Heart of the Matter: From Hemoptysis and Left Arm Pain to Diagnosis, Importance of Imaging

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A 34-year-old male presented with a 10-day history of hemoptysis, cough, and a year of exercise-induced left arm pain, with no prior diagnosis. Physical exam showed a pronounced S2 and a pansystolic murmur. Elevated CRP and WBC levels were noted. Thoracic CT revealed a large pulmonary artery aneurysm (PAA), right heart enlargement (RHE), and left lung consolidation, without evidence of pulmonary embolism. Infection was suspected as the cause of hemoptysis, and treatment with tranexamic acid and antibiotics was started.

To investigate the RHE and PAA, echocardiography was performed, revealing a 2 cm ventricular septal defect (VSD) and high systolic PA pressure (PAP) (121 mmHg). Subsequent heart catheterization confirmed pulmonary arterial hypertension (mean PAP: 67 mmHg, PVR: 8.8 WU) secondary to the VSD with a dominant left-to-right shunt (Qp/Qs: 1.5).

Due to exertion-induced left upper-extremity pain, a coronary angiogram was undertaken, revealing noteworthy ostial left main coronary artery (LMCA) stenosis (Figure 1). ECG-gated contrast-enhanced thorax computed tomography angiography showed LMCA compression by the massive PAA and enlarged bronchial artery collaterals (Figure 2). No bronchial obstruction was detected. Subsequent bronchoscopy elucidated hemorrhage in the superior segment of the left lower lobe likely associated with infection. The patient declined surgical (repair of the PAA and CABG) and interventional options (LMCA stenting). Bosentan therapy was initiated for PAH.

Main PA diameter norms in healthy adults range from 25 mm ± 3 mm, with 29 mm as the upper limit of normal in males and 27 mm in females.[1] Pulmonary artery aneurysm is defined as diameters exceeding 40-45 mm,[2,3] often associated with PAH and potential complications, including LMCA compression, bronchus compression, hemoptysis, PA dissection, ruptures, and sudden cardiac death.[4-8]

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Computed tomography has emerged as an important noninvasive tool to understand these complex complications with an appropriate protocol.[9] Clinicians and diagnostic radiologists should be aware of these complications for timely diagnosis. Any exertional chest or arm pain in patients with PAH should raise suspicion of LMCA compression.[4-6,10] Dilatation of PA (>40 mm), a reduced takeoff angle (<60), and LMCA stenosis on CT should prompt referral for further evaluation.[6] Coronary angiography is the conclusive technique for diagnosing significant LMCA compression. However, it may be overlooked, as the compression is not discernible in many angiographic perspectives. In many cases, a 45˚ left anterior oblique view with a 30˚ cranial angulation is needed for visualization of the LMCA compression.

Hemoptysis in PAH patients requires comprehensive evaluation, considering various associated causes, including enlarged bronchial collaterals, PAA compression to bronchus, aneurysmatic PA dissection or rupture, and infection.[7,8]

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

Informed Consent: Written informed consent was obtained from all participants who took part in this study.

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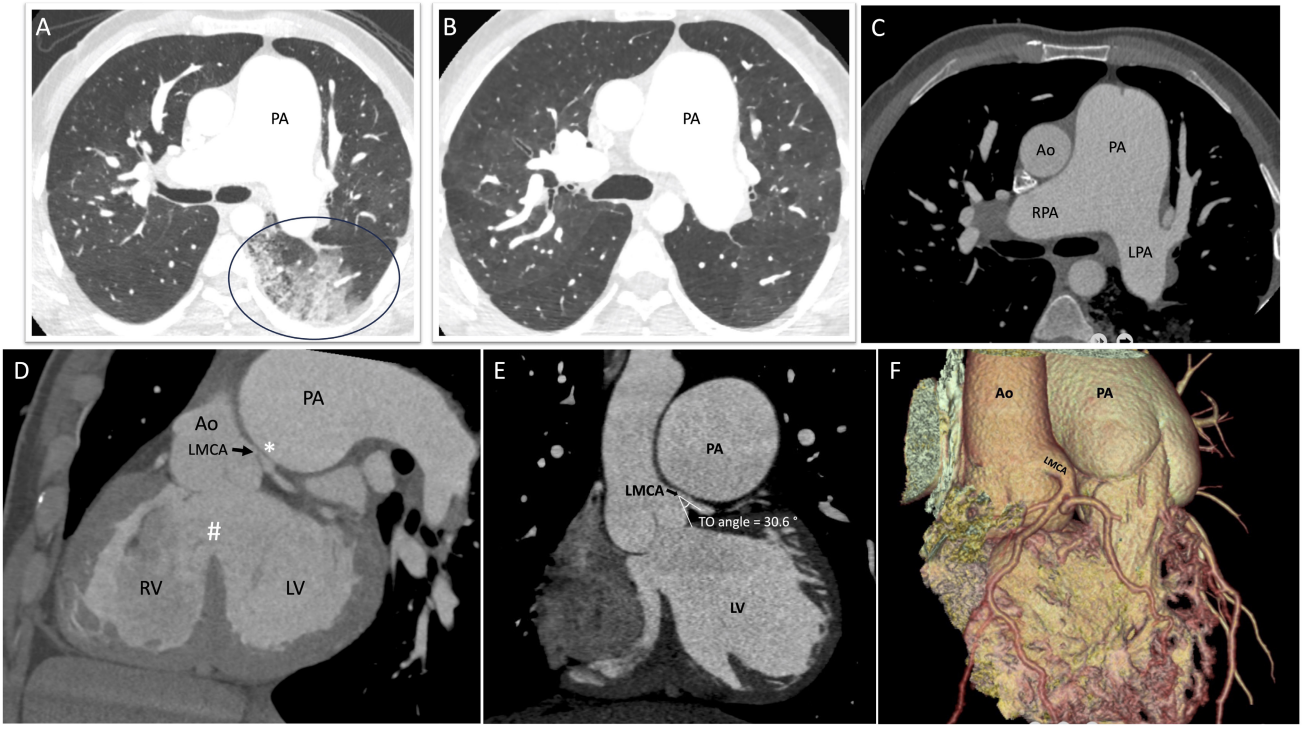

Figure 1. Coronary angiogram revealing noteworthy ostial LMCA stenosis. A and B show contrast-enhanced chest CT scans. (A) Initial scan reveals an enlarged PA and ground glass opacities with interlobular septal thickening in the superior segment of the left lower lobe, suggesting alveolar hemorrhage (black circle). (B) Follow-up scan shows complete resolution of the previously noted abnormalities. Panels C-F present images from ECG-gated CT coronary angiography. Panel C displays the pulmonary artery aneurysm (PAA) with a diameter of 58 mm. Panel D highlights the large ventricular septal defect (white #) and compression of the LMCA by PAA (white *). Panel E shows the downward displacement and reduced take-off angle (<60˚) of the LMCA in an oblique coronal view. (F) 3D imaging demonstrates the PAA and reduced LMCA take-off angle, though compression is less apparent compared to 2D imaging. Ao, aorta; LMCA, left main coronary artery; LPA, left pulmonary artery; LV, left ventricle; PA, pulmonary artery; RPA, right pulmonary artery; RV, right ventricle.

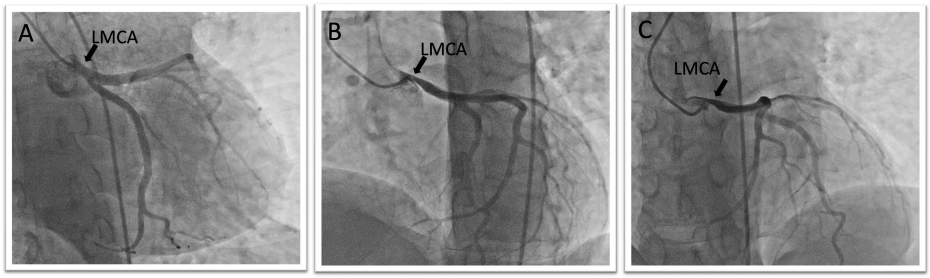

Figure 2. (A) Coronary angiography in anteroposterior-caudal view shows no stenosis of the left main coronary artery (LMCA). (B and C) Angiograms in left anterior oblique (LAO) and right anterior oblique (RAO) views with cranial angulation reveal 50%-70% stenosis of the ostial LMCA. The LMCA is observed to be inferiorly displaced and in close contact with the left aortic sinus.

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