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Item 9 of 40 Question Id: 19972

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This patient with upper respiratory symptoms (eg, rhinorrhea, nasal congestion) now has a barking cough, retractions, and inspiratory stridor, symptoms suggestive of **croup**.

**Croup** is a viral infection caused by the **parainfluenza virus** most commonly seen in children age 6 months to 3 years. The virus spreads from the nasopharyngeal mucosa to the larynx and trachea, causing inflammation and **edema of the proximal trachea** (ie, **subglottis**). Narrowing at this area creates a partial airway obstruction, which results in **inspiratory stridor**, hoarseness, and a **barking cough**. X-ray may reveal subglottic narrowing (ie, **steeple sign**).

**(Choice A)** The nasal mucosa is likely inflamed and edematous in this patient, leading to nasal congestion and rhinorrhea. However, edema of the nasal mucosa does not lead to stridor or a barking cough.

**(Choice B)** The tonsils are located in the oropharynx and can become inflamed and edematous in conditions such as mononucleosis or a peritonsillar abscess. Although severe swelling in the oropharynx can lead to airway obstruction, it classically presents with voice changes (ie, hot potato voice) but not a barking cough.

**(Choice C)** Inflammation and edema of the submandibular and sublingual spaces is characteristic of Ludwig angina, a rapidly progressive cellulitis that can lead to airway obstruction due to displacement of the tongue posteriorly. However, this typically occurs in adults due to an infection in the mandibular molars and presents with a firm, elevated floor of mouth, "woody" induration of the neck, drooling, and tripod positioning.

**(Choice D)** Epiglottitis is a severe infection that can lead to stridor and respiratory distress. However, it does not cause a barking cough. In addition, it typically occurs in unimmunized children and patients typically appear very ill, anxious, and have high fever, difficulty swallowing, drooling, and tripod positioning. In contrast, children with croup are generally comfortable, even in the supine position; if visualized, they would have a normal-appearing epiglottis.

**(Choice E)** Esophagitis can cause dysphagia, odynophagia, and chest pain. It does not lead to airway

**(Choice A)** The nasal mucosa is likely inflamed and edematous in this patient, leading to nasal congestion and rhinorrhea. However, edema of the nasal mucosa does not lead to stridor or a barking cough.

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**(Choice E)** Esophagitis can cause dysphagia, odynophagia, and chest pain. It does not lead to airway obstruction.

## **Educational objective**

Croup is a viral infection in which edema and narrowing of the proximal trachea (ie, subglottis) result in a barking cough and inspiratory stridor.

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Item 10 of 40 Question Id: 19576

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A 7-year-old girl is brought to the clinic due to nasal congestion with facial pain. The patient first developed congestion over a year ago. Her parents have been treating it with over-the-counter allergy medications, but there has been no improvement. Over the past 4 months, the congestion has worsened, and now the patient has difficulty breathing through her nose. She also developed a dry cough and a constant, dull pain over her cheeks. The patient's stools have been loose. Temperature is 37.8 C (100 F). Weight is at <1st percentile at 18 kg (39.7 lb), decreased from 19 kg (41.9 lb) 3 months ago. Examination reveals copious yellow mucus within both nares. Translucent, gray, shiny masses obscure the middle turbinates bilaterally. Lymphadenopathy is not present. The lungs have coarse breath sounds bilaterally. The abdomen is soft with no organomegaly. Which of the following is the most likely diagnosis?

- A. Cystic fibrosis (70%)
- B. HIV infection (1%)
- C. Nasopharyngeal carcinoma (7%)
- D. Primary ciliary dyskinesia (17%)
- E. Seasonal allergic rhinitis (3%)

Omitted  
Correct answer  
A

70%  
Answered correctly

02 secs  
Time Spent

2023  
Version

### Explanation

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AA

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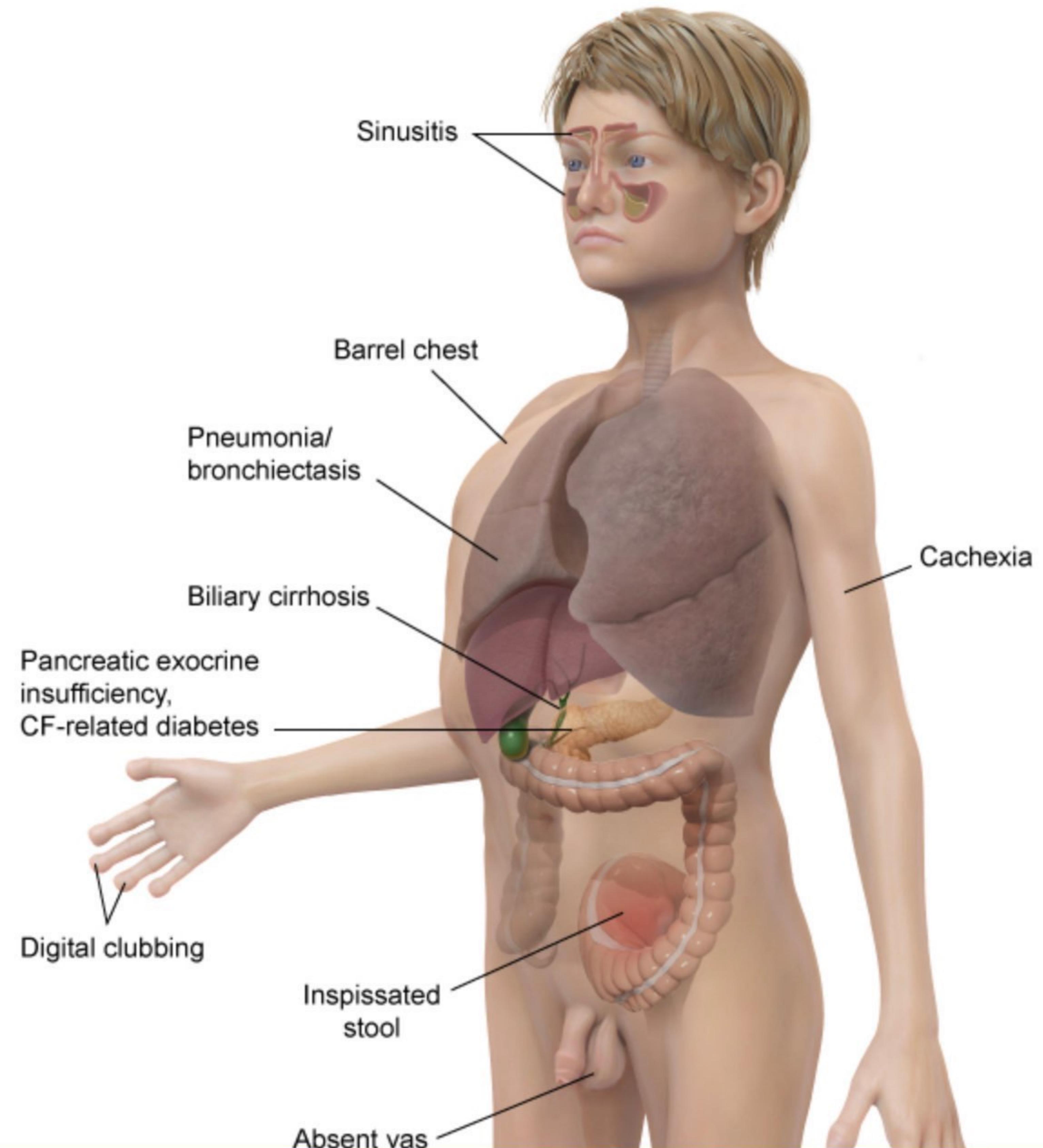
Calculator

Reverse Color

Text Zoom

Settings

## Cystic fibrosis



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Item 10 of 40 Question Id: 19576 AA Mark Previous Next Full Screen Tutorial Lab Values Notes Calculator Reverse Color Text Zoom Settings

This patient has chronic rhinosinusitis with nasal polyposis and failure to thrive, findings concerning for **cystic fibrosis** (CF). CF is an inherited, multisystem disorder characterized by the abnormal transport of sodium and chloride due to a mutation in the [CFTR gene](#). Although common CF mutations (eg, ΔF508) are often identified on newborn screening, less common mutations may go undetected and cause milder symptoms later in childhood.

Abnormal CFTR function causes thick, viscous respiratory secretions and impaired mucociliary clearance, leading to chronic sinopulmonary disease (eg, **chronic rhinosinusitis**). Patients typically have chronic cough, nasal congestion, and facial pain, as seen in this patient. Bilateral **nasal polyps**, benign outgrowths of inflamed mucosa, are also common due to chronic infection and present as nontender, shiny, gray masses in the nasal cavity or paranasal sinuses.

In CF, viscous secretions can also block pancreatic ducts, leading to **pancreatic insufficiency**. Decreased or absent pancreatic enzymes cause fat malabsorption with oily, **loose stools** and **failure to thrive** and/or **weight loss**. Over time, pancreatic injury can also lead to insufficient insulin production and CF-related diabetes.

**(Choice B)** HIV infection causes chronic infections and weight loss. However, without a known exposure (eg, blood transfusion), most pediatric HIV cases are transmitted perinatally; these patients typically develop symptoms by age 2, unlike this patient, who is age 7. In addition, nasal polyposis is rare with HIV.

**(Choice C)** Nasopharyngeal carcinoma presents with a nasopharyngeal mass that may cause facial pain and associated weight loss. However, the tumor is typically unilateral, and the diagnosis is usually in patients age >50.

**(Choice D)** Primary ciliary dyskinesia can present similarly to CF, with chronic rhinosinusitis and nasal polyposis due to impaired mucociliary clearance. However, failure to thrive and weight loss are not associated with this disorder.

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absent pancreatic enzymes cause fat malabsorption with oily, **loose stools** and **failure to thrive** and/or **weight loss**.

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**(Choice D)** Primary ciliary dyskinesia can present similarly to CF, with chronic rhinosinusitis and nasal polyposis due to impaired mucociliary clearance. However, failure to thrive and weight loss are not associated with this disorder.

**(Choice E)** Seasonal allergic rhinitis is a risk factor for developing sinus infections and nasal polyposis but would not cause weight loss.

### Educational objective:

Chronic rhinosinusitis with nasal polyposis in children should prompt evaluation for cystic fibrosis, especially when signs of pancreatic insufficiency (eg, loose stools, failure to thrive, weight loss) are present.

### References

- Paediatric nasal polyps in cystic fibrosis.

Pathophysiology

Subject

Ear, Nose & Throat (ENT)

System

Cystic fibrosis

Topic

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Item 11 of 40 Question Id: 20706 

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A 21-year-old man comes to the office due to nasal congestion and rhinorrhea that occurs intermittently and is often accompanied by sneezing and itchy, watery eyes. His symptoms began 2 years ago and have worsened in severity. He has no other medical problems. The patient works as a marketing analyst and travels out of state a few times a year. On examination, the nasal turbinates are edematous with clear rhinorrhea. There is bilateral conjunctival injection. Which of the following additional questions would be the most helpful for determining the underlying cause of this patient's condition?

- A. "Do you consume soy-based food products?" (1%)
- B. "Do your symptoms improve when you leave town?" (78%)
- C. "Do your symptoms worsen on exposure to cold air?" (10%)
- D. "Do you use cigarettes or smokeless tobacco?" (2%)
- E. "Have you been taking any new medications?" (5%)

Omitted  
Correct answer  
B

 78%  
Answered correctly

 02 secs  
Time Spent

 2023  
Version

### Explanation

This patient has nasal congestion, sneezing, and rhinorrhea accompanied by conjunctivitis. This is consistent with **allergic rhinoconjunctivitis**, a type 1 hypersensitivity that occurs via the binding of a previously recognized antigen to IgE antibodies on mast cells.

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Question Id: 20706

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Because exposure to allergens results in a rapid allergic response and avoidance of allergens improves symptoms, patients can often distinguish **patterns** to their reactions. Typical patterns include the following:

- **Seasonal** variation: The variation is often related to specific pollinators at particular times of the year.
- **Geographical** variation: Symptoms improve when patients are not exposed to the typical allergens of the region (eg, **work travel**, vacation).
- Animal exposure: Symptoms occur when visiting a house with pets or begin shortly after animal acquisition.
- **Indoor versus outdoor**: Patients with predominantly indoor symptoms may have an allergy to dust mites; outdoor symptoms suggest pollinators.

**(Choice A)** An allergic reaction to soy products can cause nasal and ocular symptoms. However, it also typically includes a rash, swelling or itching of the mouth and lips, and/or gastrointestinal symptoms. In addition, it most commonly presents in early childhood when soy is introduced into the diet.

**(Choice C)** Rhinitis symptoms caused by exposure to cold air are classically associated with nonallergic or vasomotor rhinitis. Nonallergic rhinitis typically does not cause conjunctivitis symptoms.

**(Choice D)** Tobacco smoke is a respiratory irritant that can worsen symptoms of allergic rhinitis; however, tobacco allergy is rare, and depending on route of intake, would likely produce significant oral (eg, mouth itching/swelling) and pulmonary (eg, asthma) symptoms.

**(Choice E)** Like allergic rhinitis, medication allergies can be type 1 hypersensitivity reactions. However, these

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- Animal exposure: Symptoms occur when visiting a house with pets or begin shortly after animal acquisition.
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**(Choice E)** Like allergic rhinitis, medication allergies can be type 1 hypersensitivity reactions. However, these allergies typically present with an urticarial rash shortly after ingestion of the medication; eye symptoms are uncommon.

#### Educational objective:

Allergic rhinitis often causes nasal congestion, sneezing, rhinorrhea, and conjunctivitis due to an IgE-mediated hypersensitivity response. Patients can often distinguish patterns that suggest reactions to specific allergens.

Pathology

Ear, Nose & Throat (ENT)

Rhinitis

Subject

System

Topic

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Item 12 of 40 Question Id: 21127

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A 2-hour-old girl is evaluated in the nursery. She was born to a 28-year-old primigravida via spontaneous vaginal delivery. The pregnancy was unremarkable, but family history reveals that the patient's maternal grandmother had an isolated cleft palate. Both parents have no known medical conditions. Examination of the patient shows a cleft palate. The remainder of the examination is unremarkable. The parents inquire about the cause for this anomaly. This patient's clinical findings are most likely a result of which of the following?

- A. Autosomal recessive inheritance
- B. Disrupted genetic imprinting
- C. Mitochondrial DNA heteroplasmy
- D. Polygenic and environmental interactions
- E. Skewed X chromosome inactivation

Omitted

Correct answer

D

Collecting Statistics

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Time Spent

2023  
Version

### Explanation

**Cleft palate** primarily occurs when the palatine shelves (derivatives of the maxillary prominences) fail to fuse with each other or with the primary palate during early gestation. This anomaly may occur in isolation but can be associated with **cleft lip**, which results from failed fusion of the maxillary prominences and the intermaxillary segment.

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The pathophysiology of **isolated orofacial clefts** is usually **multifactorial** and related to **complex interactions** between genetic and environmental factors. Failed fusion can result from a range of **gene variants** involved in cell differentiation, communication, and migration. Specifically, genes encoding for proteins involved in extracellular matrix formation and adhesion have been implicated because normal palatal formation requires fusion of the mesenchyme beneath the epithelial layers of each palatine shelf. In addition, certain **environmental factors** (eg, antiepileptic drugs, maternal smoking, folate deficiency) may increase the risk for cleft lip and/or palate, particularly in genetically susceptible individuals.

Some cases of orofacial clefts are related to genetic syndromes (eg, 22q11 deletion syndrome) with associated multisystem anomalies, but sporadic cases with no family history or identifiable risk factors also occur. In the absence of an identifiable genetic syndrome, the risk of recurrence during subsequent pregnancies is <5%.

**(Choice A)** **Autosomal recessive** inheritance can be responsible for rare, syndromic causes of orofacial clefts. This patient's isolated cleft palate and otherwise normal examination make a genetic syndrome (and therefore this mode of inheritance) unlikely.

**(Choice B)** Genetic imprinting refers to the inactivation of one parent's gene during meiosis, and disrupted imprinting can lead to certain genetic disorders (eg, Prader-Willi syndrome, Angelman syndrome). However, there is no known association with orofacial clefts, especially in the absence of other abnormalities suggestive of an underlying genetic syndrome.

**(Choice C)** Conditions of **mitochondrial inheritance** (eg, mitochondrial myopathies, myoclonic epilepsy) are transferred by affected females to offspring. Although this patient's maternal grandmother had a cleft palate, mitochondrial DNA does not contribute to the development of orofacial clefts.

**(Choice E)** In females, a single X chromosome is randomly inactivated in each cell during early embryonic development. **Skewed inactivation** of the X chromosomes can result in female offspring developing symptoms of

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**(Choice E)** In females, a single X chromosome is randomly inactivated in each cell during early embryonic development. Skewed inactivation of the X chromosomes can result in female offspring developing symptoms of an X-linked recessive condition (eg, hemophilia). This mechanism does not contribute to orofacial cleft development.

### Educational objective:

Most cases of cleft lip and/or cleft palate have a multifactorial pathophysiology related to complex interactions between genetic and environmental factors.

Genetics  
Subject

Ear, Nose & Throat (ENT)  
System

Cleft lip and cleft palate  
Topic

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Item 13 of 40 Question Id: 8589

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A 54-year-old woman comes to the clinic due to difficulty hearing for the past few weeks. During the neurologic examination, the physician assesses her hearing using a vibrating tuning fork. The handle of the tuning fork is placed on her left mastoid process until the sound is no longer audible. The tines are then quickly placed near the patient's left auditory meatus, and she reports hearing no sound. When the handle of the vibrating fork is placed on the middle of her forehead, she hears the vibration more strongly in her left ear than her right. This patient is most likely experiencing which of the following types of hearing loss?

- A. Conductive loss in both ears (0%)
- B. Conductive loss in left ear (68%)
- C. Conductive loss in right ear (5%)
- D. Sensorineural loss in both ears (1%)
- E. Sensorineural loss in left ear (20%)
- F. Sensorineural loss in right ear (3%)

Omitted  
Correct answer  
B

68%  
Answered correctly

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### Explanation

Interpretation of Weber & Rinne tests

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Interpretation of Weber & Rinne tests		
	Rinne result	Weber result
Normal		Midline
Sensorineural hearing loss	AC > BC bilaterally	Lateralizes to <b>unaffected</b> ear
Conductive hearing loss	BC > AC in <b>affected</b> ear, AC > BC in unaffected ear	Lateralizes to <b>affected</b> ear

AC = air conduction; BC = bone conduction.

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Hearing loss is classified as either conductive (impaired transmission of air vibrations to inner ear) or sensorineural (involving the cochlea or auditory nerve). The Rinne and Weber tests can be used to help determine the type of hearing loss.

The **Rinne test** compares air versus bone conduction (via the mastoid bone). As the vibration of the tuning fork fades, air-conducted sound is normally louder and heard longer than bone-conducted sound. The Rinne test is considered positive (normal) if the sound is heard best at the external auditory meatus (air conduction) and negative (abnormal) if the patient hears the vibration better at the mastoid (bone conduction).

- Bone conduction greater than air conduction suggests conductive hearing loss.

The **Weber test** is performed by placing a vibrating tuning fork on the middle of forehead equidistant from both ears. The vibration carried by bone conduction is normally heard equally in both ears; vibration heard louder in

The screenshot shows a mobile application interface for medical education. At the top, there is a header bar with a back arrow, a forward arrow, a double arrow for refresh, and a search bar containing the URL "apps.uworld.com". Below the header are various navigation and utility icons: a menu icon, "Item 13 of 40", "Question Id: 8589", a "Mark" icon, "Previous" and "Next" buttons, "Full Screen", "Tutorial", "Lab Values", "Notes", "Calculator", "Reverse Color", "Text Zoom", and "Settings".

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- Bone conduction greater than air conduction suggests conductive hearing loss.

The **Weber test** is performed by placing a vibrating tuning fork on the middle of forehead equidistant from both ears. The vibration carried by bone conduction is normally heard equally in both ears; vibration heard louder in one ear is abnormal.

- Conductive hearing loss causes lateralization to the affected ear as the conduction deficit masks the ambient noise in the room, allowing the vibration to be better heard.
- Sensorineural hearing loss causes lateralization to the unaffected ear as the unimpaired inner ear can better sense the vibration.

The Rinne test is abnormal in this patient's left ear, and the Weber test lateralizes to her left ear. These findings suggest **conductive hearing loss** in the left ear.

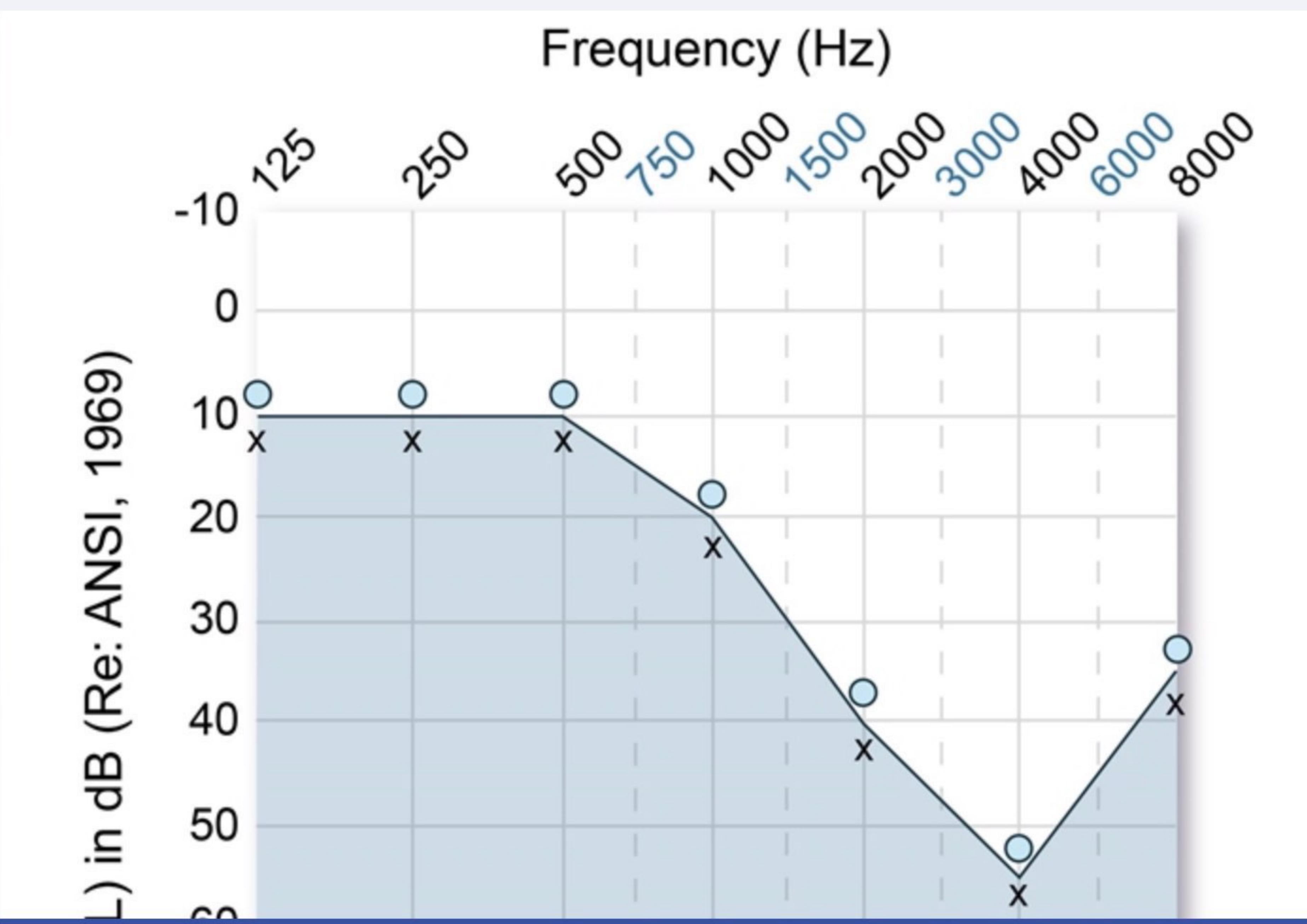
#### Educational objective:

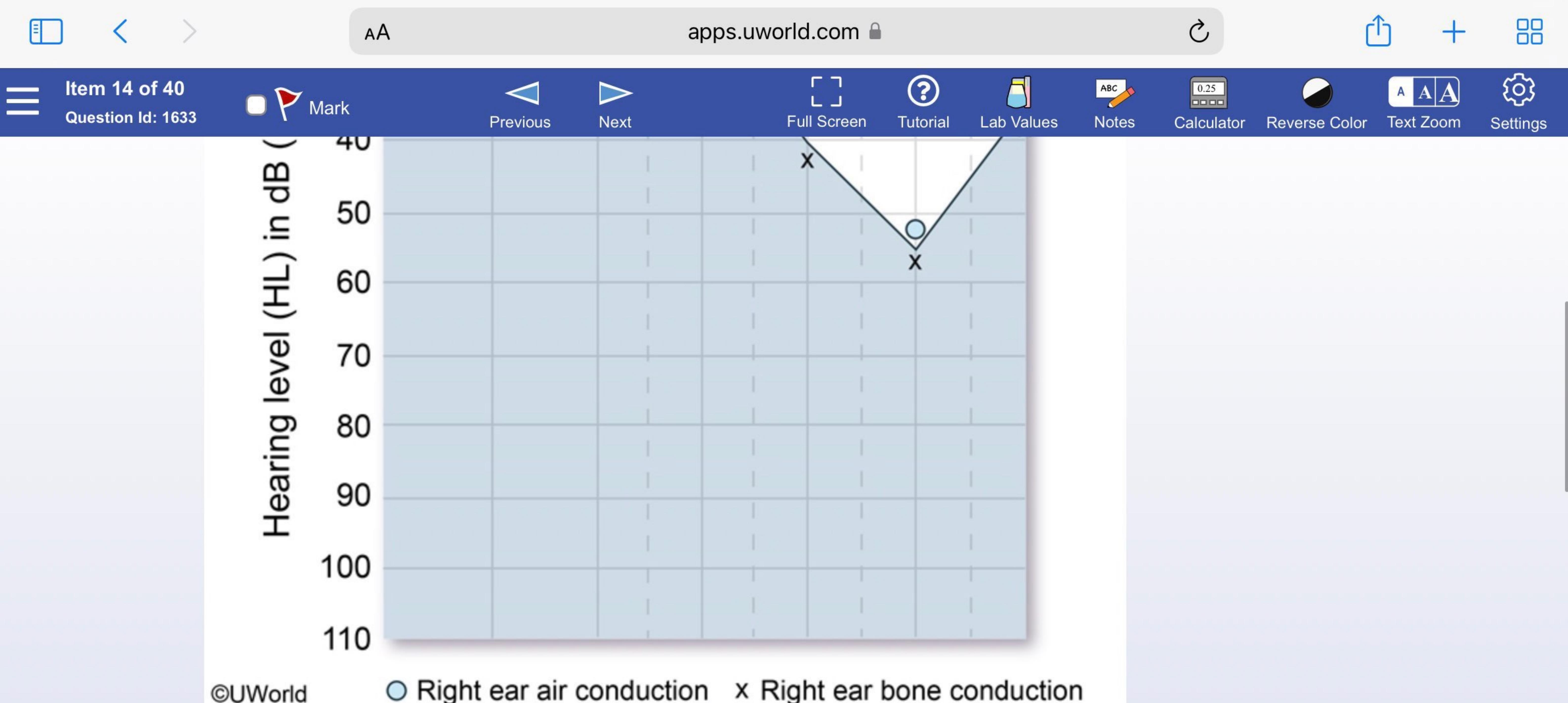
In conductive hearing loss, bone conduction will be greater than air conduction (abnormal Rinne test), and the Weber test will lateralize to the affected ear. In sensorineural hearing loss, air conduction will be greater than bone conduction (normal Rinne test), and the Weber test will lateralize to the unaffected ear.

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A 56-year-old previously healthy man comes to the office due to decreased hearing in both ears. He reports difficulty understanding conversations in crowded rooms. His wife adds that they often argue about the volume of the television set. The patient cannot remember precisely when he first noticed hearing loss but says it has been present at least 6 months and is getting worse. For the past 12 years, he has worked in a factory where he has to shout to communicate with coworkers and has seldom worn hearing protection. An audiogram is obtained as shown in the image below.





Which of the following is most likely abnormal in this patient?

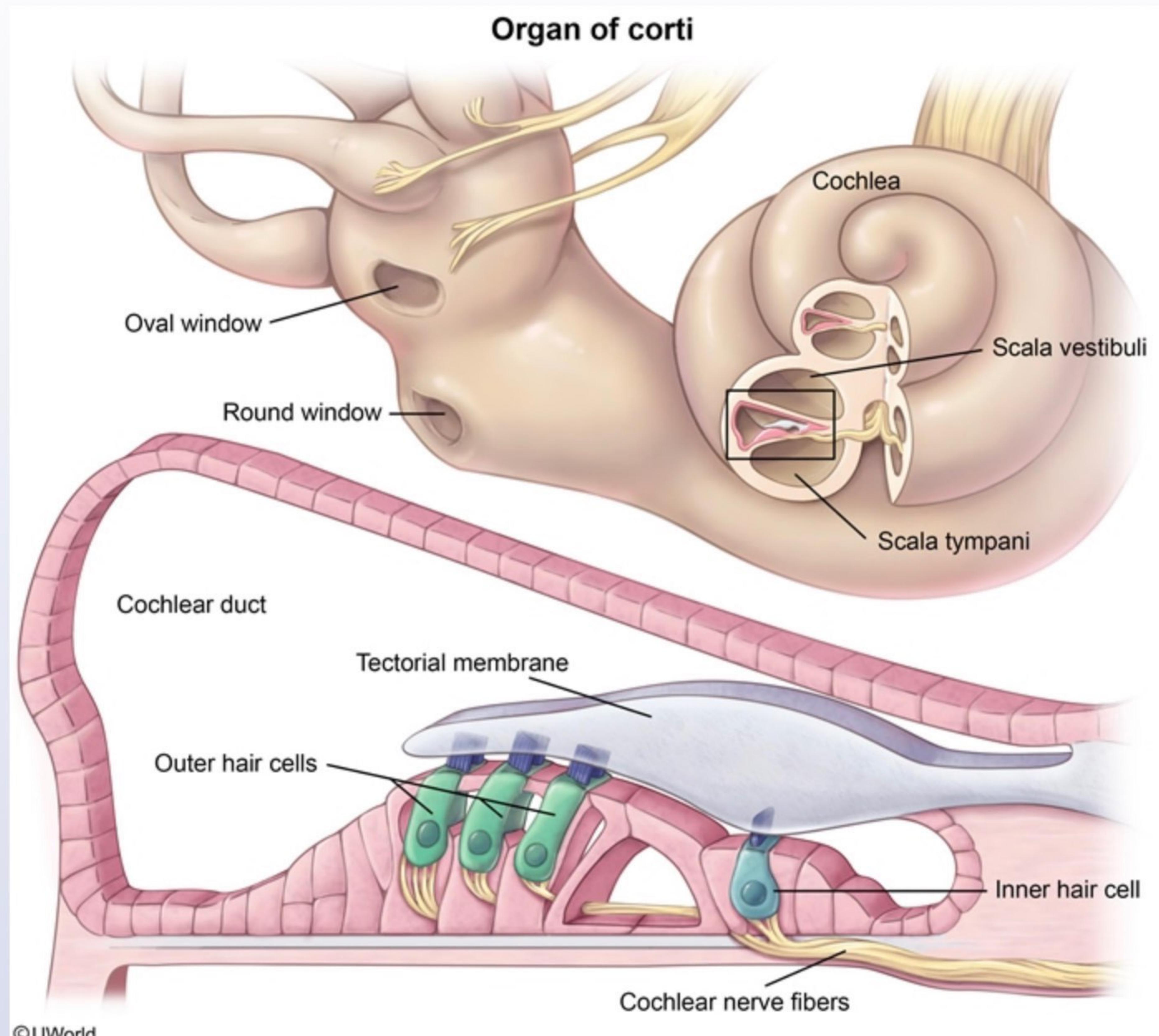
- A. Auditory nerve (10%)
- B. Cochlear cupula (13%)
- C. Middle ear ossicles (13%)
- D. Organ of Corti (51%)
- E. Round window (2%)

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AA

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This patient has high-frequency hearing loss due to chronic noise exposure. Transduction of mechanical sound

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Item 14 of 40 Question Id: 1633

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This patient has high-frequency hearing loss due to chronic noise exposure. Transduction of mechanical sound waves into nerve impulses occurs in the **organ of Corti** through the following steps:

1. Sound reaches the middle ear by vibrating the tympanic membrane.
2. The vibration is transferred to the oval window by the ossicles.
3. Vibration of the oval window causes vibration of the basilar membrane, which in turn causes bending of the hair cell cilia against the tectorial membrane.
4. Hair cell bending causes oscillating hyperpolarization and depolarization of the auditory nerve, thereby creating nerve impulses from sound.

**Noise-induced hearing loss** results from trauma to the **stereociliated hair cells** of the organ of Corti. The acoustic reflex normally dampens the effects of loud noise by causing the stapedius and tensor tympani muscles to contract, which lessens the responsiveness of the ossicles to sound. However, prolonged noise exposure can cause distortion or fracture of the stereocilia due to shearing forces against the tectorial membrane. High-frequency hearing is lost first, regardless of the frequency of the sound causing the damage.

**(Choice A)** Hearing loss originating in the auditory nerve is most commonly due to a vestibular schwannoma (acoustic neuroma). Patients develop high-frequency sensorineural hearing loss, but symptoms are usually unilateral.

**(Choice B)** The cochlear cupula is the apex of the cochlea and is distant from the oval window. The distal cochlea primarily registers low-frequency sound.

**(Choice C)** Defects of the middle ear ossicles (eg, otosclerosis) can cause hearing loss that generally affects air conduction across all frequencies. This patient's hearing loss affects both air and bone conduction.

**(Choice E)** The round window lies between the middle and inner ear and moves outward when the stapes



AA

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Tutorial



Notes



Reverse Color

Text Zoom



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**(Choice B)** The cochlear cupula is the apex of the cochlea and is distant from the oval window. The distal cochlea primarily registers low-frequency sound.

**(Choice C)** Defects of the middle ear ossicles (eg, otosclerosis) can cause hearing loss that generally affects air conduction across all frequencies. This patient's hearing loss affects both air and bone conduction.

**(Choice E)** The round window lies between the middle and inner ear and moves outward when the stapes causes the oval window to move inward. Malformation of the round window can cause congenital hearing impairment, but acquired disorders are rare.

**(Choice F)** Perforation or rupture of the tympanic membrane can occur with infection, trauma, pressure changes, or sudden and very loud noises. Rupture of the tympanic membrane causes unilateral conductive hearing loss.

#### Educational objective:

Prolonged exposure to loud noises causes hearing loss due to damage to the stereociliated hair cells of the organ of Corti.

#### References

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Item 15 of 40 Question Id: 8631

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A 36-year-old man is rushed to the emergency department after sudden onset of shortness of breath and difficulty swallowing. He has visited the emergency department several times before due to food and skin allergies. The patient is unconscious on arrival. Examination shows excessive accessory respiratory muscle use and edematous swelling of the face, lips, and tongue. There is also scattered urticaria over the upper body. Attempts at intubation are unsuccessful due to massive soft tissue edema involving the pharynx. A decision is made to perform an emergency cricothyrotomy. The incisions made during this procedure will most likely pass through which of the following structures?

- A. Buccopharyngeal fascia and platysma (1%)
- B. Platysma and thyroid isthmus (3%)
- C. Pretracheal fascia and cricoid cartilage (29%)
- D. Pretracheal fascia and prevertebral fascia (1%)
- E. Superficial cervical fascia and cricothyroid membrane (63%)

Omitted  
Correct answer  
E

63%  
Answered correctly

03 secs  
Time Spent

2023  
Version

### Explanation

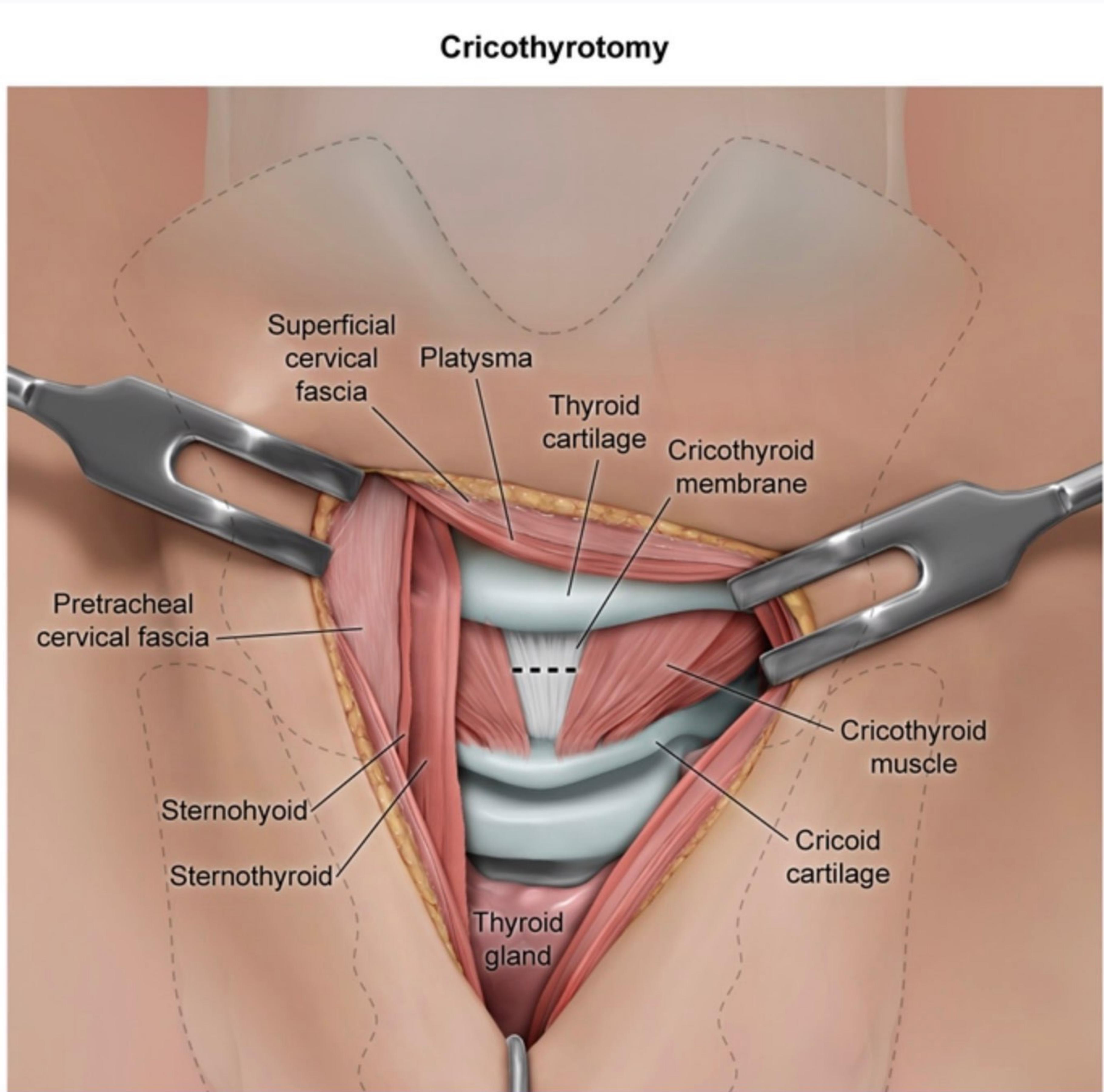
#### Cricothyrotomy

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This patient is experiencing acute, life-threatening laryngeal edema as part of an **anaphylactic reaction** precipitated by exposure to an allergen. **Laryngeal edema** can initially present with throat tightness, difficulty swallowing, dyspnea, and hoarseness. However, the condition can **quickly progress** to compromise the airway and cause **asphyxiation**.

**Cricothyrotomy** is indicated when an emergency airway is required and orotracheal or nasotracheal intubation is either unsuccessful or contraindicated (eg, massive hemorrhage, vomiting, facial trauma, airway obstruction). The procedure establishes an airway through the placement of a tube between the cricoid and thyroid cartilages and requires incision through the following structures:

1. Skin
2. **Superficial cervical fascia** (including subcutaneous fat and **platysma** muscle)
3. Investing and pretracheal layers of the deep cervical fascia
4. **Cricothyroid membrane**

**(Choice A)** The **buccopharyngeal fascia** invests the pharyngeal constrictor muscles and lies anterior to the alar fascia, forming the retropharyngeal space between them. The danger space lies posterior to the retropharyngeal space (between the alar and prevertebral fascia). Retropharyngeal abscesses can drain directly into the superior mediastinum or penetrate into the danger space to extend along the entire length of the mediastinum, causing acute necrotizing mediastinitis.

**(Choices B and C)** The cricoid cartilage lies inferior to the thyroid cartilage at the level of the C6 vertebra, and the thyroid isthmus lies inferior to the cricoid cartilage. Incisions made during cricothyrotomy should be performed with care to prevent damage to these structures.

**(Choice D)** The **deep cervical fascia** is composed of three layers: investing, pretracheal, and prevertebral. The

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Item 15 of 40  
Question Id: 8631

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2. **Superficial cervical fascia** (including subcutaneous fat and **platysma** muscle)
3. Investing and pretracheal layers of the deep cervical fascia
4. **Cricothyroid membrane**

**(Choice A)** The **buccopharyngeal fascia** invests the pharyngeal constrictor muscles and lies anterior to the alar fascia, forming the retropharyngeal space between them. The danger space lies posterior to the retropharyngeal space (between the alar and prevertebral fascia). Retropharyngeal abscesses can drain directly into the superior mediastinum or penetrate into the danger space to extend along the entire length of the mediastinum, causing acute necrotizing mediastinitis.

**(Choices B and C)** The cricoid cartilage lies inferior to the thyroid cartilage at the level of the C6 vertebra, and the thyroid isthmus lies inferior to the cricoid cartilage. Incisions made during cricothyrotomy should be performed with care to prevent damage to these structures.

**(Choice D)** The **deep cervical fascia** is composed of three layers: investing, pretracheal, and prevertebral. The prevertebral layer of the deep fascia surrounds the vertebral column and spinal muscles; it is not penetrated during cricothyrotomy.

#### Educational objective:

Cricothyrotomy is indicated when an emergency airway is required and orotracheal or nasotracheal intubation is either unsuccessful or contraindicated. The cricothyrotomy incision passes through the superficial cervical fascia, pretracheal fascia, and the cricothyroid membrane.

Anatomy

Ear, Nose & Throat (ENT)

Subject

System

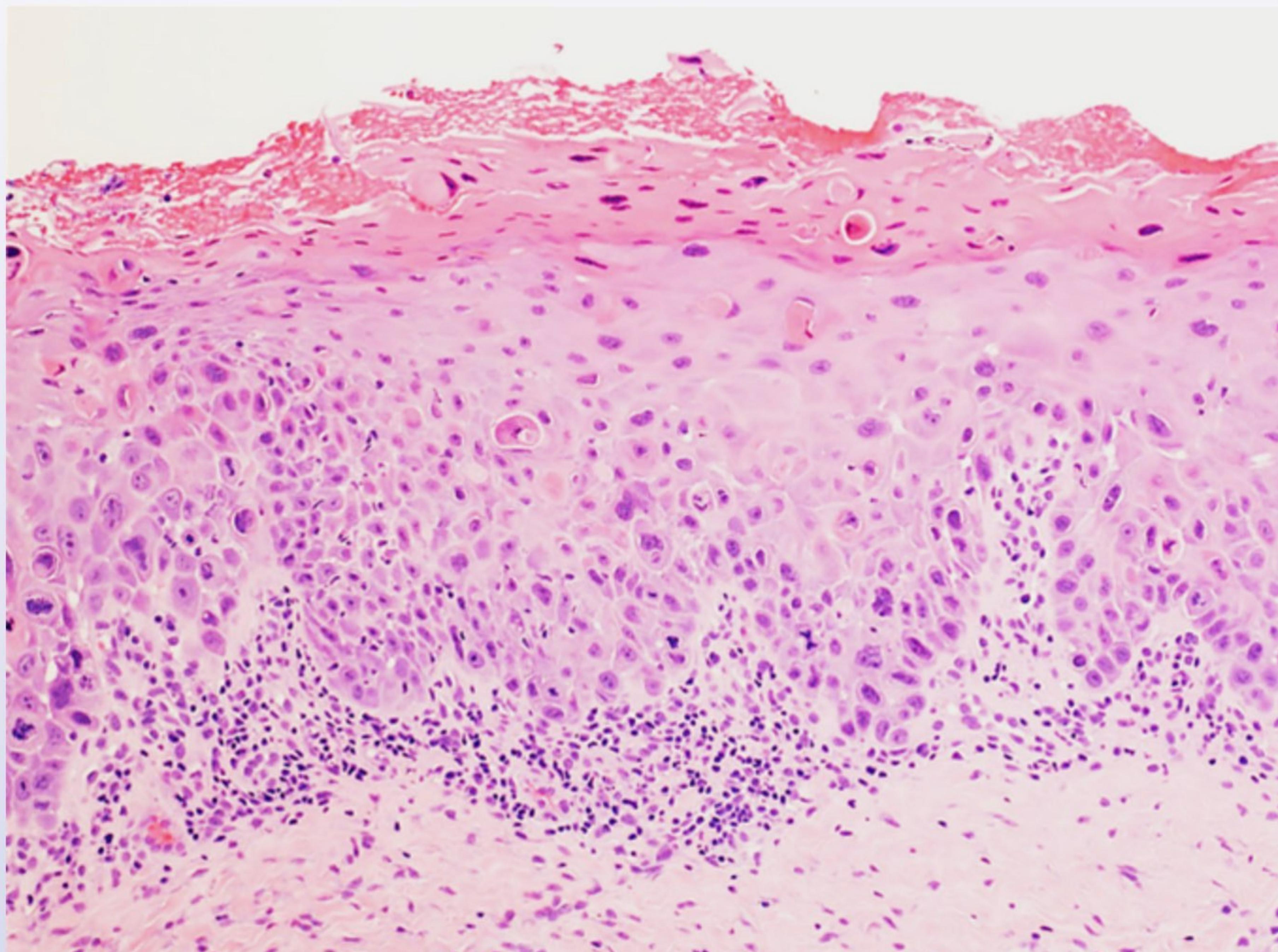
Airway emergency

Topic

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Item 16 of 40 Question Id: 22476 AA Mark Previous Next Full Screen Tutorial Lab Values Notes Calculator Reverse Color Text Zoom Settings

A 47-year-old man comes to the office due to a white patch on the inside of his lower lip. It is painless and does not bleed. The patient has used smokeless tobacco for the past 20 years. He drinks on average 5 beers a week. On physical examination, a 3.5-cm flat, white patch is seen on the inside of the lower lip, reflecting onto the gingival surface of the lower teeth. There is no cervical adenopathy. Biopsy of the mucosal lesion is shown in the image below:



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Which of the following is most likely to occur if this patient's condition is left untreated?

- A. Development of a systemic autoimmune disease (2%)
- B. Development of itchy, purple lesions over the palms (4%)
- C. Local invasion with cervical node metastases (70%)
- D. Resolution with antiretroviral treatment (6%)
- E. Spontaneous regression (15%)

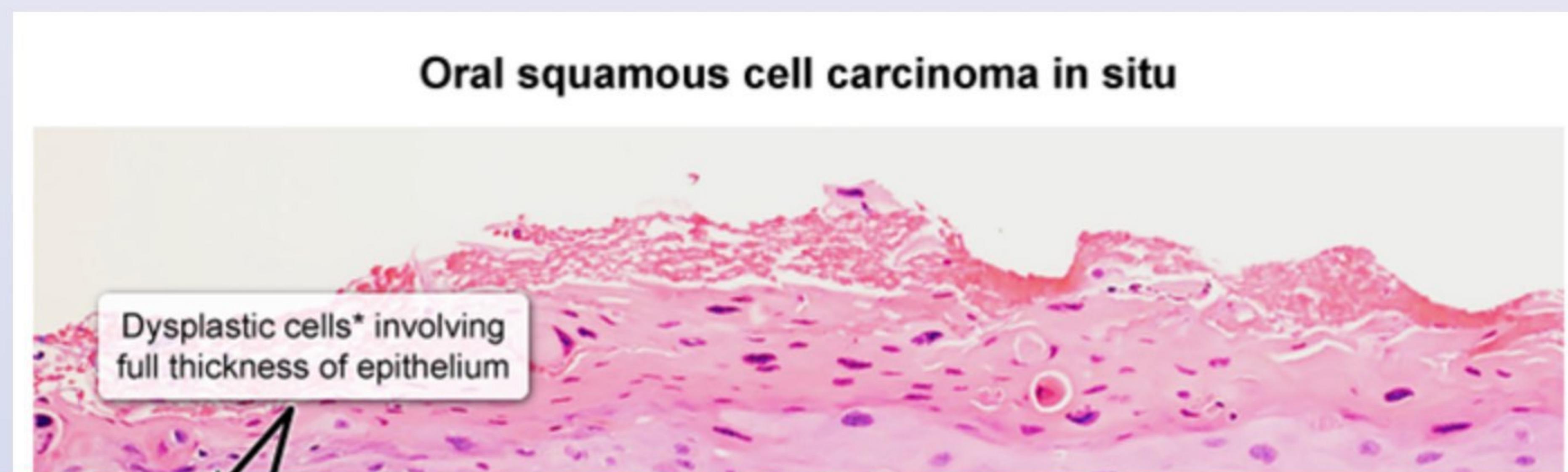
Omitted  
Correct answer  
C

70%  
Answered correctly

13 secs  
Time Spent

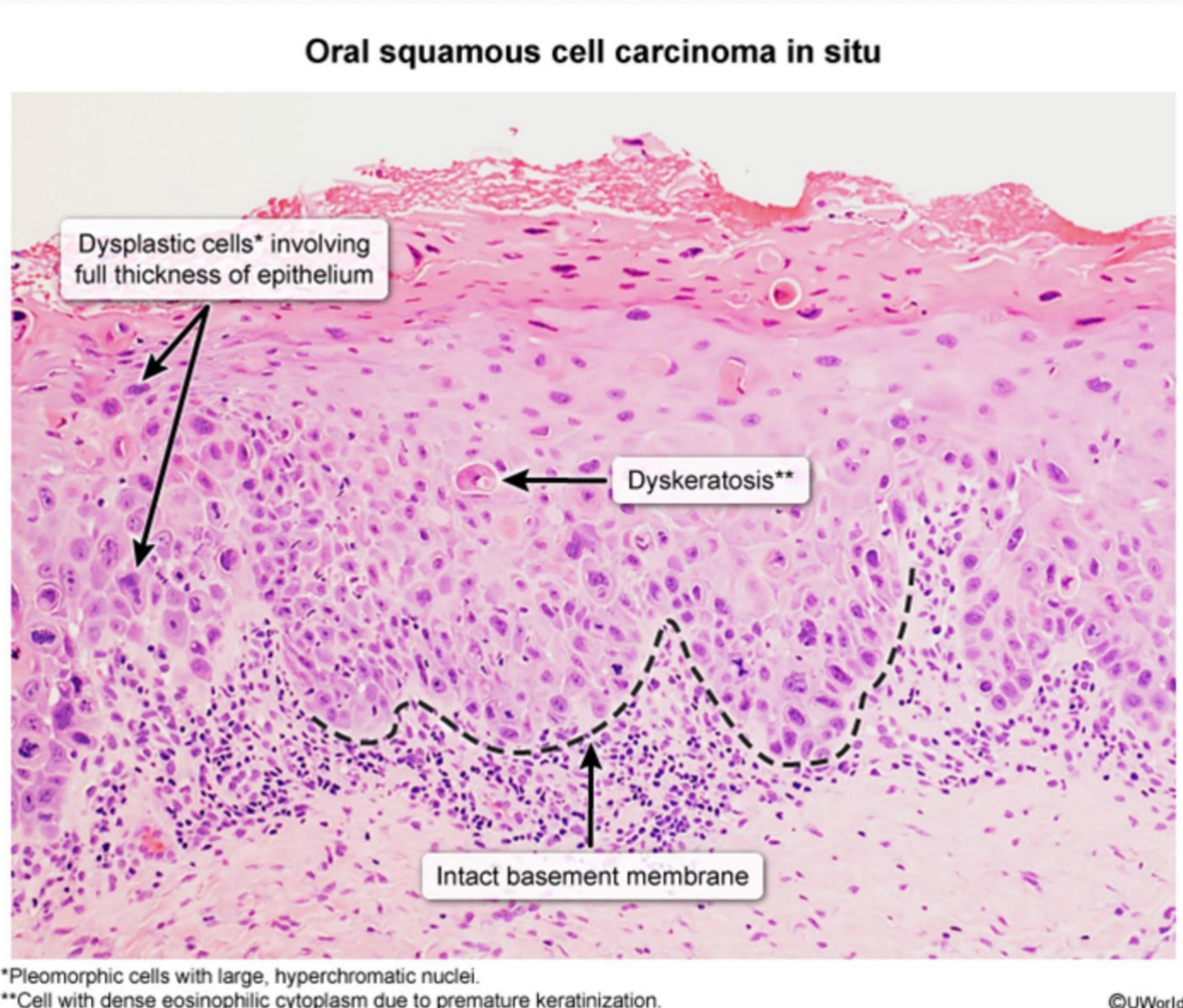
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Version

#### Explanation



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This patient with a history of tobacco and alcohol use has **persistent leukoplakia** (white mucosal lesion) on the buccal and gingival mucosa. Biopsy shows full-thickness dysplasia characterized by abnormal cytology (eg,

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Item 16 of 40 Question Id: 22476

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This patient with a history of tobacco and alcohol use has **persistent leukoplakia** (white mucosal lesion) on the buccal and gingival mucosa. Biopsy shows full-thickness dysplasia characterized by abnormal cytology (eg, squamous cells with pleomorphic and hyperchromatic nuclei, dyskeratosis) and architecture (eg, loss of normal squamous maturation). These findings are consistent with **squamous cell carcinoma in situ**.

Most cancers of the head and neck arise from squamous epithelial cells that undergo stepwise, premalignant changes that progress to carcinoma (ie, hyperplasia → dysplasia → carcinoma in situ → [invasive carcinoma](#)). Premalignant lesions may initially manifest in the oral cavity as hyperplastic or dysplastic, white (leukoplakia) or red (erythroplakia) patches. The likelihood of **progression to invasive cancer** (which has a propensity to spread first to the cervical [lymph nodes](#)) depends on the degree of dysplasia, with **severe dysplasia** having a **high likelihood** of developing into invasive carcinoma. For this reason, oral leukoplakic lesions with severe dysplasia are typically surgically removed.

**(Choice A)** Patients with systemic lupus erythematosus can have painless oral plaques or ulcerations. Histopathology typically shows hyperkeratosis and degeneration of the basal epithelial cells with perivasular inflammation, not dysplasia.

**(Choice B)** [Lichen planus](#) can present with lesions in the oral mucous membranes; pruritic, purple/pink, polygonal papules and plaques often develop on the flexural surfaces of the wrists and ankles. Histology usually shows a band of lymphocytic inflammation, degeneration of the basal epithelium with apoptotic cells (ie, Civatte or colloid bodies), saw-toothed rete ridges, hyperkeratosis, and hypergranulosis. Dysplasia would not be seen.

**(Choice D)** Oral hairy leukoplakia has a distinct, corrugated appearance and is caused by Epstein-Barr virus (EBV). It occurs almost exclusively in patients with significant immunosuppression (eg, HIV) and often resolves with antiretroviral treatment; it is not premalignant. Pathology usually shows hyperparakeratosis and hyperplastic epithelium with viral cytopathic effect (not dysplasia).

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Spreads first to the cervical lymph nodes, depends on the degree of dysplasia, with severe dysplasia having a high likelihood of developing into invasive carcinoma. For this reason, oral leukoplakic lesions with severe dysplasia are typically surgically removed.

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**(Choice E)** Leukoplakia that shows benign hyperkeratosis and epithelial hyperplasia or even mild dysplasia may regress, especially if risk factors are modified (eg, cessation of tobacco and alcohol use). When severe or full-thickness dysplasia is present (as in this case), it is unlikely to spontaneously regress.

#### Educational objective:

Oral leukoplakia is a potentially premalignant lesion; the risk for progression to invasive carcinoma is related to the degree of dysplasia.

Pathology

Subject

Ear, Nose & Throat (ENT)

System

Leukoplakia

Topic

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Item 17 of 40 Question Id: 18598

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A 30-year-old woman comes to the emergency department after a seizure. The patient reports pain on the left side of her face and is unable to fully open or close her mouth. She is drooling. On examination, the jaw deviates to the right and the left mandibular condyle is very prominent with a palpable depression posterior to it. The patient is diagnosed with an anterior dislocation of the left temporomandibular joint. The jaw is most likely maintained in a dislocated position due to continued spasm of which of the following muscles?

- A. Buccinator (6%)
- B. Genioglossus (0%)
- C. Lateral pterygoid (85%)
- D. Sternocleidomastoid (1%)
- E. Superior pharyngeal constrictor (0%)
- F. Zygomaticus major (4%)

Omitted  
Correct answer  
C

85%  
Answered correctly

02 secs  
Time Spent

2023  
Version

### Explanation

#### Lateral pterygoid function

Lateral pterygoid

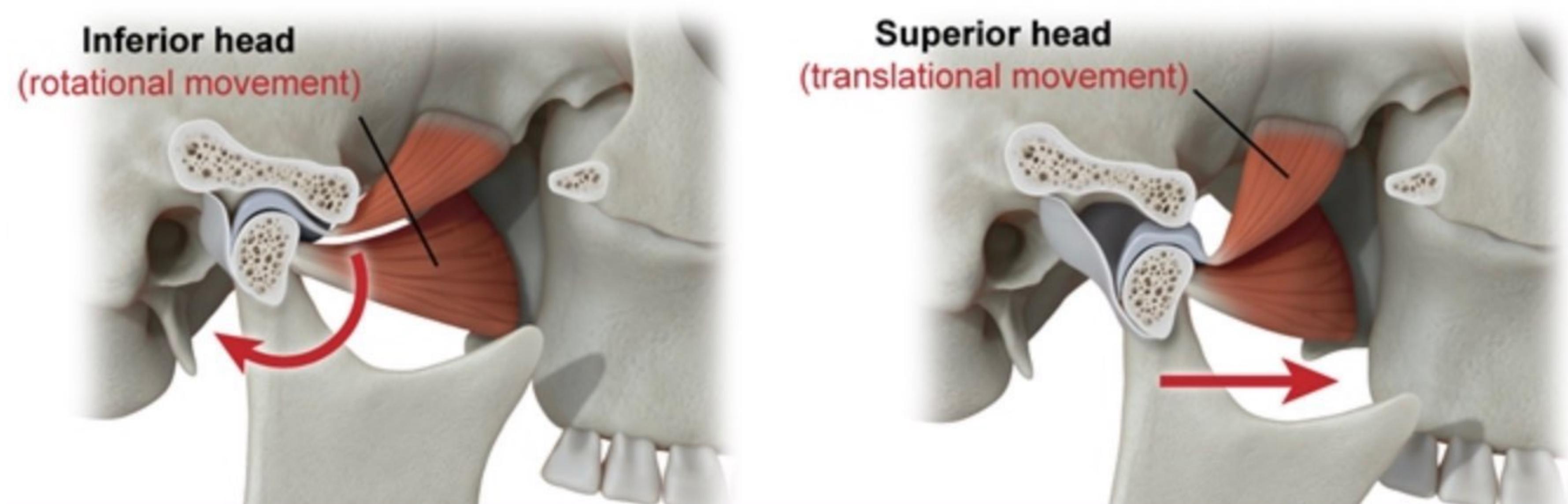
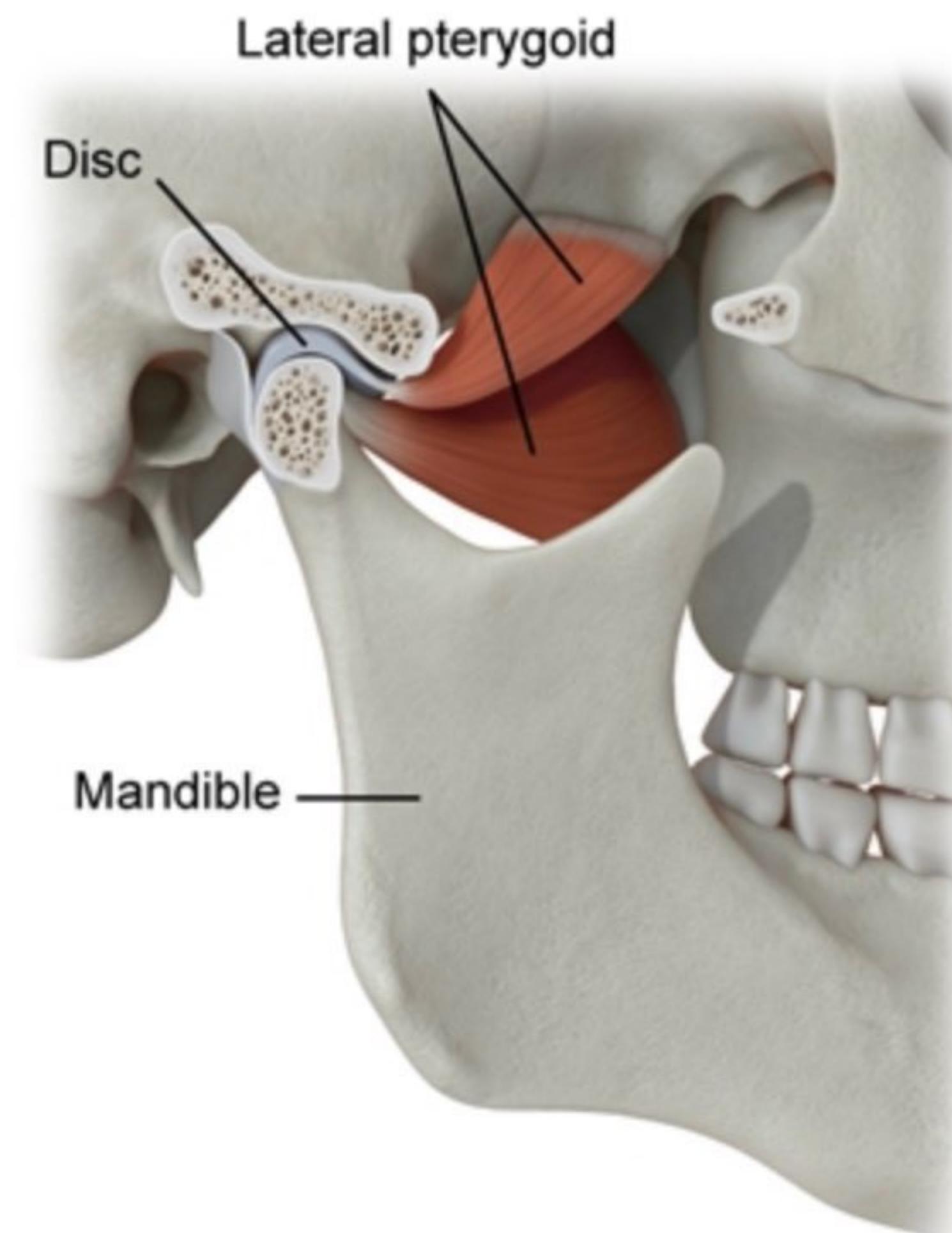
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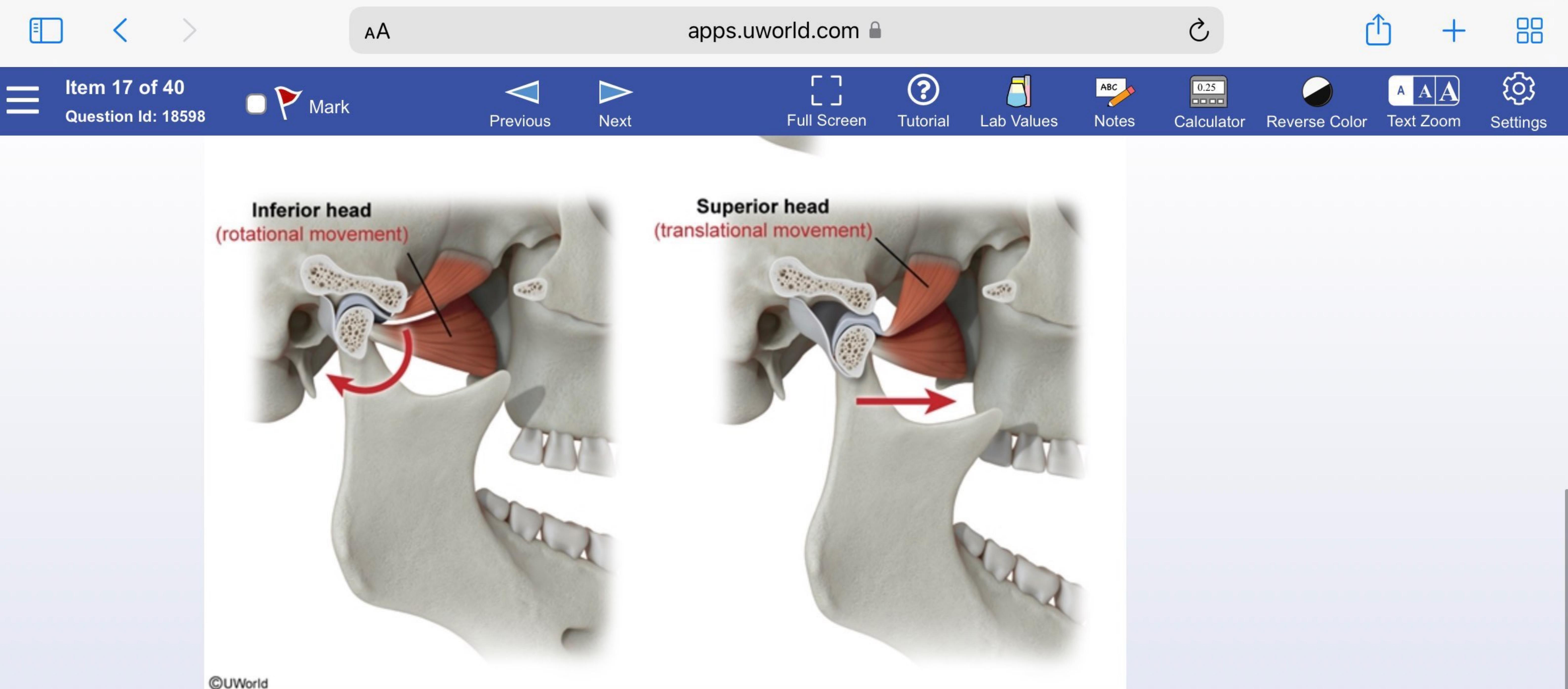
AA

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## Lateral pterygoid function





This patient has an anterior dislocation of the **temporomandibular joint** (TMJ), the synovial joint that opens and closes the jaw. The joint is formed by the mandibular condyle that sits in the glenoid fossa of the squamous portion of the temporal bone.

TMJ opening involves a complex movement that has both hinge and sliding components:

- The initial movement is rotational (ie, hinge) and driven by the **lateral pterygoid muscles**, which are the only muscles of mastication that aid in **depressing the mandible** (ie, opening the jaw).
- As the jaw opens, the ligaments become taut, stopping further rotation.

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- The initial movement is rotational (ie, hinge) and driven by the **lateral pterygoid muscles**, which are the only muscles of mastication that aid in **depressing the mandible** (ie, opening the jaw).
- As the jaw opens, the ligaments become taut, stopping further rotation.
- Further action by the lateral pterygoids results in translational movement (ie, condyle slides anteriorly) that opens the jaw fully.

TMJ dislocation occurs when translational movement is exaggerated due to **extreme jaw opening** (eg, yawning, orotracheal intubation, **seizure**) that causes displacement of the condyle anteriorly out of the glenoid fossa. Stretching of the ligaments causes significant pain and spasm of the muscles of mastication. This **muscle spasm** (specifically of the lateral pterygoids that aid jaw opening) **prevents spontaneous resolution** of the dislocation; manual reduction is usually necessary.

**(Choice A)** The buccinator muscle underlies the cheek. It holds the cheek close to the teeth to control food boluses during chewing but is not involved in movement of the jaw.

**(Choice B)** The genioglossus muscles form the body of the tongue. Although they originate on the tubercle of the mandible (and insert into the hyoid bone and the bottom of the tongue), they are responsible for tongue protrusion rather than mandibular movement.

**(Choice D)** The sternocleidomastoid muscles originate at the sternum and the clavicle and insert on the mastoid tip. They rotate the head (when acting independently) or flex the neck (when acting in concert).

**(Choice E)** The superior pharyngeal constrictor forms portions of the posterior and lateral oropharyngeal walls. Muscle contraction propels food and liquid inferiorly into the esophagus during swallowing.

**(Choice F)** The *zygomaticus major* originates from the zygomatic bone and inserts onto the angle of the mouth.

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Item 17 of 40 Question Id: 18598

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**(Choice E)** The superior pharyngeal constrictor forms portions of the posterior and lateral oropharyngeal walls. Muscle contraction propels food and liquid inferiorly into the esophagus during swallowing.

**(Choice F)** The *zygomaticus major* originates from the zygomatic bone and inserts onto the angle of the mouth. Contraction pulls the angle of the mouth laterally and superiorly during a smile.

### Educational objective:

The lateral pterygoid muscles are the only muscles of mastication that aid in depressing the mandible (ie, opening the jaw). Spasm of the lateral pterygoids prevents spontaneous reduction of an anterior dislocation of the temporomandibular joint.

### References

- Temporomandibular joint dislocation.
- The emerging role of botulinum toxin in the treatment of temporomandibular disorders

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Item 18 of 40 Question Id: 107861 

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A 28-year-old primigravida at 20 weeks gestation comes to the clinic for follow-up. It is discovered that the fetus has a genetic change that results in developmental disruption of the third pharyngeal pouch. Which of the following would most likely be observed in the child after birth?

- A. Branchial cleft cyst (8%)
- B. Ectopic thyroid tissue (14%)
- C. Impaired auditory conduction (4%)
- D. Mandibular hypoplasia (7%)
- E. T-cell dysfunction (64%)

Omitted  
Correct answer  
E

 64%  
Answered correctly

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Time Spent

 2023  
Version

### Explanation

#### Nonarch adult derivatives of the pharyngeal apparatus

	Pharyngeal pouches*	Pharyngeal clefts*	Associated pathologies
1st	<ul style="list-style-type: none"><li>Eustachian tube</li><li>Tympanic cavity</li></ul>	<ul style="list-style-type: none"><li>External auditory meatus</li><li>Tympanic membrane</li></ul>	<ul style="list-style-type: none"><li>1st cleft: preauricular cyst/fistula</li></ul>

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Item 18 of 40 Question Id: 107861

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Nonarch adult derivatives of the pharyngeal apparatus			
	Pharyngeal pouches*	Pharyngeal clefts*	Associated pathologies
1st	<ul style="list-style-type: none"> <li>Eustachian tube</li> <li>Tympanic cavity</li> <li>Mastoid air cells</li> </ul>	<ul style="list-style-type: none"> <li>External auditory meatus</li> <li>Tympanic membrane</li> </ul>	<ul style="list-style-type: none"> <li>1st cleft: preauricular cyst/fistula</li> </ul>
2nd	<ul style="list-style-type: none"> <li>Palatine tonsil</li> <li>Supratonsillar fossa</li> </ul>		<ul style="list-style-type: none"> <li>2nd cleft: persistent cervical sinus/fistula</li> <li>2nd pouch: cleft palate</li> </ul>
3rd	<ul style="list-style-type: none"> <li>Dorsal wings: inferior parathyroid glands</li> <li>Ventral wings: thymus</li> </ul>	<ul style="list-style-type: none"> <li>Cervical sinus (obliterated by development of 2nd arch)</li> </ul>	<ul style="list-style-type: none"> <li>3rd &amp; 4th pouches**: 22q11 microdeletion syndrome (eg, DiGeorge, velocardiofacial)</li> </ul>
4th	<ul style="list-style-type: none"> <li>Dorsal wings: superior parathyroid glands</li> <li>Ventral wings: parafollicular C cells of thyroid</li> </ul>		

\*Pharyngeal pouches derive from endoderm; pharyngeal clefts derive from ectoderm.

\*\*22q11 microdeletion also affects 3rd & 4th arches and can involve 2nd pouch.

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The structures of the head and neck are derived from components of the pharyngeal apparatus, an early embryologic structure consisting of pharyngeal arches, pouches, and clefts. The developing embryo forms 6 pairs of pharyngeal arches, each contributing to various musculoskeletal and vascular structures. Evaginations between consecutive arches are referred to as pharyngeal clefts externally and pharyngeal pouches internally.

This fetus has a genetic defect that disrupted development of the **third pharyngeal pouch**, the derivates of which include the **inferior parathyroid glands** and **thymus**. Because the thymus is the site of T-cell maturation, patients with abnormal development of the third pharyngeal pouch often develop recurrent viral and fungal infections due to **T-cell dysfunction**.

The most common cause of pharyngeal pouch pathology is **DiGeorge syndrome**, which results from a chromosome 22q11 microdeletion. This condition affects both the third and the fourth pharyngeal pouches, causing variable **immunodeficiency**, depending on the degree of thymic hypoplasia (eg, recurrent sinopulmonary infections vs severe combined immunodeficiency). Patients also have **hypocalcemia** from parathyroid gland hypoplasia, as well as other anomalies (eg, conotruncal cardiac defects, craniofacial abnormalities).

**(Choice A)** A **branchial cleft cyst** is a lateral neck mass anterior to the sternocleidomastoid muscle. It results from incomplete involution of the second pharyngeal cleft; it is not a pharyngeal pouch malformation.

**(Choice B)** The thyroid gland **descends in utero** from the base of the tongue to its anatomic position in the neck, and abnormal migration can result in ectopic thyroid tissue along this path. The thyroid gland develops independently of the third pharyngeal pouch.

**(Choice C)** Impaired auditory conduction can occur with disrupted development of the first pharyngeal arch (gives rise to incus/malleus) and second pharyngeal arch (gives rise to stapes), as well as the first pouch and cleft, which contribute to middle and outer ear structures. The third pharyngeal pouch does not give rise to any

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sinopulmonary infections vs severe combined immunodeficiency). Patients also have **hypocalcemia** from parathyroid gland hypoplasia, as well as other anomalies (eg, conotruncal cardiac defects, craniofacial abnormalities).

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**(Choice C)** Impaired auditory conduction can occur with disrupted development of the first pharyngeal arch (gives rise to incus/malleus) and second pharyngeal arch (gives rise to stapes), as well as the first pouch and cleft, which contribute to middle and outer ear structures. The third pharyngeal pouch does not give rise to any structures of the ear.

**(Choice D)** Mandibular hypoplasia (micrognathia) is related to disrupted development of the first pharyngeal arch, which gives rise to the mandible.

#### Educational objective:

Derivatives of the third pharyngeal pouch include the thymus and inferior parathyroid glands. Disrupted development of the third pharyngeal pouch (eg, DiGeorge syndrome) leads to thymic hypoplasia/aplasia with impaired T-cell development and immunodeficiency.

Embryology

Subject

Ear, Nose & Throat (ENT)

System

Embryologic derivatives

Topic

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Item 19 of 40 Question Id: 20020

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A 5-year-old girl is brought to the emergency department after having a seizure at home. Approximately an hour ago, the patient collapsed at the dinner table and developed full body shaking and urinary incontinence. Her mother says that the girl has had a mild headache and fatigue for the past few days. On examination, the patient is sleepy and difficult to rouse. Vital signs are normal. Cardiopulmonary examination is unremarkable. CT scan of the head is shown in the image below:

