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CASE REPORT : Aortopulmonary fistula in a 60-year-old male

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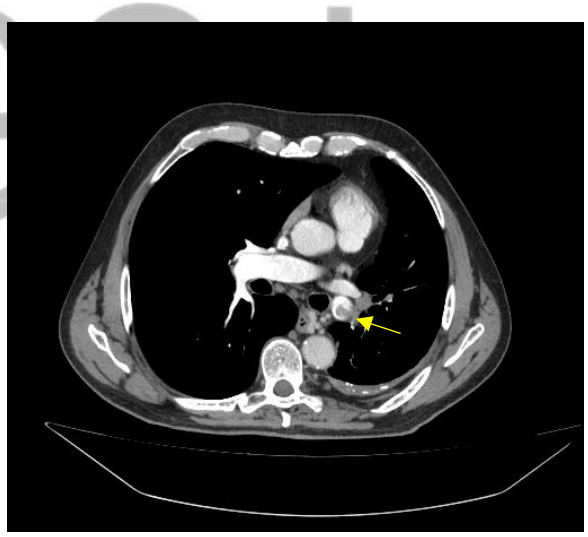
Introduction

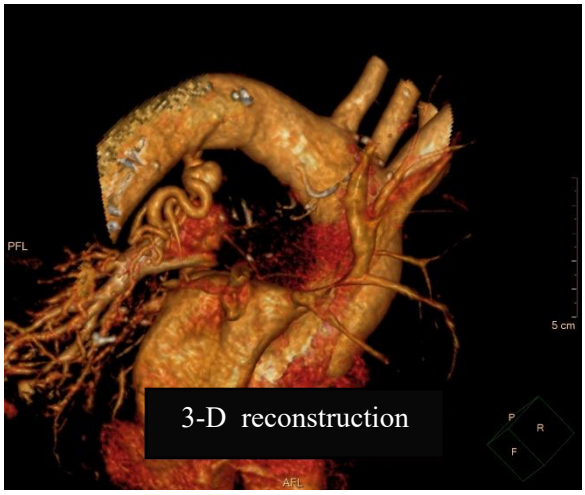
Aortopulmonary fistula occur when there is a communication between aorta and adjacent pulmonary artery. It is a rare but has been thought to be uniformly fatal if not treated. However, they usually occur after erosion or rupture of a degenerative or false aneurysm of the distal aortic arch or descending thoracic aorta into the lung, but can also be caused by trauma or post-operative complications after aortic surgery. This case highlights the importance of thorough imaging studies in patients with unexplained chronic respiratory symptoms and the role of CT diagnosis in managing rare and high morbidity vascular pathologies.

Case Report

A 60-year-old male presented with a several-month history of dry cough, intermittent chest discomfort, episodes of sweating, and lightheadedness. The patient had previously been hospitalized at a regional hospital, where conservative management yielded no clinical improvement. Due to the persistence of symptoms and inconclusive findings, he was transferred to *Shefqet Ndroqi University Hospital* for further evaluation and treatment. Upon admission, the patient was hemodynamically stable. Physical examination revealed decreased breath sounds on the left hemithorax with mild tenderness upon palpation. No cyanosis, clubbing, or peripheral edema were noted. Electrocardiogram (ECG): Normal sinus rhythm, right ventricular systolic strain, no evidence of ischemia or previous myocardial infarction. Fibro bronchoscopy: Nonspecific findings, no endobronchial lesions observed. Thoracic CT with IV contrast: Demonstrated



a *communicating vascular structure between the descending thoracic aorta and the inferior left pulmonary artery*, consistent with an *aortopulmonary fistula*. Additional findings included *left pleural thickening* and *pachypleuritis*.

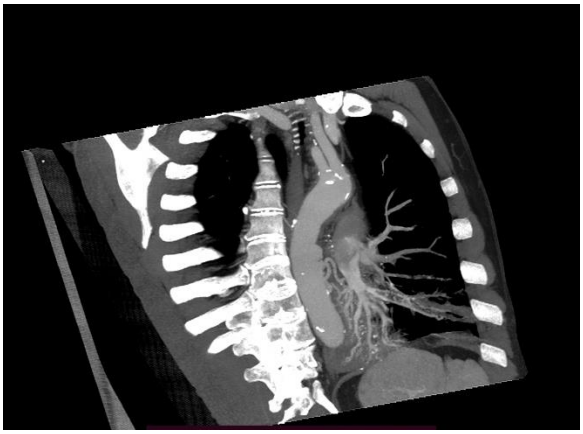


CTA reveals a "filling defect" in the early stages

CTA reveals the communication between thoracic aorta and left pulmonary artery in the late stage.

3D reconstruction showing the vascular fistulous trajectory

CTA evaluation initially raised a differential diagnosis between aortopulmonary fistula, pulmonary embolism, and pulmonary sequestration. The filling defect observed in the early contrast phase , which disappeared in the venous phase, showing to be a turbulent flow artifact because of the fistulous communication. Pulmonary sequestration was excluded, as it typically presents with an aberrant systemic arterial supply, absence of connection to the pulmonary artery, and a nonfunctional bronchovascular structure.

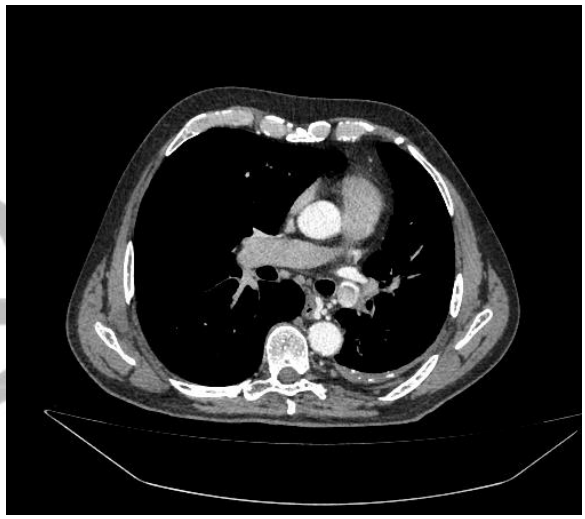


MIP reconstruction showing the fistulous communication

The patient underwent surgical intervention consisting of *left inferior lobectomy*, *left posterolateral thoracotomy*, and *left pleural drainage*. The intraoperative findings confirmed the presence of the aortopulmonary fistula.

Discussion

Aorto-pulmonary artery fistulas are rare vascular anomalies that create an



abnormal communication between the aorta and pulmonary artery, resulting in a left-to-right shunt. Over time, this can lead to volume overload, pulmonary hypertension, and heart failure. Etiologies include congenital defects, trauma, or iatrogenic causes (post-surgery, catheterization, or infection). Early recognition and intervention are crucial to prevent irreversible pulmonary vascular damage. Risk factors of aortopulmonary fistulas include aortic aneurysms, hypertension, arteriosclerosis, cystic medial necrosis, Marfan's syndrome, Ehlers-Danlos

syndrome, aortic bicuspid valve, syphilis, infectious aortitis, ciprofloxacin use, giant cell aortitis, post-surgery false aneurysms , aortic trauma and neoplasia.

The normal aortic diameter varies based on age, sex, and body surface area. Previously, the term aneurysm was used when the axial diameter exceeded >5.0 cm for the ascending aorta and >4.0 cm for the descending aorta . When enlarged above normal but not reaching aneurysmal definition, the terms dilatation/ectasia were used .

According to the 2024 Guidelines of the European Society of Cardiology (ESC) for the Management of Peripheral Arterial and Aortic Diseases, the use of the term "ectasia" in the context of thoracic aortic disease is discouraged due to its imprecise definition. In light of the increased risk of complications associated with an ascending aortic diameter of 4.0 cm, and for the sake of clinical practicality, a threshold of 4.0 cm has been adopted as the criterion for diagnosing an ascending aortic aneurysm.

Aortopulmonary communication should be suspected in a patient who has a dilated aneurysm of the ascending aorta, a history of infection or trauma, and generally deteriorating cardiac status . The common symptoms of aortopulmonary fistula include chest pain, hemoptysis, dyspnea and other respiratory symptoms, fever, cool extremities, dysphagia if compression of the esophagus, hoarseness if recurrent laryngeal nerve compression, right ventricular dysfunction and other symptoms of congestive heart failure The hemoptysis, which is characteristically intermittent or recurrent, occurs when developed hematoma "leaks" into the bronchopulmonary tree due to aortic rupture.

In this case, there was neither surgical history nor hemoptysis, and aortopulmonary fistula might have formed due to erosion from continuous pulsatile friction between the pulmonary artery and the aortic wall, but it remains unclear how long the fistula had been present.

Accurate diagnosis of non-aneurysmal, non-traumatic aortopulmonary fistula (APF) relies heavily on advanced imaging modalities, as clinical manifestations are often nonspecific and can mimic more common cardiopulmonary conditions. A multimodality imaging approach is therefore essential to characterize the anatomical details, hemodynamic impact, and etiology of the fistulous communication.

Chest Radiography may demonstrate indirect signs such as mediastinal widening, increased pulmonary vascular markings, or cardiomegaly secondary to volume overload. However, these findings are nonspecific and rarely diagnostic. In most instances, radiographic abnormalities prompt further cross-sectional imaging.

Computed Tomography Angiography (CTA) is considered the gold standard for noninvasive diagnosis of APF. High-resolution, multiphasic CTA allows direct visualization of the fistulous tract and its relationship to adjacent vascular structures. Early arterial phase imaging may show a focal filling defect or irregular contrast enhancement that can initially be misinterpreted as pulmonary embolism. In contrast, delayed phases reveal opacification

of both the aorta and pulmonary artery, confirming pathological communication. This temporal evolution of contrast enhancement highlights the importance of multiphasic imaging in distinguishing APF from other pathologies. CTA further provides critical information on fistula size, origin, drainage site, and associated pulmonary or aortic wall changes, facilitating preoperative planning and endovascular assessment. Three-dimensional volume-rendered reconstructions enhance spatial understanding and aid in surgical or interventional decision-making.

Magnetic Resonance Angiography (MRA) offers a valuable alternative for patients with contraindications to iodinated contrast. MRA provides detailed visualization of vascular anatomy and enables dynamic assessment of flow patterns through phase-contrast sequences. Its ability to quantify shunt volume and assess cardiac function is advantageous in evaluating hemodynamic significance, although its spatial resolution may be inferior to that of CTA.

Echocardiography, particularly **transesophageal echocardiography (TEE)**, can assist in detecting left-to-right shunts and assessing secondary cardiac consequences such as pulmonary hypertension or right ventricular overload. While TEE provides real-time hemodynamic information, it is limited in its ability to delineate distal or descending thoracic lesions due to restricted acoustic windows.

Catheter-based Digital Subtraction Angiography (DSA) remains the definitive diagnostic tool when noninvasive imaging is inconclusive or when endovascular treatment is contemplated. DSA allows dynamic visualization of blood flow through the fistula and precise localization for interventional occlusion or stent graft deployment. However, it is an invasive procedure and is typically reserved for therapeutic planning rather than initial diagnosis.

In summary, multiphasic CTA constitutes the cornerstone of diagnostic evaluation for non-aneurysmal, non-traumatic aortopulmonary fistula, combining superior spatial resolution with rapid, noninvasive assessment. Complementary modalities such as MRA, TEE, and DSA play adjunctive roles in confirming diagnosis, assessing functional impact, and guiding therapeutic strategy. The integration of these imaging techniques ensures accurate characterization of this rare vascular anomaly and optimizes patient outcomes through tailored management planning.

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