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CASE REPORT

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Interventional closure of aortomitral perforation after TAVR: A case report

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Abstract

Despite TAVR emerging as the gold standard for a broad spectrum of patients, it is associated with serious complications. In this report we present a case, where a TAVR procedure led to a perforation at the aortomitral continuity, discuss the risk factors for the occurrence of perforations and how we decided to treat the patient.

KEYWORDS
aortic valve disease percutaneous intervention (AVDP), closure AV fistula/AVM (CLAV), imaging TTE/TEE (ITTE), percutaneous valve therapy (PVT), transcatheter valve implantation (TVI)

1 | INTRODUCTION

Transcatheter aortic valve replacement (TAVR) has emerged as the gold standard for the treatment of a broad spectrum of patients with aortic valve stenosis. Especially older patients typically present with heavily calcified valves. While the calcium has positive attributes by serving as an anchor for the prosthesis, it can also be the cause for severe complications. We present a case, where calcification caused a perforation in the aortomitral continuity and subsequent treatment of the patient.

1.1 | Case series

An 82-year-old female patient with high-grade aortic stenosis was transferred to our institution for aortic valve replacement. Due to the age and comorbidities of the patient the heart team recommended a TAVR procedure. Heavily calcified femoral and iliac arteries made a transfemoral approach impossible (see Figure 1), instead a transapical approach was chosen. The patient had severe calcification of the aortic valve extending into the left ventricular outflow tract (LVOT). Furthermore, an extensive mitral annular calcification was present.

FIGURE 1 Shown is a three-dimensional (3D) MIP reconstruction. Noteworthy are the heavy calcified iliac arteries and aorta. For this reason, a transapical approach was chosen

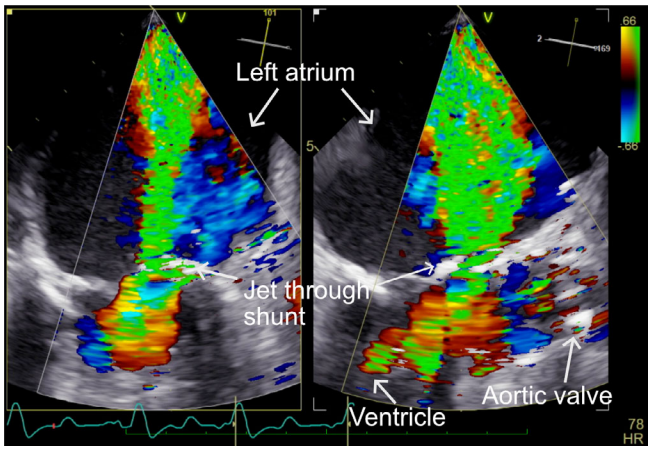

FIGURE 2 TEE image of the fistula in the aortomitral continuity with a big jet into the left atrium

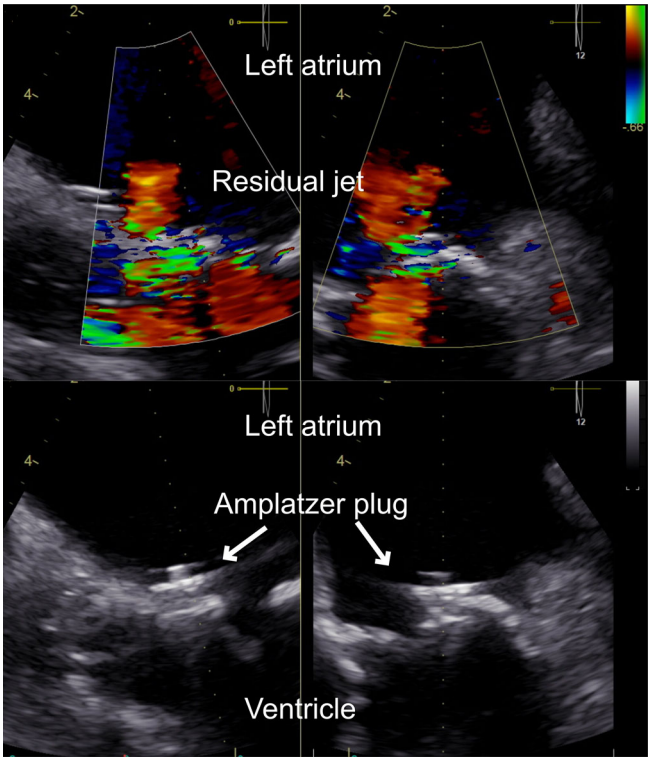

FIGURE 3 After deployment of an Amplatzer Valvular Plug III the jet was significantly reduced

The annulus size as determined by computed tomography was 532 mm^2 and the diameter 24 × 29 mm. The TAVR procedure, using a 29 mm Edwards SAPIEN 3 valve, was performed under general anesthesia. Postinterventional transoesophageal echocardiography (TEE) by the anesthesiologist showed a normal function of the deployed valve without paravalvular leakage. No postdilatation was performed. The patient was transferred to the ICU and was extubated shortly after. Due to a worsening respiratory situation with lung edema, the patient had to be reintubated the day after the TAVR procedure. A repeat TEE still showed normal function of the prosthetic valve but revealed a large jet in the left atrium arising from the aortomitral continuity (Figure 2). An atrioventricular shunt in the aortomitral continuity proximal of the TAVR valve was diagnosed, probably caused by a shift of the LVOT calcification during valve deployment.

The interdisciplinary heart team decision was to opt for an interventional closure of the leak as the potentially best treatment option for the patient. It was planned to initially try cannulating the perforation from the left atrium after transseptal puncture. In case this would not work, the backup plan was to use a retrograde transaortic approach via the TAVR bioprosthesis.

Using fluoroscopy and TEE for guidance, cannulation and catheter passage of the perforation after transseptal puncture could be achieved without particularly great effort, due to the size of the defect. To make sure not to disturb either the function of the aortic prosthesis or the mitral valve, an Amplatzer Valvular Plug III (Abbott Medical) was chosen. From periinterventional TEE guidance, we estimated the defect size to be 5 × 3 mm and initially decided for an 8 × 4 mm plug that could be easily deployed. During the tug test, however, the device proved to be insufficiently anchored. After recannulation, we deployed a 10 × 5 mm Valvular plug. This time, the plug was sitting securely in the defect. After documentation of a satisfactory reduction of the insufficiency jet, the plug was released. The TEE result after deployment is shown in Figure 3. Left atrial mean pressure (LAmP) and LA v-wave pressure (LAvP) went from initially 22 mmHg and 43 mmHg to 10 mmHg LAmP and 13 mmHg LAvP immediately after deployment. The patient was transferred back to the ICU, where she could be extubated soon after. In a follow-up transthoracic echo 4 weeks after the procedure, a residual shunt could be excluded. Additionally, there was no sign of hemolysis in the lab. A short video with sequences from the TEE and fluoroscopy is provided as a Video S1.

2 | DISCUSSION

Ventricle perforation following TAVR is a serious and in many cases lethal complication.[1,2] In this case, the perforation in the aortomitral continuity that led to a shunt between the left atrium and ventricle was likely caused by a shift of the LVOT calcification. Remarkably, the perforation was not seen in the periprocedural TEE and probably occurred a day after the procedure.

By choosing adequate valve type and size for the individual patient, important preventative steps can be made to reduce the risk of perforation. In this case, TAVR was done using the balloon-expandable SAPIEN 3 valve (Edwards Lifesciences). In patients with an LVOT calcification, such as the patient described here, a self-expanding valve might have been the better choice.[3]

Another risk factor is choosing a valve that might be too large. Choosing a smaller valve and perhaps slightly oversizing it, might have prevented the perforation in hindsight. The downsides are higher

gradients and possibly patient-prosthesis mismatch as well as a higher incidence of paravalvular leaks.

Postdilatation is another known risk factor for perforation. As there was no paravalvular leak and the valve was fully expanded, postdilatation was not performed in this case.

The occurrence of intracardiac shunts following a TAVR procedure is rare but is associated with a high mortality if left untreated in symptomatic patients.[2]

As TAVR patients are typically high-surgical risk patients, a percutaneous closure of the shunt is often the treatment of choice. Patients who underwent successful interventional shunt closure demonstrate a satisfactory outcome, although no long-term data exists.[2]

3 | CONCLUSION

The occurrence of intracardiac shunts is a rare, but serious complication of a TAVR procedure. The most important aspect is the prevention of a perforation; thus, it is crucial to know and recognize the risk factors that lead to it. In this case the fistula at the aortomitral continuity was successfully treated by percutaneous closure of the shunt with a valvular plug.

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CONFLICTS OF INTEREST

All authors have reported that they have no relationships relevant to the contents of this paper to disclose.

DATA AVAILABILITY STATEMENT

Data sharing not applicable. No new data generated.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

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