Pneumomediastinum: complication of an aspirated foreign body

Clinical History:
A 91-year-old man with good quality of life was admitted to the emergency department with a cough and left pleuritic pain over the previous three days.

Imaging Findings:
A posteroanterior and lateral chest X-ray was performed and showed an extensive pneumomediastinum, extending into the neck and chest wall (subcutaneous emphysema). Some typical radiographic signs were seen: tubular artery sign, “ring around the artery” sign, double bronchial wall sign and continuous diaphragm sign (Fig. 1).

Chest CT: Extensive pneumomediastinum, which continues towards the planes of the neck and chest wall (subcutaneous emphysema) (Fig. 2). Within the left main bronchus, a 1.2 x 0.8 cm nodular structure with a hyperdense periphery is observed. The foreign body, which was later proven to be an olive stone by bronchoscopy (Fig. 3), was causative for the partial collapse of the left upper lobe and the pneumomediastinum (Fig. 4 and 5).

Discussion:
Pneumomediastinum is a diagnostic challenge for the radiologist because it can be caused by many thoracic as well as extrathoracic aetiologies [1].

The pathophysiological mechanism of pneumomediastinum in most cases is alveolar rupture. Alveolar rupture is caused by a pressure gradient between an alveolus and the interstitium. In our case, this occurred due to an airway obstruction by a foreign body (common cause in children, rare in adults) added to cough. Alveolar rupture initially produces pulmonary interstitial emphysema (not seen in our case). Gas then travels centrally along the bronchovascular interstitial sheaths into the mediastinum [1, 3].

Other common causes are blunt or penetrating trauma, oesophageal perforation, gas-forming infections, cocaine inhalation, and extension of air from a pneumothorax [4].

Careful examination of chest radiographic findings is crucial in the diagnosis of pneumomediastinum. Radiographic signs include [1, 2, 3]:

- Thymic sail sign (in infants): The thymus can become elevated and partly surrounded by air.
- "Ring around the artery" sign: Air surrounding the pulmonary artery or its main branches.
- Tubular artery sign: Pulmonary air and pneumomediastinum can surround the aorta and its main branches.
- Double bronchial wall sign: Air outside and within the bronchial wall allows the wall to be seen.
- Continuous diaphragm sign: caused by air located posterior to the pericardium.
- Extrapleural sign: Air from mediastinum can extend laterally between the parietal pleura and the diaphragm.
atrium, distention of the inferior vena cava, compression of the mediastinal vessels and the main bronchi [4].

Radiographic findings of aspirated foreign bodies include a dense nodule in the tracheobronchial tree with or without obstructive pulmonary changes such as atelectasis [5, 7].

Differential diagnosis of high-attenuation endobronchial lesions can be narrowed by carefully obtaining patient history and evaluating CT findings. For example, inflammatory reaction around the foreign body can simulate an endobronchial mass which, together with obstruction image findings, should be differentiated from endobronchial carcinoma [6].

Bronchoscopy can be necessary, especially to remove the aspirated foreign body.

**Differential Diagnosis List:** Pneumomediastinum secondary to an obstructive aspirated foreign body (olive stone), Broncholithiasis caused by calcified lymph nodes, Intrabronchial tumours

**Final Diagnosis:** Pneumomediastinum secondary to an obstructive aspirated foreign body (olive stone).

**References:**


Description: Abundant subcutaneous emphysema (yellow arrows) and pneumomediastinum: tubular artery sign (red arrows), “ring around the artery” sign (blue triangle only in 1b) and continuous diaphragm sign (yellow triangle). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Abundant subcutaneous emphysema (yellow arrows) and pneumomediastinum: Tubular artery sign (red arrows), “Ring around the artery” sign (blue triangle only in 1b) and Continuous diaphragm sign (yellow triangle). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Axial chest CT, window settings image that reveals pneumomediastinum (red arrows) and subcutaneous emphysema (yellow arrows). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Axial chest CT. Lung window settings image that reveals pneumomediastinum (red arrows) and in the left main bronchus a nodular image with a hyperdense periphery measuring 1.2 x 0.8cm. (yellow arrow). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Axial (A) and coronal (B) chest CT. mediastinum window settings image that reveals in the left main bronchus a nodular image with a hyperdense periphery measuring 1.2 x 0.8cm. Probably an aspirated foreign body (yellow arrow). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Axial (A) and coronal (B) chest CT. mediastinum window settings image that reveals in the left main bronchus a nodular image with a hyperdense periphery measuring 1.2 x 0.8cm. Probably an aspirated foreign body (yellow arrow). Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.
Description: Bronchoscopy image confirming the finding of an aspirated foreign body (Olive stone).
Origin: J. Galvan Fernandez, Department of Radiology, HCUV, Valladolid, Spain.