Title: Atrial Transseptal Coil Embolization of a Pulmonary Venous Aneurysm In a 38-Year-Old Male With Hemoptysis:

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INTRODUCTION:
Pulmonary venous aneurysm (varix) is a rare venous abnormality defined as local dilation >50% than that of normal vasculature, with normal pulmonary vein diameter ranging from 9 mm to 13 mm [1]. The etiology of pulmonary aneurysm seems to be associated with disruption of pulmonary parenchyma (e.g. trauma, cancer, infection, etc.) or congenital in origin. The overall incidence of these aneurysms is unknown. Historically, treatment of pulmonary vein aneurysms has been based on the presence or absence of hemoptysis. Hemoptysis has been used as a criterion to intervene surgically or endovascularly. The absence of hemoptysis has led others to observe mixed outcomes. Endovascular treatment of pulmonary venous aneurysms is uncommon due to the challenge of accessing the left atrium and the pulmonary venous system. Reported cases have described percutaneous CT-guided [2] and transseptal [3] approaches. In one case report a venous aneurysm was accessed through a patent foramen ovale [4]. We present the case of a pulmonary venous aneurysm in which the left atrium and pulmonary venous system was accessed with a transseptal puncture approach utilizing intracardiac echocardiography (ICE) in collaboration with the cardiac electrophysiology team.

CASE REPORT:

IRB determination was not required by our institution for submission of this case. A 38-year-old male with a history of metastatic synovial sarcoma to the lungs status post chemotherapy treatment who presented to the emergency department with shortness of breath and multiple episodes of hemoptysis. He had presented to an outside facility for recurrent hemoptysis six months prior, where he was found to have hemorrhages of the bilateral upper lobes of his lungs. This was treated with five sessions of radiation therapy. A contrast-enhanced CT angiogram of the chest was performed in our facility at the time of presentation revealing interval enlargement of known metastatic lesions, ground-glass alveolar opacification in the left upper and right lower lobes thought to be hemorrhage, and a new right lower

lobe pulmonary venous aneurysm (Figure 1.) Interventional radiology was consulted for a pulmonary artery angiogram, which revealed no abnormalities in the arterial circulation. Delayed images during the angiogram revealed opacification of the pulmonary venous aneurysm previously seen on CT scan, estimated to be 2.7cm without arterial communication. Multidisciplinary discussions took place between interventional radiology, cardiac electrophysiology, radiation oncology, and pulmonology teams. The decision was made to coil embolize the pulmonary venous aneurysm as there was no other identified potential source of hemoptysis. This procedure would be performed in collaboration with the cardiac electrophysiology team, who would grant access to the left atrium via a transseptal approach utilizing intracardiac echocardiography (ICE.)

Cordis introducer sheaths were inserted into the right and left common femoral veins using the modified Seldinger technique and ultrasound guidance. A Biosense Webster ACUSON AcuNav Intracardiac Echocardiography (ICE) 10F catheter was advanced into the right atrium of the heart to visualize the cardiac structures. Transseptal puncture was performed using an Abbott Vascular BRK-1 needle inserted through an Abbott Vascular SL1 sheath. A guidewire was advanced into the left atrium. The SL1 sheath was exchanged for a medium-curve Abbott Vascular Agilis steerable introducer sheath. The sheath was positioned in the right inferior pulmonary vein and a pulmonary venogram was performed to confirm positioning.
A Cook Medical Bentson guidewire and a 6F Argon Plasma Coagulation (APC) catheter were advanced into the right atrium. The catheter and guidewire combination was successfully navigated through the right ventricle into the right pulmonary artery. Right pulmonary venography was performed revealing filling of the right inferior pulmonary vein aneurysm.

Next, a steerable 8 French sheath, and a Cook Medical coaxial 5F Vert and microcatheter system was advanced through the Agilis sheath into the right inferior pulmonary vein. A right pulmonary venogram was performed, confirming the positioning of the catheter tip within the venous aneurysm (Figure 4). A Stryker Excelsior 1.7F microcatheter was then advanced into the aneurysm sac over a guidewire. Numerous Stryker XL and XXL framing coils ranging in size from 12 to 24 mm in diameter were used for embolization of the aneurysm sac (Figure 5). Another pulmonary venogram was performed, confirming successful occlusion of the venous aneurysm and patency of the draining pulmonary vein (Figure 6.)

Following the pulmonary vein aneurysm coiling, the patients' hemoptysis resolved. He was able to discharge in stable condition the following day.

Symptomatic pulmonary vein aneurysm is a rare occurrence. Among those pulmonary vein aneurysms that are symptomatic needing treatment, it is not often repaired endovascularly. One large obstacle to overcome in endovascular repair is accessing the left atrium and pulmonary venous system, which we were able to achieve through a transseptal approach utilizing ICE.

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Figures

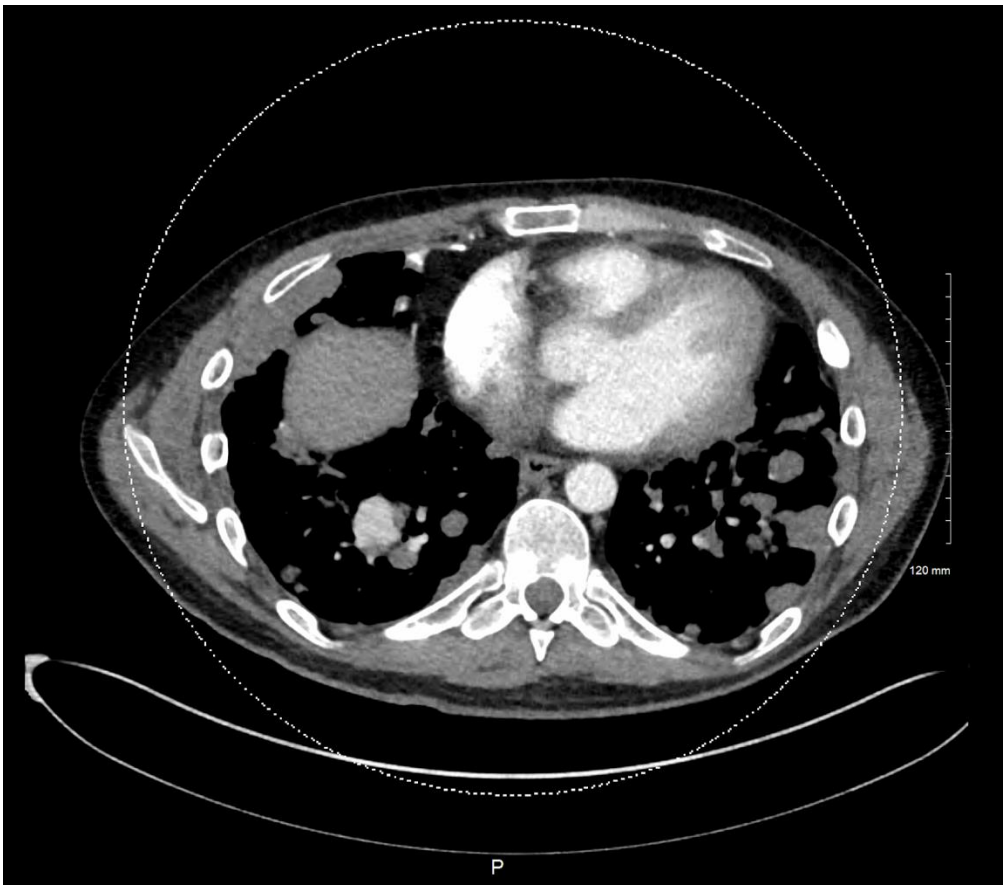

Figure 1: delayed phase axial CT imaging demonstrating the right lower lobe pulmonary vein aneurysm.

Figure 2: Intracardiac echocardiography showing tenting of the atrial septum with a BRK-1 needle prior to puncture into the left atrium.

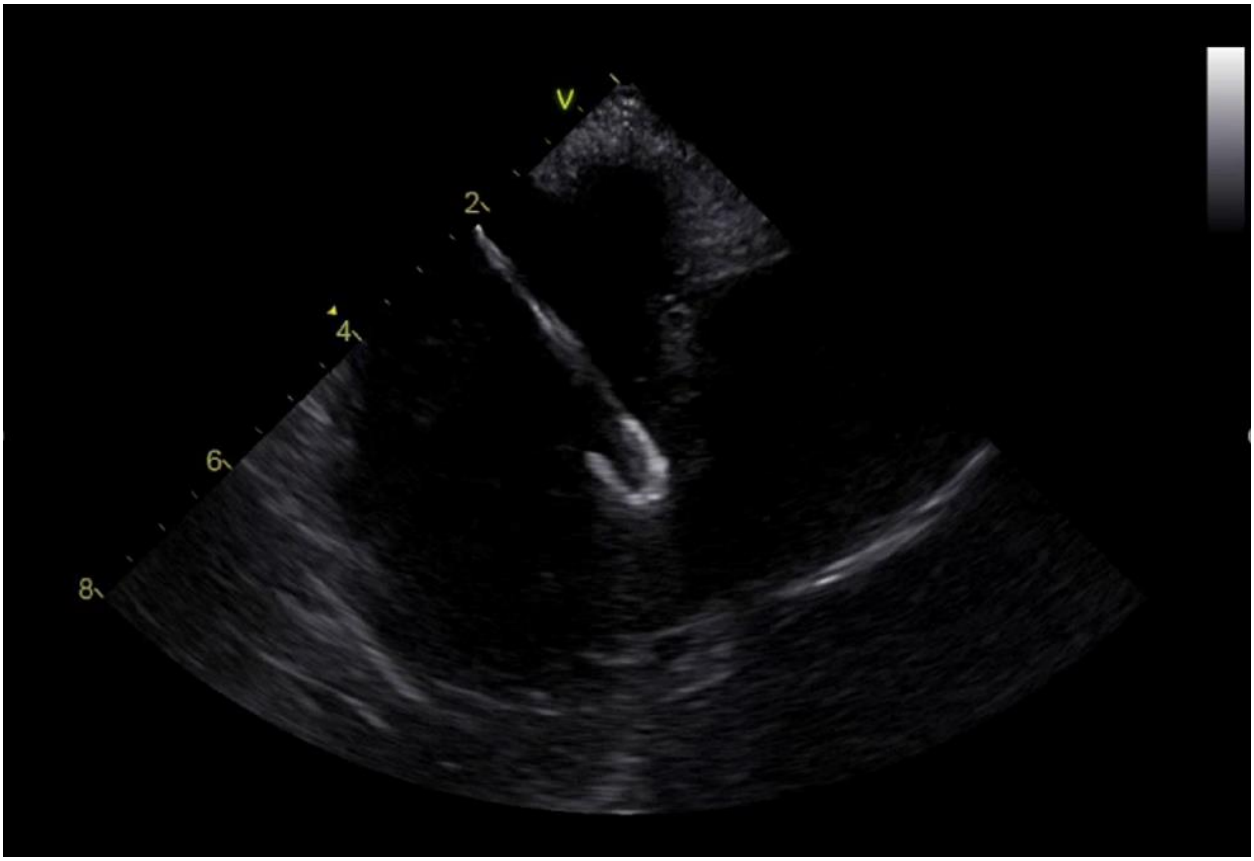

Figure 3: Intracardiac echocardiography image of a guidewire advanced into the left atrium after transseptal puncture.

Figure 4: Pulmonary venogram confirming the appropriate position of the microcatheter within the pulmonary venous aneurysm.

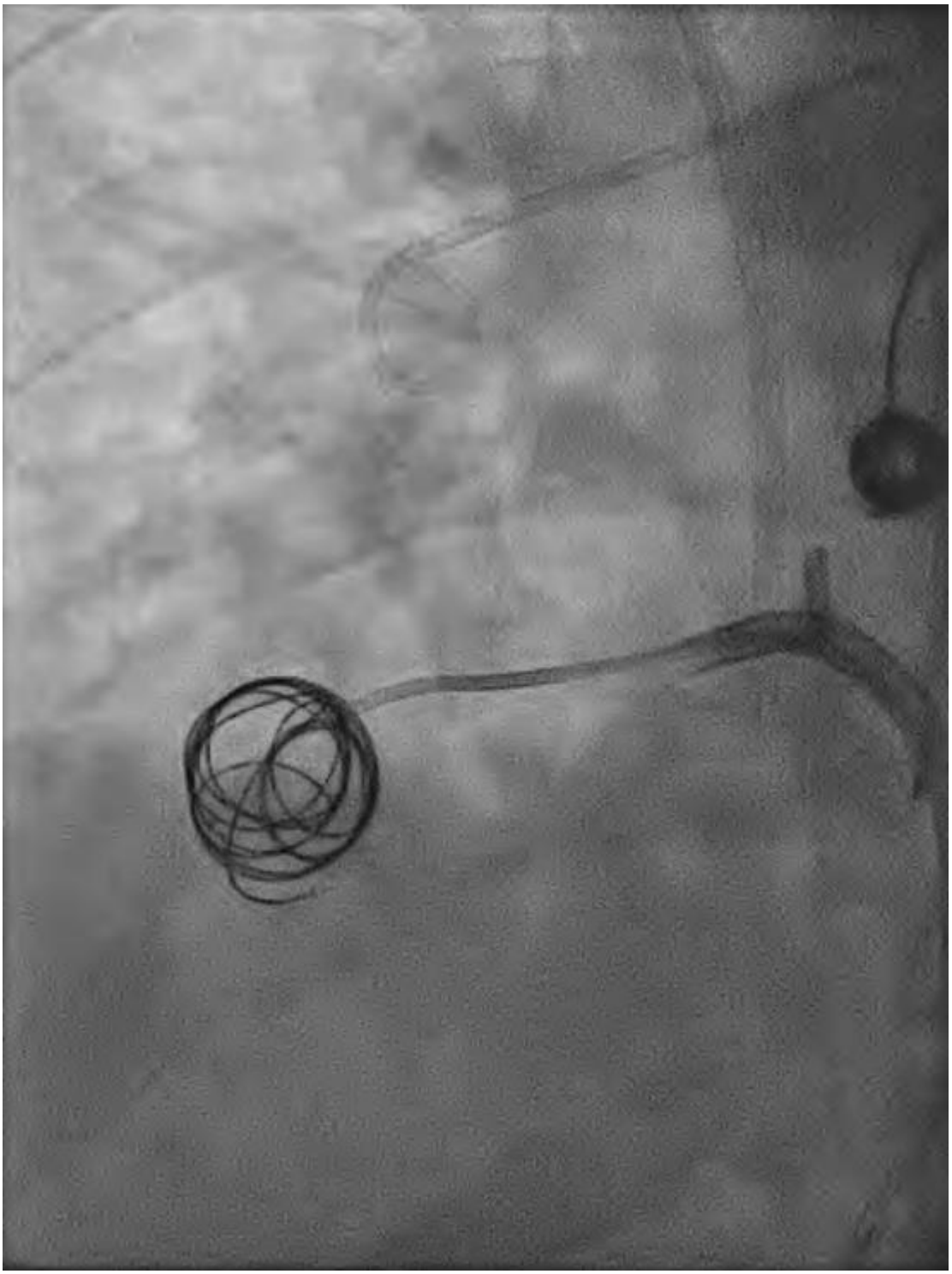

Figure 5: Intra-procedural coiling of the pulmonary venous aneurysm.

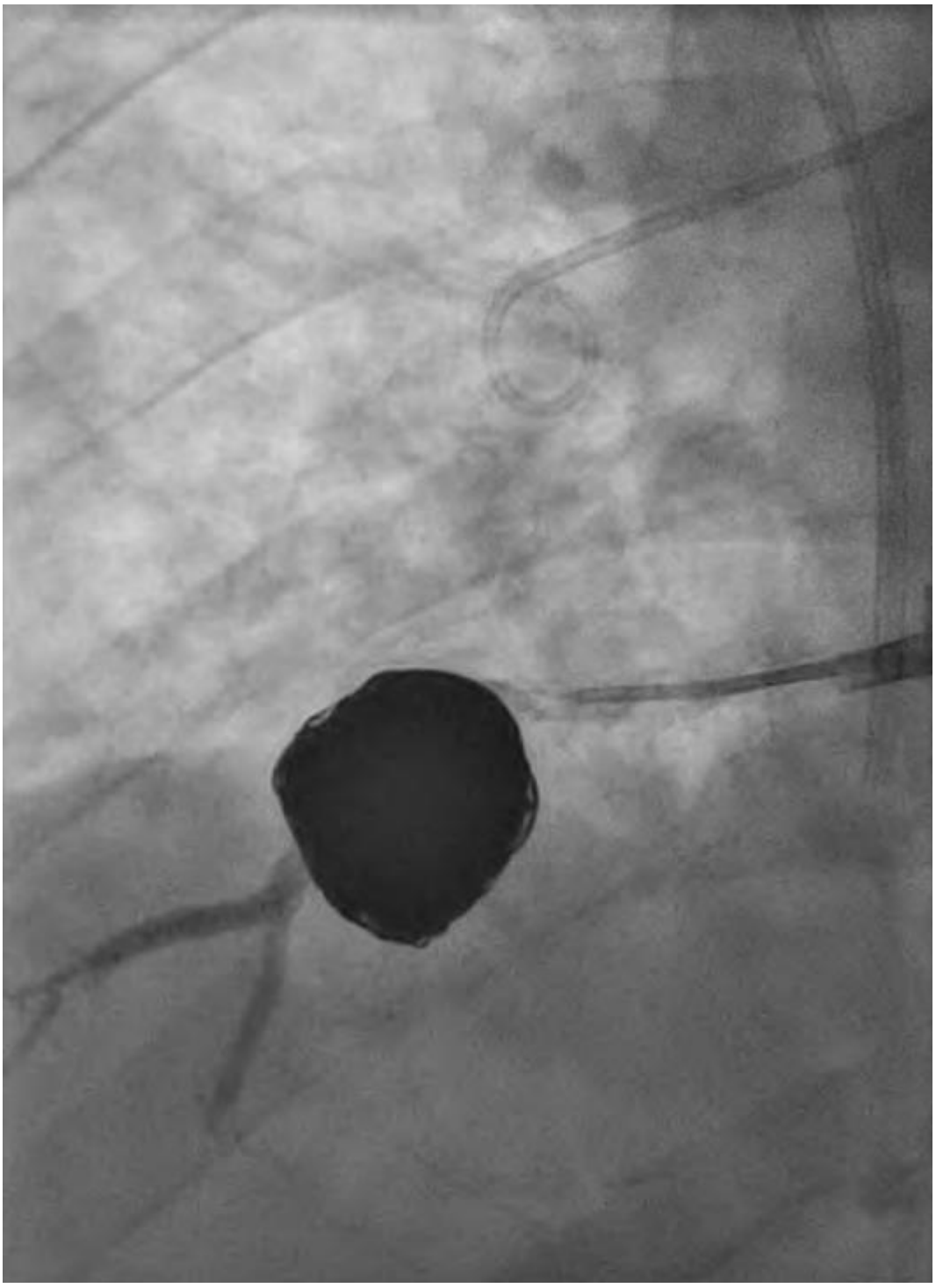

Figure 6: Post-coil embolization of pulmonary venous aneurysm venogram