Free-floating occluder device in the left atrium during paravalvular leak closure in a child: Nightmare in the cath lab

Paravalvular leak (PVL) is a complication that occurs in 5%–10% of patients after surgical mitral valve replacement. Reoperation may be necessary for a rare group of patients with heart failure or progressive hemolysis. Surgical repair has been considered a standard treatment method for a long time; however, the percutaneous route may be preferred owing to lower morbidity and mortality rates in high-risk patients. There are few experiences of percutaneous PVL closure in children.

A 7-year-old-girl, who has been followed-up with dilated cardiomyopathy and left ventricle noncompaction cardiomyopathy (LVNC) diagnosis since she was 15-days old, underwent surgical mitral valve replacement due to severe mitral insufficiency. Further, 7 months after the operation, she was referred for severe mitral PVL that caused significant hemolysis requiring blood transfusion. Transesophageal echocardiography (TEE) revealed significant mitral PVL, moderate tricuspid valve insufficiency, LVNC, and reduced left ventricular contraction with a shortening fraction of 20% (Video 1). We decided to perform hybrid PVL closure because she was hemodynamically unstable and the operative risk was unacceptably high. After left anterior minithoracotomy, a 9 Fr introducer sheath was inserted into the left ventricular apex. The mean width of PVL measured by 3D-TEE was 16×6 mm (Fig. 1). A 14-mm Amplatzer Septal Occluder (ASO) device was successfully deployed across the PVL. However, the disc of the device on the ventricular side was remarkably close to the mitral valve, preventing proper valve functioning. Unfortunately, the ASO device was embolized during repositioning and started to float in the left atrium (Videos 2, 3). Subsequently, the device was captured with a snare and successfully retrieved (Video 4). Attentive device reimplantation with reassurance that it does not touch the mitral valve was performed (Video 5). We observed that the mitral valve movements were favorable by 3D-TEE, the mitral inflow was clear by 2D-TEE, and there was no residual leakage by color Doppler TEE after the procedure (Video 6).

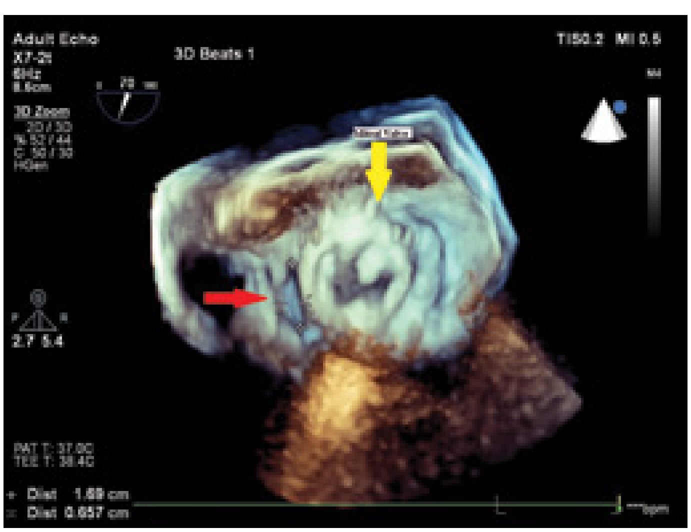

Figure 1. 3D-transesophageal echocardiography image indicating the measurement of paravalvular leak (red arrow)

Informed consent: Informed consent was obtained from the patient's parents.

Video 1. Color Doppler transesophageal echocardiographic video indicating severe mitral paravalvular leak

Video 2. Catheter angiography video indicating embolization of the Amplatzer Septal Occluder device during repositioning

Video 3. Transesophageal echocardiography and catheter angiography videos indicating floating of the Amplatzer Septal Occluder device within the left atrium

Video 4. Catheter angiography video indicating the capture of the Amplatzer Septal Occluder device in the left atrium with a snare and its successful retrieval

Video 5. Placement and deployment of the Amplatzer Septal Occluder in the appropriate position

Video 6. 2D, 3D, and color Doppler transesophageal echocardiography videos indicating the device position after the procedure

İbrahim Cansaran Tanıdır*, Bekir Yükcü*, Mugisha Kyaruzi, Alper Güzeltaş***
Departments of *Pediatric Cardiology, and **Cardiovascular Surgery, University of Health Sciences, İstanbul Mehmet Akif Ersoy Thoracic and Cardiovascular Surgery Training and Research Hospital; İstanbul-*Turkey*

Address for Correspondence: Dr. Alper Güzeltaş,
Sağlık Bilimleri Üniversitesi,
İstanbul Mehmet Akif Ersoy Göğüs Kalp ve Damar Cerrahisi,
Eğitim ve Araştırma Hastanesi,
Çocuk Kardiyoloji Kliniği,
İstanbul-*Türkiye*
Phone: +90 542 256 06 01
E-mail: alperguzeltas@hotmail.com

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Left ventricular outpouching - A challenging diagnosis

Under conditions of acute myocardial infarction (AMI), left ventricular outpouching (LVO) detection requires emergency differential diagnosis because the outcome of LVOs differs substan-

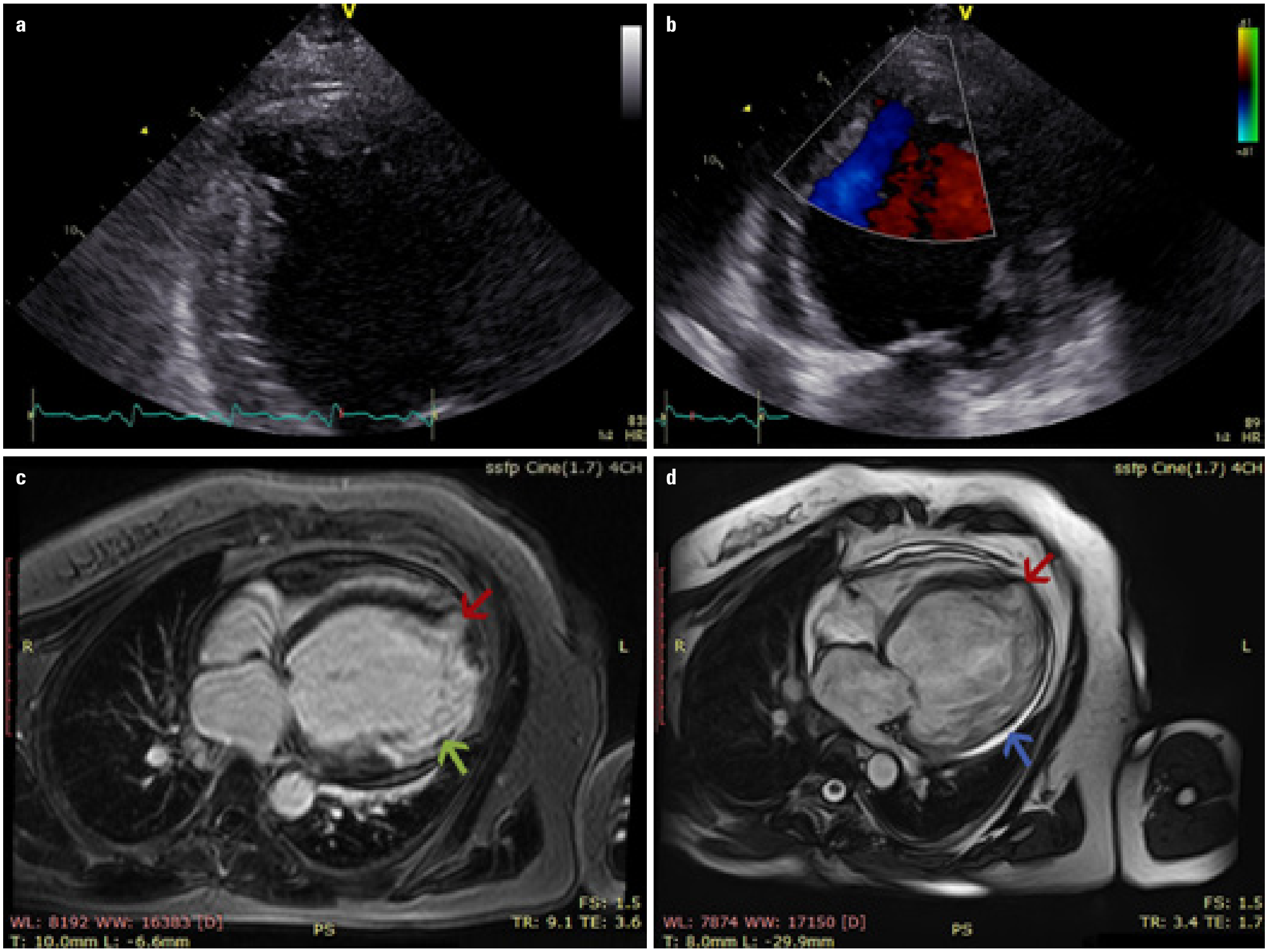

Figure 1. Transthoracic echocardiography apical images. (a) Extremely dilated left ventricle, end-diastolic volume of 330 ml, small apical interruption of the myocardial wall of the left ventricle (18/7 mm) (white arrow), with a small circumferential pericardial effusion. (b) Color Doppler during end-diastole suggesting flow signal between the left ventricular outpouching and the left ventricle. Cardiac magnetic resonance horizontal long-axis images. (c) Steady-state free precession image revealing septal apical myocardial cleft (red arrow) and small pericardial effusion (blue arrow), and an extremely dilated left ventricle with LVEF of 14%. (d) Late gadolinium-enhancement image showing no delayed enhancement at the level of the myocardial cleft (red arrow) and high lateral transmural late enhancement (green arrow)

tially. Differentiation among different types of LVOs is challenging considering the overlapping diagnostic criteria.

We report the case of a 63-year-old woman who was admitted with AMI and cardiogenic shock, with onset of symptoms 24 hours prior to admission. ECG findings showed left bundle branch block. Transthoracic echocardiography (TTE) revealed markedly impaired left ventricular (LV) ejection fraction (LVEF=15%), extremely dilated LV, global hypokinesia, and thin circumferential pericardial effusion. A small LVO having concordant motion with adjacent segments was noted in the apical part of the interventricular septum, suggesting a pseudoaneurysm (Fig. 1a, 1b, Video 1), a potentially life-threatening condition in AMI. Cardiovascular magnetic resonance imaging (CMR) confirmed severely dilated LV; diffuse thinning of the myocardium; lateral and inferior wall akinesia; myocardial edema and high transmural enhancement, indicating myocardial infarction with no signs of viability; and a thin pericardial effusion (Fig. 1c, 1d). CMR confirmed apical septal LVO, containing all myocardial layers (17/6 mm) (Fig. 1 c, 1d - red arrow, Video 2), and provided better information about LVO type, well-perfused myocardium, and concordant motion with adjacent segments, without associated ischemia, scar, or thrombus, clearly excluding pseudoaneurysm. Aneurysm was also excluded due to the lack of fibrous tissue or paradoxical expansion. The position of LVO was common for both the diverticulum and myocardial cleft. The diverticulum appeared to be congenitally narrow mouthed with wide outpouching of the entire thickness of the myocardium. LVO variability in systole may suggest the presence of myocardial cleft, but not myocardial diverticulum. In this case, wall thickness reduction of LVO resulted from myocardial fiber disarray, called myocardial cleft, with benign acute prognosis. The patient recovered slowly and was discharged after 10 days.

Therefore, an atypical myocardial cleft was the final diagnosis, incidentally discovered using TTE. CMR plays a vital role for acute diagnosis and management. In this particular setting of extremely dilated LV, a thorough imaging follow-up plan (TTE and CMR) is mandatory, with LVO being prone to rupture.

Informed consent: Written informed consent was obtained from the patient.

Video 1. Echocardiography video. A small LVO (187 mm) having concordant motion with adjacent segments was noted in the apical part of the interventricular septum, suggesting a pseudoaneurysm

Video 2. CMR video. Steady-state free precession image revealing septal apical myocardial cleft and small pericardial effusion. LVO had thin, well-perfused myocardium having concordant motion with the adjacent segments, clearly excluding pseudoaneurysm

Alexandra Maria Chitroceanu, Roxana Cristina Rimbas*, Alina Ioana Nicula, Dragos Vinereanu***
Department of Cardiology, University and Emergency Hospital; Bucharest-*Romania*
Departments of *Cardiology, and **Radiology, University and Emergency Hospital, University of Medicine and Pharmacy Carol Davila; Bucharest-*Romania*

Address for Correspondence: Roxana Cristina Rimbas, MD,
Department of Cardiology,
University and Emergency Hospital,
University of Medicine and Pharmacy Carol Davila;
Bucharest-*Romania*
Phone: 0040213180576
E-mail: roxanasisu@gmail.com

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Retained outflow graft following the explantation of left ventricular assist device

A 21-year-old man underwent coronary angiography because he presented with chest pain, serum troponin elevation, and a decline in left ventricular ejection fraction. His medical history included dilated cardiomyopathy, left ventricular assist device implantation (Heartmate II) 48 months prior, and the explantation of this device because of recovery 5 months prior (Figs. 1 and 2). Coronary angiography showed normal coronary arteries. During right coronary artery canalization attempts, the Judkins right catheter indwelled outside of the aorta easily, but

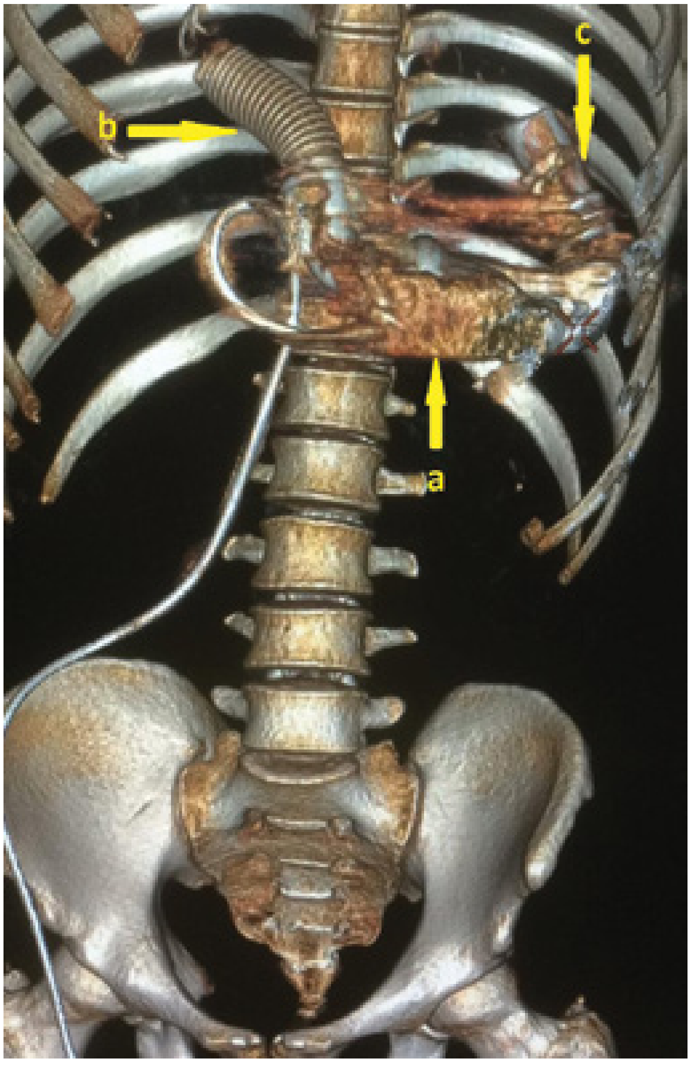

Figure 1. Computed tomography image of left ventricular assist device (Heartmate II) demonstrating the pump (a), outflow graft (b), and inflow cannulas (c)

we could not ascertain the reason for this. However, we observed a faint contrast efflux from the ascending aorta during nonselective aortography (Video 1). The angiography procedure concluded with no complications. Subsequently, we reviewed medical and operation records in detail. Although the pump of the device had been withdrawn, outflow graft had been retained in situ following its detachment from the pump. The inflow cannula had been withdrawn, and a plug had been placed within the retained sewing ring. The distal ostia of the outflow graft had been closed using a primary stitch, whereas the aortic ostia had remained open. The outflow graft was supposed to be closed with blood stasis and clot formation following operation. Various device explantation techniques have been described in the literature with differing degrees of retained device material (1). These techniques include the complete pump explant, which was used in this case, inflow and outflow ligation with retention of inlet cannula, outflow graft ligation with retention of other parts, and driveline transection with the pump left in