REVIEW ARTICLE

Respiratory Examination for Postgraduate Residents: Unrevealing Expert's Questions and Answers

Deependra Kumar Rai[1*], Agam Vora[2], Pranav Ish[3], Saurabh Mittal[4]

Received: 04 May 2025; *Accepted:* 09 September 2025

Abstract

Physical examination is pivotal for getting a clue about the disease and making a provisional diagnosis. The respiratory examination is considered to be one of the toughest systemic examinations by undergraduate and postgraduate residents. No well-defined literature is available regarding the ideal method and interpretation of respiratory examination findings. There are many questions asked by experts that are hardly found in the literature. This review included a total of 30 important questions and the best possible answers, including expert questions from top institutes that are important for respiratory examination and would help all students (MBBS/MD/DNB/DM) to excel in their practical examination.

Journal of The Association of Physicians of India (2026): 10.59556/japi.74.1313

Introduction

Physical examination is crucial for getting a clue about the disease and making a provisional diagnosis. However, there has been a trend toward less emphasis on physical assessment throughout medical school and residency training and increased use of technology-based diagnostic techniques.

It was previously noted that a comprehensive medical history and physical examination were responsible for 88% of all diagnoses in primary care, and this may still be the case today.[1,2] Respiratory system examination is perceived as one of the toughest systemic examinations by undergraduate and postgraduate residents. No well-defined literature is available regarding the ideal method and interpretation of respiratory examination. This review included common questions and answers that are important for respiratory examination and would help all students (MBBS/MD/DNB/DM) to excel in their practical examination.

Methodology

A literature review was performed utilizing various online databases and various clinical books to compile this review. This review of various respiratory examination techniques, their interpretation, various signs, etc., was conducted during the MD/DM respiratory examination. We also asked important questions from leading pulmonologists from various institutes running an MD/DM Pulmonary medicine course, and summarized them in question-and-answer format, along with some basic questions.

Questions and Answers

Q1. Enumerate the signs indicative of respiratory distress.

Ans: There is a rise in the respiratory rate, accessory muscles usage, intercostal retraction, cyanosis, nose flaring, wheezing, and sweating, and leaning forward in a sitting position for deep breathing.

Q2. What are the different signs to look for in hand examination?

Ans: Clubbing, pallor, cyanosis, warm, well-perfused palm (CO_2 retention), tremor, tobacco staining, pulse, skin thinning, bruising, asterixis, skin thickening in scleroderma, arthritic changes in RA-ILD, Gottron's papules, etc.

Q3. What are the causes of clubbing?

Ans: Causes are divided into respiratory and nonrespiratory:

- Respiratory: Bronchogenic carcinoma, ILD, bronchiectasis, lung abscess, empyema.
- Nonrespiratory: Congenital cyanotic heart disease, Bacterial endocarditis, Cirrhosis, Ulcerative colitis, Coeliac disease.
- Point to Remember:
  - Hereditary/acquired.
  - Close mimicker: Chronic paronychia and Heberden nodes (Swelling at the DIP joint in Osteoarthritis).
  - Generally, bilateral conditions occur in hand and feet.
  - Unilateral clubbing (e.g., either after hemiplegia or in an ipsilateral pulmonary sulcus tumour invading the brachial plexus).
  - One finger only: May be due to local injury or median nerve injury.
  - Only Toe: PDA with shunt reversal.
- Be aware of the importance of the Lovibond angle (profile sign) (normally <180°), the hyponychial angle (<192°), the Schamroth sign, the digital index, and the pharyngeal depth ratio.[3]
- Be aware of grading:
  - Grade 1: Nail bed fluctuation.
  - Grade 2: Obliteration of the Lovibond angle.
  - Grade 3: Parrot beaking.
  - Grade 4: Hypertrophic osteo-arthropathy (HOA).
- Clubbing is a common paraneoplastic manifestation of lung cancer (especially in NSCLC).
- Clubbing is seen in IPF and asbestosis, but rarely in sarcoidosis.

Q4. What is the pathogenesis of clubbing?

Ans: There are multiple theories, but the common denominator is vasodilation of vessels in the fingertip, including arteriovenous connections.

Increased platelet-derived growth factor (PDGF) and vascular endothelial growth factor (VEGF) release from peripheral megakaryocytes leads to increased vascularity, permeability, and connective tissue changes. The release of both PDGF and VEGF is thought to be enhanced by hypoxia.[4]

[1]Professor and Head, Department of Pulmonary Medicine, All India Institute of Medical Sciences, Patna, Bihar, [2]Medical Director, Department of Pulmonology, Vora Clinic, Mumbai, Maharashtra, [3]Associate Professor, Vardhman Mahavir Medical College and Safdarjung Hospital, Delhi, [4]Assistant Professor, Department of Pulmonary and Sleep Medicine, All India Institute of Medical Sciences, New Delhi, India; *Corresponding Author

How to cite this article: Rai DK, Vora A, Ish P, *et al.* Respiratory Examination for Postgraduate Residents: Unrevealing Expert's Questions and Answers. J Assoc Physicians India 2026;74(4):103–109.

Q5. What should be the patient's position for respiratory examination?

Ans: For the majority of the respiratory system assessment, the patient should be propped up with a pillow and comfortably reclining on a bed or couch (to lean back at a 45° angle).

- For movement of the chest, make the patient lie down and see from the foot end for any lagging in movement.
- To demonstrate paradoxical breathing or the Hoover sign, make the patient lie down.[5]

Q6. What is the anatomical boundary of oblique and horizontal fissure?

Ans:

- *Oblique fissure landmark*: Starting from T2 spine posteriorly to anteriorly mid clavicular line at the position of sixth rib.
- *Horizontal Fissure landmark*: Oblique fissure on the right side meeting a horizontal line which is drawn from sternum at level of fourth costal cartilage.
- Anteriorly, all three lobes (mostly upper), posteriorly upper and lower lobes (Lower lobe predominant), and laterally upper and lower lobes are almost in equal proportion in representation.

Q7. What is the importance of sternal angle?

Ans: Another name for sternal angle is the manubriosternal joint (Angle of Louis, Levis, Ludovic), which is around 162°.[6]

- This angle corresponds to the level of 4th and 5th thoracic vertebrae.
- Forms an imaginary demarcation between the superior and inferior mediastinum.
- Ribs are counted downwards from the second costal cartilage (second intercostal space below), attached with angle.
- It also marks the point of tracheal bifurcation, the origination and termination of the aortic arch, bifurcation of the Pulmonary trunk, and where the azygous vein arches over hilum to enter SVC.

Q8. What are the features of a normal chest and the types of abnormal shapes of chest?

Ans: *Shape of chest* : Normally, the chest is symmetrical bilaterally, forming an elliptical shape in horizontal cross-section, with the transverse diameter greater than the anteroposterior, with a ratio of 7:5. The subcostal angle is 70°, and intercostal spaces are wider anteriorly than posteriorly. It gets deformed by either disease of Rib, vertebra, or underlying lung disease.

- *Barrel-shaped chest*: The anteroposterior diameter is increased, the subcostal angle get wide, and the sternal angle becomes prominent. The amount of trachea palpable above the suprasternal notch is reduced. The buckle handle movement of the ribs (upwards and outwards) changes to a pump handle (up and down motion). It is seen that chronic airflow limitation leads to hyperinflation and markers of severity of airflow limitation. In most of the cases, there is kyphosis, and the ribs become increasingly horizontal. Among rest of the findings are widening of intercostal spaces, elevation of clavicles, shortening of neck, and prominence of the sternum.
- *Pectus excavatum (Funnel chest or* Cobbler's *chest):* The lower portion of sternum has a depression in the case of a cobbler's chest. The cause could be congenital, following rickets in childhood, or a kind of occupational deformity observed in cobblers. The depression in the sternum leads to a prominent cardiac shadow in chest X-ray (Pomfret's heart).
- *Pectus carinatum or pigeon chest or Keeled chest:* There is depression on either side of the sternum, along with a bead, such as an enlargement at the costochondral junction (Rickety rosary), and a transverse groove passing outwards from the xiphisternum to the mid-axillary line (Harrison's sulcus). It may be secondary to childhood asthma, Rickets or localized deformity of the sternum and costal cartilage.
- *Flat chest (phthinoid chest):* The anteroposterior diameter is reduced in chronic nasal obstruction (adenoid hypertrophy, bilateral TB, or childhood rickets).
- Alar chest: The scapula is winged, which occurs in advanced TB.
- *Bulging:* One-sided bulging may be due to pleural effusion, pneumothorax, tumors, aneurysm, cardiomegaly, or scoliosis. Aneurysm of the aorta, pericardial effusion, liver abscess, and tumors of the chest wall can all cause localized bulging.
- *Depression of flattening*: It may be seen in fibrosis, collapse, scoliosis, unilateral muscle wasting due to poliomyelitis, and congenital absence of the pectoralis muscle (Poland's syndrome).
- *Spinal deformities*: Kyphosis and Scoliosis may lead to asymmetry. Both, but especially scoliosis, can lead to respiratory failure.

Q9. What is the difference between abdominal paradox and chest wall paradox?

Abdominal Paradox

Normally, the diaphragm descends in inspiration, and the abdominal wall moves outwards. It moves inwards, then called the abdominal paradox.

This is seen when the diaphragm is paralyzed or in advanced chronic obstructive pulmonary disease (COPD). Consequently, the exhausted diaphragm and abdomen migrate inward with each inspiration as the drop in pleural pressure brought on by the contraction of the intercostal muscles sucks upward. This is referred to as the respiratory or abdominal paradox.

Bimanual palpation, which involves placing one hand over the patient's chest and the other over the belly, is the most effective method of illustrating abdominal paradox.

Inspection of the chest and abdomen in the supine position may reveal paradoxical inward movement of the abdomen, indicative of respiratory muscle weakness.

Dysfunction of the diaphragm in COPD may lead to the development of various clinical signs such as abdominal paradox, Hoover's sign, and tripod position.

Chest Wall Paradox

It can be seen when there are multiple rib fractures allowing the affected segment to move independent of the rest of the chest (Flail Chest). The segment which is fractured moves inward instead of outward, and during exhalation, it moves outward instead of inward.

Q10. What are the accessory muscles of respiration?

Ans:

- Accessory muscles of respiration comprises of the sternocleidomastoid, scalene, trapezius, internal intercostal, and abdominal muscles.
- The usage of accessory muscles is an indicator of disease which is severe and is a marker of reduction of forced expiratory volume in 1 s (FEV_1) to 30% of normal or less.
- The clavicles are elevated by sternocleidomastoid activity, and a clavicle that moves upward by more than 5 mm is a useful indicator of severe obstruction and correlates with a FEV1 of 0.6 L.
- The scalene muscle is usually recruited prior to the sternomastoid muscles.

- Sternomastoids are typically recruited at times of increased ventilation, such as during exercise, and at very large lung volumes.[6]

Q11. What is purse lip breathing and its importance?

Ans: Purse lip breathing (PLB): COPD patients frequently adapt to the usage of the purse lip breathing pattern either spontaneously or as a component of a program of pulmonary rehabilitation.

Patients with PLB frequently exhale with pursed lips. PLB lowers the respiratory rate while exercising and at rest, prolongs exhalation, adds positive end expiratory pressure (keeps the airway patent during exhalation for a longer duration), enhances oxygenation and ventilation while lowering the quantity of carbon dioxide. By extending the expiration time, PLB lowers the respiratory rate.

Q12. What is Hoover's chest sign?

Ans: COPD patients, along with hyperinflation of the lungs may exhibit various abnormalities of chest wall movements, the most common being the paradoxical indrawing of the lateral rib cage (costal margin) known as the Hoover's sign.

Paradoxical movement of the lateral rib cage movement although present in both the upper and lower rib cage, but is seen more prominently on the lower rib cage.

Another phenomenon that can be seen in COPD patients is the anteroposterior ribcage paradox, where inspiratory indrawing of the lower sternum is seen.

It usually occurs with the lateral paradox during early phase of inspiration.

As the severity of airflow obstruction increases, the frequency of this sign also increases.

a. It was demonstrated in 36, 43, and 76% of patients with moderate, severe, and very severe COPD, respectively.

Hoover's sign, when compared to other signs of COPD such as wheeze, rhonchi, and reduced breath sounds, exhibits a good interobserver agreement with a kappa statistic of 0.74.

Inward pulling of the lateral rib cage by the flattening of diaphragm results in the development of Hoover's chest sign.[8–10]

Q13. What is the meaning of the tripod posture?

Ans:

- COPD patients often instinctively adopt a posture to relieve dyspnea in case of respiratory distress, which is known as tripod position.
- The patients sit and lean forward, with their outstretched hands placed on their knees in tripod position.
- This leaning forward position relieves dyspnea due to various mechanisms. The length tension relationship of accessory muscles (pectoralis major and minor) which are attached between the upper limb or shoulder girdle with the ribs is improved due to the lifting of shoulder girdle and fixation of position provided by the arm support.
- In COPD there is flattening of the diaphragm however the tripod position leads to compression of the abdominal contents and pushes the short flattened diaphragm upwards which leads to the restoration of the normal appearance of diaphragm which is dome-shaped.
- The diaphragm function is improved due to optimization of the relationship between length and tension of the diaphragm. The reduction in sternocleidomastoid and scalene muscle recruitment is also a mechanism by which tripod position relieves dyspnea.
- The thoracoabdominal movement is also improved with tripod position.

Q14. What is Campbell and Oliver's sign?

Ans: In patients having chronic airflow obstruction, such as patients with COPD, there is displacement of the trachea in the downward direction during the phase of inspiration. This sign is known as the Campbell sign, which must be differentiated from another sign known as Oliver's sign or the tracheal tug sign, which is seen in patients with an aortic aneurysm where the aortic pulsation is palpable through the trachea.

The depressed diaphragm is pulled downwards, resulting in the Campbell sign. It is best palpated by placing the tip of the index finger on the thyroid cartilage.[11]

Q15. What is the importance of a patient's odor in examination?

Ans:

- The smell may be a clue to habits or addictions.
- Tobacco leaf stains may be visible on teeth, lips, fingers, or clothing, and tobacco or cannabis smoke may leave a characteristic odor on hair and clothing.
- The odor of ethanol or other toxic alcohols may be detected on the breath, as is the odor of ketones during a diabetic crisis.
- Characteristic odors may also arise from certain infections, such as the foul smell of an anaerobic lung abscess, or the sweet smell of a skin and soft tissue infection caused by *Pseudomonas aeruginosa*.

Q16. What are the non-respiratory causes of changes in respiratory rate?

Ans:

- Tachypnea causes: Exertion, excitement, fever, pneumonia, acidosis, and anemia.
- Bradypnea causes: CNS depressant drugs, narcotic poisoning, brain tumor, and pain while breathing (pleurisy).
- Cushing's triad, a sign of increased intracranial pressure, consists of hypertension, bradycardia, and bradypnea or irregular respirations.
- Ratio between heart rate and respiratory rate, also called PRQ (pulse respiratory quotient): 4:1.

Q17. What is trail sign?

Ans: The sternal head of the sternocleidomastoid muscle becomes prominent due to the shifting of the trachea, with the prominence visible on the side where the trachea is shifted. This is known as the trail's sign.

The clavicular head of sternocleidomastoid bilaterally is enclosed by the pretracheal fascia.

With the shifting of trachea there is relaxation of the pretracheal fascia, which covers the sternocleidomastoid on the side where the trachea is shifted, leading to clavicular head becoming more prominent on the same side.

Q18. What are the conditions leading to mediastinum shift other than lung parenchymal and pleural conditions?

Ans: Mediastinum shift may occur in Scoliosis, in pectus excavatum, or in the enlargement of the left ventricle.

Q19. What are the causes of localized tenderness in the chest?

Ans: Local injury leads to rib fracture, e.g., cough fracture, inflammatory condition, intercostal muscle pain (myositis), costochondritis (Teitz syndrome—there is swelling also), metastatic deposit, herpes zoster, empyema.

Q20. Who was the first person to describe percussion?

Ans: Chest percussion was first described back in the year 1761 by Dr Josef Leopold Auenbrugger, who got the idea about percussion after seeing his father striking the barrels in order to determine the liquid level.

Q21. What is the Skodiac resonance?

Ans: A hyper-resonant note just below the clavicle or top of massive pleural effusion due to relaxed lung called Skodaic resonance.[12]

Q22. What should be smallest size of pathological lesion to detect a percussion note?

Ans: Lesions of the lung, which are situated 5–7 cm away from the chest wall or are less than 2–3 cm in diameter, are beyond the reach of conventional percussion.

Auscultatory percussion may be used to overcome this limitation.

It is done by tapping over the manubrium sterni lightly using the distal phalanx of one finger while simultaneously auscultating with a stethoscope over the posterior chest wall. A reduction in the amplitude is usually attributed to an abnormality of the lung.[13]

Point to Remember

- A stony dullness feeling when you percuss on a solid wall or the thigh.
- Tympany note is a drum-like resonance normally on stomach, intestine, trachea. You can also see in Pneumothorax, emphysema, superficial empty cavity.
- Bell typmpany: Tympanic sound heard over the chest in case of a large pneumothorax. To demonstrate need to place a silver coin on the affected side and percussed with another silver coin, the ear or stethoscope placed on the opposite of the chest may detect a clear bell-like sound resembling the sound of "hammer on an anvil."
- Remember the boundary of Kronig's isthmus.
- Clavicular percussion is performed by directly tapping on the middle part of the clavicle, tell about the pathology of the lung apex.
- Coin percussion, shifting dullness, and succussion splash can be seen in hydropneumothorax.

Q23. What are the characteristics of vesicular and bronchial breath sounds?

Ans: See Table 1

Whispering pectoriloquy is absolutely essential in case of doubt about the presence of bronchial breathing as whispering pectoriloquy is always present along with bronchial breath sound.[15]

Other Types of Breath Sound

- Bronchovesicular breath sound.
- It is an intermediary between the features of bronchial and vesicular breathing.
- Intensity as well as pitch of this sound is intermediate with similar duration of inspiratory and expiratory phases.
- This sound can be normally auscultated over the 1st and 2nd intercostal space in the anterior region and between the two scapulae in the interscapular region posteriorly.
- Interrupted or cogwheel breathing.
- Sometimes, there is interruption of the vesicular breath sound during the inspiratory phase and this is known as cogwheel breathing.
- For example, an enlarged mediastinal lymph node obstructing the bronchus or an aneurysm of the aorta, or during nervousness or fatigue.

Q24. What are the types of bronchial breath sounds?

Ans: There are three types of bronchial breath sounds

1. Tubular
- The pitch of this sound is high, and it is a subclass of bronchial breath sound.
- This is seen in cases such as pneumonia (consolidation), at the level above the level of pleural effusion, in pulmonary fibrosis, or in distal collapse, if the collapsed segment is in contact with the chest wall and the bronchus is patent. It can also be seen in a mediastinal tumor compressing over a large patent bronchus.

2. Amphoric
- It is a bronchial breath sound which is low in pitch, along with high pitch overtone.
- Character of this sound is metallic.
- This sound can be artificially produced through blowing over an empty glass or a clay jar's mouth.
- Meaning of the Greek word amphoreus is jar thereby justifying the name of this sound.
- It can be heard over a superficial cavity, which is large in size, measuring at least 5–6 cm in diameter, along with a patent bronchus, and it may also be present in a case of open pneumothorax.
- For this sound to be produced, a smooth wall is needed as it is a good reflector of sound.
- High-pitched overtones are heard due to the sound wave resonance inside the cavity wall or in the pleural cavity.
- A fungal ball or the presence of fluid within the cavity causes the amphoric breath sound to disappear.

3. Cavernous
- It is a low-pitched bronchial breath sound
- It was heard over an irregular, superficial, large cavity with a patent bronchus, an abscess, and a bronchiectatic cavity with a patent bronchus.

Q25. What is the significance of vocal resonance?

Ans:

- Vocal resonance or vocal sounds are produced in the larynx not like breath sound or added sound in the lungs.
- Formants are overtones containing a combination of both low and high frequencies that are present in vowel sounds.
- Usually, in a healthy individual, the speech is incomprehensible as the high frequencies are lost owing to the air-filled lungs, leading to the filtration of the sound.

Table 1: Depicts difference between the vesicular and breathing sound[14]

Vesicular breath sound	*Bronchial breath sound*
Soft, rustling in quality and low-pitched sound. The inspiratory phase is usually lengthier than the expiratory phase (I: E ratio 2:1 during tidal breathing). The intensity and pitch of the inspiratory phase are more than those of expiration. No pause between inspiration and expiration.	It is usually auscultated anteriorly over the manubrium and posteriorly in the region between the C7 and T3 vertebrae. It is high-pitched, loud, and hollow in quality. Expiratory phase is lengthier than the inspiratory phase, which leads to a change in the I:E ratio from normal 3:1 to 1:2. There is a gap between the inspiratory and expiratory phases due to the absence of the alveolar phase. Bronchial breath sound is accompanied by whispering pectoriloquy.

- In cases where the air inside the lungs is replaced by fluid or solid substances or when the alveoli undergo atelectasis, the transmission of these voice sounds is improved and becomes sharply differentiated.
- Transmitted speech can be classified into three categories, namely: egophony, bronchophony, and whispered pectoriloquy.
- Sounds with an increase in intensity and clarity are present in bronchophony.
- For whispered pectoriloquy to be elicited, the patient is asked to whisper words such as "one-two-three" or "ninety-nine" while the examiner auscultates simultaneously with a stethoscope. Usually, the words can only be heard faintly. However, in cases of consolidation where the air is replaced by solid substances, the sounds that are whispered are heard distinctly and with more clarity.
- The word "egophony" is derived from the word "ego" which means goat in the Greek language. It was initially described by Laënnec in the year 1816. For egophony to be elicited, the patient is asked to say the word "Ee," which gets converted to "A." Egophony is seen in patients with pleural effusion or consolidation.[16]

Q26. What is the difference between wheeze, rhonchi, crackles, and crepitus?

Ans:

- Crackles are divided into fine (previously called crepitus) and coarse type (previously called rales). Rhonchi is an older term for Wheeze.
- First, in 1957, Robertson classified additional sounds into two main categories: continuous and interrupted sounds. Continuous sounds were then classified further into two categories, i.e., high- and low-pitched wheeze. Interrupted sounds were further classified into three types, namely: coarse, medium, and fine crackles.[17] Eventually, the International Lung Sound Association in the year 1976 changed the terminology to simplify it: Discontinuous sound was classified into fine and coarse crackles, and continuous sounds were classified into wheeze and rhonchi.[18]
- According to the American Thoracic Society, wheeze has been defined as a high-pitched continuous sound having a frequency of 400 Hz or more, and rhonchi has been defined as low-pitched sounds that are continuous, having a frequency of 200 Hz or less.[19]
- Wheeze is generally louder in intensity than the breath sounds that are underlying and is usually audible at the open mouth or by auscultation over the trachea and sometimes at a short distance from the patient.
- Rhonchi are low-pitched sounds and are therefore best heard over the wall of the chest.
- Generation of wheeze occurs by the bronchial wall oscillation, which is due to the airflow, and pitch of the wheeze is dependent on the bronchial wall's mechanical properties.

Q.27. What are squeaks or squawks?

Ans: Squeaks, also called Squawks, are wheezes present in inspiration and are short in duration (less than 200 ms). Squawks can be found in cases of interstitial lung disease due to various etiologies, especially in cases of hypersensitivity pneumonitis. It can also be present in cases of pneumonias and bronchiolitis obliterans. The mechanism of production of squeaks is not completely understood; however, according to Forgacs, it is produced due to the peripheral airway oscillation, which is present in the lung zones that are deflated while their walls remain in contact for a longer duration of time and open up in late inspiration.

Q28. Define crackles and the mechanism of formation?

Ans:

Discontinuous adventitious lung sounds, which are explosive in nature and non-musical usually auscultated in the inspiratory phase and sometimes during expiration and are known as crackles.

Classification of crackles can be done based upon the duration of sound, its loudness, pitch, and timing of the respiratory cycle, along with the relationship with change in posture of the body or coughing (Table 2). It is also classified based on different phases of respiration (Table 3).

Small airways are the location for the production of fine crackles, whereas medium crackles are produced due to bubbling of the air through the mucus present in small bronchi and coarse crackles are produced in the large bronchi or in the bronchiectasis segments.

Table 2: Differences between fine and coarse crackles

Fine crackles	*Coarse crackles*
Auscultated in the mid to late phase of inspiration.	It can be auscultated during both the inspiratory and expiratory phases of respiration.
High pitched.	Low pitched.
A change in posture of the body leads to alteration; however, there is no alteration by coughing.	Alteration may occur due to coughing; however, posture change doesn't lead to any change.
They are not transmitted to the mouth.	It may transmit to the mouth.
Sudden opening of small airways during the phase of inspiration, which are collapsed during the expiratory phase, leads to the production of fine crackles.	Passage of gas through the airways, undergoing opening and closing intermittently, leads to the production of coarse crackles.

Table 3: Classification of crackles based on respiratory time and their causes

Timing	*Early inspiratory*	*Mid-inspiratory*	*Late-inspiratory*	*Pan-inspiratory*	*Expiratory*
Condition	COPD	ILD, Acute pneumonia (coarse type)	ILD (profuse at the end), resolution phase pneumonia (Fine type), heart failure	Bronchiectasis, heart failure	COPD, bronchiectasis, IPF

Mechanism: It was believed earlier that the crackles are produced due to the air passing through the large and medium-sized airways while they are filled with secretions, leading to the production of bubbling sounds.

However, the crackles that persist after coughing, which are seen in many patients and localized predominantly in the inspiratory phase, poses as a argument against this theory.[20]

Therefore, another theory for the production of crackles was proposed by Forgacs, which said that the small airways that collapsed during the phase of expiration are opened with a snap during the inspiratory phase as gas pressure gradient develops across these collapsed airways which leads to the production of sounds known as crackles.

The collapsed airways open with a snap, inducing a rapid equalization of gas pressures, which causes oscillations of the column of gas, leading to the production of crackles.[21]

Q29. What are the characteristics of pleural rub?

Ans: Pleural rub is a nonmusical sound, short in duration and explosive, grating, rubbing, creaky, or leathery in character, which can be auscultated during both inspiratory and expiratory phases of respiration. The component of the expiratory phase mirrors the inspiratory component.

The mechanism of the pleural rub has been postulated as the rubbing of the pleural surface against itself after it becomes inflamed during respiration. It is important to differentiate pleural rub from crackles in clinical examination.

Q30. What is tidal percussion?

Ans: Tidal percussion is a way to assess the diaphragm movement by percussing the chest during tidal breathing. We start from the infraclavicular region and keep percussing till liver dullness is reached. At this time, the patient is asked to take a deep breath, and we percuss to see if the area with liver dullness has become resonant. This shift of the liver dulless suggests that the diaphragm has moved down with respiration and suggests a likely normal diaphragm function.

Important Sign to Remember

Coin test: It is usually performed in patients with pneumothorax, a large bulla, or in hydropneumothorax.

The patient should be either in a sitting or standing posture. A metallic coin is placed horizontally against the chest just beneath the clavicle's midpoint, and the coin is struck with another coin's edge. The diaphragm of the stethoscope is placed at the same point on the back. The coin test is deemed to be positive if a high-pitched metallic bell-like sound is heard with the help of a stethoscope, which is placed at the back.

Scratch sign test: The scratch sign is a positive sign seen in pneumothorax. It can be done while sitting or in a supine posture. The diaphragm of the stethoscope is placed at the sternum midpoint and the chest wall surface. The skin is lightly scratched with a fingernail, and auscultation is done to differentiate sounds between the pathological side and the normal side. The sound auscultated is louder in intensity when the side of the pneumothorax is scratched.

Succussion splash: It is also called the Hippocratic succussion. This sign is detected in cases of hydro- or pyo-pneumothorax. It is also seen sometimes in cases of herniation of stomach or intestine through the diaphragm, and a large cavity containing air and fluid in the lungs.

The site that contains the air along with fluid is selected with the help of percussion and the stethoscope is placed on the pathological side. The patient is then shaken by the clinician side to side. On auscultation a sound which is splashing-like is heard which can also be heard sometimes by an unaided ear.

Hamman's sign: Louis Hamman was the first to describe Hamman's sign back in the year 1939. This can be produced in patients with pneumomediastinum and pneumothorax, particularly in cases of left-sided pneumothorax. It is also known by the name of mediastinal crunch. A crunching, crackling sound is auscultated over the 3rd to 5th intercostal space over the precordium, which is synchronized with the heartbeat. Hamman's sign is diagnostic of pneumomediastinum and is more sensitive for diagnosing pneumomediastinum when compared to chest X-ray; however, it can be seen only in 20% of the cases.

D'Espine's sign: D'Espine's Sign is one of the earliest clinical findings that can be elicited in cases of tracheobronchial lymph node enlargement and was first described by a French physician named Jean Henri Adolphe D'Espine, by noting that in some cases a whispered sound may be auscultated over the spinous process of upper thoracic vertebrae.

Normally, the sound auscultated over the spine is less intense than the vesicular breath sounds heard at the same level on both sides of the spine. The D'Espine's sign is described to be positive when the breath sound which is auscultated over the vertebrae is louder than the corresponding lung sounds auscultated bilaterally at the same level.

A positive D'Espine's sign indicates the presence of a posterior mediastinal mass, for example presence of an enlarged lymph node.

Dahl sign: Patches of hyperpigmentation or bruising above the knee are found in COPD caused by the constant 'tenting' position of hands or elbows.

Litten's sign: This is also called the diaphragm phenomenon, demonstrated during percussion. It refers to a loss of diaphragmatic movement on one side, indicating a paralyzed hemidiaphragm. This sign elicits a sound produced during percussion in the lower intercostal spaces between expiration and inspiration.[22]

Conclusion

Residents need to do an honest practice of various methods to elicit even a subtle finding. It is very important to examine a patient as a short case without a history and imaging to master respiratory examination. Respiratory assessment includes interpretation of vital signs; inspection of the patient's breathing pattern, skin color, and respiratory status; palpation, percussion to identify anatomical & pathological lung abnormalities. Diagnosis always includes pathological lesion, location, etiology, any complications, and comorbidities, for example, consolidation of the right upper lobe, pneumonia, with pleural effusion (severity mentioned), with diabetes and CKD.

Orcid

Deependra Kumar Rai https://orcid.org/0000-0001-9090-8124
Agam Vora https://orcid.org/0000-0002-9632-1807
Pranav Ish https://orcid.org/0000-0003-1701-4970
Saurabh Mittal https://orcid.org/0000-0002-7979-6405

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