

JoVE: Science Education
Respiratory Exam I: Inspection and Palpation
--Manuscript Draft--

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Clinical Skills Education Title

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Overview

Disorders of the respiratory system with a chief complaint of shortness of breath are among the most common reasons for both outpatient and inpatient evaluation. The most obvious visible clue to a respiratory problem will be whether the patient is displaying any signs of respiratory distress, such as fast respiratory rate and/or cyanosis. In a clinical situation, this will always require emergent attention and oxygen therapy.

Unlike pathology in other body systems, many pulmonary disorders, including Chronic Obstructive Pulmonary Disease (COPD), asthma, and pneumonia, can be diagnosed by careful clinical examination alone. This starts with a comprehensive inspection and palpation. Keep in mind that in non-emergency situations the patient's complete history will have already been taken, gaining important clues as to their smoking and other exposure history that could give rise to specific lung disease. This history can then confirm physical findings as the examination is performed.

Procedure

1. Preparation for exam

1.1 Before examining the patient, wash hands thoroughly with soap and water or clean them with antibacterial wash.

1.2. Explain to the patient that you are going to perform a lung examination.

2. Positioning the patient

2.1. Make sure the patient is undressed down to their waist (females keeping on underwear and exposing each hemithorax one at a time).

2.2. Position the patient on the examination table at a 30-45 degree angle and approach them from their right side. Examining the posterior of the lung requires that the patient be leaning forward or sitting on the edge of the bed.

3. General observation

Have a general look at the patient first. By this time, the patient's vital signs should have already been obtained. Pay particular attention to their respiratory rate and oxygen saturation.

3.1 Note the signs of obvious respiratory distress. These include:

- Fast respiratory rate (normal respiratory rate is around 14-20 breaths per minute)

- Cyanosis (blue or purple coloration of the skin or mucous membranes)
- Unusual posturing to maximize air entry (patient may lean forward on outstretched arms (tripod position))
- Breathing using accessory muscles (scalene, sternocleidomastoid, and trapezius muscles) in addition to the diaphragm
- Inward movement of intercostal muscles (intercostal retractions)

3.2 Note if the patient is coughing. If the patient is producing sputum, this can also provide an important diagnostic clue that there is an underlying respiratory infection.

3.3 Note if the patient's voice sounds hoarse when they speak. A hoarse voice may be a sign of upper airway inflammation, infection, or malignancy.

3.4 Note if wheezing is present.

3.5 Observe carefully for any other specific abnormal breathing patterns.

4. Peripheral examination

A lot of diagnostic information can be gained from a thorough peripheral examination.

4.1 Hand examination.

4.1.1 Assess for flapping tremor (asterixis, sometimes caused by carbon dioxide retention). Note that a patient can also exhibit tremors if they've just received bronchodilator therapy.

4.1.1.1 Ask the patient to stretch out their arms and extend the wrists.

4.1.1.2 Note if the tremor is present.

4.1.2 Note if nicotine staining on the nails is present.

4.1.3 Assess for clubbing (a decrease in angle between the nail and nail bed). Clubbing can be a sign of pulmonary fibrosis, cystic fibrosis, or bronchogenic carcinoma.

4.1.3.1 Ask the patient to put their two thumbnails side-by-side.

4.1.3.2 Note if a diamond-shape is formed on the inside. If clubbing is present, this doesn't happen.

4.2 **Examine the skin** for erythema nodosum (red, painful, tender lumps or nodules associated with sarcoidosis).

4.3. **Palpate the radial pulse** at the wrist. A bounding or abnormally strong pulse can be a sign of carbon dioxide retention.

4.4. Head examination.

4.4.1 Inspect for a facial flushing, a potential indication of carbon dioxide retention.

4.4.2 Inspect the nose for nasal polyps or evidence of epistaxis. Ask the patient to tilt their head upwards and look into each nostril, using a flashlight.

4.4.3 Inspect the mouth.

4.4.3.1 Ask the patient to open their mouth and stick out their tongue. The color of the tongue should be pink/red. If it is a bluish discoloration, this indicates central cyanosis.

4.4.3.2 Inspect the throat for pharyngitis or tonsillar inflammation.

4.4.3.2.1 Ask the patient to phonate by saying, "Ahhhhh".

4.4.3.2.2 Use a flashlight and look at the back of their throat.

4.4.3.2.3 Use a tongue depressor to get a good view of the back of the mouth.

4.4.4 Observe patient's face for the signs of Horner's syndrome (the triad of miosis (constricted pupil), ptosis, and hemifacial anhidrosis (decreased sweating on that side of the face)). Horner's syndrome can be caused by brachial plexus compression from a Pancoast (apical lung) tumor.

4.5. Assess for lymphadenopathy.

4.5.1 Palpate the cervical lymph nodes (Figure 1) with both hands, one on each side of the patient's face.

4.5.2 Start at the preauricular glands and then work down, palpating with the ends of your fingers: jugulodigastric, submandibular, submental, anterior cervical, supraclavicular, posterior cervical, posterior auricular, occipital lymph nodes.

4.5.3 Assess for axillary lymphadenopathy by holding the patient's arm near the elbow with one hand and palpating in the axilla with your other hand.

5. Chest inspection

5.1 Inspect the chest wall for scars that would be evidence of a prior thoracotomy.

5.2 Inspect for any visible chest deformities (Figure 2). Look for pectus excavatum (sunken or caved-in chest, usually congenital) versus pectus carinatum (a protruding or

“pigeon” chest, again usually congenital). A “barrel” chest is a bulging chest with an abnormal increase in anteroposterior diameter and decreased movement in respiration, observed in COPD and emphysema.

5.3 Note if kyphoscoliosis (Figure 2), an outward and lateral curvature of the spine which can impair respiration, is present.

5.4 Note if the chest movements are symmetrical with equal expansion of both hemithoraces.

6. Palpation

6.1 Palpate the trachea.

6.1.1 Position yourself in front of the patient.

6.1.2 Place your right index finger in the sternal notch.

6.1.3 Palpate the lateral borders of the trachea to determine if it is in normal (midline) position. A deviated trachea can indicate lung pathology either away or towards the side of deviation. The trachea will be deviated away from the side of an effusion or lung mass, and towards the side of a pneumothorax, collapsed lung, or atelectasis.

6.2. Palpate the chest wall.

6.2.1 Use the palm of your right or left hand to assess for any obvious point tenderness, masses, or rib deformities.

6.2.2 Palpate at 4-5 levels up the chest anteriorly and posteriorly. Any differences between right and left can indicate abnormal underlying lung tissue.

6.2.3 Note any evidence of subcutaneous emphysema, which feels like a crackly tactility under the skin. This is observed when air gets into the subcutaneous tissues, and is associated with lung collapse secondary to trauma or a ruptured bronchial tube.

6.3 Assess chest expansion.

6.3.1 Place your hands, with thumbs touching, in the midline and extend your fingers to make contact with the lateral edges of the chest anteriorly, just below the level of the nipples.

6.3.2 Ask the patient to take a deep breath. The thumbs should separate by approximately 5 cm or more in normal chest expansion (this technique can also be utilized posteriorly).

6.4 Assess tactile vocal fremitus. Typically, tactile vocal fremitus is increased over areas of consolidation and decreased over pleural effusion in the case of lung collapse.

6.4.1 Place your hands at the lower anterior part of the chest with the hypothenar (ulnar) sides of each hand touching the chest at the same level on the right and left.

6.4.2 Ask the patient to say "99" or "1-2-1". The vibration felt against your hand should be the same in each hand.

Summary

Look first and foremost for any signs of respiratory distress in a patient and their unique breathing pattern. Severe underlying pulmonary illnesses will often be apparent from simply glancing at patients. Conditions such as COPD and emphysema can reveal themselves in a patient's appearance and body habitus. These patients can loosely be classified as either "pink puffers" or "blue bloaters". "Pink puffers" are usually thin and have emphysema. They have a hyperinflated chest, usually have a fast respiratory rate in order to maintain their oxygen saturations, and are mildly hypoxemic. "Blue bloaters" are obese and more severely hypoxic, relying on hypoxia for their respiratory drive. They typically have COPD and carbon dioxide retention with signs of heart failure.

Remember that crucial diagnostic clues will be provided by simply listening during the process of inspection and palpation (without using a stethoscope). For instance, if a patient sounds hoarse, congested, wheezy, or is coughing, this can give a pointer towards the diagnosis in many cases. Palpation will then confirm what has already been found through careful visual inspection. Lymphadenopathy can indicate a respiratory tract infection and decreased chest expansion is a sign of chronic underlying lung disease. Take the time to go through this entire process on every patient during your examination.

Figures and legends.

Figure 1. Anatomy of the cervical lymph nodes.
A cartoon showing positions of lymph nodes.

Figure 2. Common chest deformities

From left to right: A normal, healthy chest; Pectus Excavatum (depression of the lower portion of sternum); Pectus carinatum (increased anteroposterior chest diameter, anteriorly displaced sternum, and depression of the costal cartilages); Barrel chest (increased anteroposterior diameter); Thoracic kyphoscoliosis (abnormal spinal curvatures and vertebral rotation).

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5.1 Inspect the chest wall for scars that would be evidence of a prior thoracotomy.

5.2 Inspect the chest shape and look for any visible chest deformities. The anteroposterior diameter of the chest is normally smaller than its lateral diameter

Comment [AK1]: This is a detailed figure with multiple labels. The intentions with it are not completely clear. Do we only show cervical nodes here? The subsequent steps discuss other nodes also present in this figure. Does it not relate to these steps as well?

Comment [AS2]: The figure from shutterstock that Dr Dhand chose has only cervical and head lymph nodes (as in step 4.5.2). It is not the best image, of course, but the alternatives are not much better either. Dr Dhand suggested to illustrate this point, but I leave it for you to decide.

(Figure 2). A “barrel” chest (Figure 3) is a bulging chest with an abnormal increase in anteroposterior diameter and decreased movement in respiration, observed in COPD and emphysema. Also look for pectus excavatum (Figure 4) (sunken or caved-in chest, usually congenital) versus pectus carinatum (Figure 5) (a protruding or “pigeon” chest, again, usually congenital).

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Figures and legends.

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A cartoon showing positions of lymph nodes.

Figure 2. Thorax of a normal adult.

A transverse section of a thorax (left); a torso (right). The anteroposterior chest diameter is smaller than lateral diameter.

Figure 3. Barrel chest

A transverse section of thorax (left); a torso (right) with signs of barrel chest (increased anteroposterior diameter)

Figure 4. Pectus excavatum (Funnel chest)

A transverse section of thorax (left); a torso (right) with signs of pectus excavatum (depression of the lower portion of sternum)

Figure 5 Pectus carinatum (Pigeon chest)

A transverse section of thorax (left); a torso (right) with signs of pectus carinatum (increased anteroposterior chest diameter, anteriorly displaced sternum, and depression of the costal cartilages)

Figure 6. Thoracic kyphoscoliosis

A transverse section of thorax (left); a torso (right) with signs of kyphoscoliosis (abnormal spinal curvatures and vertebral rotation).

Figure 2. Common chest deformities

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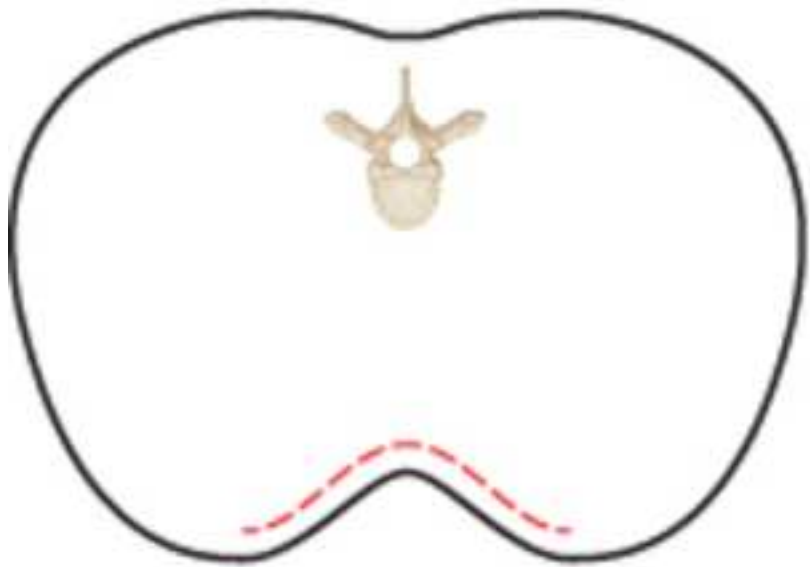
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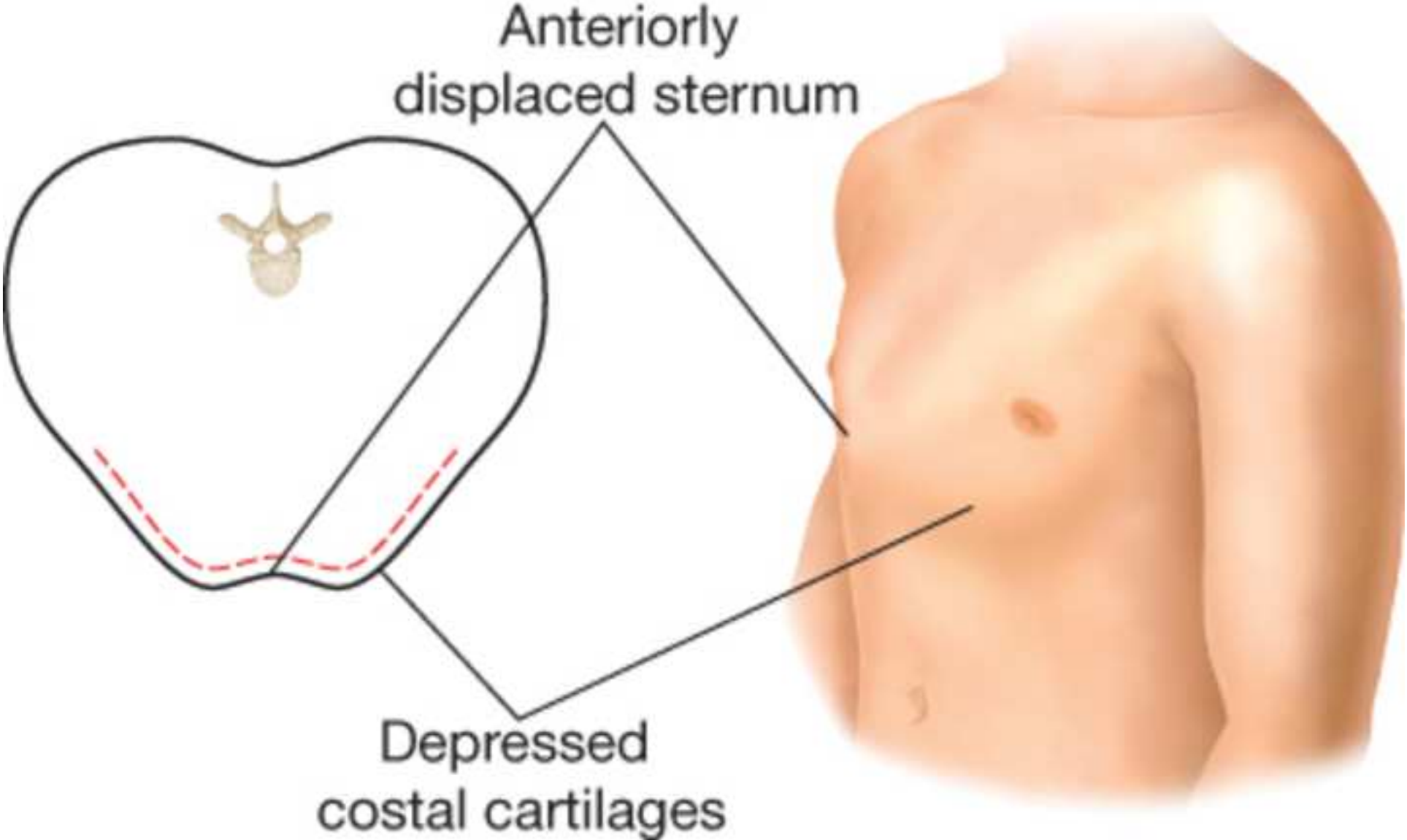
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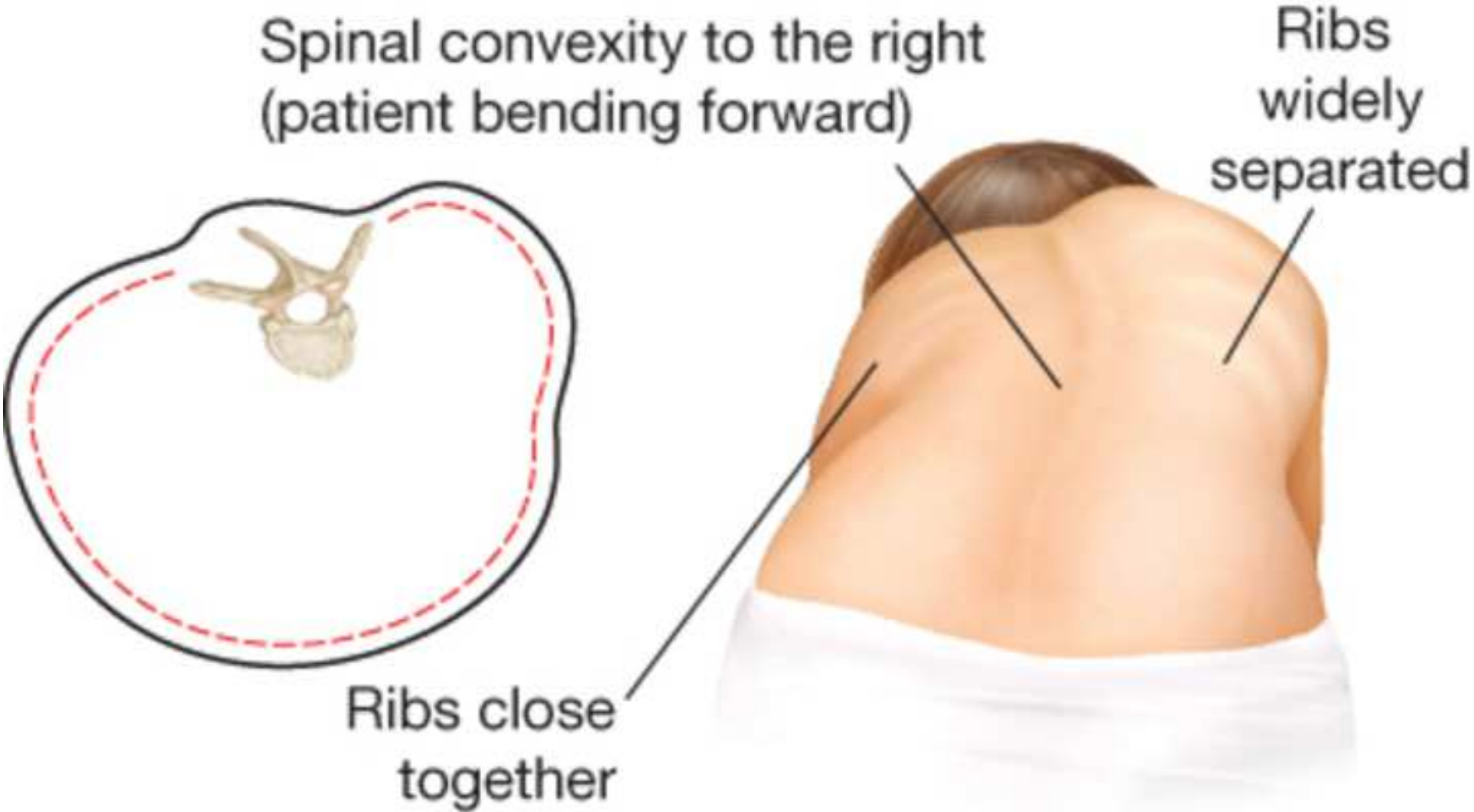
Comment [AK4]: These will have to count as five figures, despite the request for them to be consolidated into a single











Lymph nodes of the neck and head

