

## Inhaled Foreign Body - trachea

**Price inquiry:** +48 605999769, [kontakt@openmedis.pl](mailto:kontakt@openmedis.pl)

Product code: AM02751



### Clinical History

A 57-year old male presented with a 3-week history of cough and pleuritic left sided chest pain. Chest x-ray showed left upper lobe collapse with large left sided pleural effusion. Pleurodesis aspirated frank pus from the pleural cavity. He later died despite pleural drainage and antibiotic treatment.

### Pathology

This specimen shows the lower trachea and main bronchi. These have been cut open and the left upper lobe has been sliced to display the cut surface. At the point of origin of the left upper lobe bronchus there is an impacted foreign body; an inhaled rabbit vertebra! As a result of the obstruction, the upper lobe has collapsed, pneumonia has developed and the pleural surface is covered by fibrinous exudate. This is an inhaled foreign body with associated collapse and pneumonic consolidation of the left upper lobe and empyema.

### Further Information

Inhalation of a foreign body or foreign body aspiration (FBA) occurs when a foreign body is inhaled into the airway causing partial or complete obstruction of the airway. This can potentially be fatal. It is more common in children than adults. It is a leading cause of accidental death worldwide. FBA poses greatest risk of death to those less than 1-year old and patients over 75 years of age.

Risk factors for FBA in adults include decreased level of consciousness, drug or alcohol intoxication, or anaesthesia. In the elderly additional risk factors include medication use (impairing cough and swallowing), stroke-related dysphagia, and degenerative neurologic diseases, such as Alzheimer's or Parkinson's disease. In adults, the most commonly aspirated foreign bodies include inorganic items (e.g. nails, pins, dental debris) and organic material (e.g. bones, improperly chewed meat, and watermelon seeds). Symptoms on presentation vary depending on the degree of airway obstruction caused. Larger obstruction may present as choking or sudden asphyxia. Smaller foreign bodies may present with more insidious symptoms such as cough, dyspnoea, fevers, chest pain and haemoptysis. Airway collapse distal to the foreign body will lead to infection. Treatment involves retrieval of the foreign body with bronchoscopy or emergency tracheostomy.

## Lung - Staphylococcus aureus Abscesses

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Product code: AM02762



### Clinical History

A 55-year old female presents with severe dyspnoea, a productive cough and oral candidiasis. She is immunosuppressed with a history of rheumatoid arthritis being treated with steroids and cyclophosphamide. Sputum cultures grew staphylococcus aureus. She was commenced on appropriate therapy but died shortly after admission.

### Pathology

The right lung has been bisected. There are multiple irregular abscess cavities visible. The largest of these, in the apex of the lower lobe, measures 4 x 3 cm in diameter. At the apex of the upper lobe, there is another irregular abscess cavity which is less obvious, approximately 3 x 2 cm in diameter surrounded by a zone of consolidation. A number of small abscesses are also seen. Patchy consolidation is present in the middle lobe. Numerous bronchi contain and are obstructed by plugs of pus. Cultures taken from the specimen grew Staph. aureus. This is an example of multiple Staphylococcal lung abscesses in an immunosuppressed patient.

### Further Information

Staphylococcus aureus is a gram-positive coccus. It is part of the microbiota of the human body usually found on the skin or upper respiratory tract. It is usually commensal but may cause opportunistic infections such as skin infections commonly or less frequently, pneumonia and endocarditis. It can cause both community and hospital-acquired pneumonia. Hospital-acquired Staph pneumonia is most commonly associated with intubation and prolonged admissions. Prevalence of hospital acquired pneumonia caused by MethicillinResistant Staph Aureus (MRSA) is increasing.

It is an important cause of secondary bacterial pneumonia in patients following viral respiratory infection e.g. post influenza infection. Intravenous drug users have an increased risk of developing 'metastatic' Staph. aureus pneumonia and endocarditis, as a result of staph bacteraemia caused by the use of dirty needles. Staph. aureus pneumonia is severe and associated with an increased rate of complications, such as ca vitating abscess formation and empyema.

Staph Aureus pneumonia should be suspected in any of the highrisk groups above as well as patients with pneumonia with rapid deterioration, haemoptysis, early multilobar pneumonia on X-ray, pulmonary cavitation or disseminated intravascular coagulation. First line treatment for Staph. aureus pneumonia is penicillin antibiotics, such as flucloxacillin. Staph aureus resistance to penicillin is very common with penicillinase production e.g MRSA. MRSA is treated with glycopeptide antibiotics, such as vancomycin, or oxazolidinone antibiotics, such as linezolid.

## Thorax with Heart and Vessels

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Product code: AM02695



The superior thoracic aperture contains structures emerging from the thorax and entering the head and neck and upper limb. In this specimen, both clavicles, key venous structures and other musculature have been removed. Despite this, other important components of anatomy can be observed. Key structures include the Trachea seen most superiorly with a thick ring of cartilage, rib one has been exposed prior to meeting its costal cartilage, travelling in a lateral to medial direction and the anterior scalene muscle inserting into Rib one superiorly.

In regards to the blood supply, The right subclavian can be seen superior to rib one, giving off the thyrocervical trunk to supply the neck, the left subclavian can also be seen superior to rib one, giving off the suprascapular artery and both the left and right common carotid can be seen superiorly with the left also containing a clear left vagus nerve.

Travelling inferiorly from the cranium, the vagus nerve follows the common carotid arteries in the carotid sheath which can be seen in the left common carotid artery. The left phrenic nerve remains unclear until it emerges in the mediastinum. Components of the left brachial plexus can be seen, from roots to trunks. Numerous smaller branches move off, including the Dorsal Scapular nerve.

In the mediastinum, key structures can be identified in the mediastinum of the thorax. However, other pieces of anatomy including the inferior vena cava, right vagus nerve and some coronary vessels cannot be observed in this specimen. The Right phrenic nerve can be traced posteriorly to the heart, this has been shifted from its normal anterior to the heart position during dissection. Also seen is the Left phrenic nerve is still contained in its connective tissue and remains located anteriorly to the heart, until reaching the diaphragm for innervation. The left vagus nerve can be seen posterior to the heart and is easier to identify superiorly following the left common carotid artery in the carotid sheath. Note the left recurrent laryngeal nerve moving under the aorta.

The Arch of aorta giving branches of brachiocephalic and left common carotid superior to the heart. The left subclavian artery can be seen just posterior to the left common carotid. With the pulmonary trunk exiting immediately superior to the heart. The Left anterior descending carotid artery can be observed cascading anteriorly on the heart with the superior vena cava can be seen to the right of the aorta and posterior.



The inferior thorax shows Ribs 8 through 12 on the specimen, the musculature in-between these ribs can also be seen. Notably, the direction of external intercostal muscle inferomedially can be seen as it progresses into a layer of fascia.

As observed in the specimen, the right hemidiaphragm is located more superiorly than the left hemidiaphragm, and this is due to the presence of the liver on the right side of the abdominal cavity.

## Lung - Multiple Secondary Carcinoma Deposits in The Lung and Pleura

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Product code: AM02763



### Clinical History

This 47-year old woman was admitted with terminal carcinomatosis. On examination, a hard liver and a right pelvic mass were palpable. She had been ill with constitutional symptoms for months and she finally sought medical attention. She was admitted for palliative care and died shortly afterwards.

### Pathology

The left intact lung has multiple pale tumour nodules of varying size are scattered throughout the lung substance. Near the hilum several nodules are confluent. The hilar lymph nodes contain pale tumour tissue. Small tumour nodules from 2mm to 2cm can be seen beneath the thickened pleura on the costal, mediastinal and diaphragmatic surfaces. Histologically, these were metastatic deposits of adenocarcinoma. At post-mortem there was an adenocarcinoma of ovary, with metastases in lungs, heart, liver and pericardium.

### Further Information

Pulmonary metastases are more common than primary lung cancer. Malignant diseases arising anywhere in the body may spread to the lungs due to its rich blood supply and lymphatic drainage. Sarcomas usually metastasize by the bloodstream, and carcinomas spread either via the bloodstream or the lymphatic system or both.

## Lobar pneumonia - Grey Hepatisation Phase

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Product code: AM02759



### Pathology

The specimen is a parasagittal section of the right lung and the boundaries between the upper and lower lobes is clearly visible. The entire upper lobe is congested and pale grey in colour.

### Further Information

This is an example of a stage of lobar pneumonia in which the inflammatory exudates within the intra-alveolar space resulting in consolidation that affects a large and continuous area of the lobe of a lung. The affected lobe in this case shows grey hepatisation or late consolidation. This usually occurs 2 to 3 days following red hepatisation, and lasts for 4 to 8 days. The lung appears grey with liver-like solid consistency, due to a fibrinopurulent exudate, progressive disintegration of red blood cells, and haemosiderin. Large numbers of macrophages begin to appear in the interstitial tissue. They are the dominant cells, which attempt to clear away the cellular debris and acute inflammation through phagocytosis. The macrophages may contain iron due to consumption of erythrocytes, and are thus termed siderophages. Following grey hepatisation, resolution and restoration of the pulmonary architecture start by the eighth day. The enzymatic action begins centrally and spreads peripherally, which liquefies the previous solid fibrinous content and eventually restores aeration.

The most common organisms that cause lobar pneumonia are *Streptococcus pneumoniae*, also called pneumococcus, *Haemophilus influenzae* and *Moraxella catarrhalis*. *Mycobacterium tuberculosis*, the tubercle bacillus, may also cause lobar pneumonia if pulmonary tuberculosis is not treated promptly. Other organisms causing lobar pneumonia are *Legionella pneumophila* and *Klebsiella pneumoniae*. [2] On a posteroanterior and lateral chest radiograph, an entire lobe will be radiopaque, which is indicative of lobar pneumonia.



## Right Lung, Hilum Removed

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Product code: AM02704



This 3D model represents the complimentary section to the TW 63 right lung hilum 3D model within our series and provide a direct contrast to the TW 61 left lung section. While expressing few discrete features, this 3D model affords a view of the major structural elements of the right lung from the apex to the base. On the lateral aspect, the well-developed oblique and horizontal fissures divide the lung into its three lobes (superior, middle, inferior) – and the cross-section demonstrates the depth of these fissures into the deep portions of the organ itself. The rib impressions have been highlighted running from the apex to the base, and the extremely concave diaphragmatic surface on the section reflects the strong doming of the right hemisphere of the diaphragm in life due to the underlying liver.

## Lung — Cystic Fibrosis

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Product code: AM02761



### Clinical History

A 6-year old girl was admitted with a productive cough, dyspnoea and fevers. She became increasingly hypotensive and dies soon after admission. She had a previous history of recurrent pneumonia and meconium ileus. The clinical diagnosis was cystic fibrosis (mucoviscoidosis). Her sister died aged 3 from the same disease.

### Pathology

The lung parenchyma shows extensive changes mainly with a bronchial distribution. Many bronchi are dilated (bronchiectasis) and contain thick, yellowish, purulent material. These changes are most marked in the upper lobe, at the apex of which a small focus of 'honeycomb' change is also seen. Multiple abscesses are present, especially in the basal and central parts of the lower lobe. The base of the lower lobe is severely affected with fibrosis and consolidation being evident. There is very little normal lung tissue remaining. These pathological changes are characteristic but not pathognomonic of cystic fibrosis.

### Further Information

Cystic fibrosis (CF) is an inherited disorder of chloride ion transport. Mutations in the cystic fibrosis conductance regulator (CFTR) gene on chromosome 7 cause defects in the chloride channel protein leading to dysfunction of the chloride channels. This causes increased water absorption in exocrine glands and epithelium of the respiratory, gastrointestinal and reproductive tracts. These dehydrated viscous secretions then obstruct these organ passage causing clinical features including: persistent pulmonary infection, pancreatic insufficiency, liver cirrhosis, intestinal obstruction, male infertility, and elevated sweat chloride levels. In the airway, CF patients have decreased chloride secretion and increased water reabsorption. This causes dehydrated mucous lining the airways leading to defective mucociliary action, mucous obstructing the airway, bronchiole dilatation (bronchiectasis) and secondary infection. *Staphylococcus aureus*, *Haemophilus influenzae* and *Pseudomonas* are the most common bacteria causing CF patients' lower respiratory tract infections. Chronic bronchitis and bronchiectasis develops as a result. Pulmonary issues are the highest cause of mortality in CF patients. The average life expectancy is between 40-50 years of age in developed countries.

CF occurs in around 1 in 3000 live births. It is inherited in an autosomal recessive pattern. It is most common in fair-skinned populations: with 1 in 20 being a carrier of the gene. Symptoms can present in-utero or even up to adolescence, depending on the severity of the disease. It is now most commonly diagnosed with the neonatal screening test for immunoreactive trypsinogen (a pancreas enzyme precursor). If this screening test is positive, a formal diagnosis is made with a sweat test showing  $>60\text{mmol/L}$  of chloride.



## Lung Slab, Hilum Removed

**Price inquiry:** +48 605999769, [kontakt@openmedis.pl](mailto:kontakt@openmedis.pl)

Product code: AM02703



The lung has been dissected following a parasagittal plane, removing the mediastinal surface. Ordinarily, the pulmonary arteries, veins and bronchi can be observed entering the lung in the hilum – but the primary bronchi cannot be seen in this specimen as they have already divided substantially. It is unclear how far laterally the specimen has been dissected hence the bronchi subdivision level (secondary or tertiary) cannot be determined.

The cardiac impression is formed by the left ventricle of the heart resting on the mediastinal surface of the lung. Although the lung has been dissected following a parasagittal plane, the cardiac impression can still be observed as it is the most concave area of the medial surface of the lung.

The lung sits above the diaphragm, forming the concave diaphragmatic surface. The pleura has not been preserved in this specimen, but ordinarily, there exists a diaphragmatic recess bounded by the costal and diaphragmatic pleura. This would lie between the lung's diaphragmatic impression and the diaphragm.

## Hilum of the Left Lung

**Price inquiry:** +48 605999769, [kontakt@openmedis.pl](mailto:kontakt@openmedis.pl)

Product code: AM02702



The hilum of a lung is the point at which visceral and parietal pleura meet and functions with the pulmonary ligament as the lungs only connection with the rest of the body. This connection includes the Pulmonary Artery, Superior and Inferior Pulmonary Veins, Main Bronchi, Nerves and Lymphatics.

As the definition of an artery involves carrying blood AWAY from the heart, this will be deoxygenated blood in the pulmonary system, in contrast with the systemic circulation. Similarly, veins carry blood TOWARDS the heart, meaning it will be oxygenated in the pulmonary system.

With the specimen cut in a sagittal plane in line with the cardiac notch, nerves are difficult to identify however, the impression from the arch of the aorta around the hilum can be seen alongside the left main bronchi and its subsequent divisions into lobar bronchi; found in this specimen more posterior in the hilum; the pulmonary artery and its divisions, located most superior; the superior and inferior pulmonary veins and their divisions which are most inferior and anterior in the specimen; the oblique fissure along the lateral surface of the specimen; various arteries, veins and bronchioles on the lateral surface; the diaphragmatic at the bottom and costal visceral on the posterior surfaces of the specimen and the pulmonary lymph nodes around the hilum on both the medial and lateral components of the lung.

## Hilum of the Right Lung

**Price inquiry:** +48 605999769, [kontakt@openmedis.pl](mailto:kontakt@openmedis.pl)

Product code: AM02705



The hilum of a lung is the point at which visceral and parietal pleura meet and functions with the pulmonary ligament as the lungs only connection with the rest of the body. This connection includes the Pulmonary Artery, Superior and Inferior Pulmonary Veins, Main Bronchi, Nerves and Lymphatics.

As the definition of an artery involves carrying blood AWAY from the heart, this will be deoxygenated blood in the pulmonary system, in contrast with the systemic circulation. Similarly, veins carry blood TOWARDS the heart, meaning it will be oxygenated in the pulmonary system.

With the specimen cut in a sagittal plane in line with the cardiac impression, nerves and lymphatics are difficult to identify however the groove from the oesophagus as it descends posteriorly to pierce the diaphragm can be seen alongside the cardiac impression (of the right atrium) is notable anterior to the hilum of the right lung; the right main bronchi and its subsequent divisions into lobar bronchi, found in this specimen more posterior in the hilum; the pulmonary artery and its divisions, located most superior within the hilum; the superior and inferior pulmonary veins and their divisions which are most inferior and anterior in the specimen. the oblique and horizontal fissures along the lateral surface of the specimen and the Hilar lymph nodes around the hilum on the medial surface of the lung.

The diaphragmatic surface is found inferiorly and the costal visceral surface is on the posterior of the specimen.

## 3D anatomical print - Bronchial tree

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Product code: MA02674



The highly detailed 3D model of the bronchial tree shows the airways from the trachea, spurs trachea and the entire right and left bronchial tree to the bronchial level of the tertiary lobes. Each lobe bronchus system has been color coded to illustrate the bronchopulmonary segments of the right and left lobes.

### Advantages of 3D printed models:

- Models of this type can be used in ordinary classrooms,
- They do not wear out over time, which creates the same and equal educational conditions for students
- Health and safety at work for both students and teachers
- Low to maintain
- No need for disposal
- An alternative to plastinates, 3D models accurately reflect the "cadaver" preparations
- Inexpensive to produce
- Relatively fast production time
- Possibility to make models in enlargement or reduction

### Additional information:

- stationary model
- professional anatomy trainer for medical students