

IMAGING VIGNETTE

ADVANCED

CLINICAL VIGNETTE

Late Complication After Transcatheter Closure of Patent Ductus Arteriosus



Alessandro Salustri, MD, PhD,^{a,b} Smitha Anilkumar, MD,^a Abdel Naser Ghareep, MD,^c Maryam Alkuwari, MD,^c Ziyad M. Hijazi, MD, MPH^d

ABSTRACT

We describe the case of a 32-year-old man with history of patent ductus arteriosus (PDA) closed with an Amplatzer device 12 years earlier. Imaging investigations revealed a persistent large PDA and the device migrated in the right pulmonary artery. A new transcatheter PDA occlusion was attempted with optimal post-procedural results. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2019;1:433-5) © 2019 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

A 32-year-old man from Nepal was referred for evaluation of a cardiac murmur detected during his pre-employment process. The patient had a history of cardiac catheterization in Nepal 12 years prior to this visit, but he was not able to clarify the reasons and there was no report available. He was otherwise healthy with mild shortness of breath on exertion and no clinical signs of congestive heart failure. His oxygen saturation in the right hand in room air was 98%. His electrocardiogram showed sinus rhythm and right ventricular hypertrophy. Chest x-ray showed a rounded radiopaque image superimposed on the right hilar region (Supplemental Figure 1). A transthoracic echocardiogram revealed a patent ductus arteriosus (PDA) with left-to-right shunt and severely dilated main pulmonary artery and its branches (Figure 1A). There were signs of right ventricular pressure overload (estimated pulmonary artery systolic pressure 105 mm Hg) with normal right ventricular function, and the left ventricle was mildly dilated with preserved systolic function (left ventricular ejection fraction 62%).

Computed tomography pulmonary angiography confirmed significant dilatation of the main pulmonary artery (4.5 cm) and its 2 main branches (2.9 cm). A PDA was noted with a size of about 1.7 cm and marginal calcifications (Figures 1B and 1C, Supplemental Figure 2). An Amplatzer Muscular ventricular septum defect device (St. Jude Medical, St. Paul, Minnesota) was evident in the distal part of the right pulmonary artery, suggesting an embolized device from the previously attempted PDA closure 12 years earlier (Figures 1D to 1F, Supplemental Figure 3).

The patient was referred for cardiac catheterization and assessment of his hemodynamics and possible attempt at closure of the PDA. The procedure was performed under conscious sedation and access was obtained in the right femoral vein (10-F sheath) and right femoral artery (5-F sheath). In room air, his QP-QS ratio was 2.1:1 with a pulmonary artery pressure of 116/59 mm Hg (mean 84 mm Hg) and mean wedge pressure of 20 mm Hg. His pulmonary vascular resistance in room air was calculated to be 10.4 Woods units. The patient was placed on 100% FiO₂ and 20 parts per million NO for 20 min. Repeated hemodynamics revealed an increase

From the ^aDepartment of Noninvasive Cardiology, Heart Hospital, Doha, Qatar; ^bWeill Cornell Medicine-Qatar, Doha, Qatar; ^cDepartment of Radiology, Heart Hospital, Doha, Qatar; and the ^dDepartment of Pediatrics, Sidra Medicine, Doha, Qatar. Dr. Hijazi has received consulting fees from and holds stock options in Occlutech. All other authors have reported that they have no relationships relevant to the contents of this paper to disclose.

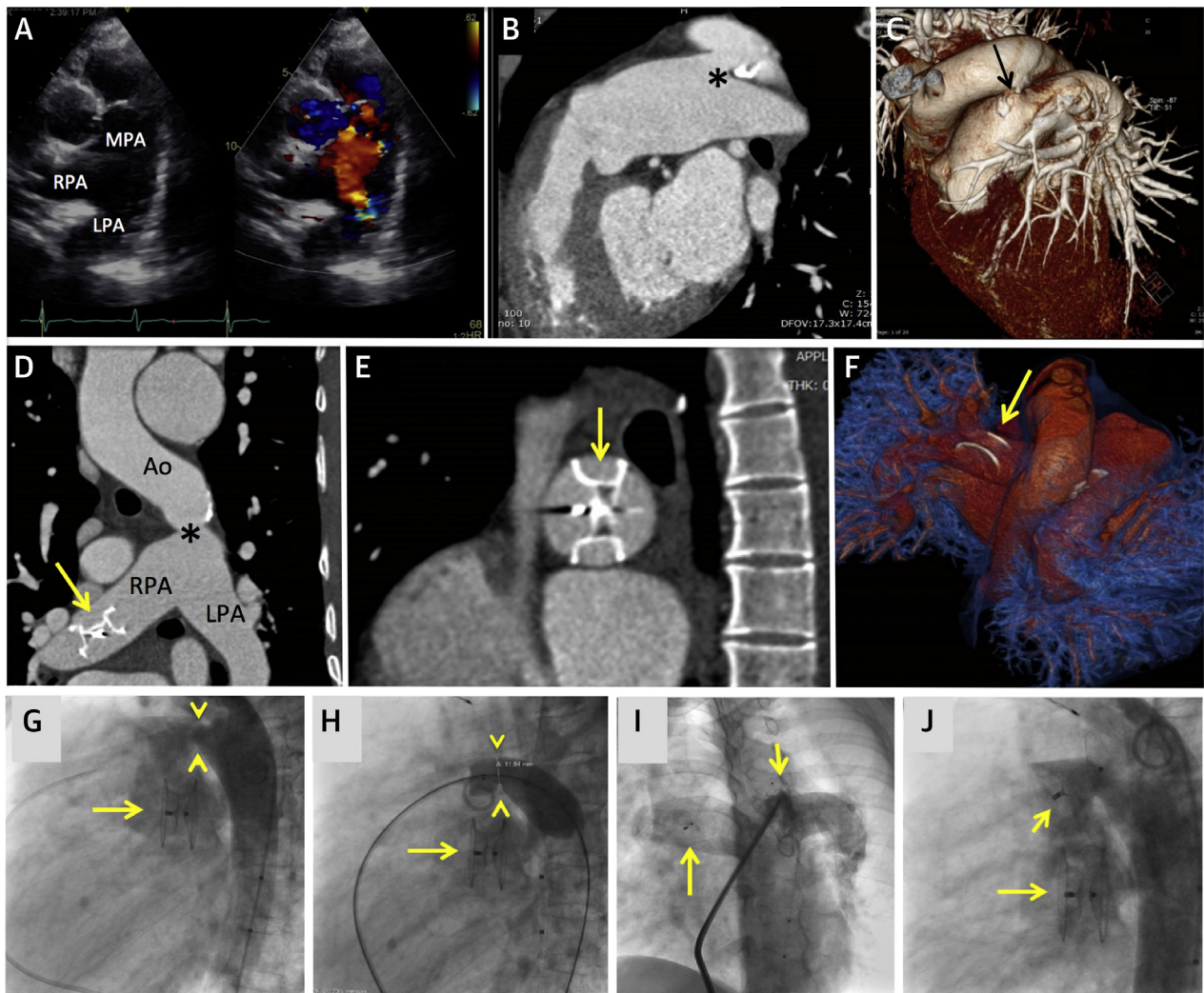
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**ABBREVIATIONS
AND ACRONYMS**

PDA = patent ductus arteriosus

of QP-QS ratio to 7.5:1 with pulmonary artery pressure of 102/49 mm Hg (mean 72 mm Hg) and mean wedge pressure of 23 mm Hg. His pulmonary vascular resistance was calculated at 4.2 Woods units. Based on 94% O₂ saturation in the lower extremities, suggesting a nonsevere right-to-left shunt, and on the vasoreactivity testing, we decided to proceed and close the PDA (**Figures 1G and 1H, Video 1**).

FIGURE 1 Late Embolization of an Amplatzer Device and Subsequent Interventional Patent Ductus Arteriosus Closure



(A) Transthoracic echocardiogram. Parasternal short-axis view at the base of the heart, diastolic frame. Dilated pulmonary artery and main left and right branches. The color flow Doppler imaging reveals a flow from the aorta (Ao) into the pulmonary artery in a proximal direction toward the pulmonary valve, consistent with the presence of left-to-right shunt due to patent ductus arteriosus. **(B)** Computed tomography (CT) pulmonary angiogram. Sagittal view at the level of the right ventricular outflow tract showing a large patent ductus arteriosus (PDA) with marginal calcification (**asterisk**). **(C)** CT pulmonary angiogram. Volume-rendering technique image showing the PDA with marginal calcification (**arrow**). **(D)** CT pulmonary angiogram. Reconstructed oblique coronal image showing the embolized device (**arrow**) in the right pulmonary artery (RPA) and the PDA with marginal calcification (**asterisk**). **(E)** CT pulmonary angiogram. Reconstructed sagittal oblique view showing the embolized device end on in the RPA (**arrow**). **(F)** CT pulmonary angiogram. Volume-rendering technique image showing the embolized device (**arrow**) in the RPA. **(G)** Cardiac catheterization. Angiogram in the descending aorta showing the presence of a large PDA, angiographic type A (**arrowheads**) with some calcifications. Note, the **arrow** indicates the embolized muscular ventricular septum defect device in the RPA. **(H)** Balloon sizing of the PDA. The balloon's narrowest diameter was almost 12 mm (**arrowheads**). Note, the **arrow** indicates the embolized muscular ventricular septum defect device in the RPA. **(I)** Pre-procedural cardiac catheterization. Angiogram via side arm of delivery sheath in the main pulmonary artery (MPA) in 4-chamber view prior to device release, revealing good and unobstructed flow to the left pulmonary artery (LPA) and device in good position (**short arrow**). **Long arrow** indicates the embolized device in the RPA. **(J)** Post-procedural cardiac catheterization. Final descending aorta angiogram in lateral projection, revealing device in good position and small residual shunt through device (**short arrow** pointing to device in position). The **long arrow** points the previously embolized device in the RPA. See [Video 1](#).

Surgical closure of PDA was not considered due to the risk of rupture related to the presence of calcifications. An initial attempt using a 14-mm Amplatzer Muscular ventricular septum defect device failed because it pulled through without much tension. Therefore, an 18-mm Amplatzer Post Infarct ventricular septum defect device was used. This time, the device was stable and an angiogram in the main pulmonary artery prior to release of the device demonstrated good position and no interference with the left pulmonary artery blood flow (Figure 1I). The device was released successfully. Repeat hemodynamics in room air 10 min after device release revealed that the main pulmonary artery pressure was 56/20 mm Hg (mean 39 mm Hg) and a descending aortic pressure of 136/64 mm Hg (mean 93 mm Hg). Final angiogram in the descending aorta revealed good device position and minimal residual shunt through the device (Figure 1J). The patient was evaluated after 6 weeks, the PDA was completely closed and his right ventricular pressure was about 40% systemic.


Embolization of an Amplatzer device is a rare complication of interventional PDA occlusion ranging between 0% and 16% (1,2) and usually requires reposition and redeployment of the device. Late embolization, as in the case we reported, is extremely rare (3). Percutaneous recovery of the device was not attempted due to the risk of severe injury to the right pulmonary artery wall.

ADDRESS FOR CORRESPONDENCE: Dr. Alessandro Salustri, Noninvasive Cardiology, Heart Hospital-Hamad Medical Corporation, P.O. Box 3050, Doha, Qatar. E-mail: asalustri@hamad.qa.

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KEY WORDS device embolization, patent ductus arteriosus

 **APPENDIX** For supplemental figures and a video, please see the online version of this paper.