

Chronic thromboembolic pulmonary hypertension: a review of imaging findings on ECG gated pulmonary circulation MDCTA

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Section: Chest imaging

Area of Interest: Lung

Procedure: Contrast agent-intravenous

Imaging Technique: CT-Angiography

Special Focus: Embolism / Thrombosis Case Type:

Clinical Cases

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Patient: 63 years, female

Clinical History:

A 63-year-old female patient presented recurrent and progressive dyspnoea. Clinical examination revealed lower legs swelling. History included prior pulmonary embolism. Echocardiography, combined ventilation perfusion scintigraphy, right cardiac catheterisation and CT angiography were performed.

Imaging Findings:

Radiological evaluation by means of chest CT angiography revealed a filling defect in the right pulmonary artery (Fig. 1), smaller partial mural adherent defects in the branches for the left lower lobe and smaller webs in others (Fig. 2). Also, shunt circulation in the posterior basal segments of right lower lobe (Fig. 4) and bronchial shunt circulation in mediastinum were noted (Fig. 6). CT scan showed also enlarged pulmonary artery trunk and central branches. High resolution CT of lung parenchyma revealed the characteristic mosaic perfusion pattern (Fig. 5). Venous triplex examination showed no findings of deep venous thrombosis. Right cardiac catheterisation revealed high pressures in the pulmonary artery and echocardiography findings were right ventricle enlargement, hypertrophy, and moderate systolic dysfunction suggesting the diagnosis of severe pulmonary hypertension. Combined ventilation perfusion scintigraphy showed a mismatch between normal ventilation and non-perfused areas.

Discussion:

Chronic thromboembolic pulmonary hypertension (CTEPH) is a treatable form of pulmonary hypertension which requires multimodality imaging for accurate diagnosis. Pulmonary hypertension is defined as elevation of pressure in pulmonary circulation higher than 25mmHg at rest and above 30mmHg during physical activity [1]. Catheterisation of the right side of the heart is the gold standard for the diagnosis. It confirms pulmonary hypertension by direct measurement of pulmonary pressures, resistance and cardiac output. [2] Echocardiography estimates peak velocity of tricuspid valve regurgitation, and detects right atrial and right ventricular dilatation, right ventricular systolic dysfunction and Doppler flow abnormalities in the right ventricular outflow tract. ECG-gated pulmonary circulation CT angiography is of great value for the diagnosis of CTEPH. The trunk of pulmonary artery has a diameter larger than

29mm and ratio pulmonary trunk: ascending aorta > 1:1. CTA reveals also the mural defects (thrombus) being attached to the vessel wall with eccentric position and obtuse angle, in contrast to the centrally located and with acute angle defects seen in acute pulmonary embolism patients [3]. Bronchial shunt circulation is of great importance and a highlight of CTEPH. Also imaging with intravenous contrast media, is mandatory for findings such as the webs due to prior pulmonary embolism [4]. A characteristic finding in lung parenchyma is the mosaic perfusion pattern caused by irregular lung perfusion. Parenchymal fibrosis, cavities, irregular peripheral linear densities and wedge-shaped areas —pulmonary infarction— in the periphery of the lung field are seen [5].

Differential Diagnosis List: Chronic thromboembolic pulmonary hypertension., CTEPH, COPD, Pulmonary artery sarcoma, Interstitial lung disease induced pulmonary hypertension

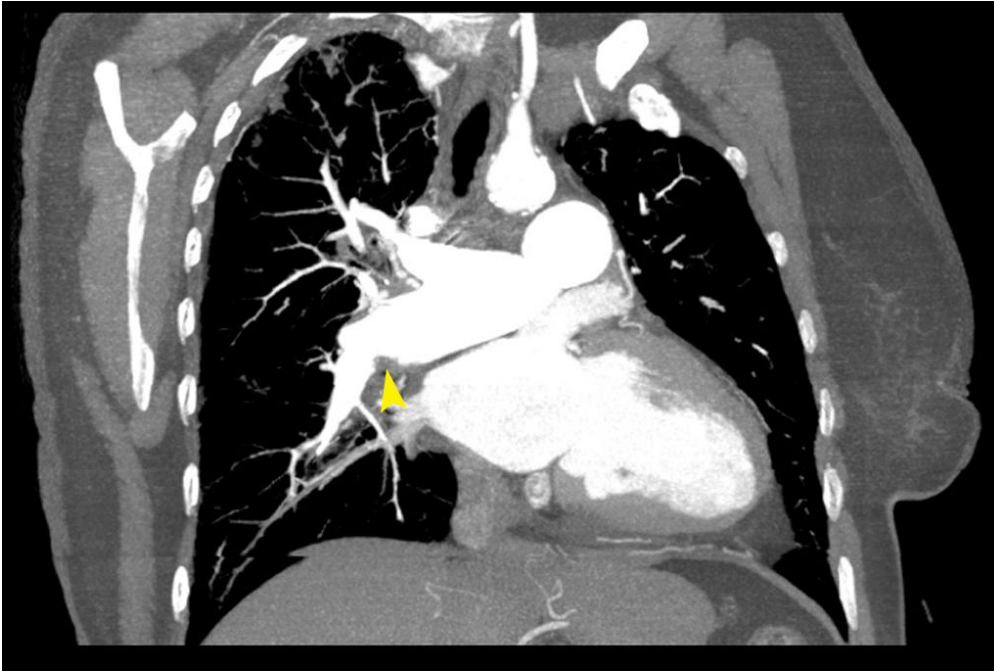
Final Diagnosis: Chronic thromboembolic pulmonary hypertension.

References:

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Figure 1

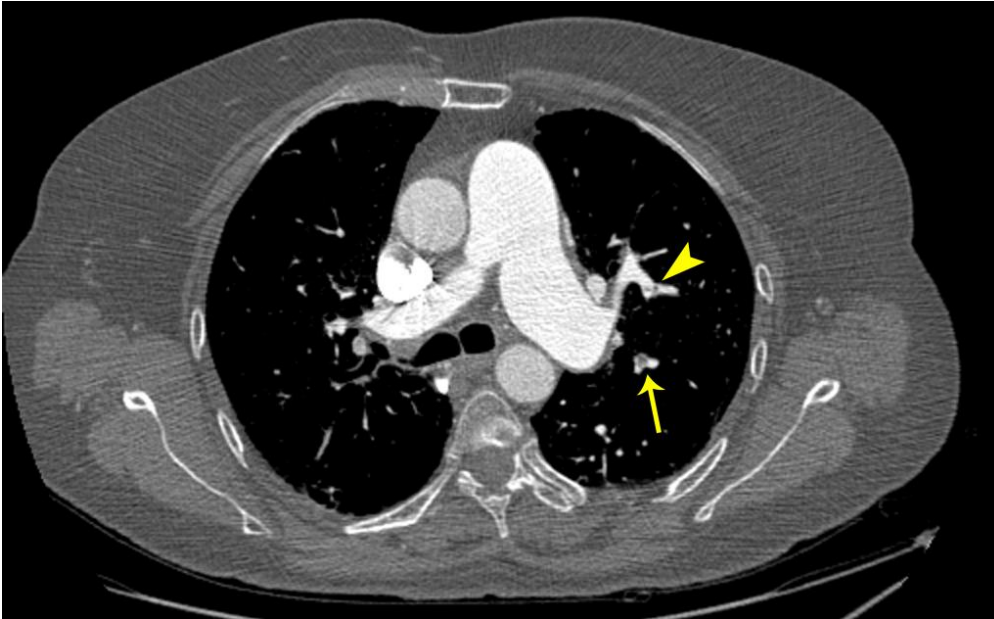
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Description: This shows enlarged right pulmonary artery and a mural attached filling defect at its bifurcation branch (eccentric thrombus —arrowhead). **Origin:** Department of radiology, University hospital AHEPA, Thessaloniki, Greece

Figure 2

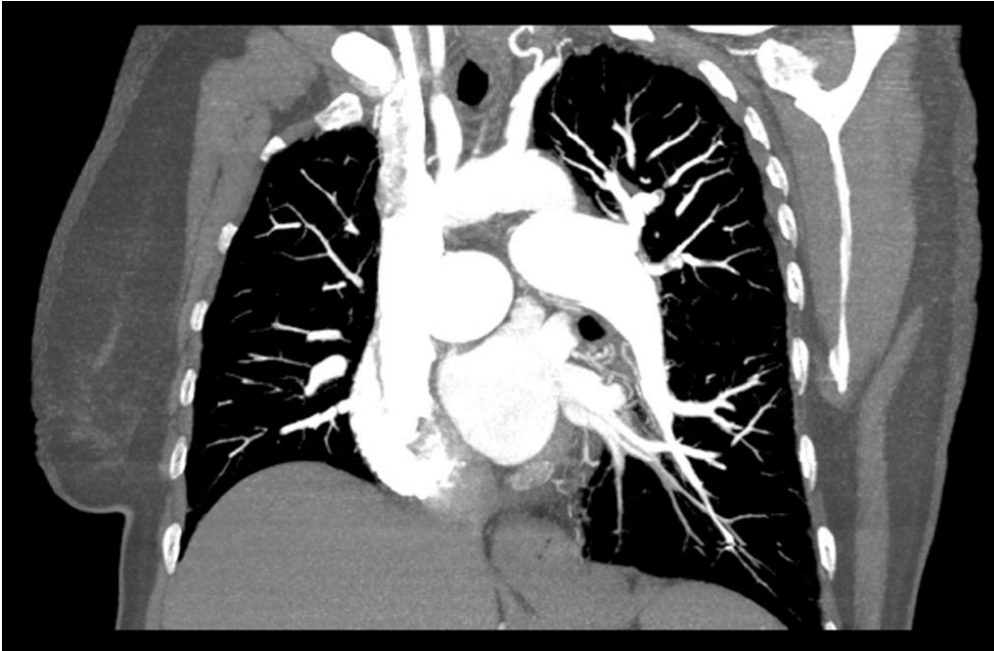
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Description: This shows the partial intraluminal and attached to the vessel wall defects (arrowhead: webs, arrow: eccentric thrombus). Enlarged pulmonary artery trunk and abrupt angular narrowing of pulmonary artery branch is noted **Origin:** Department of radiology, University hospital AHEPA, Thessaloniki, Greece

Figure 3

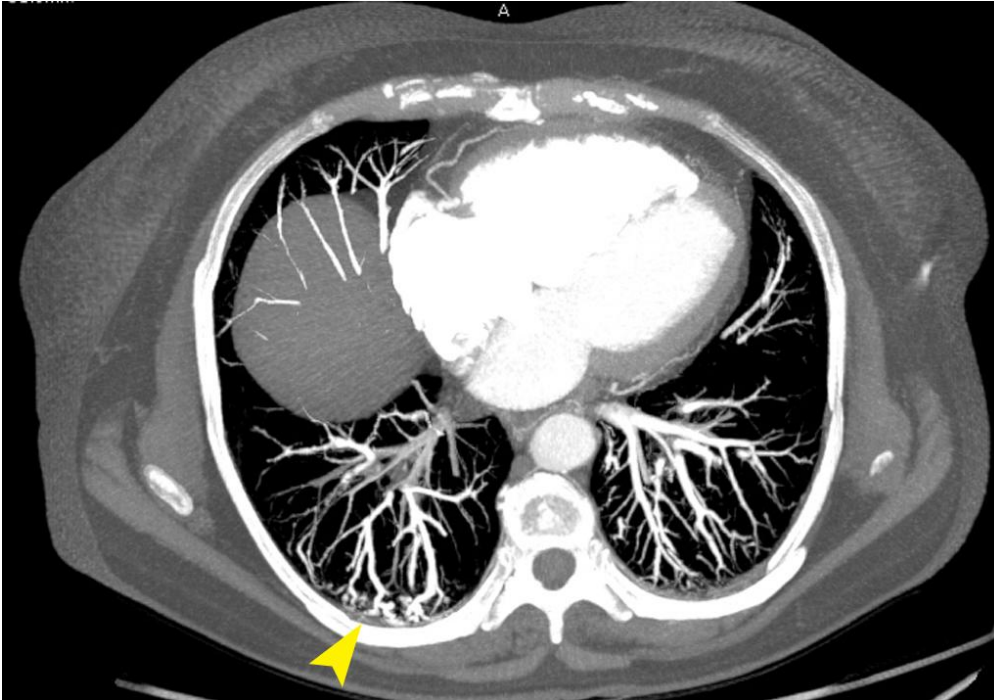
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Description: This shows the enlarged left pulmonary artery and branches. There are also small filling defects attached to the vessel wall. **Origin:** Department of radiology, University hospital AHEPA, Thessaloniki, Greece

Figure 4

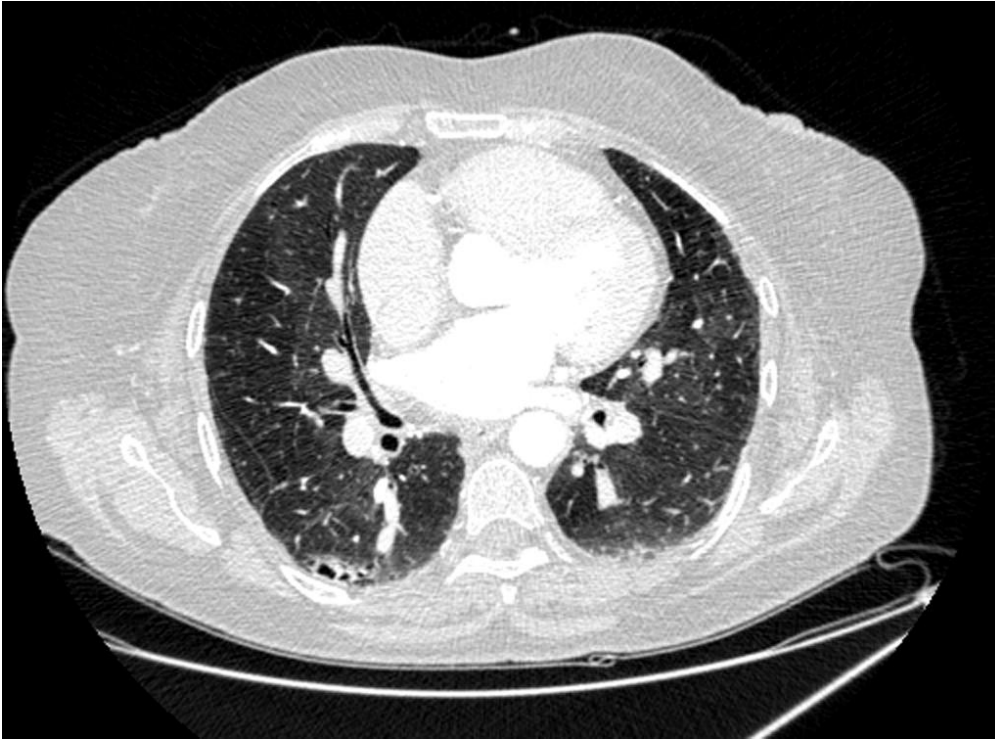
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Description: Collateral arterial shunt in posterior basal segments of right lower lobe is shown (arrowhead) **Origin:** Department of radiology, University hospital AHEPA, Thessaloniki, Greece

Figure 5

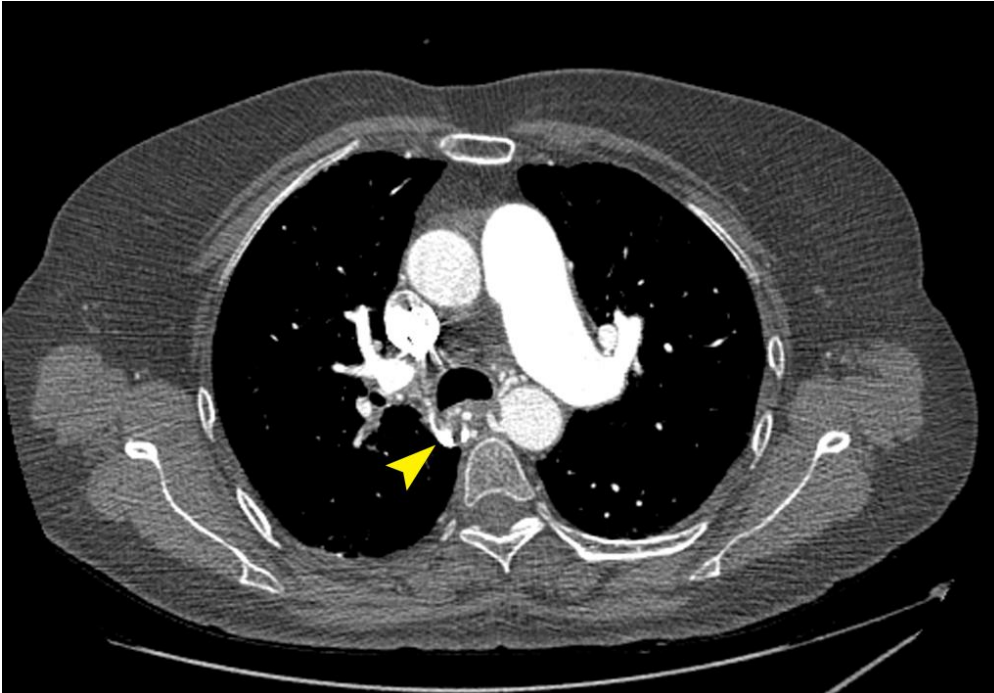
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Description: Mosaic pattern due to irregular perfusion. Hypo- and hyperperfused areas. **Origin:** Department of radiology, University hospital AHEPA, Thessaloniki, Greece

Figure 6

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Description: Enlarged bronchial arteries arising from thoracic aorta and coursing behind the carina.

Origin: Department of radiology, University hospital AHEPA, Thessaloniki, Greece