



## Case Report

## Transcatheter mitral paravalvular leakage closure: A beautiful last resort



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## ABSTRACT

We describe a case of a 54-year-old patient with rheumatic heart valve disease who was treated with double valve replacement (both aortic and mitral) twice. Two months after the second operation she developed a severe mitral paravalvular leakage (PVL) leading to cardiogenic shock for which she was hospitalized in the intensive care unit. Multiple weaning efforts proved to be unsuccessful because of persistent hemodynamic instability caused by the severe PVL. Since re-redo cardiac surgery would have meant an unacceptable high peri-operative risk it was decided in the heart team to close the PVL by a transcatheter technique. This was done successfully and led to a spectacular hemodynamic improvement. Just 24 h after closure of the PVL she could be discharged from the intensive care unit and the day after the procedure she came walking into the echocardiography laboratory for an echocardiographic evaluation. This case demonstrates not only the feasibility of transcatheter closure of a PVL but also that this can be a true life-saving act.

**<Learning objective:** This case emphasizes that refractory heart failure can be a hard indication for closure of a PVL given the fast and complete clinical recovery after closure of the defect. Furthermore, it demonstrates the feasibility and the efficacy of transcatheter PVL closure, even when multiple devices have to be used to close the leak properly avoiding the risks inherent to redo cardiac surgery.>

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## Introduction

A paravalvular leak (PVL) is the consequence of an incomplete sealing between the sewing ring and the valvular annulus. For mitral valve prostheses, its estimated incidence is about 7–17%. Although most PVLs are asymptomatic, 1–5% of patients exhibit serious clinical consequences, which may consist of hemolytic anemia, infective endocarditis, or congestive heart failure as in our patient [1]. Currently, the gold standard treatment is redo cardiac surgery involving either repair of the leak or re-replacement of the valve.

The current case was deemed to be too high risk for redo surgery by our heart team, and she was treated with a transcatheter technique. Three approaches can be used: retrograde transapical, antegrade transseptal, or retrograde aortic. Based on the two largest case series, technical success ranges from 77% to

86% with a clinical success rate of almost 90% and a major adverse event rate of less than 10% at 30 days after the procedure [2,3]. Consequently, transcatheter PVL closure might be an appropriate alternative for redo surgery in patients deemed at too high risk.

## Case report

A 54-year-old female patient of north-African origin had a mechanical aortic (Sorin Carbomedics Top Hat<sup>®</sup> 21 mm; Sorin, Milan, Italy) and mitral (Sorin Bicarbon<sup>®</sup> 25 mm) valve implanted because of rheumatic heart valve disease 10 years before the current presentation. Because of dysfunction of the mechanical mitral valve prosthesis due to excessive pannus formation, she underwent redo mitral (Edwards Perimount<sup>®</sup> 29 mm; Edwards, Irvine, CA, USA) and aortic (Sorin Mitroflow<sup>®</sup> 23 mm) valve replacement (the latter was functioning properly but was removed to be able to carry out the redo mitral valve replacement safely). Both procedures were carried out in another hospital. Initially there was an uneventful postoperative recovery and she went home clinically well. Two months afterwards she was hospitalized because of cardiogenic shock with pulmonary edema secondary to

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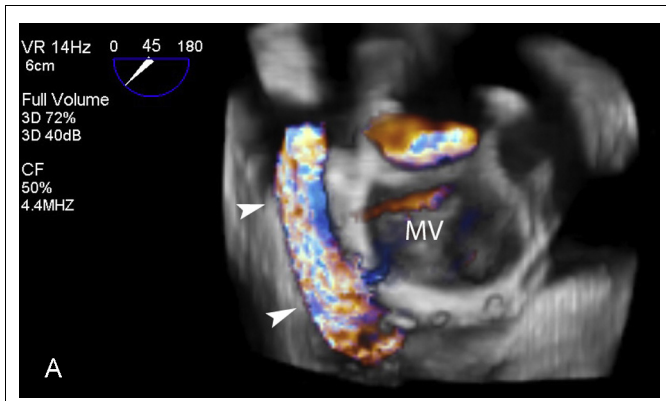


Fig. 1.

Three-dimensional transesophageal echocardiography (left atrial view with color flow) before closure showing massive paravalvular regurgitation on the posterolateral side of the mitral valve bioprosthesis. MV, mitral valve; arrowheads, regurgitant jet.

an important mitral PVL. Transesophageal echocardiography showed a large defect on the posterolateral side of the mitral valve prosthesis causing severe PVL (Fig. 1). There was no significant valvular mitral regurgitation, a normal functioning aortic bioprosthesis and a preserved left ventricular ejection fraction.

The patient was transferred to the cardiac intensive care unit of our hospital where she was mechanically ventilated maintaining a high need of vasopressors, inotropics, and loop diuretics despite the implantation of an intra-aortic balloon pump. Multiple weaning efforts were unsuccessful. Given the high risk of re-redo cardiac surgery (EuroSCORE II: 47%), the heart team decided to treat her by means of a transapical, transcatheter technique to close the PVL, held responsible for the current therapy-resistant pulmonary edema.

This procedure was done under general anesthesia, starting with a small left anterolateral thoracotomy to expose the left ventricular apex. A purse string suture with pledges was placed, together with a 9-French sheath. The defect was easily crossed with a hydrophilic guidewire and two Amplatzer™ vascular plugs III were implanted (14 and 5 mm – AGA Medical Corporation, Plymouth, MN, USA) which resulted in an almost complete closure of the PVL, leaving only a small regurgitant jet between the two plugs (Figs. 2 and 3). During the hours following the procedure a spectacular hemodynamic improvement ensued which permitted

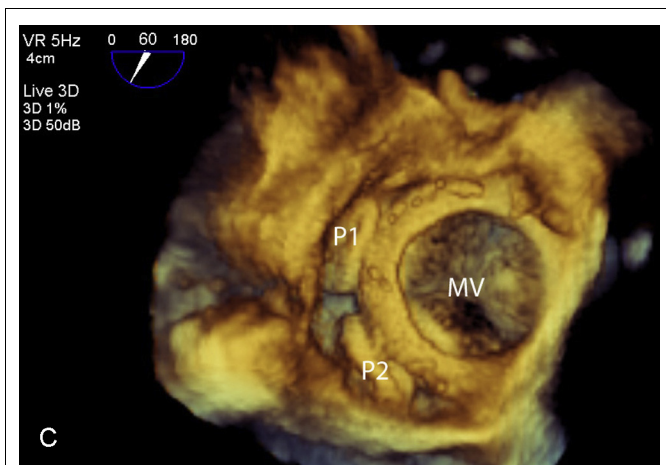


Fig. 2.

Three-dimensional transesophageal echocardiography (left atrial view) after successful positioning of the two vascular plugs. MV, mitral valve; P1, plug 1; P2, plug 2.

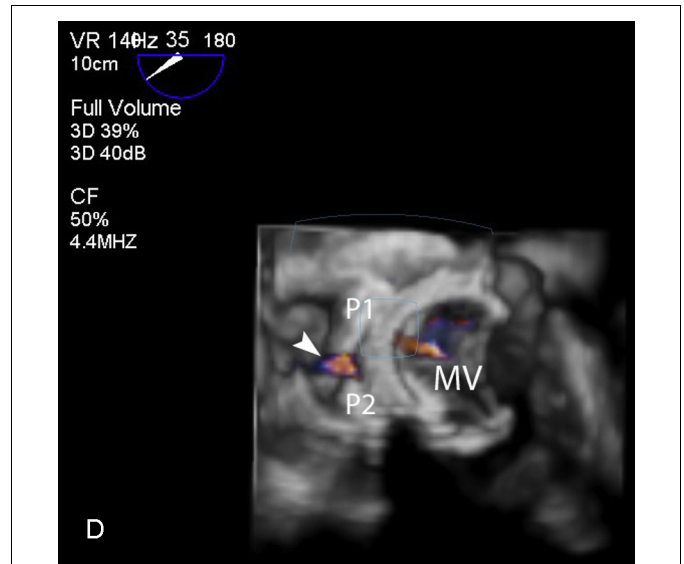


Fig. 3.

Three-dimensional transesophageal echocardiography (left atrial view with color flow) after closure showing only a trivial residual regurgitant jet between the two vascular plugs. MV, mitral valve; P1, plug 1; P2, plug 2; arrowhead, regurgitant jet.

a rapid weaning from the inotropics, vasopressors, diuretics, and ultimately from mechanical ventilatory support. The next day she could even walk to the echocardiography laboratory for a postprocedure evaluation.

## Discussion

In this case, we performed a retrograde technique via transapical approach to close a mitral PVL. In the literature however, the transfemoral approach with or without an arterio-venous loop is mostly described [2–5], although transapical transcatheter PVL closure has increased in popularity [6]. In our experience, the transapical approach offers a more direct manipulation of the wires resulting in a more controlled positioning and release of the plug. Furthermore, multiple guide-wires may be positioned through the PVL(s) to release the plugs in a serial manner, without the difficulty to pass a residual PVL again and risking migration and/or embolization. When using one catheter, the previous plug has to be released before implanting the subsequent plug as was performed in the current case. When using more than one catheter, multiple plugs can be released simultaneously decreasing the risk of migration and enabling repositioning in case of malpositioning or inadequate closure.

Although a number of unsuccessful procedures have been described [7–9], this case report emphasizes that severely symptomatic refractory heart failure can be a hard indication for closure of a PVL given the fast and complete clinical recovery after closure of the defect. Furthermore it demonstrates the feasibility and the efficacy of transcatheter PVL closure, even when multiple devices have to be used to close the leak properly avoiding the risks inherent to redo cardiac surgery.

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## Conflict of interest

The authors declare no conflict of interest.

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