

Surgery for delayed leaflet impingement after transcatheter closure of a paravalvular leak associated with an aortic pseudoaneurysm

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Abstract

Paravalvular leak (PVL) is a recognized and challenging complication after surgical or transcatheter valve replacement. The transcatheter closure of PVL has become the first-line treatment in clinical practice when the procedure is not contraindicated. Transcatheter PVL closure rests a complex procedure and complications still occur in approximately 9% of patients. We describe the case of a delayed mechanical prosthetic leaflet impingement after transcatheter closure of a paravalvular leak associated with a Valsalva pseudoaneurysm that required an urgent surgery. The transcatheter closure of PVL does not preclude subsequent attempt to surgical repair and outcome.

Introduction

Paravalvular leak (PVL) is a recognized and challenging complication after surgical or transcatheter valve replacement. The incidence of PVL is estimated to be 2-10% after surgical aortic valve replacement, 7-17% after mitral valve replacement and at even higher rates following transcatheter aortic valve replacement (1,2). Paravalvular defects after surgery may be due to infection, annular calcification, suboptimal suture or tissue fragility. While most PVLs are small and not clinically significant with an excellent long-term outcome, in 1-5% of cases, they can be responsible for severe clinical consequences including, heart failure (caused by large leaks), hemolysis (often caused by smaller, irregular defects), or both (3,4).

Until recently, the surgical treatment of PVL has been the mainstay and exclusive approach with evidence of improved outcomes compared with conservative therapy but with high early morbidity and mortality rates following reoperation (3). Percutaneous approach to PVL closure has been developed and is now considered as a safe, less invasive and first-line treatment in many centers with high rates of procedural success and positive clinical outcomes (5). We describe the case of a mechanical prosthetic leaflet impingement after transcatheter closure of a paravalvular leak with a Valsalva pseudoaneurysm that required urgent surgery.

Case report

A 83-year-old man with heart failure was referred to our institution. He had history of aortic valve replacement using a 23 mm CarboMedics mechanical valve (Sorin Group, Saluggia, Italy) 12-year earlier, moderate chronic renal insufficiency and atrial fibrillation. The heart failure was secondary to severe aortic paravalvular leak, revealed by transthoracic echocardiography (TTE). Transoesophageal echocardiography (TEE) confirmed TTE findings and additionally, it showed a pseudoaneurysm of the left sinus of Valsalva (Figure 1A, 1B). The paravalvular leak and Valsalva pseudoaneurysm were probably secondary to an asymptomatic, past endocarditis. Cardiac electrocardiogram-gated computed tomography (CT) scan confirmed the PVL and showed the presence of a bilobed pseudoaneurysm measuring 21x16x17 mm, near the origin of the left main coronary artery (Figure 1C, 1D).

After a careful analysis of echocardiography and CT scan the presence of the aortic pseudoaneurysm was

not considered a contraindication to percutaneous closure and the risk of perforation low. Therefore due to the high surgical risk (Euroscore II, 12.48%) linked to age, chronic renal failure, left ventricular impairment and previous cardiac surgery, a percutaneous treatment was decided. Two month after the acute heart failure, an Amplatzer Vascular Plug III 14 x 5 mm (St Jude Medical, St Paul, MN, USA) was implanted under echocardiographic and fluoroscopic guidance. The procedure was not easy, but at the end of procedure, a good result was obtained with a mild residual leak. Three days later, the patient presented a new episode of heart failure, echocardiography and angiography (Figure 2A) showed an impingement of the prosthesis in open position. The Amplatzer was successfully repositioned (Video 1), but two days later a new impingement was revealed, consequently, the Heart Team decided for cardiac surgery.

Surgery confirmed the obstruction of one prosthetic hemidisk (Figure 2B, 2C, 2D, Video 2), and the presence of the pseudoaneurysm. The pseudoaneurysm was excluded by direct suture and the valve was replaced with a bioprosthesis. The postoperative recovery was uneventful and at follow-up, 1 year after surgery, the patient was in good shape, any residual PVL was detected and the left ventricular function had improved.

Discussion

Paravalvular leak is a common complication after surgical or transcatheter valve replacement with substantial morbidity and mortality. Although there are, to date, no randomized study comparing transcatheter and surgical treatment of PVL, a recent meta-analysis showed, interestingly, a higher operative success rate of leak resolution after surgery (96.7% vs. 72.1%), at the expense of greater 30-day mortality (8.6% vs. 6.8%), stroke (3.3% vs. 1.4%), resource use and hospitalization duration. However, surgical and transcatheter PVL closure were associated with comparable mid-term and long-term mortality rates and clinical outcomes (6). The degree of residual leak is clearly correlated with increased all-cause mortality and major adverse cardiac events (7). The higher incidence of significant residual leak after transcatheter PVL closure could explain the lack of difference in mortality rates at 1-year between surgical and transcatheter PVL repair despite the higher in hospital mortality after surgery (6). The presence of an aortic pseudoaneurysm associated with a paravalvular leak can be considered a specific condition and the feasibility and success of the transcatheter closure is discussed.

Prosthesis impingement is a major potential complication and is more likely to occur in mechanical valves than in biological prosthesis because the occluder device can more easily interfere with the movements of the low-profile hemi-disk. A relatively late impingement, like in our case, is not usual (3 days after the first implant and 2 days after the second implant), we do not know for sure the mechanism, but we cannot exclude that the presence of the pseudoaneurysm may have played a role in the displacement of the occluder.

Surgical re-operations remain, as shown in our case, a valid option for the treatment of PVLs in selected cases. Alkhouli and colleagues show very well that patients who did not achieve procedural success with percutaneous closure had no increase of mortality after surgical intervention compared with patients selected to receive surgery as the first-choice treatment (8).

Conclusion

Percutaneous closure must be the first choice for the repair of PVL and surgery should be considered in specific settings as an auxiliary treatment in case of contraindications, complications or failure. The presence of an aortic pseudoaneurysm could be a relative contraindication to be assessed on a case-by-case basis. Transcatheter closure of PVL does not preclude subsequent attempt to surgical repair and outcome.

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Figure Legends

Figure 1 Pre-operative imaging assessment. (A). Transoesophageal echocardiography (TEE) showing the severe aortic paravalvular regurgitation and the pseudoaneurysm (red arrow) with circulating blood flow. (B) Transoesophageal echocardiography showing (red arrow) the bilobed pseudoaneurysm of the left sinus of Valsalva. (C and D) Coronal and Axial contrast-enhanced computed tomography (CT) images, showing the pseudoaneurysm (red arrows)

Figure 2 (A) Angiography view of the Amplatzer impeding the closure of the mechanical prosthesis hemidisk. (B) Intraoperative aortic view. (C) Intraoperative removal of the Amplatzer (D) excised view of the mechanical prosthesis and the occluder device with the re-creation of the obstruction mechanism.

Video Legends

Video 1 Angiography of the percutaneous procedure to repositioned the Amplatzer. The occlude device impeding the closure of the mechanical prosthesis. After a slight traction, the hemidisk is blocked in closed position.

Video 2 Intraoperative aortic video and excised view of the mechanical prosthesis and the Amplatzer occluder device, showing the interference to closure of the prosthetic hemidisk.

