Chronic Central Pulmonary Embolism Complicating Severe Aortic Stenosis
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Clinical History
An 88-year-old man with history of aortic stenosis presented with worsening dyspnea and underwent workup for TAVR (transcatheter aortic valve replacement). His medications included warfarin for a remote history of deep venous thrombosis.
Physical exam was remarkable for a grade 3 systolic crescendo-decrescendo murmur.
Cardiac ultrasound confirmed severe aortic stenosis with mean gradient of 78 mm Hg, peak gradient of 142 mm Hg, and calculated valve area of 0.7 cm². The pulmonary arteries and right ventricle were dilated, the right ventricular systolic pressure was estimated at 101 mm Hg, with severe tricuspid insufficiency.
Cardiac catheterization revealed a right atrial pressure of 5 mm Hg, pulmonary artery systolic pressure of 70 mm Hg, and a pulmonary capillary wedge pressure of 10 mm Hg.
Aortic valve replacement was considered by the multidisciplinary structural heart disease team. The patient was at increased operative risk due to age and frailty, and so TAVR was thought to be preferable.

Findings
Cardiac CT angiography (CTA) revealed a sclerotic and stenotic aortic valve, as well as a large chronic pulmonary thromboembolism in the right main pulmonary artery, dilated main and peripheral pulmonary arteries, and bronchial artery enlargement. The right ventricle was enlarged with an RV:LV ratio of greater than 1.3:1 (normal = 1:1 or less).

Discussion
Chronic pulmonary thromboembolism in this patient resulted in pulmonary artery hypertension and right heart strain, compounding his symptoms. A normal pulmonary capillary wedge pressure makes the presence of left-sided heart disease as a cause of right-heart disease unlikely.
Chronic pulmonary thromboembolism typically results from incomplete resolution of acute pulmonary embolism. Symptoms result from development of pulmonary artery hypertension. Diagnosis on CTA is based on pulmonary artery findings such as complete or partial obstruction, filling defects which are typically along the periphery of the artery, and bands or webs. Secondary findings of pulmonary artery hypertension manifest as enlargement of the main pulmonary artery.
and systemic-to-pulmonary collateral vessels. Pulmonary parenchymal abnormalities include scarring, ground glass opacities, and mosaic perfusion.

This patient’s severe aortic stenosis was medically managed, due to unfavorable aortic annular dimensions for TAVR, and multiple open surgical risk factors, compounded by his chronic thromboembolic disease. In addition to the warfarin prescribed for his chronic pulmonary thromboembolism, his pulmonary hypertension was managed with an endothelin receptor antagonist and home oxygen.

**Figure 1:** Supine PA scout radiograph of the chest performed during CT scan demonstrates bilateral pulmonary artery enlargement (LPA, RPA) and cardiomegaly.

**Figure 2:** Cardiac CTA confirms marked pulmonary artery enlargement, with the main pulmonary artery measuring 48 mm in diameter (yellow calipers), and eccentric thrombus (red arrows) of the peripherally calcified right pulmonary artery consistent with chronic pulmonary thromboembolism.

**Figure 3:** Cardiac CTA four-chamber view reveals asymmetric enlargement of the right ventricle chamber compared to the left.

**Figure 4:** Cardiac CTA axial image through the aortic valve at end systole reveals severe coarse calcification of all three leaflets and a restricted valve opening area (yellow outline).

**REFERENCES**

