

# Percutaneous Closure of Mitral Paravalvular Leak

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Received: 11/01/2010

Accepted: 01/21/2011

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## SUMMARY

The development of paravalvular leak (PVL) after mitral valve replacement is a rare event but of high symptomatic incidence. The surgical repair of this condition has high morbidity and mortality; for this reason, several percutaneous techniques have been attempted with a successful rate that varies between 60% and 90%. In this presentation is described the case of a young female patient, with multiple prior mitral valve surgeries, symptomatic because of limiting dyspnea and hemolytic anemia. The PVL was closed using a specially designed Amplatzer III device under three-dimensional echocardiographic images. After 3 months of follow up, the PVL remains totally excluded and the patient is asymptomatic.

REV ARGENT CARDIOL 2011;79:537-540.

## Key words >

Heart Valve Prosthesis - Prosthesis Failure – Percutaneous Closure

## Abbreviations >

<b>MVRS</b>	Mitral Valve Replacement Surgery	<b>PVL</b>	Paravalvular Leak
<b>TEE</b>	Transesophageal Echocardiogram		

## BACKGROUND

The development of paravalvular leak (PVL) after mitral valve replacement (MVR) is a rare event (3.5 to 12.5%) but highly symptomatic incidences. (1-3) Its cause is given for technical issues, local infections or severe calcification of the ring. (4-6) Invasive treatment of the PVL results in a marked symptomatic improvement and increased survival. However, its surgical correction is associated with a high morbidity and mortality. This led to several percutaneous techniques were tried with success rate varies between 60% and 90% and a recurrence rate of 40%. (2, 3, 7)

The inability to cross the secondary PVL to complex position relative to transeptal puncture and / or incompatibility of the devices to adapt to the shape of the leakage or compromise of mechanical surrounding valves are the most frequent causes of failure of percutaneous closure. There are essentially three key points to the success of the percutaneous technique: 1) detailed spatial anatomical knowledge, 2) use of a via of appropriate access and 3) use of a device that fits to the anatomy of the PVL. In this presentation is described the case of a female patient

with mitral PVL who was successfully undergone to percutaneous closure with an innovative device called Amplatzer III (AGA Medical, Plymouth, Minnesota, USA) for myocardial transapical via and guided by three-dimensional echocardiographic images.

## CASE REPORT

A patient aged 50 years with a history of severe mitral regurgitation of rheumatic type and multiple MVRS who was referred to our service due to the presence of a mitral PVL. The female patient underwent surgery three times: in 2005 (# 27 mechanical MVRS), in 2006 (# 27 new mechanical MVRS secondary to pannus) and 2007 (# 27 new biological MVRS, secondary valvular dysfunction of thrombotic cause). Since March 2010, the patient had progressive dyspnea associated with paroxysmal atrial fibrillation and hemolytic anemia type (hematocrit 33%). It was carried out a transesophageal echocardiogram (TEE) before the PVL diagnosis by transthoracic Doppler, which showed anterolateral dehiscence at 10 × 4mm, below the appendage, with production of high-velocity regurgitant flow (Figure 1AC).

On the history of her multiple previous surgeries

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and interpreting important her PVL, percutaneous closure was proposed. To guide its closure, it was carried out a three-dimensional echocardiographic reconstruction of the mitral prosthesis that allowed us to observe the precise shape and location of the PVL and its anatomical relationship to adjacent structures (Figure 1 D).

### Procedure

Under general anesthesia and guided by TEE, a transapical approach was carried out (Figure 2A). First, the apex was punctured directly (TEE-guided), then a small intercostal incision. Immediately after punching, a 0.035-inch rope advanced into the left ventricle, exchanging the needle puncture by a 6-Fr introducer of 11cm (Figure 2). 8,000 IU of heparin were given intravenously. Next, a hydrophilic angled catheter was advanced with guide, also hydrophilic and angled line, of 0.035-inches, crossing the regurgitant lesion into the left atrium (with rope and catheter). The rope cord was exchanged by a rope cord with extra- support Amplatz (0.035inches, 260mm long with a flexible tip of 1.5mm in length) for greater stability and support. Subsequently, it was advanced the releasing sheath of the device (7 Fr 22-cm long) into the left atrium. The used occlusive device was an Amplatzer III of 14 × 5mm. The great advantage of this device is that it can be picked up during the procedure despite having been released from the sheath.

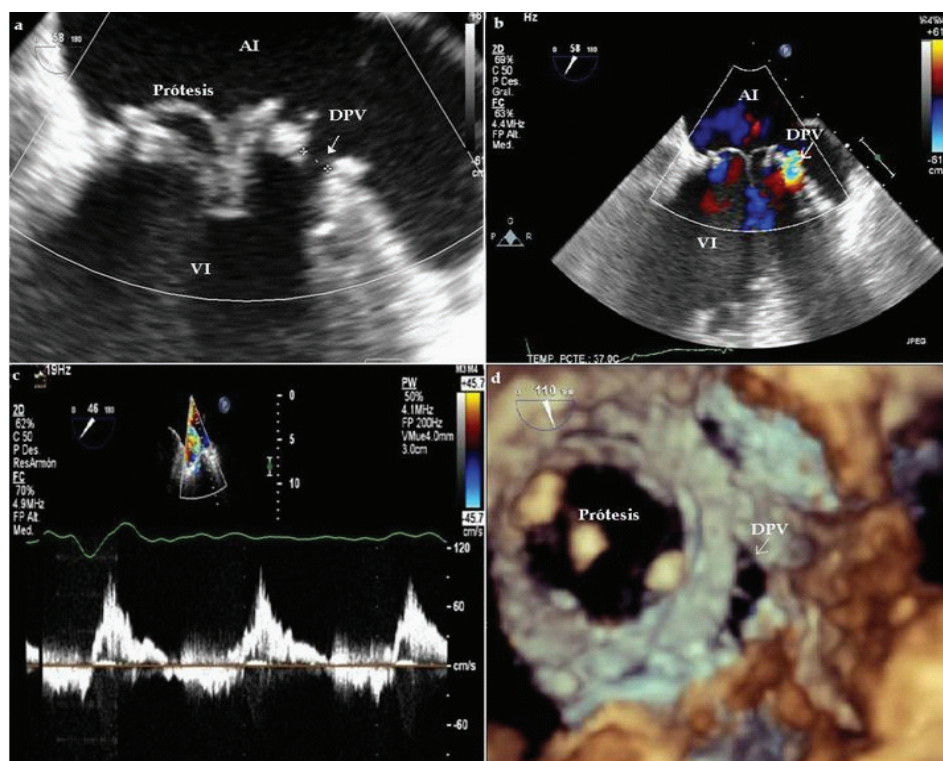
For its release, first device was advanced through

the sheath, which was removed to expose the device. By TEE assessment was confirmed its correct positioning with little residual paravalvular flow and normal functioning of the mitral prosthesis (Figure 3AC), so it was decided its final release. At follow-up to 30 days it was observed a marked symptomatic improvement, with evidence of total occlusion of the PVL (Figure 3 D).

### DISCUSSION

Percutaneous closure of PVL in high surgical risk patients is shown as a useful and effective practice in this pathology. (8, 9) The success of the procedure has clear relationship to the modality of images obtained during the planning of the strategy. The oval shape of the PVL, the quantification of defects and assessment of the surrounding anatomy explain the growing adoption of 3D echocardiography. Also, these types of images began to be used to guide the procedure, since they are obtained a greater spatial awareness and less exposure to X-rays and contrast. However, there are still some limitations related to the relatively slow acquisition, lack of standardized views and proper integration of images.(10)

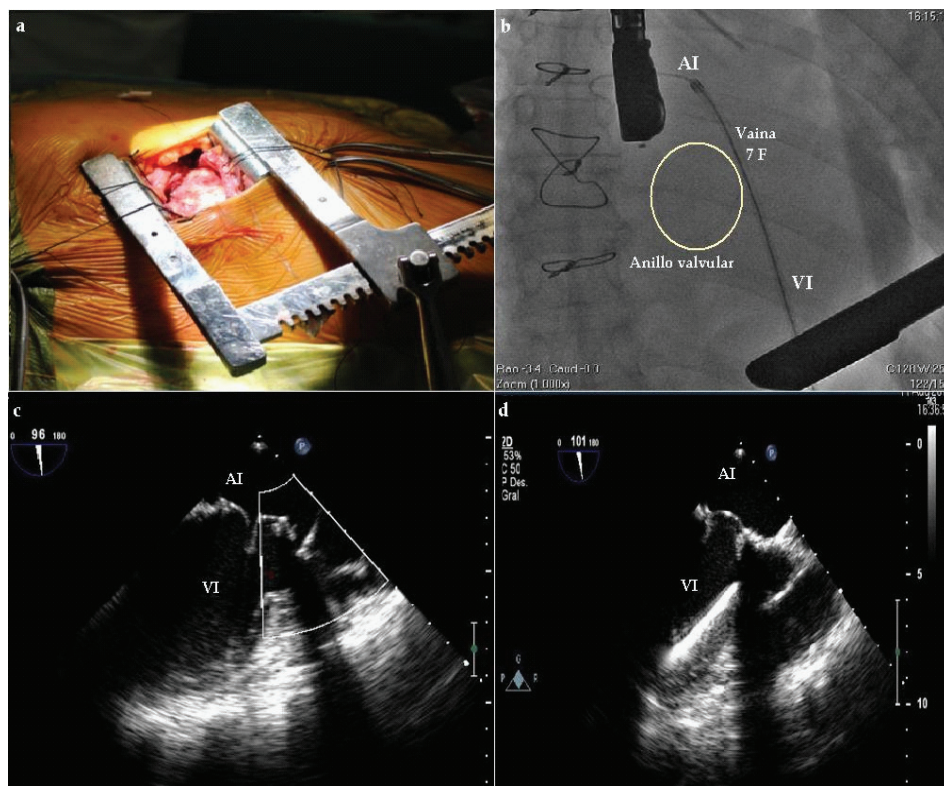
In the bibliography can be found the description and using of different devices in the treatment of PVL, however, none has been created for this special use. (11-13) The vascular Amplatzer III is a device designed in oval shaped of nitinol, to fit the crescentic conformation of the defects. In the top and bottom are two rings of 2mm protruding to provide greater



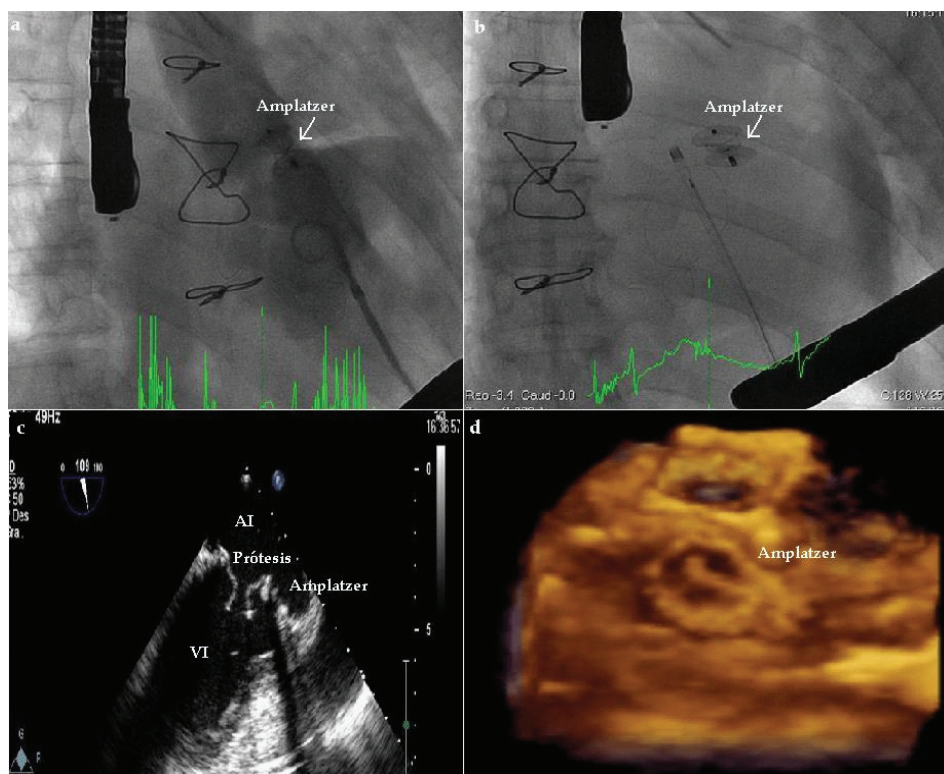
**Fig. 1.** Initial assessment by TEE. **A-C.** Doppler and two-dimensional images that reveal the presence of PVD. **D.** Three-dimensional reconstruction illustrating the shape and location of the PVD. LA: left atrium. LV: left ventricle. MiV: mitral valve. PVD: paravalvular dehiscence.



**Fig. 2. A.** Transapical access. **B-D.** Angiographic images (top) and ECG (bottom) used to guide the apical puncture and the procedure.



**Fig. 2. A-B.** Control angiographic images after implant of the device, confirming the absence of residual flow. **C.** 2D and 3D echocardiographic image at follow up. It is observed the device correctly implanted without signs of paravalvular dehiscence



stability. The devices are designed for their use in structures that are located in sites of high pressure gradient. The height of the device is 6.5mm and sizes vary from 4 to 14mm long and 2-5mm wide. This advance would allow us greater clinical success

of the procedure and a decrease in the number of reoperations, since the latter represent a significant rate and a limitation of the technique.

Finally, the transapical access via has been improved with diagnostic hemodynamic study

of patients with valvular disease. Access may be carried out percutaneously or surgically. Although the latter is more complex, the risk of hemothorax or hemopericardium is very low, since it allows a strict control of the puncture site and fixing the apex to prevent ventricular motion injuries. The apical approach allows a direct and short access to the mitral valve, which prevents septal puncture and complex angles of sheath to the defect.

Even with the approach of new techniques and diagnostic tools, percutaneous closure of mitral PVL remains being a great challenge. However, these advances allow us to obtain greater success with this technique and thus, delay the surgical indication to this complex entity.

## RESUMEN

### Cierre percutáneo de fuga paravalvular mitral

El desarrollo de fuga paravalvular (FPV) luego del reemplazo valvular mitral es un fenómeno poco frecuente pero de gran repercusión sintomática. Debido a la elevada morbimortalidad de su abordaje quirúrgico se han intentado varias técnicas percutáneas con una tasa éxito que varía entre el 60% y el 90%. En esta presentación se describe el caso de una paciente joven, con múltiples cirugías valvulares mitrales previas, sintomática por disnea limitante y anemia hemolítica. Con el uso de imágenes ecocardiográficas tridimensionales, se realizó la oclusión de la FPV con un dispositivo Amplatzer III, diseñado específicamente para dicha indicación. Luego de un seguimiento de 3 meses, la FPV permanece totalmente excluida y la paciente se encuentra asintomática.

**Palabras clave >** Prótesis valvular cardíaca - Falla de prótesis - Cierre percutáneo

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