Early transcatheter valve dysfunction after transapical mitral valve-in-valve implantation

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Abstract

Some patients who underwent previous mitral valve surgery experience bioprosthetic valve degeneration or recurrent mitral valve regurgitation, and the transcatheter valve-in-valve or valve-in-ring procedure is a promising therapeutic option. Early thrombotic complications have been recently reported in 0.6–0.8% of TAVI prostheses implanted in aortic position. To the best of our knowledge, this article reports on the first case of thrombotic transcatheter mitral valve dysfunction which occurred on oral anticoagulation with Coumadin in combination with antiplatelet therapy. Although it is quite a rare complication, early thrombotic dysfunction of transcatheter valve prosthesis may occur.

Keywords: Transcatheter valve therapy • Valve disease • Thrombosis

INTRODUCTION

After a decade of increasing experience in transcatheter aortic valve implantation (TAVI), the indications for TAVI procedures are further expanding [1]. Some patients who underwent previous mitral valve surgery experience bioprosthetic valve degeneration or recurrent mitral valve regurgitation, and the transcatheter valve-in-valve or valve-in-ring procedure is a promising therapeutic option [2].

Several safeguards and pitfalls have been reported for this type of surgery [3]. Moreover, several cases of early valve thrombosis were published for TAVI valves in aortic position which were successfully treated by oral anticoagulation [4]. Hereewith, we report a case of early TAVI valve thrombotic dysfunction following transapical mitral valve-in-valve procedure, which was associated with an extensive left atrial thrombus formation.

CASE REPORT

A 75-year old woman was referred to our emergency unit due to progressive shortness of breath on exertion. She experienced a rapid and progressive functional deterioration during the last 2 weeks before hospital admission, accompanied by tachycardia, nausea and loss of appetite.

Her cardiovascular history revealed previous coronary artery bypass grafting surgery and bioprosthetic mitral valve replacement using a Carpentier-Edwards Perimount Mitral 29-mm valve prosthesis 10 years ago. Moreover, 6 months prior to hospital admission, she was subjected to a transapical mitral valve-in-valve implantation using a Carpentier-Edwards Sapien XT 29-mm valve prosthesis due to bioprosthetic mitral valve degeneration. At that time, she had an uneventful postoperative course and was discharged on oral anticoagulation (International normalized ratio [INR] 2.5–3.5) plus aspirin 100 mg/day due to a permanent atrial fibrillation. Pre-discharge transthoracic echocardiography revealed a well-functioning mitral valve-in-valve prosthesis (i.e. without residual regurgitation, transvalvular pressure gradients peak/mean 15/6 mmHg) and reduced left ventricular ejection fraction (45%).

At the time of hospital admission, the patient was found at New York Heart Association Class III, the INR was 2.05 (her Coumadin-pass documented an INR rate in the therapeutic range during the whole postoperative period) and she had an elevated D-dimer value (1333 mg/l), slightly increased leucocytes (14.1 Gpt/l) and reactive protein C (162.5 mg/l) without any clinical signs of infection. Although procalcitonin was normal, empirical intravenous antibiotics (piperacillin/tazobactam) were initiated. Transthoracic echocardiography at admission showed a significantly increased transmural pressure gradient (i.e. peak/mean gradient—31/24 mmHg) and a calculated effective mitral valve orifice of 0.7 cm². Subsequently, transoesophageal echocardiography confirmed these findings and revealed severely reduced leaflet mobility of the mitral valve-in-valve prosthesis with thrombotic apposition (Fig. 1A). Additionally, an extensive left atrial thrombus formation was demonstrated (Fig. 1B). On the basis of these findings, an urgent surgical re-exploration was scheduled. Coronary angiography revealed no further progression of coronary artery disease and good function of left internal mammary to left anterior descending artery bypass.
INTRAOPERATIVE FINDINGS

The surgery was performed through resternotomy and the superior septal approach was used for mitral valve exposure. Extensive thrombotic material in the left atrial dome was completely removed (Fig. 2A). The left atrial appendage with a fresh thrombus inside was eliminated using the ‘cut and sew’ technique. The mitral valve-in-valve prosthesis (29 mm Sapien XT) was found to be severely stenotic with rigid and thickened leaflets but without any macroscopic signs of active infection (Fig. 2B). Both mitral prostheses (Carpentier-Edwards Sapien XT and Carpentier-Edwards Perimount Mitral) were subsequently removed (Fig. 2C) and a new bioprosthesis (C-E Perimount Mitral 29 mm) was successfully implanted.

Intraoperative and predischarge echocardiography showed a well-functioning mitral valve bioprosthesis with proper transvalvular gradients (i.e. peak/mean gradient—14/5 mmHg) and minimal intrinsic insufficiency. The patient could be discharged on postoperative day 12 after an uneventful postoperative course.
DISCUSSION

As the mitral valve-in-valve TAVI is still an off-label procedure, the indications for this procedure should be carefully reconsidered and other alternatives re-evaluated on a case-by-case basis.

To the best of our knowledge, this article reports on the first case of thrombotic transcatheter mitral valve dysfunction which occurred on oral anticoagulation with Coumadin in combination with antiplatelet therapy. Recently, D’Onofrio et al. described a stuck leaflet after transapical mitral valve-in-valve procedure, which was diagnosed 6 months post-TAVI and affected only one of the three pericardial leaflets [3]. Early thrombotic complications have been recently reported in 0.6–0.8% of TAVI prostheses implanted in aortic position [5]. The majority of these patients (88%) were successfully treated by oral anticoagulation [5]. Therefore, an oral anticoagulation regimen has been advocated even in TAVI patients without visible thrombus on echocardiography owing to the increasing transaortic gradients [4]. However, our patient has been on oral anticoagulation therapy for the last decade due to persisting atrial fibrillation and aspirin was additionally administered after the TAVI procedure. Moreover, thrombus formation was predominantly found in the roof of the left atrium/left atrial appendage and not on the TAVI prosthesis itself, which may support the secondary character of thrombosis. On the basis of the intraoperative findings, we strongly believe that thrombotic adhesions on the leaflets were the primary cause of TAVI valve dysfunction, and the left atrial thrombus was only a result of diminished transvalvular flow/stasis in the left atrium.

Technical issues associated with the valve-in-valve TAVI procedure may lead to early bioprosthesis dysfunction and should be considered [1]. However, the C-E Sapien XT valve was fully expanded following the valve-in-valve procedure (Fig. 2D), and no post-dilatation was required and initial postimplant leaflet mobility/hemodynamic performance was very appropriate, as documented by intraoperative and predischarge echocardiography and the intraoperative angiography. Moreover, the proper positioning and full expansion of the valve-in-valve prosthesis was confirmed by intraoperative inspection.

Furthermore, early prosthetic valve endocarditis might have induced an extensive infiltration and gross thickening of valve leaflets, resulting in immobility and secondary thrombosis. However, the clinical presentation of our patient was not supportive of active infection. Echocardiographic, intraoperative findings and, most importantly, the results of microbiological examination demonstrated with near certainty that prosthetic dysfunction did not have an infectious origin.

CONCLUSION

Although it is quite a rare complication, early thrombotic dysfunction of transcatheter valve prostheses may occur. Continuous and thorough post-TAVI echocardiographic surveillance is obligatory to analyse such events in a systematic manner.

Conflict of interest: none declared.

REFERENCES