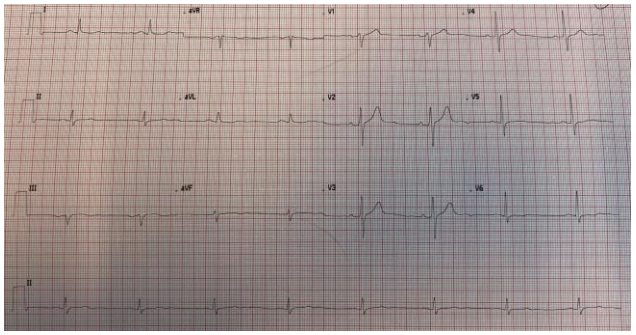
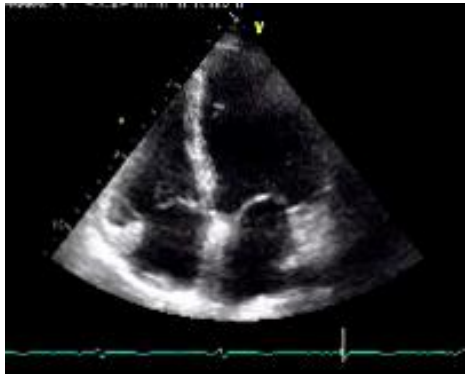
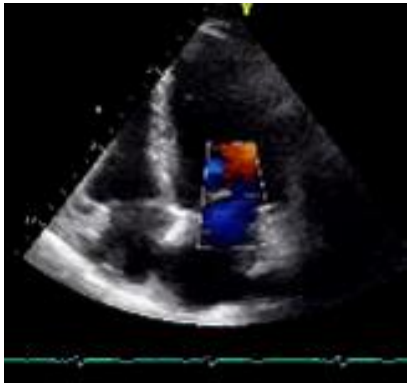
Double Anterograde and Retrograde Approach for Embolization of a Large Pulmonary Arteriovenous Malformation with Vascular Plugs

Case Presentation

- 54 years old man, with high blood pressure, overweight, was admitted for acute respiratory failure (NYHA Class III).
- **Past medical history** included long-standing shortness of breath on mild/moderate exertion with previous normal stress test.
- **Vital signs:** 140/80 millimetres of mercury, heart rate 48 beat/minute , **oxygen saturation 90%.**
- **Electrocardiogram** was promptly performed to exclude an acute coronary sindrome with atypical presentation.
- **Ecocardiography:** left ventricle hypertrophy, with preserved systolic function; absence of significant valvulopathies; mild left atrial dilation; right chambers of normal size and with preserved ventricular contractility, systolic pulmonary artery pressure 40 millimetres of mercury.
- **Blood tests** found no elevation of myocardial biomarkers, **thrombophilic screening** showed a heterozygous mutation for the MTHFR1 gene, anticardiolipin antibodies and a reduction in serum free protein S levels.

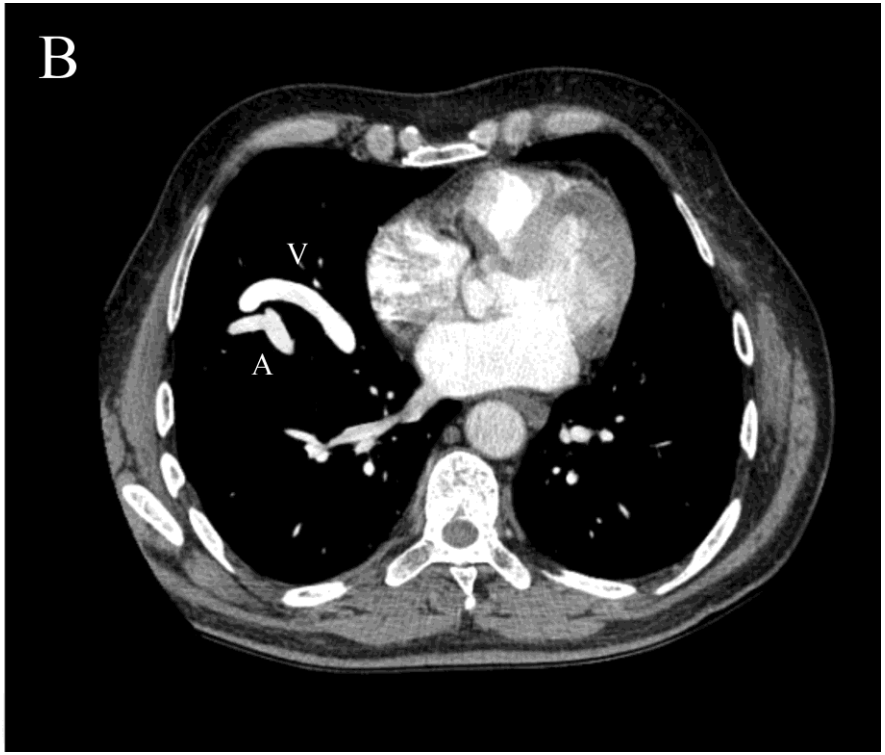






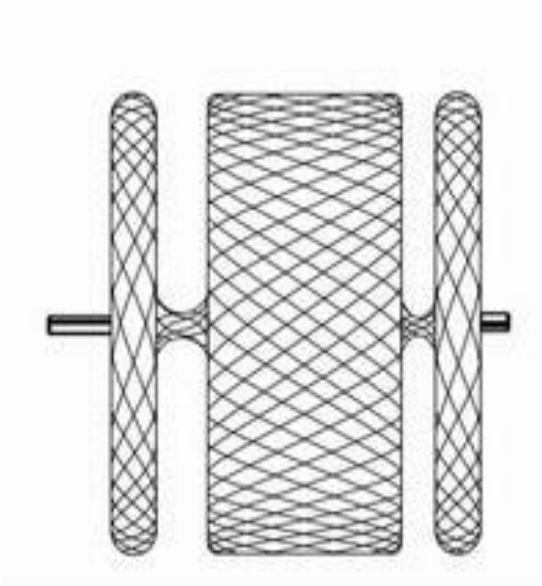
CT scan

- Patient underwent **pulmonary CT angiography** that surprisingly showed a voluminous arteriovenous fistula with the feeding artery coming from a segmental artery for the right pulmonary lower lobe and with the venous drainage confluent into the inferior right pulmonary vein.



Procedure

- Contemporary percutaneous embolization of both artero-venous pulmonary malformation branches using a double access technique transfemoral transseptal (retrograde) and transfemoral transpulmonary artery (anterograde) was planned.
- Amplatzer Vascular Plug II device has been selected for embolization of both branches

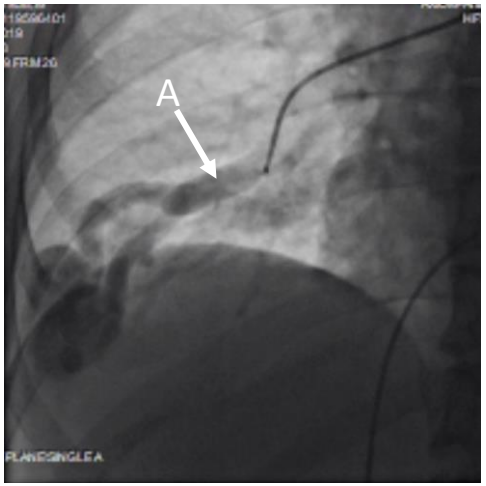


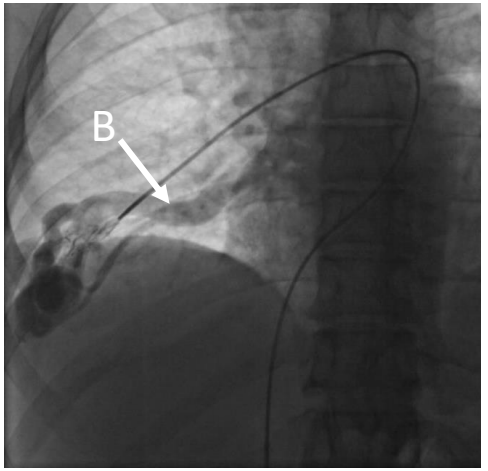
Procedure

Selective right pulmonary artery injection (6 French Multipurpose catheter – left femoral vein)

- The artero-venous malformation pulmonary artery afferent branch is 10 mm ∅ (A)
- In the levo-phase the 10 mm ∅ efferent branch (B) is draining in the right lower pulmonary vein.

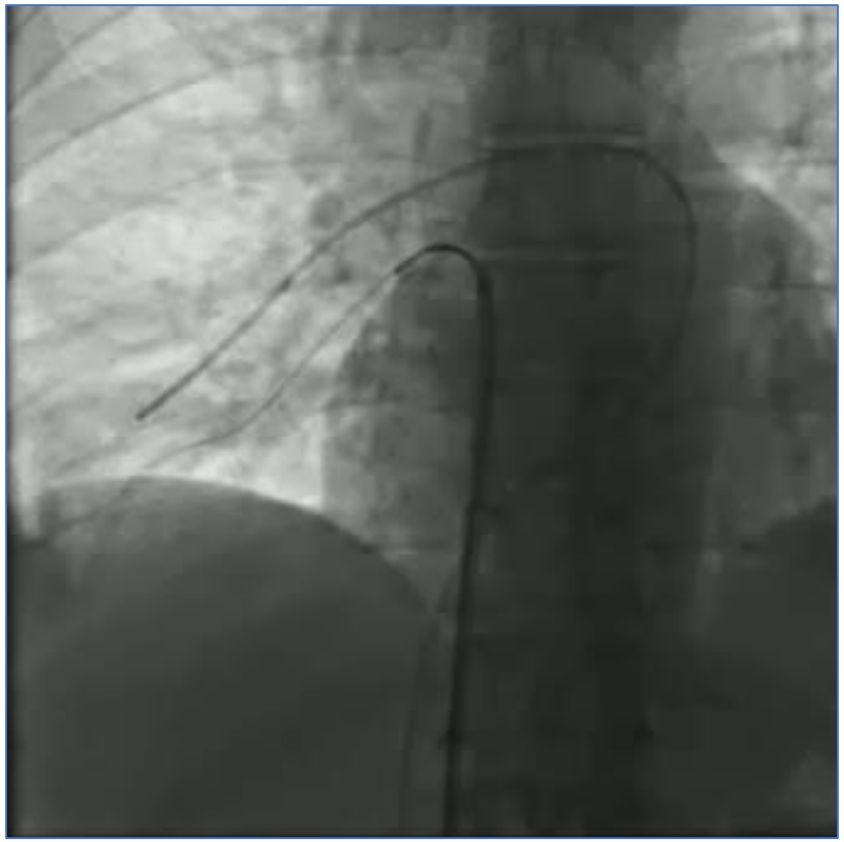
Pulmonary artery angiography



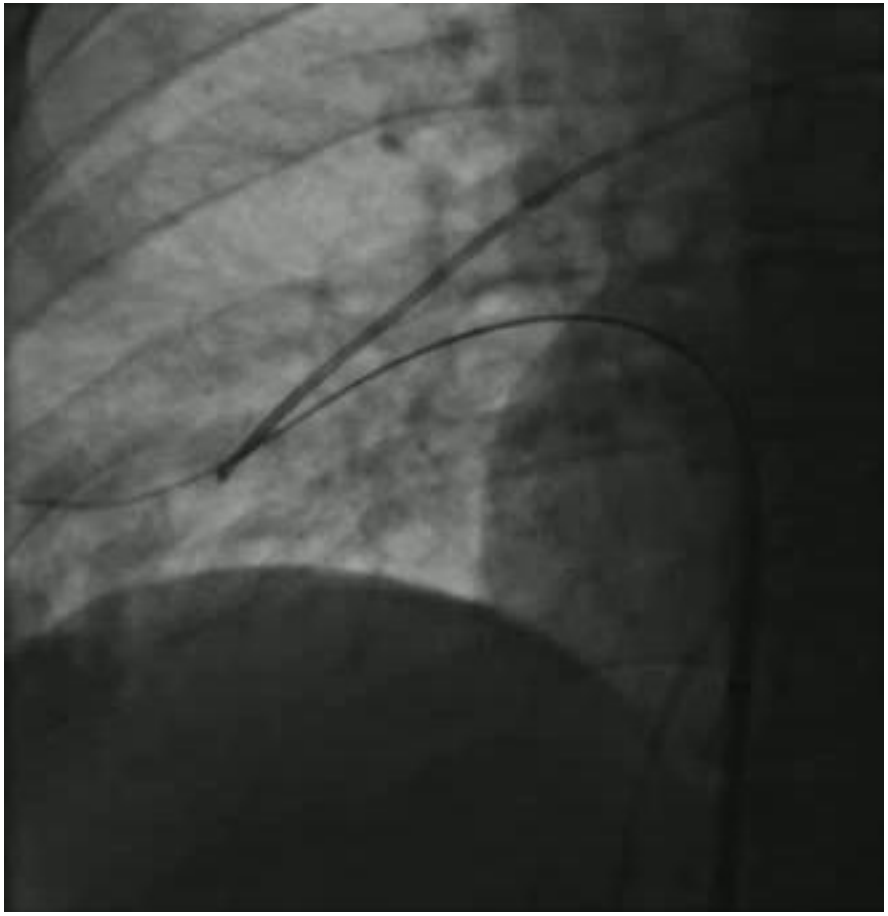


Procedure

Afterwards, under trans-esophageal echocardiography and fluoroscopic monitoring, a posterior trans-septal puncture was carried out from right femoral vein using a Brockenbrough needle and once entered into the left atrium, the hypertrophic venous branch draining the malformation was selectively cannulated with a 6 French right Judkins catheter from the right lower pulmonary vein



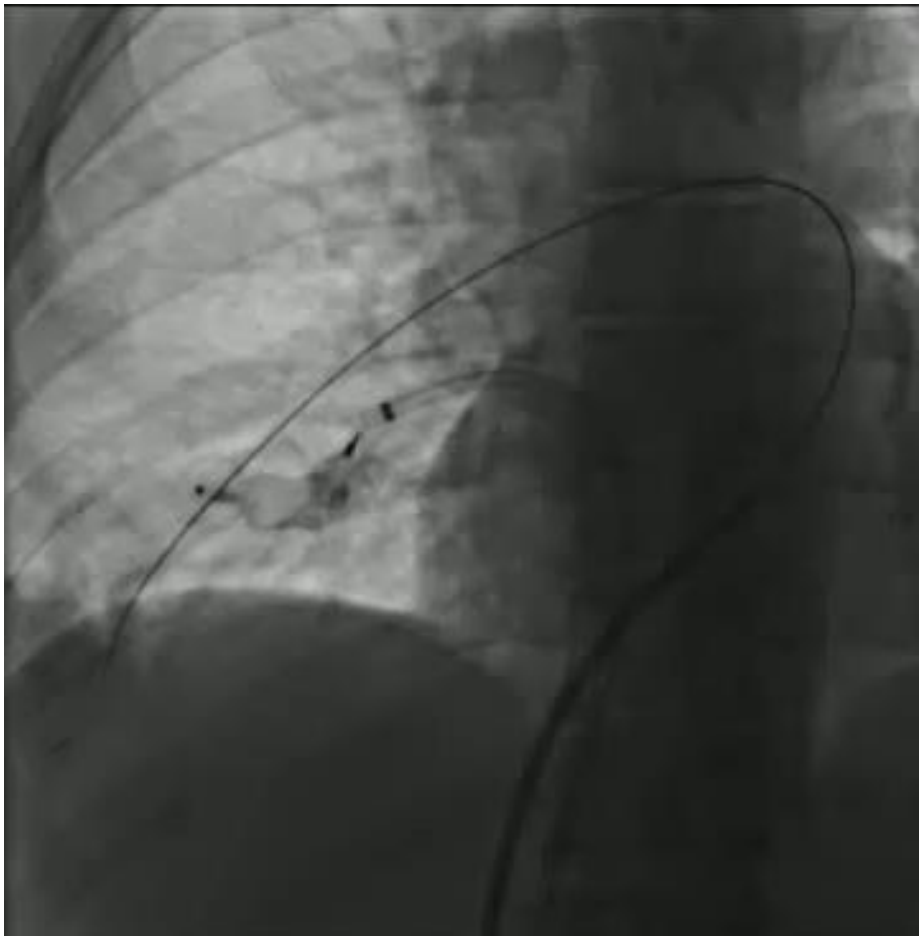
Right Lower Pulmonary Vein branch occlusion



Using an Amplatz stiff wire, a 9 French delivery steerable catheter was positioned into the vein drainage and an Amplatzer Vascular Plug II 20 mm was exposed

Selective pulmonary angiography shows effective embolization during deployement in the right lower pulmonary vein branch

Right Pulmonary Artery branch occlusion



On another stiff guide, a 9 French delivery was then advanced into the pulmonary artery branch and an Amplatzer Vascular Plug II 20 mm was deployed.

Devices release

Release sequences of the two vascular plugs:

I. **Right Lower Pulmonary Vein branch device**
II. **Pulmonary Artery branch device**

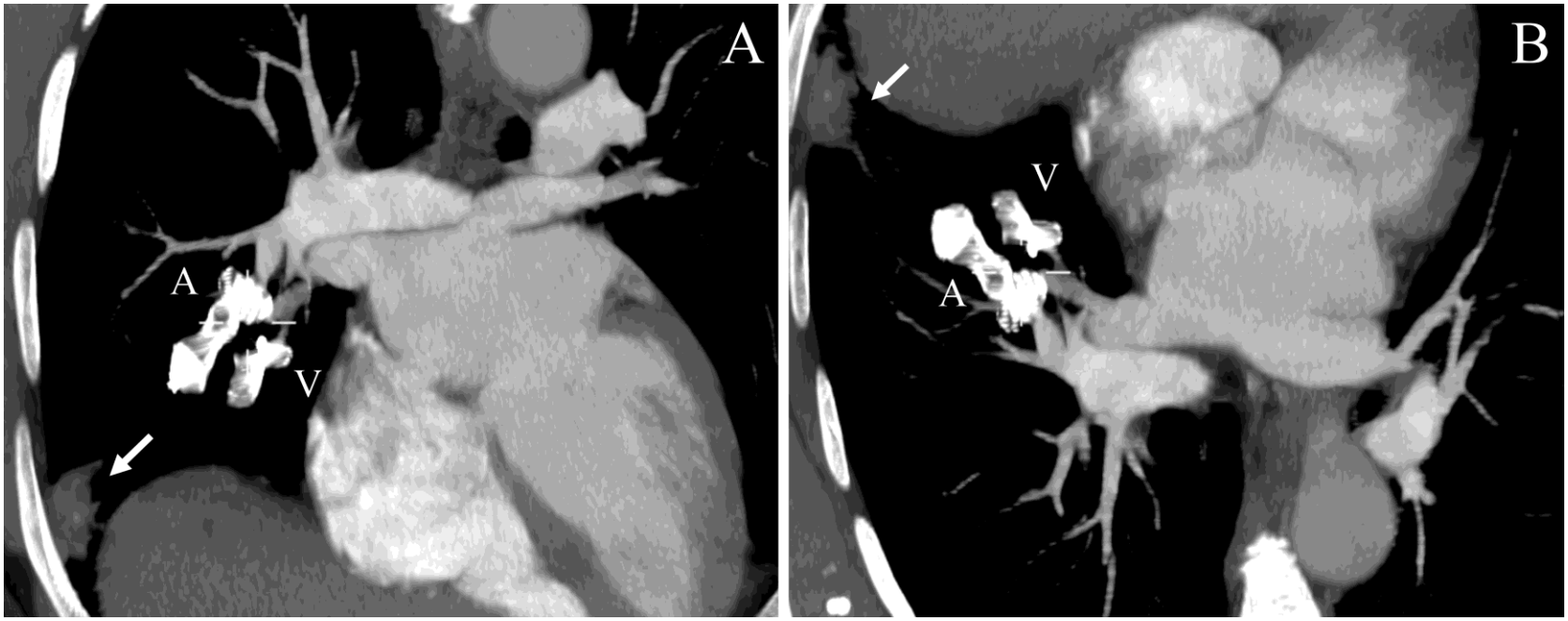
Intraoperatory improvement in arterial saturation values: 91% to 99%.

1° step: Release Right Lower Pulmonary Vein branch

2° step: Release Pulmonary Artery branch

Final angiography: complete occlusion of the artero-venous malformation

Follow-up



Coronal (A) and sagittal (B) MIP reconstructions of the six-month post-procedural AngioCT scan showing the two plugs devices in arterial (A) and venous (V) branches and complete exclusion of the malformation from intrapulmonary circulation (white arrow).

Conclusion

- Pulmonary arteriovenous malformations are an underappreciated cause of respiratory failure and life-threatening neurological events.
- CT scan is the gold standard imaging technique for the diagnosis and morfologic characterization.
- The artero-venous pulmonary malformations treatment of choice is percutaneous transcatheter embolization of the feeding vessel using dedicated device.
- Transcatether occlusion of artero-venous pulmonary malformations with large diameter efferent branch can be complicated by recanalization and late systemic embolization.

- **Contemporary double access technique using transfemoral transseptal (retrograde) and transfemoral transpulmonary artery (anterograde) may be a valid option for reducing the postprocedural embolization risk and recanalization rate.**

Thanks for the attention