

# Evaluating Patent Ductus Arteriosus during Percutaneous Closure:

Correlation between Intravascular Ultrasonography and Computed Tomographic Angiography

Matthew LaBarbera, MD  
Bess M. Storch, MD  
Cezar S. Staniloae, MD  
James Slater, MD

**A** 39-year-old man presented with dyspnea on exertion and was found on auscultation to have a continuous machinery-like murmur. A computed tomographic (CT) angiogram with 3-dimensional reconstruction showed a tubular patent ductus arteriosus (PDA) that measured  $1.7 \times 1.3$  cm in diameter (Figs. 1 and 2). Given the large size of the defect, we entered the PDA with a peripheral intravascular ultrasound catheter (Volcano Corporation; San Diego, Calif) to obtain ultrasonographic images (Fig. 3), which precisely confirmed the dimensions shown on the CT scan. Because of the defect's large size, we used an AMPLATZER™ 20-mm vascular plug II (St. Jude Medical, Inc.; St. Paul, Minn) for closure (Fig. 4). Multiple aortograms verified cessation of left-to-right flow across the PDA, consistent with occlusion of the PDA (Fig. 5).

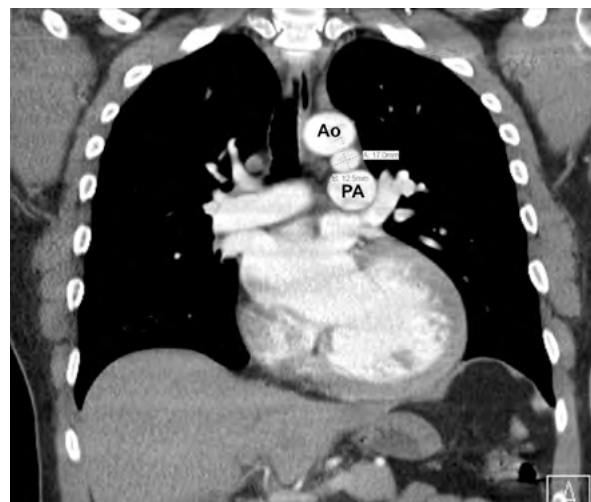
**Section Editor:**  
Raymond F. Stainback, MD,  
Department of Adult  
Cardiology, Texas Heart  
Institute, 6624 Fannin St.,  
Suite 2480, Houston, TX  
77030

**From:** Division of Cardiology,  
Department of Medicine  
(Drs. LaBarbera, Slater, and  
Staniloae) and Department  
of Medicine (Dr. Storch),  
NYU Langone Medical Cen-  
ter, New York, New York  
10016

**Address for reprints:**  
Matthew LaBarbera, MD,  
Division of Cardiology,  
Department of Medicine,  
NYU Langone Medical  
Center, 550 First Ave.,  
New York, NY 10016

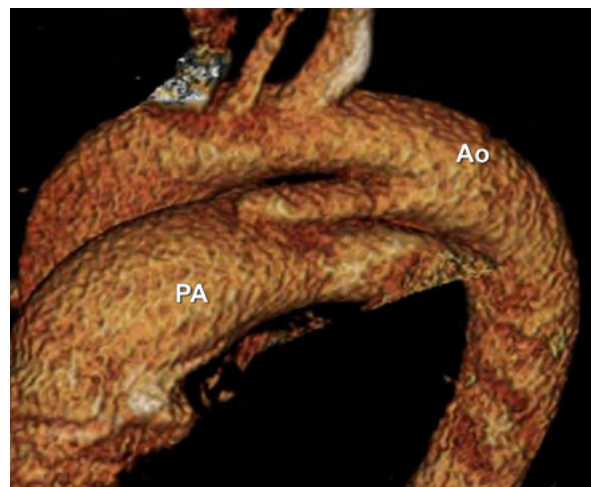
**E-mail:** Matthew.LaBarbera  
@nyumc.org

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**Fig. 1** Coronal image of a contrast-enhanced computed tomographic scan shows a large patent ductus arteriosus ( $1.7 \times 1.3$  cm).

Ao = aorta; PA = pulmonary artery

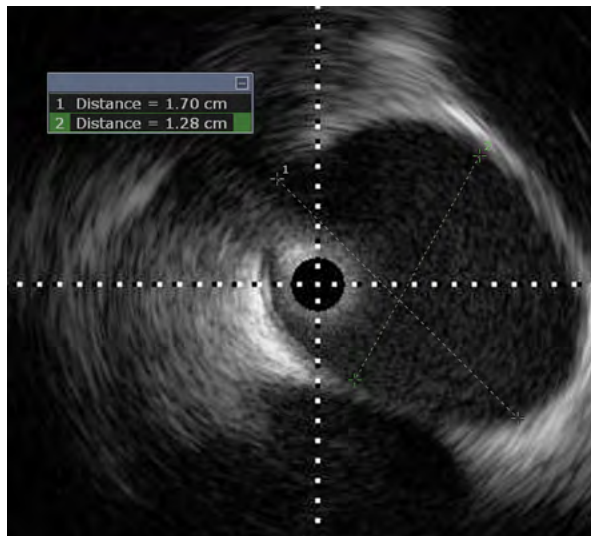


**Fig. 2** Three-dimensional reconstruction of a contrast-enhanced computed tomographic scan shows a large patent ductus arteriosus.

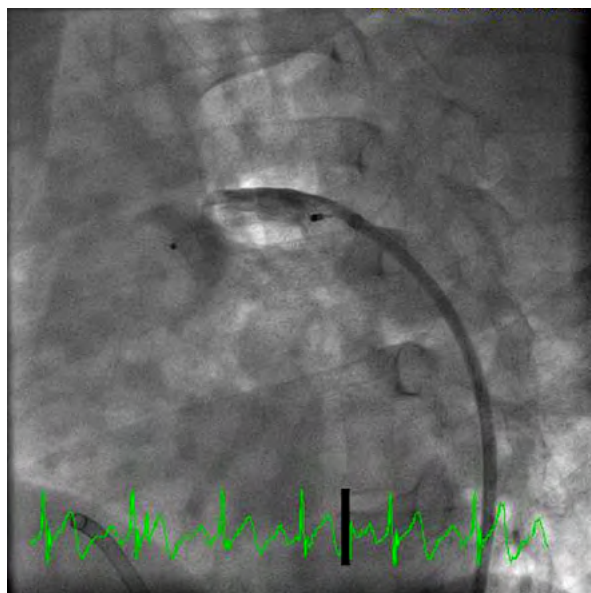
Ao = aorta; PA = pulmonary artery

## Comment

Various imaging methods have been used in the evaluation of PDA, including cardiac angiography, CT and magnetic resonance angiography, echocardiography, and intravascular ultrasonography (IVUS). Computed tomography has been used to evaluate PDA size and shape in preparation for percutaneous closure and has correlated well with echocardiography.<sup>1</sup> Intravascular ultrasonography is helpful in delineating the size and other characteristics of a PDA, especially when echocardiographic images are insufficient.<sup>2</sup> For example, IVUS



**Fig. 3** Intravascular ultrasonographic image of a large patent ductus arteriosus (1.7 × 1.3 cm).



**Fig. 4** Aortogram shows placement of the AMPLATZER™ 20-mm Vascular Plug II within the patent ductus arteriosus.

Supplemental motion image is available for Figure 4.



**Fig. 5** Aortogram shows closure of the patent ductus arteriosus with use of the AMPLATZER Vascular Plug.

Supplemental motion image is available for Figure 5.

provides insight into the structure of the vascular wall, including aneurysmal dilation and the presence and distribution of calcification.<sup>3</sup> This, to the best of our knowledge, is the first report of the use of a peripheral IVUS catheter in the evaluation of a PDA during percutaneous closure; the catheter revealed excellent correlation between IVUS and CT angiography in the sizing of the PDA. Intravascular ultrasonography should be considered in lieu of CT in young patients to avoid unnecessary radiation exposure, as well as in patients with substantial renal impairment, allergy to contrast solution, or other contraindications to contrast administration. Indeed, one might choose to bypass CT altogether and use IVUS in all cases, because IVUS (in our judgment) should be considered the gold standard for the measurement of vascular size. This eliminates the need for contrast solution and potentially could reduce costs. Intravascular ultrasonography can be a useful imaging technique at the time of percutaneous closure for the sizing and characterization of a PDA, especially if CT angiographic data are not available.

## References

1. Thai WE, Harper RW, Seneviratne S. Dynamic volume 320-slice CT in the assessment of patent ductus arteriosus for percutaneous closure. *Heart* 2010;96(4):321.
2. Fechtrop C, Kerber S, Karbenn U, Borggrefe M, Breithardt G. Value of intravascular ultrasound in the diagnosis and characterization of patent ductus arteriosus in an adult patient. *Eur Heart J* 1993;14(8):1148-9.
3. Ho YL, Kao HL, Wu CC, Chen MF, Lee YT. Intravascular ultrasonographic characterization of calcification of the patent ductus arteriosus in adults. *Am Heart J* 1996;132(2 Pt 1):457-9.