Case Report

Anterior Mitral Leaflet Perforation and Infective Endocarditis Following Transcatheter Aortic Valve Replacement in a Patient Presenting with Heart Failure

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Abstract

Transcatheter aortic valve replacement (TAVR) is an alternative treatment option for patients with severe aortic stenosis. Although rarely described, mitral valve perforation because of mechanical stimulation due to low deployment of the prosthesis and the association with infective endocarditis, are potentially life-threatening complications that physicians should be aware of because patients should not be suitable for further surgical or percutaneous management. Herein, we present a case of an 88-year-old man presenting with worsening heart failure 6 months after TAVR. We discuss the diagnostic process and the therapeutic issues. Finally, we underline the invaluable role of echocardiography during TAVR procedures, due to its ability in detecting early complications and avoiding incorrect prosthetic deployment.

Keywords: Computed tomography, echocardiography, heart failure, infective endocarditis, mitral valve perforation, mitral-aortic curtain, multimodality imaging, transcatheter aortic valve replacement

Introduction

Transcatheter aortic valve replacement (TAVR) is an alternative option for patients with severe aortic stenosis who are at increased risk for death from cardiac surgery. Indications for TAVR are expanding since clinical trials demonstrated that this technique is noninferior to surgery in terms of clinical outcomes even in low-risk patients.[1] Technical aspects of TAVR procedure are very important since incorrect maneuvers may cause an incorrect deployment of the prosthesis and mitral valve lesions. Although rarely described, mitral valve perforation is a well-known complication after TAVR and it could be associated with infective endocarditis (IE).[2-6] The management of these serious complications is challenging, since they usually affect high-risk patients without further surgical or percutaneous therapeutic options.

Case Report

An 88-year-old man was admitted to our hospital with worsening dyspnea (New York Heart Association Functional Class III–IV). He underwent a femoral access TAVR (26 mm CoreValve Evolut PRO, Medtronic, Minneapolis, MN, USA) for symptomatic severe aortic valve stenosis 6 months before. The procedure was uneventful although an optimal depth was not reached, resulting in a low deployment of the prosthesis in the left ventricular outflow tract and reduced stent expansion [Figure 1]. Patient medical history also included stable coronary artery disease treated with percutaneous revascularization of the left anterior descending and right coronary arteries. Transthoracic echocardiography showed degenerative mitral valve disease with a central moderate-to-severe regurgitant jet. However, color Doppler analysis showed a second anomalous regurgitant jet raising the suspicion of mitral leaflet perforation [Figure 2]. Subsequent transesophageal examination (TOE) revealed

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Access this article online

Quick Response Code:

Website: www.jcecho.org

DOI: 10.4103/jcecho.jcecho_52_19

Submitted: 04-Oct-2019 **Revised:** 08-Feb-2020 **Accepted:** 18-Feb-2020 **Published:** 13-Apr-2020

How to cite this article: Sanna GD, Moccia E, Pepi M, Parodi G. Anterior mitral leaflet perforation and infective endocarditis following transcatheter aortic valve replacement in a patient presenting with heart failure. J Cardiovasc Echography 2020;30:44-6.

perforation (about 5 mm) of the basal part of the anterior mitral leaflet in proximity to the mitral-aortic curtain where the valvular leaflet made contact with the proximal edge of the CoreValve stent. This perforation resulted in a large regurgitant jet directed from the left ventricular outflow tract to the left atrium [Figure 3a-d]. Furthermore, TOE confirmed the suboptimal stent expansion and the low deployment of the prosthesis. Last but not least, two filamentous structures (about 9 mm each) on both edges of the perforation site were noticed raising the suspicion of IE [Figure 4a and b]. The computed tomography (CT) angiography was unable to better define the mitral leaflet perforation; however, it revealed the presence of an ascending aorta ulcer on the distal edge of the prosthetic valve stent [Figure 5a and b]. Furthermore, CT showed the underexpansion of the aortic prosthetic valve stent [Figure 5c].

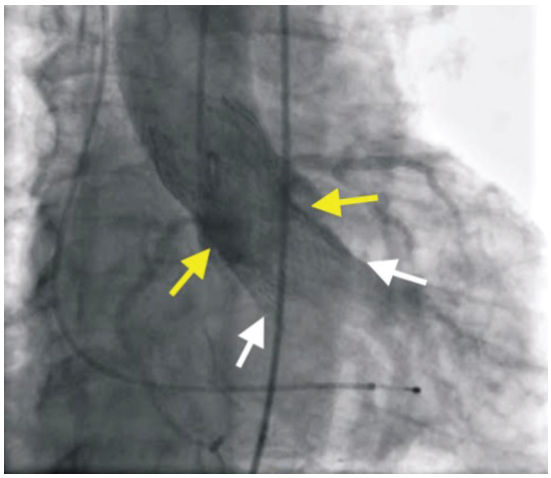

Figure 1: Postimplantation angiographic image showing a low deployment of the CoreValve prosthesis in the left ventricular outflow tract (white arrows) and the incomplete stent expansion (yellow arrows)

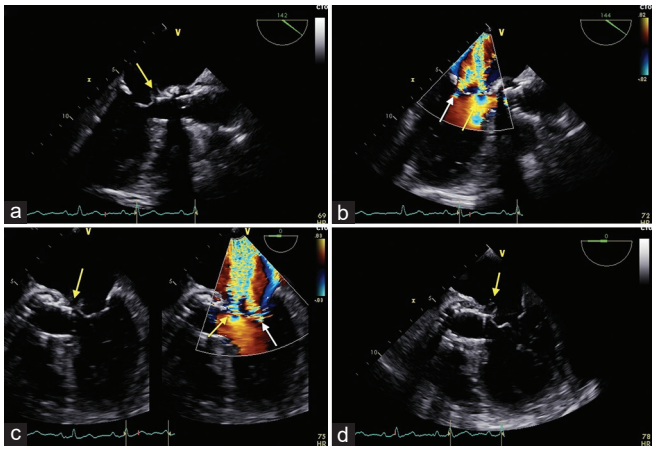

Figure 3: (a and d) Transesophageal examination revealing the perforation of the anterior mitral leaflet where it made contact with the proximal edge of the CoreValve stent. Two filamentous structures are present on both edges of the perforation (yellow arrows). (b and c) Color Doppler interrogation showing the presence of a large intraleaflet regurgitant jet from left ventricular outflow tract to left atrium (yellow arrows). Another second interleaflet regurgitant jet is present (white arrows)

Blood cultures (three out three) were positive for methicillin-resistant *Staphylococcus aureus* and *Staphylococcus epidermidis*. Intravenous antibiotic treatment (teicoplanin and rifampin) was started. Cardiac surgery was excluded due to high risk in this patient. Percutaneous management (i.e., closure of the defect with an Amplatzer Septal Occluder) was also considered an unsuitable option due to scarce probability of successful device crossing of the CoreValve stent and risk of impingement; furthermore, mitral valve mechanics after percutaneous closure was considered unpredictable with a nonnegligible risk of potential worsening regurgitation. Finally, IE contraindicated the deployment of new prosthetic material in the patient's heart. The Heart Team opted for a noninvasive management of the patient with antibiotic treatment for endocarditis and heart failure medications.

Discussion

We described the case of a patient presenting with heart failure due to mitral valve perforation and IE 6 months after TAVR with a self-expanding valve. The mitral apparatus is vulnerable, and it could be impaired in TAVR patients. Albeit rare, the perforation of the mitral-aortic curtain or the anterior mitral leaflet is a well-known complication of TAVR procedures usually resulting from the incorrect (i.e., low) deployment of the prosthesis.[2,3] The association of mitral perforation with

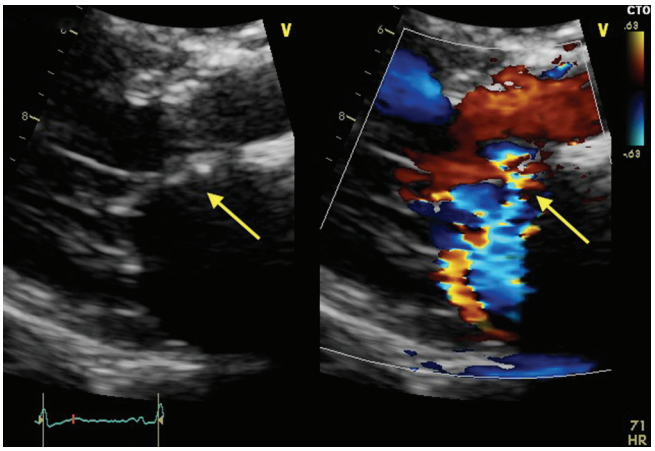

Figure 2: Transthoracic echocardiography (parasternal long-axis zoom mode). Color Doppler examination revealing the presence of a regurgitant jet originating from the basal portion of the anterior mitral leaflet near the mitral-aortic curtain (yellow arrow)

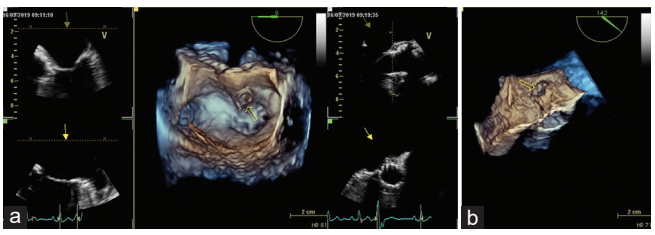

Figure 4: (a and b) Three-dimensional transesophageal echocardiography (zoom mode) better defines the site and size of mitral leaflet perforation and the presence of two vegetations (yellow arrows)

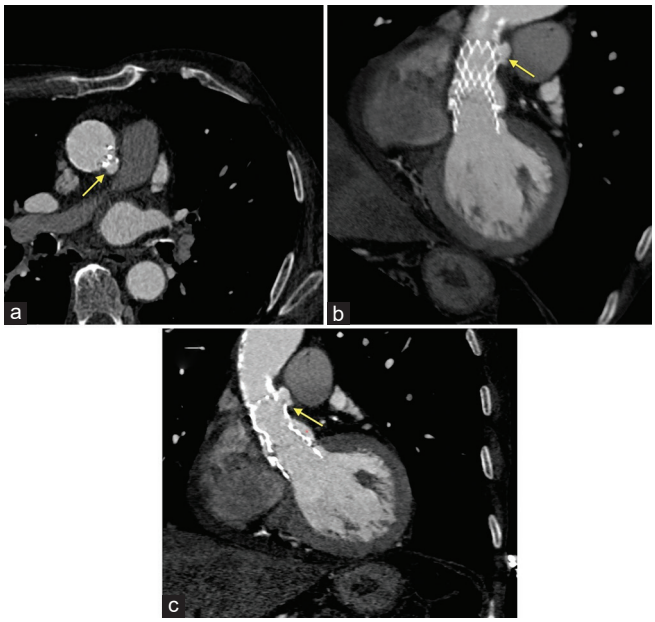

Figure 5: (a and b) Computed tomography angiography revealing the presence of an ascending aorta ulcer on the distal edge of the prosthetic valve stent (yellow arrows). (c) The stent frame is grossly underexpanded (red asterisk)

IE after TAVR has been previously reported.[4,6] However, the time relationship between these two pathological entities, as demonstrated by our case, is difficult to ascertain a posteriori, and the chicken or egg diagnostic dilemma usually remains unsolved.[5] We may speculate that the mitral valve had been perforated by the continuous mechanical stimulation deriving from the contact of the bottom of the CoreValve with the anterior mitral leaflet as a woodpecker beak movement during the cardiac cycle. This complication would have favored the subsequent development of IE.

Whatever the sequence of events was, our case emphasizes the role of echocardiography during structural interventional procedures.[7] CT angiography has emerged in recent years as the standard of care for procedural planning of TAVR, thus favoring the opinion that this imaging technique renders TOE not mandatory and largely avoidable during the procedure. However, intraoperative TOE is able to detect the incorrect positioning of the prosthesis (real-time feedback) and to prevent serious and potentially life-threatening complications in the mid and long term. This emphasizes the role of multimodality imaging in the management of TAVR patients.

Finally, we would like to underline the importance of awareness of the risk of IE together with the need of preventative measures in patients undergoing TAVR. Although the incidence of early, late, and overall IE resulted to be similar between TAVR and surgical aortic valve replacement, some subgroup analyses suggested a trend toward increased risk of IE in TAVR patients.[8] This emphasizes the need for a careful sterile surgical technique not only in the cath-lab but also in the surgical theater. In fact, the development of IE after TAVR may be a life-threatening complication for patients and a nightmare for physicians, due to the limited therapeutic options in these very high-risk patients.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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