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Excerpt

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Module 1

Chest and cardiovascular

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1. Regarding the imaging modalities of the chest:

- (a) High resolution computed tomography (HRCT) uses a slice thickness of 4–6 mm to identify mass lesions in the lung.
- (b) Spiral CT ensures that no portion of the chest is missed due to variable inspiratory effort.
- (c) MRI shows excellent detail of the lung anatomy.
- (d) Bronchography is the technique of choice to visualize the bronchial tree
- (e) CT pulmonary angiography (CTPA) is performed using catheters placed in a femoral vein.

2. Regarding the development of the lung:

- (a) The tracheobronchial groove appears on the ventral aspect of the caudal end of the pharynx.
- (b) The primary bronchial buds develop from the tracheobronchial diverticulum.
- (c) The epithelium lining the alveoli is the same before and after birth.
- (d) A persistent tracheo-oesophageal fistula (TOF) is commonly associated with an atresia of the duodenum.
- (e) Uni-lateral pulmonary hypoplasia is usually due to a congenital diaphragmatic hernia.

3. Regarding the blood supply to the chest wall:

- (a) The posterior intercostal arteries supply the 11 intercostal spaces.
- (b) The internal thoracic artery arises from the subclavian artery and supplies the upper six intercostal spaces.
- (c) The neurovascular bundle passes around the chest wall in the subcostal groove deep to the internal intercostal muscle.

Chest and cardiovascular

ANSWERS

1.

- (a) False – HRCT uses 1–2 mm slice thickness and a high resolution computer algorithm to show fine detail of the lung parenchyma, pleura and tracheobronchial tree. It is not used to delineate masses in the lung.
- (b) True
- (c) False – currently MRI is a poor technique for showing lung detail. It allows visualisation of the chest wall, heart, mediastinal and hilar structures.
- (d) False – this invasive technique has largely been superseded by HRCT.
- (e) False – CTPA is performed to diagnose major pulmonary emboli using a cannula placed in any peripheral vein and is relatively non-invasive compared to conventional pulmonary angiography.

2.

- (a) True
- (b) True – the bronchial buds differentiate into bronchi in each lung.
- (c) False – during embryonic life the alveoli is lined by cuboidal epithelium that lines the rest of the respiratory tract. When respiration commences at birth the transfer to the flattened pavement epithelium of the alveoli is accomplished.
- (d) False – TOF indicates the close developmental relationship between the foregut and the respiratory passages. It is usually associated with an atresia of the oesophagus and the fistula is situated below the atretic segment.
- (e) True

3.

- (a) False – there are usually nine pairs of posterior arteries from the postero-lateral margin of the thoracic aorta, distributed to the lower nine intercostal spaces. The first and second spaces are supplied by the superior intercostal artery, branches of the costocervical trunk from the subclavian artery.
- (b) True
- (c) True

4 Module 1: Chest and cardiovascular

- (d) The intercostal spaces are drained by two anterior veins and a single posterior intercostal vein.
- (e) The posterior intercostal vein drains into the internal thoracic vein.

4. Regarding the azygos venous system:

- (a) The azygos vein at the level of the fourth thoracic vertebra arches over the root of the right lung to end in the superior vena cava (SVC).
- (b) About 10% of the population have an azygos lobe.
- (c) The thoracic duct and aorta are to the right of the azygos vein.
- (d) The second, third and fourth intercostal spaces on the right, drain via the right superior intercostal vein into the azygos vein.
- (e) In congenital absence of IVC the azygos vein enlarges.

5. Regarding the hemiazygos and accessory hemiazygos venous systems:

- (a) The hemiazygos vein at the level of the fourth thoracic vertebra crosses the vertebral column behind the aorta, oesophagus and thoracic duct.
- (b) The ascending lumbar veins and the lower three posterior intercostal veins are the tributaries of the hemiazygos vein.
- (c) The accessory hemiazygos vein receives the fourth to the eighth intercostal veins on the left.
- (d) The accessory hemiazygos vein may drain into the left brachiocephalic vein.
- (e) The first posterior intercostal vein may drain into the corresponding vertebral vein.

6. Regarding the airways:

- (a) In adults the right main-stem bronchus is steeper than the left.
- (b) The left main bronchus is about twice as long as the right.
- (c) The bronchioles contain cartilage.
- (d) Gas exchange takes place in the terminal bronchioles and acini.
- (e) The bronchopulmonary segments are based on the pulmonary arterial system.

5 Module 1: Chest and cardiovascular

- (d) True
- (e) False – posterior intercostal veins drain into the brachiocephalic vein and azygos system. The anterior veins drain into the musculo-phrenic and internal thoracic veins.

4.

- (a) True
- (b) False – in 1% of the population, the azygos vein traverses the lung before entering the SVC resulting in the azygos fissure. The azygos ‘lobe’ is not a true segment.
- (c) False – they are to its left.
- (d) True – hemiazygos, accessory hemiazygos, oesophageal, mediastinal, pericardial and right bronchial veins drain into the azygos system.
- (e) True – in the azygos continuation of the IVC, the azygos is a large structure, but otherwise the anatomy is unaltered. This may be confused with a mediastinal mass.

5.

- (a) False – at the level of T8.
- (b) True – and subcostal veins of the left side, some mediastinal and oesophageal veins.
- (c) True – sometimes the bronchial veins.
- (d) True – through the left superior intercostal vein. It may join the hemiazygos and/or drain into the azygos vein at the level of T7.
- (e) True – or the corresponding brachiocephalic vein.

6.

- (a) True
- (b) True
- (c) False – after 6 to 20 divisions the segmental bronchi no longer contain cartilage in their walls and become bronchioles.
- (d) False – the terminal bronchiole is the last of the purely conducting airways, beyond which are the gas-exchange units of the lung – the acini.
- (e) False – based on the divisions of the bronchi.

6 Module 1: Chest and cardiovascular

7. Regarding the secondary pulmonary lobule:

- (a) It consists of approximately ten acini.
- (b) The lobular vein follows the branches of the bronchioles.
- (c) Lymph drainage is both interlobular and central along the arteries.
- (d) Lobules are best demonstrated nearer to the hilum of the lung on CT.
- (e) The interlobular septa are seen usually on conventional CT.

8. Regarding the pulmonary blood vessels:

- (a) The bronchovascular bundle of the secondary pulmonary lobule is demonstrated as a rounded density about 1 cm away from the pleural border on axial CT.
- (b) The inferior pulmonary veins draining the lower lobes are more vertical than the lower lobe arteries.
- (c) The upper lobe veins lie lateral to the arteries.
- (d) In a frontal chest radiograph the artery and bronchus of the anterior segment of the upper lobes are frequently seen end-on.
- (e) The left pulmonary artery passes anterior to the left main bronchus.

9. Regarding the pleura:

- (a) The parietal pleura is continuous with the visceral pleura at the hilum.
- (b) On a PA radiograph the pleura is seen in the costophrenic sulcus.
- (c) The parietal pleura is supplied by the pulmonary circulation.
- (d) The fissures usually contain a layer of parietal and visceral pleura.
- (e) The intercostal stripe is seen on axial CT as a linear opacity of soft tissue density at the intercostal space.

10. Regarding the fissures of the lung:

- (a) Complete fissures may be crossed by small bronchovascular structures seen on HRCT.
- (b) The oblique fissure separates the upper and lower lobes from the middle lobe on the right.

7 **Module 1: Chest and cardiovascular**

7.

- (a) True – acini are 8–20 mm in diameter and consists of respiratory bronchioles, alveolar ducts and alveoli.
- (b) False – the lobular artery follows the branches of the bronchioles. Peripheral veins drain the lobule and run along the interlobular septum.
- (c) True
- (d) False – lobules are surrounded by connective tissue septa which contain veins and lymphatic vessels, in the lung periphery. Therefore they are best demonstrated in the periphery of the lung.
- (e) False – they can just be appreciated on HRCT.

8.

- (a) True
- (b) False – the opposite is true.
- (c) True
- (d) True
- (e) False – it arches over the left main bronchus and left upper lobe bronchus to descend postero-lateral to the left lower lobe bronchus.

9.

- (a) True – and in the inferior pulmonary ligament.
- (b) False – the visceral pleura can be seen on a plain radiograph only where it invaginates the lung to form fissures and at the junctional lines.
- (c) False – the parietal pleura is supplied by the systemic circulation, and the visceral pleura is supplied by the pulmonary and bronchial circulation.
- (d) False – only two layers of visceral pleura.
- (e) True – two layers of pleura, extrapleural fat, innermost intercostal muscle and endothoracic fascia.

10.

- (a) False – incomplete fissures have parenchymal fusion and small bronchovascular structures.
- (b) False – the oblique fissure separates the upper and middle lobes from the lower lobe on the right.

8 Module 1: Chest and cardiovascular

- (c) The lateral and medial portion of the oblique fissure are equidistant from the anterior chest wall.
- (d) The major fissures appear as a soft tissue linear density from the hilum to the chest wall on standard 10 mm thick CT sections.
- (e) The minor fissure separates the right middle lobe from the right lower lobe.

11. Regarding the accessory fissures of the lung:

- (a) The azygos fissure results from failure of normal migration of the azygos vein from the chest wall through the lung.
- (b) The inferior accessory fissure separates the medial basal segment from the rest of the right lower lobe.
- (c) The superior accessory fissure lies above the minor fissure.
- (d) A left minor fissure is seen in 10% of frontal radiographs.
- (e) The inferior pulmonary ligaments are pleural reflections from the pericardium.

12. Regarding blood supply of the lung:

- (a) The left bronchial artery arises from the right bronchial artery.
- (b) The deep bronchial veins may end in the left atrium.
- (c) The right and left pulmonary arteries are at the same height in the chest.
- (d) The right upper lobe pulmonary artery is anterior to the right upper lobe bronchus.
- (e) The veins of the upper lobe are posterior to the arteries and bronchi.

9 Module 1: Chest and cardiovascular

- (c) False – the oblique fissures follow a gently curving plane. The upper portion faces forward and laterally and the lower portion forwards and medially.
- (d) False – the most common appearance is a curvilinear avascular band extending from the hilum to the chest wall, reflecting the lack of vessels in the subcortical zone of the lung. On HRCT, the major fissure appears as a line or a band.
- (e) False – the minor fissure separates the anterior segment of the right upper lobe from the right middle lobe.

11.

- (a) True – almost always on the right, rarely an analogous fissure may be seen on the left with the accessory hemiazygos or left superior intercostal vein.
- (b) True – runs upward and medially towards the hilum, from the medial aspect of the diaphragm.
- (c) False – superior accessory fissure separates the superior segment of the lower lobe from the basal segments and is inferior to the minor fissure on the frontal radiograph.
- (d) False – left minor fissure seen in 10% of individuals is hardly seen on frontal or lateral radiographs. It separates the lingular segments from the rest of the upper lobe.
- (e) False – they are pleural reflections that hang down from the hila and from the mediastinal surface of each lower lobe to the mediastinum and to the medial part of the diaphragm.

12.

- (a) False – bronchial arteries are variable. Usually the right bronchial artery arises from the third posterior intercostal artery or from the upper left bronchial artery. The left bronchial arteries are two in number and arise from the thoracic aorta.
- (b) True – the deep bronchial veins communicate freely with the pulmonary veins, end in a pulmonary vein or left atrium. The superficial bronchial veins drain extrapulmonary bronchi, visceral pleura and hilar lymph nodes, end on the right side into the azygos vein and on the left into the left superior intercostal vein or the accessory hemiazygos vein.
- (c) False – the left pulmonary artery is higher than the left as it arches over the left main bronchus and descends posterior to it.
- (d) True
- (e) False – the veins of the upper lobe are anterior to the arteries and bronchi.

10 Module 1: Chest and cardiovascular

13. In the chest:

- (a) Air in the oesophagus on axial CT usually indicates a dilated abnormal oesophagus.
- (b) On T₂-W MRI the oesophagus shows similar intensity to skeletal muscle.
- (c) The thoracic duct transports all of the body lymph into the great veins of the neck.
- (d) The thoracic duct is mostly a single structure as it runs from the cisterna chyli.
- (e) The thoracic duct crosses from the left to the right at the level of T4.

14. Regarding the mediastinal blood vessels:

- (a) The three major aortic branches from right to left are the innominate, left common carotid and left subclavian arteries.
- (b) In approximately 0.5% of the population the right subclavian artery arises distal to the left subclavian artery.
- (c) The left brachiocephalic vein is anterior to the subclavian, common carotid arteries and trachea.
- (d) The internal thoracic veins empty into the corresponding subclavian veins.
- (e) The left SVC results from a persistent left cardinal vein.

15. Regarding the mediastinal spaces:

- (a) The pretracheal space is bounded anteriorly by the anterior junctional line.
- (b) The aortopulmonary window is above the aortic arch.
- (c) The aortopulmonary window contains the ligamentum arteriosum and the left recurrent laryngeal nerve.
- (d) The azygo-oesophageal recess lies behind the subcarinal space.
- (e) The right paratracheal stripe extends down as far as the right tracheobronchial angle.