this patient's oral mucosa?

- A. Acyclovir (1%)
- B. Amphotericin-B (12%)
- C. Griseofulvin (4%)
- D. Nystatin (77%)
- E. Penicillin (0%)
- F. Terbinafine (2%)

Omitted

Correct answer

D



77%

Answered correctly



06 secs

Time Spent



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Explanation

The thick white patches seen on this patient's tongue are indicative of oral thrush (oropharyngeal candidiasis). Thrush is a common variant of localized infection with *Candida* fungi. Oral thrush is common in young infants due to immaturity of the newborn immune system. In older children and adults, it is associated with immunosuppression and frequently occurs in patients with HIV infection, diabetes mellitus, and cancer. Asthma patients who take oral or inhaled steroids are also at risk for candidiasis. Systemic antibiotic therapy and dentures are other predisposing factors.

In immunocompetent patients, localized candidiasis is treated with topical antifungal medications. Nystatin is a

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In immunocompetent patients, localized candidiasis is treated with topical antifungal medications. Nystatin is a polyene antifungal with a mechanism of action similar to amphotericin B. It binds to ergosterol molecules in the fungal cell membrane, causing pores and leakage of fungal cell contents. Nystatin is not absorbed from the gastrointestinal tract. It is administered as an oral agent ("swish and swallow") for oropharyngeal candidiasis.

(Choice A) Acyclovir is an antiviral drug effective against herpes simplex virus (1 and 2) and varicella zoster virus. It is a nucleoside analog that is converted into acyclo-GTP in infected cells, which inhibits viral DNA polymerase.

(Choice B) Amphotericin B is a polyene antifungal similar to nystatin used for systemic mycoses. It is administered intravenously and never used for simple mucocutaneous infections due to many toxic side effects.

(Choice C) Griseofulvin inhibits fungal cell mitosis at metaphase. It is indicated for the treatment of dermatophytoses, not candidiasis.

(Choice E) Penicillins are β -lactam antibiotics that inhibit the formation of peptidoglycan cross-links in bacterial cell walls.

(Choice F) Terbinafine is an allylamine antifungal that accumulates in the skin, nails, and adipose tissue. It is used to treat dermatophytosis (onychomycoses), not candidiasis.

Educational objective:

Nystatin is a polyene antifungal and the drug of choice for oropharyngeal candidiasis in patients without advanced immunodeficiency. It acts by binding to ergosterol in the fungal cell membrane, causing the formation of pores and leakage of fungal cell contents. Nystatin is not absorbed from the gastrointestinal tract and is administered as an oral "swish and swallow" agent.

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A 6-year-old boy is brought to the emergency department by his parents due to persistent nasal bleeding. The boy picks his nose frequently and has had several nosebleeds in the past, all of which stopped spontaneously after pinching the nose. The parents say that they have been pinching the nasal alae for over 30 minutes while the boy leans forward. Family history is negative for bleeding disorders. The patient takes no medications and has no allergies. Examination shows continuous blood trickle from his right nostril. Silver nitrate cautery is performed and the bleeding stops. Cautery was most likely applied to which of the following locations in this patient's nasal cavity?

- A. Inferior turbinate (12%)
- B. Middle meatus (10%)
- C. Nasal septum (45%)
- D. Posterior choanae (10%)
- E. Posterolateral wall (21%)

Omitted
Correct answer
C

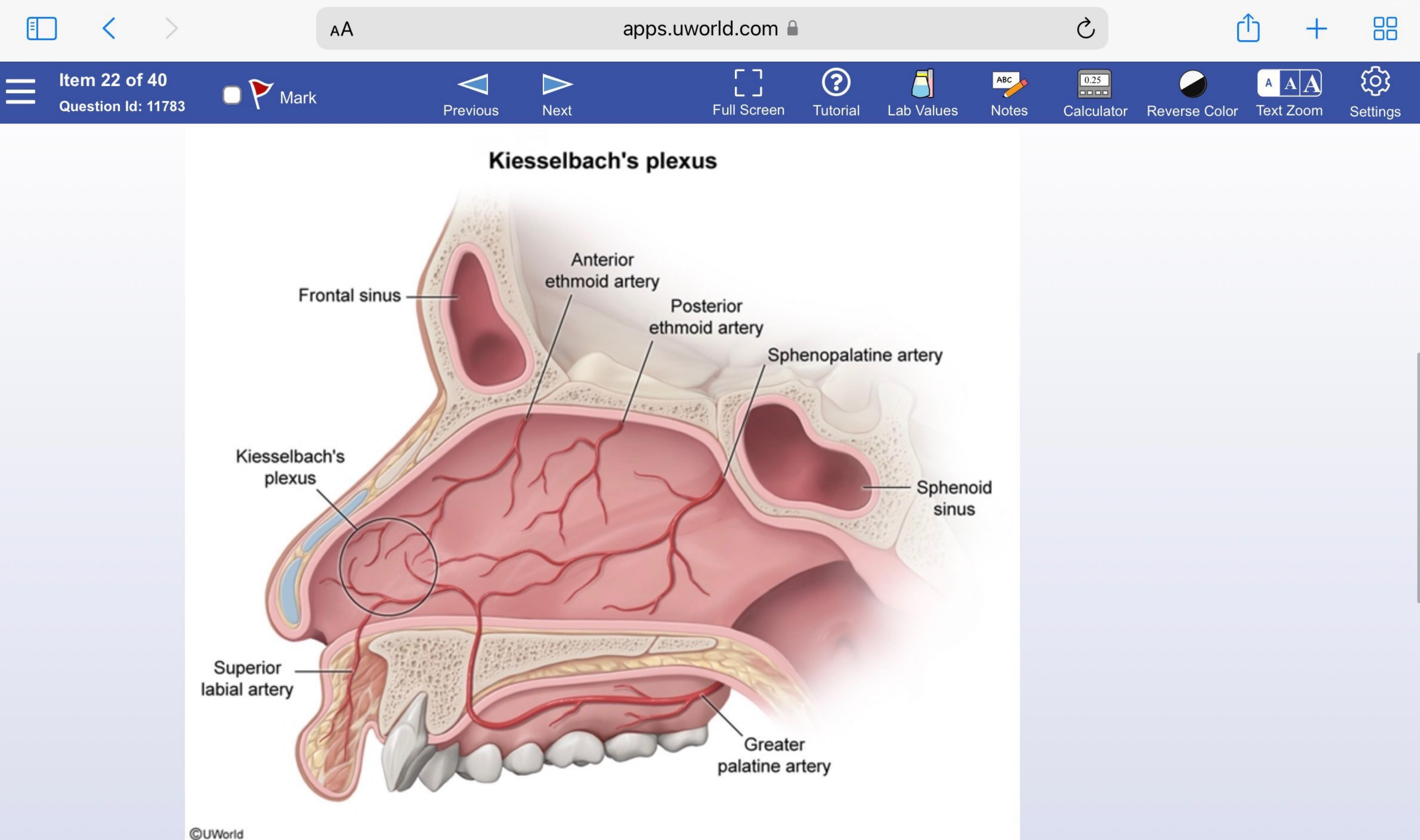
45%
Answered correctly

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Explanation

Kiesselbach's plexus



The nasal mucosa is highly vascular and easily irritated by trauma (eg, nose-picking), mucosal dryness, foreign body insertion, and rhinitis (eg, allergy, infection). **Epistaxis** is very common in children and may be classified as anterior or posterior, depending on the bleeding source. Anterior nosebleeds are by far the most common, and

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The nasal mucosa is highly vascular and easily irritated by trauma (eg, nose-picking), mucosal dryness, foreign body insertion, and rhinitis (eg, allergy, infection). **Epistaxis** is very common in children and may be classified as anterior or posterior, depending on the bleeding source. Anterior nosebleeds are by far the most common, and the vast majority occur within the vascular watershed area of the **nasal septum** (anteroinferior part of the nasal septal mucosa) known as **Kiesselbach plexus**. Anastomosis of the following vessels occurs in this region:

- Septal branch of the **anterior ethmoidal artery**
- Lateral nasal branch of the **sphenopalatine artery**
- Septal branch of the **superior labial artery** (branch of the facial artery)

Management is directed at stopping the bleeding from Kiesselbach plexus, preferably by direct [compression of the nasal alae](#). Cautery (eg, silver nitrate) of the area surrounding the bleeding site may be necessary for persistent bleeding.

(Choices A and B) The [lateral nasal wall](#) contains the superior, middle, and inferior turbinates (also known as conchae). These 3 bony projections are covered with mucous membrane; they warm, humidify, and filter inspired air and expand and contract in response to environmental changes (eg, temperature, humidity, allergens). The turbinates form corresponding meatuses that serve as drainage pathways. The superior meatus provides drainage for the sphenoidal and posterior ethmoidal sinuses. The middle meatus drains the frontal, maxillary, and anterior ethmoidal sinuses and is the most common site of nasal polyps. The inferior meatus drains the nasolacrimal duct.

(Choices D and E) Branches of the sphenopalatine artery supply the posterolateral wall and posterior choanae. These posterolateral branches are the most likely source of posterior nosebleeds. Posterior epistaxis is usually severe and cannot be treated with cautery.

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persistent bleeding.

(Choices A and B) The lateral nasal wall contains the superior, middle, and inferior turbinates (also known as conchae). These 3 bony projections are covered with mucous membrane; they warm, humidify, and filter inspired air and expand and contract in response to environmental changes (eg, temperature, humidity, allergens). The turbinates form corresponding meatuses that serve as drainage pathways. The superior meatus provides drainage for the sphenoidal and posterior ethmoidal sinuses. The middle meatus drains the frontal, maxillary, and anterior ethmoidal sinuses and is the most common site of nasal polyps. The inferior meatus drains the nasolacrimal duct.

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Educational objective:

Epistaxis is commonly caused by irritation of the highly vascular mucosa at the anterior nasal septum. The anterior nasal septum contains the Kiesselbach plexus. The anterior ethmoidal, sphenopalatine, and superior labial arteries anastomose in this region.

References

- Fifteen-minute consultation: investigation and management of childhood epistaxis.
- Interventions for recurrent idiopathic epistaxis (nosebleeds) in children.

Anatomy

Ear, Nose & Throat (ENT)

Subject

System

Epistaxis

Topic

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A 15-year-old boy comes to the office due to right ear itching and discomfort for the past several days. He has no fever or hearing loss but has noted scant drainage of thin, whitish fluid. The patient has been taking swimming lessons at a local gym. On examination, there is no redness around the ear, but gentle traction of the pinna elicits pain. During inspection of the external auditory canal, a speculum is inserted into the meatus in close contact with its posterior wall, causing the patient to suddenly become lightheaded and faint. He recovers spontaneously within a few minutes with no residual confusion. Which of the following nerves was most likely irritated during the procedure?

- A. Accessory (0%)
- B. Facial (10%)
- C. Trigeminal (6%)
- D. Vagus (50%)
- E. Vestibulocochlear (32%)

Omitted
Correct answer
D

 50%
Answered correctly

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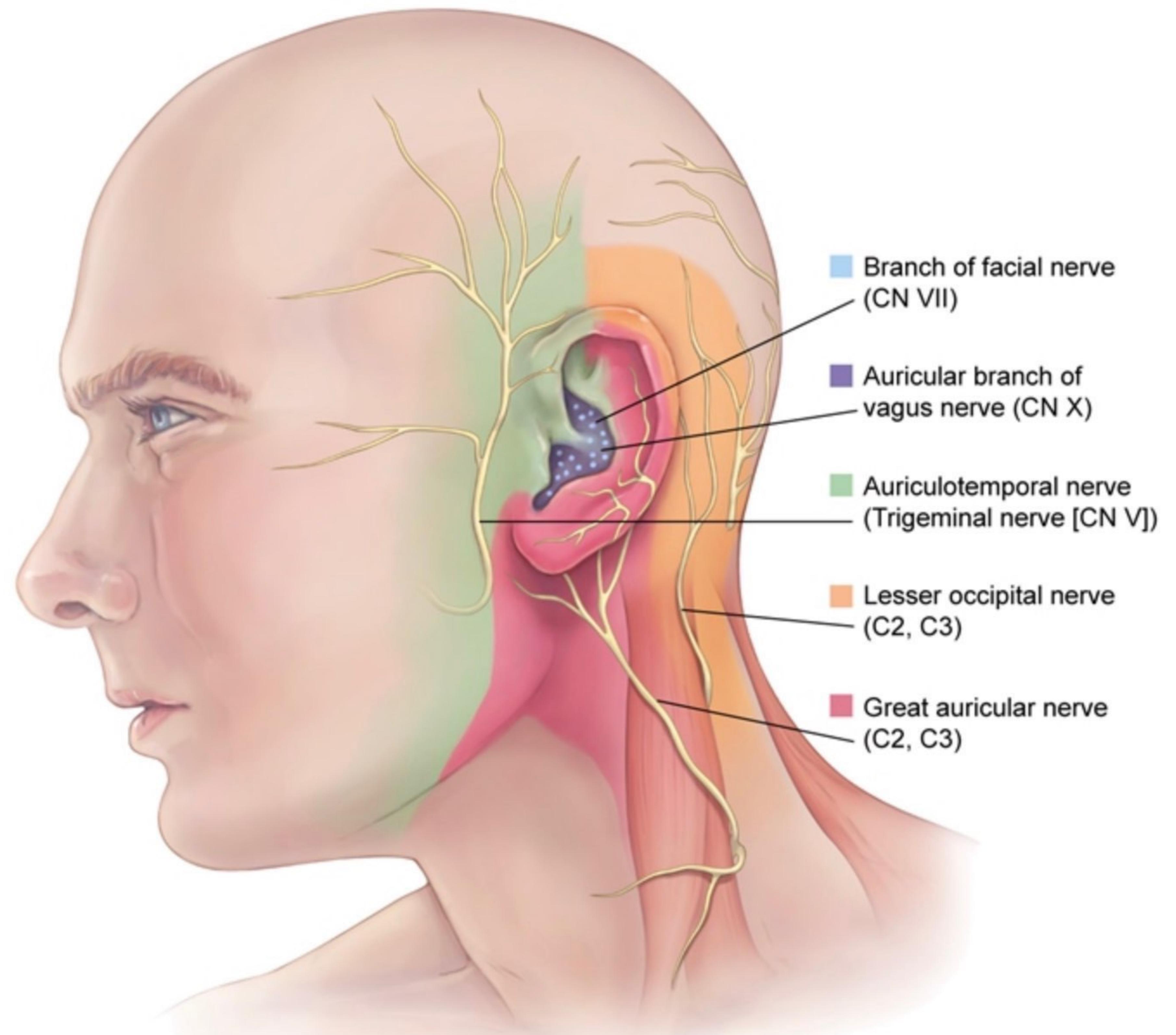
Explanation

Cutaneous innervation of the ear

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Cutaneous innervation of the ear



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The majority of the external ear receives cutaneous innervation from the great auricular nerve, lesser occipital nerve, and auriculotemporal nerve. Most of the external auditory canal, including the external portion of the tympanic membrane, is innervated by the mandibular division of the trigeminal nerve (cranial nerve [CN] V3) via its auriculotemporal branch.

However, the **posterior** part of the **external auditory canal**, as well as the concavity and posterior eminentia of the concha, is innervated by the small auricular branch of the **vagus nerve** (CN X). This patient has experienced **vasovagal syncope** after stimulation of his posterior external auditory canal by an otoscope speculum. In this form of syncope, parasympathetic outflow via the vagus nerve leads to decreased heart rate and blood pressure.

(Choice A) The accessory nerve (CN XI) provides voluntary motor innervation to the trapezius and the sternocleidomastoid.

(Choice B) The facial nerve (CN VII) has a small motor component to the stapedius and muscles behind the ear. It supplies cutaneous sensation to a small area of the auricle, but stimulation here would be unlikely to trigger a vasovagal response.

(Choice C) The mandibular branch of the trigeminal nerve carries sensation from the majority of the external auditory meatus, except for the posterior wall.

(Choice E) The vestibulocochlear nerve (CN VIII) mediates hearing and vestibular proprioception. It does not mediate any cutaneous sensation.

Educational objective:

The vagus nerve provides cutaneous sensation to the posterior external auditory canal via its small auricular

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nerve, and auriculotemporal nerve. Most of the external auditory canal, including the external portion of the tympanic membrane, is innervated by the mandibular division of the trigeminal nerve (cranial nerve [CN] V3) via its auriculotemporal branch.

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Educational objective:

The vagus nerve provides cutaneous sensation to the posterior external auditory canal via its small auricular branch. Sensation to the rest of the canal is from the mandibular division of the trigeminal nerve.

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A 23-year-old man comes to the emergency department due to a sensation of food being stuck in his throat. His symptoms started 2 hours ago after eating fish at a local seafood restaurant. He has tried swallowing many times in an attempt to clear the food but has had no relief. The patient has no difficulty with breathing. He does not appear to be in significant distress on physical examination. Laryngoscopy reveals a fish bone lodged in the left piriform recess. During retrieval of the fish bone, a nerve deep to the mucosa overlying the recess is damaged. Which of the following is most likely to be impaired in this patient as a result of his iatrogenic injury?

- A. Cough reflex (32%)
- B. Gag reflex (57%)
- C. Mastication (1%)
- D. Salivation (3%)
- E. Taste sensation (4%)

Omitted
Correct answer
A

32%
Answered correctly

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Time Spent

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Explanation

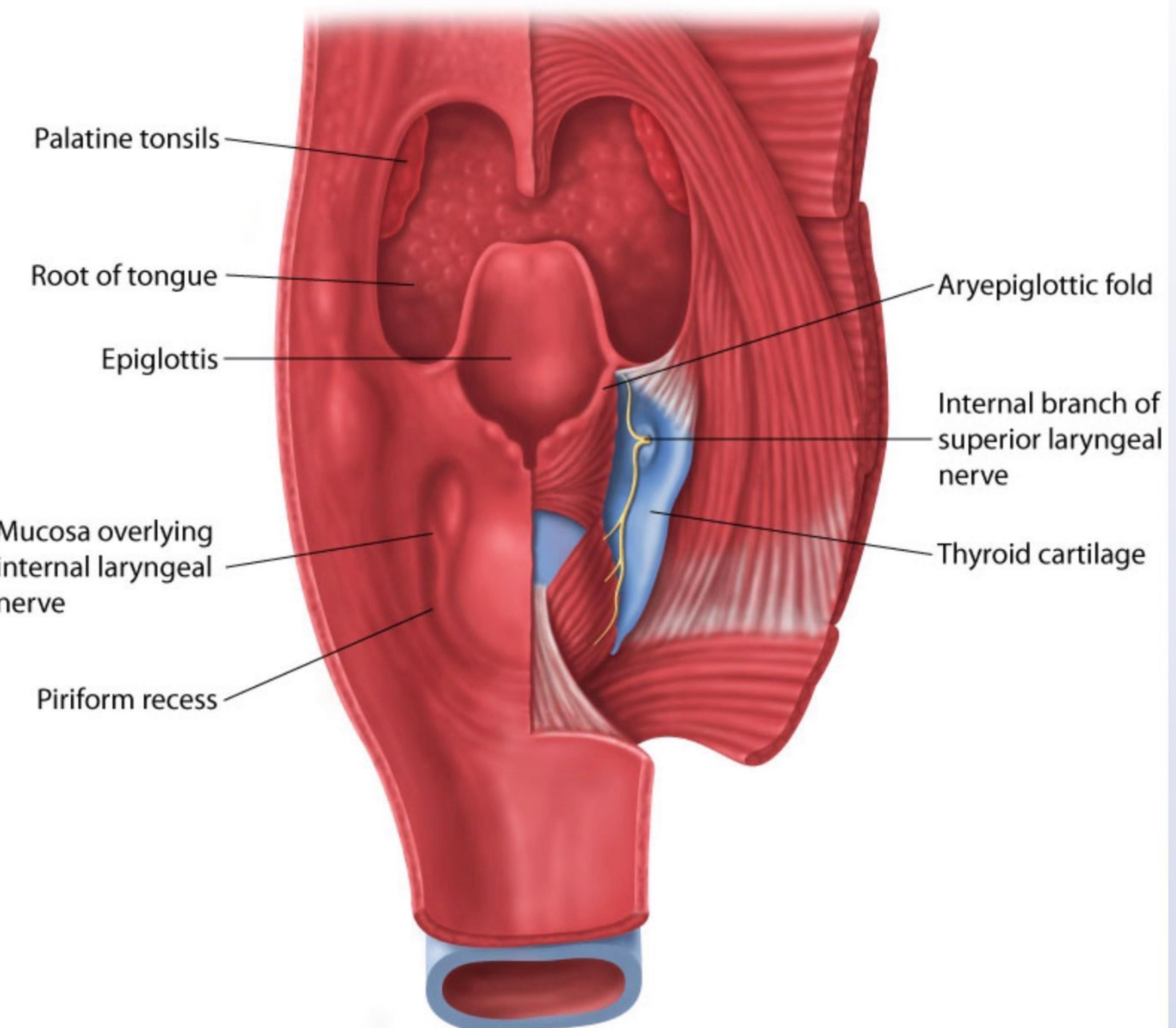
Posterior view of pharynx

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Posterior view of pharynx



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The **piriform recesses** are small cavities that lie on either side of the laryngeal orifice. They are bounded medially by the aryepiglottic folds and laterally by the thyroid cartilage and thyrohyoid membrane. During normal swallowing, food is diverted by the epiglottis laterally through the piriform recesses into the esophagus without endangering the airway.

A thin layer of mucosa overlying the piriform recess is all that protects the superficially coursing **internal laryngeal nerve**, a branch of the [superior laryngeal nerve](#) (part of the vagus nerve [CN X]). Unlike the recurrent and external laryngeal nerves that carry motor fibers to the muscles involved in vocal cord function, the internal laryngeal nerve contains only **sensory** and autonomic fibers. It mediates the afferent limb of the cough reflex by carrying sensation from the mucosa **superior to the vocal cords**.

Damage to the internal laryngeal nerve can occur when foreign bodies (eg, chicken or fish bones) become lodged in the piriform recess or during attempts to retrieve them. The resulting reduction in laryngeal sensation can **impair the cough reflex**.

(Choice B) The afferent limb of the [gag reflex](#) is mediated predominantly by the glossopharyngeal nerve (CN IX), whereas the efferent limb is carried by the vagus nerve (CN X). Although the internal laryngeal nerve is a branch of CN X, it does not carry motor fibers and is not involved in the gag reflex.

(Choice C) The muscles of mastication are innervated by the mandibular branch of the [trigeminal nerve](#) (CN V₃). This nerve is involved in the [jaw jerk reflex](#), which is typically prominent only in patients with upper motor neuron lesions.

(Choice D) Salivation is mediated by the glossopharyngeal nerve (which innervates the parotid gland via the [otic ganglion](#)) and the facial nerve (which innervates submandibular and sublingual glands via the submandibular ganglion). These nerves do not lie in close proximity to the piriform recess.

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(Choice E) Although the internal laryngeal nerve carries taste sensation from the root of the tongue and epiglottis, its role in the perception of taste is extremely minor. [Taste sensation](#) is primarily mediated by glossopharyngeal nerve (posterior one-third of the tongue and oropharynx) and facial nerve (anterior two-thirds of the tongue).

Educational objective:

The internal laryngeal nerve mediates the afferent limb of the cough reflex above the vocal cords. Foreign bodies (eg, fish bones) can become lodged in the piriform recess and may cause damage to the nerve, impairing the cough reflex.

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Item 25 of 40 Question Id: 1698

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A 30-year-old man comes to the emergency department due to left eye pain after being involved in a street fight. He received a fist blow to the left eye and has since had pain and diplopia. Past medical history is notable for 2 previous gunshot wounds. The patient does not smoke cigarettes but has a history of heavy alcohol intake and frequent marijuana use. On examination, there is significant soft tissue swelling around the left eye. Visual acuity is normal, but extraocular motility of the left eye is limited. Pupillary reflexes are normal. Coronal CT scan of the orbits is shown in the image below.



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The orbital contents of this patient are most likely to herniate into which of the following sites?

- A. Ethmoid cells (4%)
- B. Frontal sinus (2%)
- C. Inferior conchae (0%)
- D. Maxillary sinus (85%)
- E. Sphenoid sinus (6%)

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The orbit is bound superiorly by the thick orbital plate of the frontal bone and laterally by the thick bone of the zygoma and greater and lesser sphenoid wings. In contrast, the **orbital floor** is composed of a very thin layer of bone that separates the orbit from the air-filled **maxillary sinus**. Similarly, the orbit's medial wall is composed of the thin ethmoid and lacrimal bones, which separate it from the ethmoid air cells.

Blunt trauma to the eye causes a rapid increase in pressure that typically does not rupture the globe but is transmitted posteriorly into the orbit. The weakest plates of bone in the orbit, the medial and inferior walls, are common sites of fracture. Fracture is typically evident on radiographic imaging, and **fluid (eg, blood)** or herniation of the orbital contents can often be visualized in the adjacent normally air-filled sinuses.

(Choice A) The ethmoid air cells are medial to the orbit. They are unaffected in this patient, but they can be affected in blowout fractures of the orbit's medial wall.

(Choice B) The frontal sinus is not pictured above. It lies in the medial part of the supraorbital frontal bone.

(Choice C) The inferior nasal conchae form part of the nasal turbinate system. They are not air-filled sinuses.

(Choice E) The sphenoid sinuses (not pictured above) lie anterior to the optic chiasm and are not in close relation to the orbit.

Educational objective:

Blunt trauma to the globe can cause orbital blowout fractures. These fractures most commonly involve the medial or inferior orbital walls due to the thin bone bordering the ethmoid and maxillary sinuses.

Anatomy

Ear, Nose & Throat (ENT)

Subject

System

Orbital fracture

Topic

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Item 26 of 40 Question Id: 1345

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A 35-year-old man comes to the physician because of a 2-week history of nasal congestion. He has used a topical decongestant every few hours since his symptoms began. He experienced relief for almost 1 week, but then his nasal congestion returned. The patient has a history of allergic rhinitis and has had episodes of rhinorrhea in the past, but none of them lasted longer than a few days. He denies fever, throat pain, headaches, cough, and lymph node enlargement. Aside from his allergic rhinitis, the patient has no other medical problems. Physical examination shows nasal mucosa that appears edematous and red with a few areas of punctate bleeding. The remainder of the examination reveals no abnormalities. Which of the following is the most appropriate next step in the management of this patient?

- A. Stop the decongestant (67%)
- B. Switch to ephedrine (8%)
- C. Add oral corticosteroids (5%)
- D. Add antihistamines (15%)
- E. Start antibiotics (2%)

Omitted

Correct answer
A



67%

Answered correctly



32 secs
Time Spent



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Version

Explanation

Vasoconstriction by α -adrenergic agonists is prominent in the vessels of the nasal mucosa, making these

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Question Id: 1345

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Vasoconstriction by α -adrenergic agonists is prominent in the vessels of the nasal mucosa, making these medications effective decongestants. Phenylephrine, xylometazoline, and oxymetazoline are used as topical preparations for the treatment of allergic rhinitis and common cold associated congestion and rhinitis.

These medications, however, are characterized by rapidly declining effect after a few days of use. This phenomenon is called tachyphylaxis. It occurs because of decreased production of endogenous norepinephrine from the nerve terminals due to a negative feedback mechanism, resulting in relative vasodilation (ie, removal of normal vasoconstrictive tone) and subsequent edema and congestion. This leads to exacerbation of the nasal congestion symptoms. Rebound rhinorrhea (ie, rhinitis medicamentosa) is described as nasal congestion without cough, sneezing, or postnasal drip. Rhinorrhea may or may not be present (note the paradox in naming). Rebound rhinorrhea is associated with the use of topical decongestants for ≥ 3 days. The use of adrenergic agonists should be stopped to allow the restoration of normal norepinephrine feedback pathways.

Another medication associated with the phenomenon of tachyphylaxis is nitroglycerine. The decrease in its effect is explained by the diminished release of NO from the target cells. Drug-free intervals of 8–10 hours should be maintained during the use of nitroglycerine to prevent tachyphylaxis.

(Choice B) Ephedrine is an indirect-acting adrenergic agonist used as a decongestant. Like the other adrenergic medications, it causes tachyphylaxis after a few days of treatment. A switch to ephedrine would not improve this patient's rebound rhinorrhea.

(Choice C) This patient has been excessively using a decongestant; if he discontinues it and experiences excessive withdrawal symptoms, a short-term course of topical corticosteroids can be considered for symptom control. However, oral corticosteroids would not be indicated.

(Choice D) Antihistamines are used for the treatment of allergic rhinitis, but they are not effective in treating

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Question Id: 1345

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congestion symptoms. Rebound rhinorrhea (ie, rhinitis medicamentosa) is described as nasal congestion without cough, sneezing, or postnasal drip. Rhinorrhea may or may not be present (note the paradox in naming). Rebound rhinorrhea is associated with the use of topical decongestants for \geq 3 days. The use of adrenergic agonists should be stopped to allow the restoration of normal norepinephrine feedback pathways.

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(Choice C) This patient has been excessively using a decongestant; if he discontinues it and experiences excessive withdrawal symptoms, a short-term course of topical corticosteroids can be considered for symptom control. However, oral corticosteroids would not be indicated.

(Choice D) Antihistamines are used for the treatment of allergic rhinitis, but they are not effective in treating rebound rhinorrhea.

(Choice E) Antibiotics are effective in the treatment of certain bacterial infections. They are not used in the treatment of rebound rhinorrhea.

Educational objective:

Topical preparations of α -adrenergic agonists cause vasoconstriction of the nasal mucosa vessels and are used as decongestants. Overuse of these drugs causes negative feedback, resulting in decreased norepinephrine synthesis and release from nerve endings, which diminishes their effect (ie, tachyphylaxis).

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Item 27 of 40 Question Id: 20119

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A 7-year-old boy is brought to the clinic due to 4 days of worsening left ear pain. The patient was healthy until last week, when he developed a low-grade fever and congestion, which resolved prior to the sudden development of left ear pain. Vital signs are normal. On examination, the patient appears uncomfortable but nontoxic. The left external ear is nontender with manipulation and has no visible deformities. Several mobile, 1-cm, anterior cervical lymph nodes are palpated on the left side of the neck. The left tympanic membrane is erythematous and bulging; there are no visible perforations. Right ear examination is unremarkable. Which of the following structures is most likely to become involved with progression of this patient's infection?

- A. Ethmoid sinus (14%)
- B. External jugular vein (4%)
- C. Facial artery (1%)
- D. Facial nerve (56%)
- E. Glossopharyngeal nerve (7%)
- F. Sphenoid sinus (15%)

Omitted
Correct answer
D

56%
Answered correctly

02 secs
Time Spent

2023
Version

Explanation

Acute otitis media complicated by facial neuritis

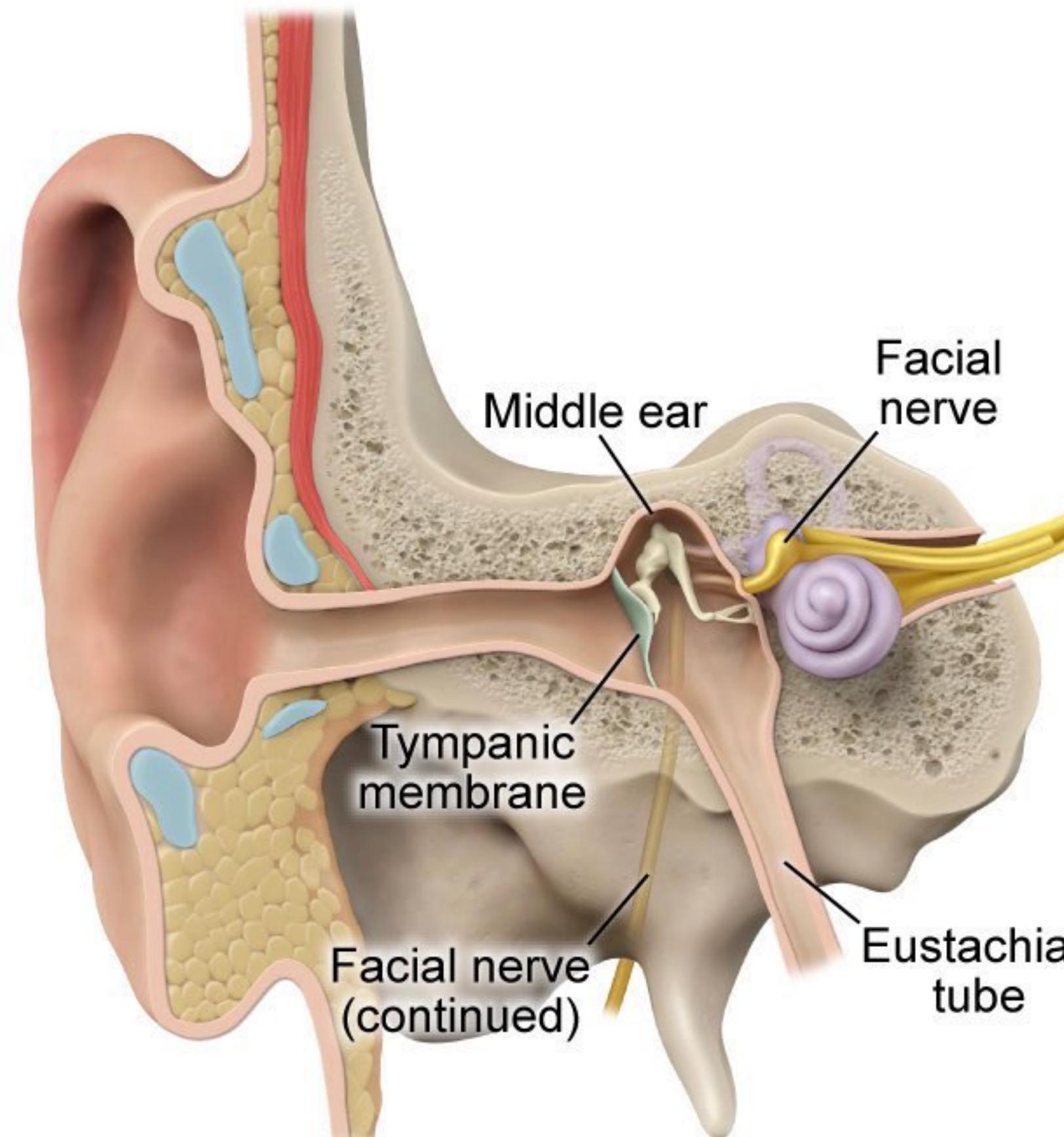
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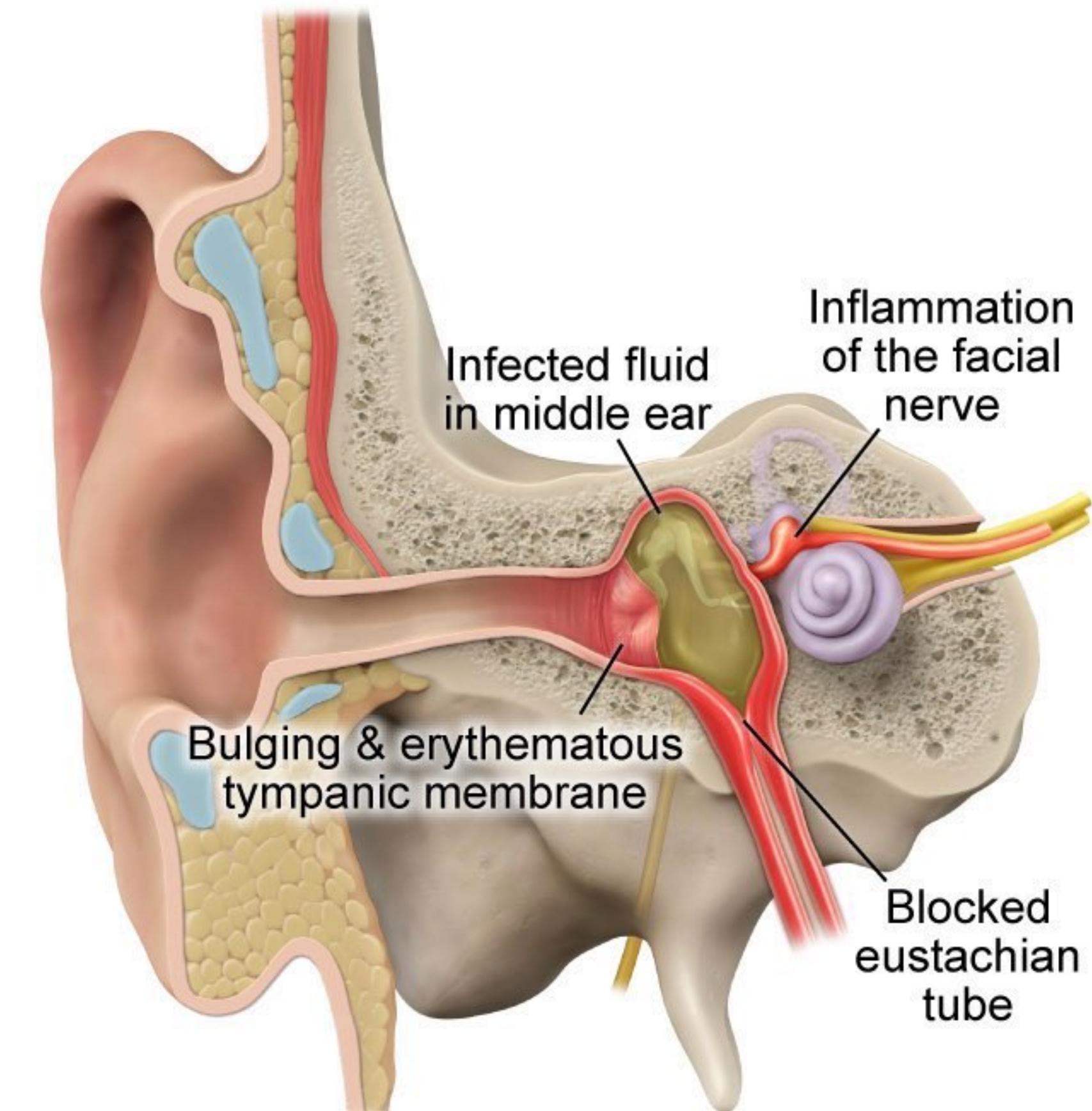
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Acute otitis media complicated by facial neuritis

Normal ear



Otitis media



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This patient with ear pain and an erythematous, bulging tympanic membrane has [acute otitis media \(AOM\)](#), an infection of the middle ear space. AOM is common in children due to poor drainage through narrow, horizontally positioned [eustachian tubes](#). Most cases are uncomplicated; however, patients are at risk for spread of infection to nearby structures.

One such structure is the **facial nerve (CN VII)**, which emerges from the internal auditory meatus and travels through the middle ear into the mastoid air cells. Inflammation of the nerve in the middle ear space during an episode of AOM can result in **unilateral facial paralysis**. Common signs include inability to raise the eyebrow or close the eye, drooping of the corner of the mouth, and disappearance of the nasolabial fold.

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through the middle ear into the mastoid air cells. Inflammation of the nerve in the middle ear space during an episode of AOM can result in **unilateral facial paralysis**. Common signs include inability to raise the eyebrow or close the eye, drooping of the corner of the mouth, and disappearance of the nasolabial fold.

Other structures in close proximity to the middle ear space include **mastoid air cells**; direct extension of infection can cause purulent fluid to fill the air cells, leading to **mastoiditis**. CNS complications (eg, **meningitis**, brain abscess) are rare sequelae of intracranial spread.

(Choices A and F) The ethmoid and sphenoid **sinuses** open into the superior nasal cavity and can become inflamed and filled with purulent material due to nasal congestion (eg, upper respiratory infection). However, these sinuses are not in direct contact with the middle ear space and are unlikely to be affected by AOM.

(Choice B) The external jugular vein drains blood from the scalp and face. Complications (eg, thrombophlebitis) are rare; jugular thrombosis most often affects the internal jugular vein (Lemierre syndrome).

(Choice C) The facial artery originates from the external carotid artery at the angle of the mandible and passes upward across the cheek, mouth, and side of the nose. In contrast, the blood supply to the ear is derived primarily from the posterior auricular artery.

(Choice E) The glossopharyngeal nerve (CN IX) travels down the neck with the internal carotid artery before entering the pharynx. The nerve provides innervation to the stylopharyngeus muscle and sensation to the posterior third of the tongue. Pathology of the middle ear is unlikely to affect this deep structure.

Educational objective:

Acute otitis media presents with an erythematous, bulging tympanic membrane and can be complicated by inflammation or infection of nearby structures. Spread of infection to the facial nerve (CN VII), which travels through the middle ear, can result in facial neuritis with unilateral facial paralysis.

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Item 28 of 40 Question Id: 19035

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A 4-year-old boy is brought to the office due to hoarseness. The parents report that he has had worsening hoarseness for the past year, and his voice now sounds very raspy and rough. Flexible laryngoscopy is performed and shows bilateral lesions on the true vocal cords. Removal of these lesions is performed via direct laryngoscopy. Histopathologic analysis shows a fibrovascular core with benign squamous cells. The physician explains to the parents that this is likely due to a viral infection acquired through which of the following routes of transmission?

- A. Arthropod vector (1%)
- B. Direct droplet (32%)
- C. Indirect contact (12%)
- D. Vertical direct contact (53%)
- E. Waterborne (1%)

Omitted
Correct answer
D

53%
Answered correctly

01 sec
Time Spent

2023
Version

Explanation

Recurrent respiratory papillomatosis

- HPV serotypes 6 & 11

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Recurrent respiratory papillomatosis	
Etiology	<ul style="list-style-type: none">• HPV serotypes 6 &11• Vertical direct spread (in infants/children)• Sexual contact or reactivation of vertically spread virus (in adults)
Histopathology	<ul style="list-style-type: none">• Infection of squamous mucosa• Fibrovascular core with benign squamous cells
Clinical manifestations	<ul style="list-style-type: none">• Hoarseness• Respiratory distress• Verrucous, polypoid growths in clusters most commonly on TVCs
HPV = human papillomavirus; TVCs = true vocal cords.	

This child has vocal fold lesions that histologically demonstrate a fibrovascular core with benign squamous cells, which is consistent with laryngeal papillomas due to **recurrent respiratory papillomatosis (RRP)**. These lesions are often [warty or grape-like](#) and, as with skin papillomas, have dark-red punctate areas corresponding to blood vessels.

Laryngeal papillomas are caused by **human papillomavirus (HPV) subtypes 6 and 11**, which are also the subtypes most likely to cause genital warts (ie, condyloma acuminatum). A mother with genital warts is the most important risk factor for developing RRP. An infection acquired from a patient's mother during pregnancy, delivery, or the first 4 weeks postpartum is called **vertical transmission**. HPV infection is often acquired via **direct contact** during passage through the birth canal. The incidence of RRP is decreasing significantly, which is likely due to increasing HPV vaccination (which typically includes serotypes 6, 11, 16, and 18) in future mothers.

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(Choice A) Arthropods can carry an infectious agent from one host and transmit it to another (eg, *Borrelia burgdorferi*, West Nile virus); some infectious agents require maturation in the arthropod vector prior to being infectious to humans (eg, plasmodium).

(Choice B) Respiratory droplets are created when an infected person coughs, sneezes, or talks. These large respiratory droplets can contain viruses or bacteria (eg, diphtheria, pertussis, influenza) that can infect others nearby (ie, <2 meters).

(Choices C and E) Indirect contact transmission includes diseases that are airborne (eg, measles), and that spread through contaminated objects (eg, viral conjunctivitis), food (eg, *Clostridium botulinum*), or contaminated drinking water (eg, cholera).

Educational objective:

Vertical direct transmission of human papillomavirus subtypes 6 and 11 can cause recurrent respiratory papillomatosis, which results in wart-like growths most commonly on the true vocal cords.

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Item 29 of 40 Question Id: 18141

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A 3-year-old boy is brought to the clinic due to left ear pain over the past 3 days. Last week, the patient developed a runny nose and cough, which resolved 2 days prior to the development of ear pain. He has no chronic medical conditions. Temperature is 38.4 C (101.1 F). There is purulent drainage from the left ear. Otoscopic examination of the left ear reveals a normal-appearing external canal and an erythematous tympanic membrane with purulent fluid pooling within the distal external canal. Which of the following organisms is the most likely cause of this patient's diagnosis?

- A. *Klebsiella pneumoniae* (0%)
- B. *Moraxella catarrhalis* (11%)
- C. *Proteus mirabilis* (0%)
- D. *Pseudomonas aeruginosa* (17%)
- E. *Staphylococcus aureus* (7%)
- F. *Streptococcus pneumoniae* (61%)

Omitted
Correct answer
F

61%
Answered correctly

10 secs
Time Spent

2023
Version

Explanation

Acute otitis media

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Item 29 of 40 Question Id: 18141

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Acute otitis media	
Pathophysiology	<ul style="list-style-type: none">• Viral URI → obstructs eustachian tube• Middle ear secretions → bacterial overgrowth of respiratory colonizers• Immune response with suppurative fluid accumulation
Microbiology	<ul style="list-style-type: none">• <i>Streptococcus pneumoniae</i>• <i>Haemophilus influenzae</i> (nontypeable)• <i>Moraxella catarrhalis</i>
Clinical features	<ul style="list-style-type: none">• Ear pain• Fever• Bulging or ruptured TM with purulence in middle ear
TM = tympanic membrane; URI = upper respiratory infection.	

This patient with an erythematous tympanic membrane and purulent otorrhea has **acute otitis media** (AOM) complicated by tympanic membrane perforation, which can be obscured due to drainage. Acute [middle ear infections](#) occur most commonly in young children (age 6 months to 2 years) and are often due to ***Streptococcus pneumoniae***.

A **viral upper respiratory infection** (URI) typically precedes the development of AOM because it causes inflammatory edema of the respiratory mucosa that can lead to **obstruction of the eustachian tube**. The eustachian tube normally opens to equalize middle ear pressure and drain secretions. Therefore, obstruction leads to the **accumulation of secretions**, providing a rich medium for bacterial growth. **Bacterial colonizers** of the upper respiratory tract (eg, *S pneumoniae*, *Haemophilus influenzae*, *Moraxella catarrhalis*) then proliferate in the middle ear secretions. This overgrowth of bacteria and consequent immune response result in AOM.