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Magnetic Resonance Angiography of a Pulmonary Artery Stenosis Late After Cardiac Surgery

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A 19-year-old man with known dextrocardia, situs inversus, and complete surgical correction of a double-outlet right ventricle was seen in the outpatient clinic for follow-up after total correction, including the implantation of a pulmonary homograft. During echocardiography, a dilated right atrium and right ventricle were noted. Increased right ventricular pressure (50 mm Hg; tricuspid regurgitation, 3.5 m/s) could only partially be explained by pulmonary valve stenosis. The pulmonary artery branches could not be visualized echocardiographically. Magnetic resonance angiography was performed using the breath-hold contrast-enhanced 3D gradient echo sequence described by Prince et al.¹ The imaging time was 24 seconds and the resolution was 1.0×2.6×1.3 mm. After the acquisition, the datasets were transferred to a dedicated graphic workstation (Indigo2, Silicon Graphics) for 3D evaluation with a volume-rendering technique^{2,3} using commercially available software (Voxel-View, Vital Images). Three-dimensional representation with volume rendering showed the situs inversus very clearly (Figure 1). The pulmonary homograft is located on the right side of the patient, with the ascending aorta on the left and

descending aorta to the right of the spine. The branch vessels are reversed, with a left brachiocephalic artery as the first arch branch.

To visualize the pulmonary artery branches, the heart and aorta were subtracted from the source images (Figure 2). Both the pulmonary arteries and veins are filled with contrast. The right pulmonary artery showed an important stenosis at the anastomosis from the pulmonary homograft. Figure 3 is a detailed view of the origin of the right pulmonary artery.

The diagnosis was confirmed during reoperation, which consisted of implanting a new pulmonary homograft and reconstructing the right pulmonary artery.

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A movie version of Figure 2 (showing 3D rotation) can be found at www.circulationaha.org

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Circulation encourages readers to submit cardiovascular images to the *Circulation* Editorial Office, St Luke's Episcopal Hospital/Texas Heart Institute, 6720 Bertner Ave, MC1-267, Houston, TX 77030.

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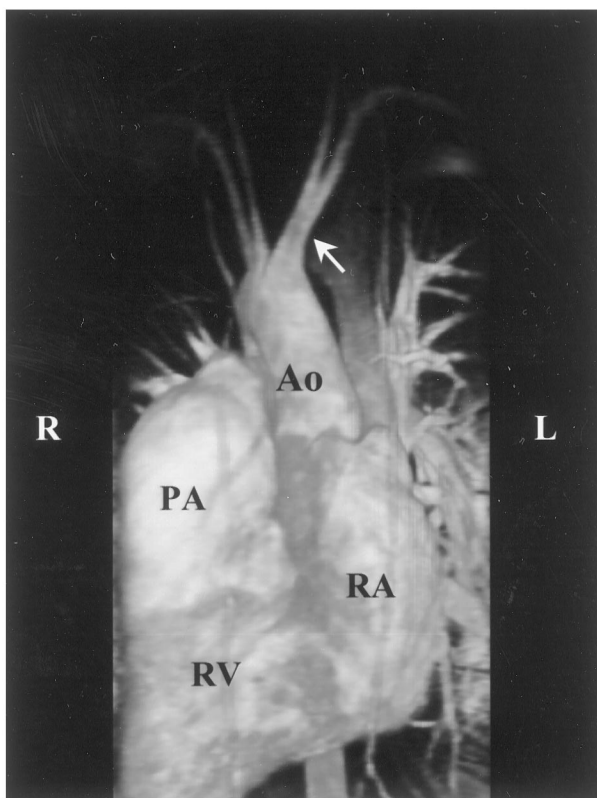


Figure 1. Breath-hold contrast-enhanced magnetic resonance angiography of a patient with situs inversus. Ao indicates aorta; PA, pulmonary artery; RV, right ventricle; RA, right atrium; R, right side of patient; and L, left side of patient. Arrow indicates left brachiocephalic artery.

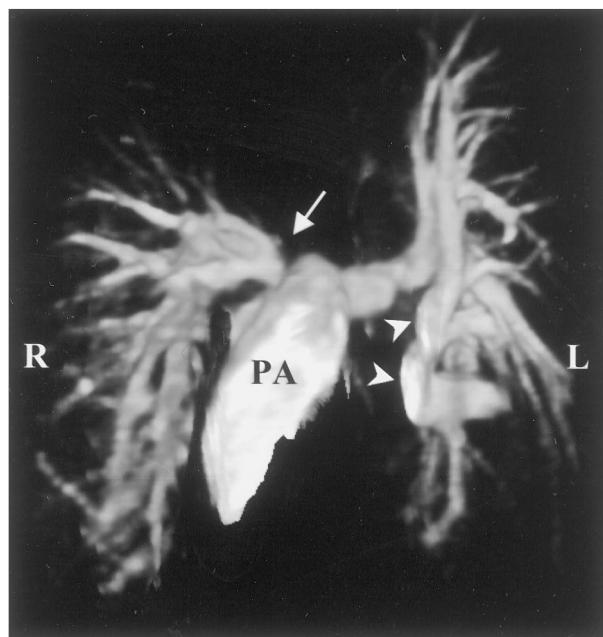


Figure 2. Visualization of the pulmonary artery (PA) after removal of the heart and aorta from the dataset. The pulmonary veins are also visualized (arrowheads). The right pulmonary artery shows an important stenosis at the origin (straight arrow). R indicates right side of patient; L, left. The 3D rotation of this image can be found at www.circulationaha.org

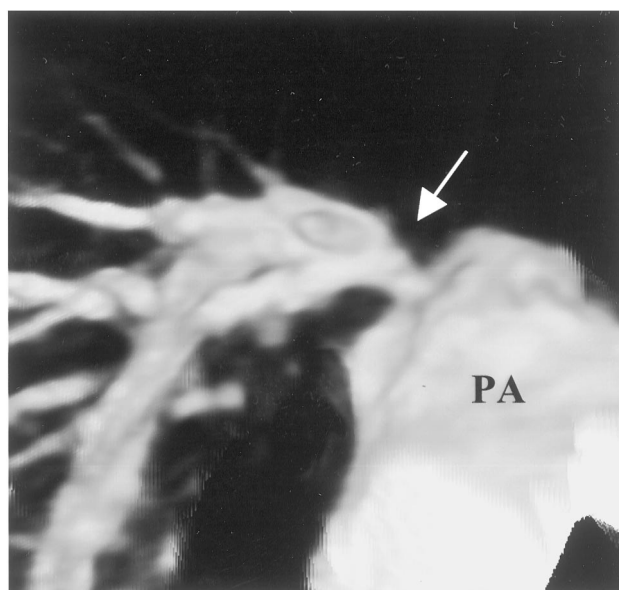


Figure 3. Detailed view of the common pulmonary artery (PA) and proximal right pulmonary artery showing a stenosis at the origin (straight arrow).