General Thoracic and Cardiovascular Surgery (2019) 67:633–636
https://doi.org/10.1007/s11748-018-0951-9

CASE REPORT

Intraoperative displacement of a Perceval sutureless prosthesis

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Received: 11 March 2018 / Accepted: 22 May 2018 / Published online: 31 May 2018

Abstract
We describe a patient with mitral incompetence and aortic stenosis who underwent mitral valve repair and aortic valve replacement using a Perceval sutureless bioprosthesis. After weaning from cardiopulmonary bypass, repeated mitral valve repair was required due to residual mitral regurgitation. During this procedure, the aortic prosthesis was displaced, most likely by undue inadvertent traction on the atrial retractor, requiring its removal and reinsertion. When employing a sutureless valve gentle manipulation of the heart is mandatory to avoid possible adverse events as that herein described. Should this happen, the Perceval valve can be easily removed and repositioned.

Keywords Aortic valve replacement · Mitral valve repair · Sutureless bioprostheses

Introduction

Sutureless bioprostheses have been recently introduced in clinical practice as an alternative to traditional stented or stentless tissue valves in patients requiring aortic valve replacement (AVR). The main advantage should derive from a reduction of the cardiopulmonary and ischemic times from which high-risk patients and those requiring combined procedures could mostly benefit [1, 2]. Among the available models the Perceval sutureless bioprosthesis (LivaNova, Saluggia, Italy) has gained widespread acceptance owing to excellent early and medium-term results [3, 4]. We describe an unusual event occurring during AVR which should help in improving the learning curve required with this new device and consequently early and long-term results.

Case

An 83-year-old hypertensive man started to complain recently of exertional dyspnea and precordial pain. He had undergone in 2015 a percutaneous transluminal coronary angioplasty with stent placement in the proximal left anterior descending coronary artery. During hospitalization he was found to have moderate mitral regurgitation due to posterior leaflet prolapse and moderate aortic stenosis. On admission to our Department for further evaluation he was in New York Heart Classification class III and in sinus rhythm. Chest X-ray showed moderate enlargement of the cardiac shadow and routine blood values were within normal limits. A transthoracic 2D echo revealed an enlarged left atrium with 58% ejection fraction and pulmonary artery pressure of 35 mmHg. The mitral valve was severely incompetent due to a flail of the posterior leaflet (P2). The aortic valve showed a mean gradient of 48 mmHg with no regurgitation; at coronary angiography no significant stenoses of the main branches were observed. EuroSCORE II was 6.34%.

Operation was performed through a median sternotomy and moderately hypothermic cardiopulmonary bypass after aortic and bicaval cannulation. Myocardial protection was achieved with antegrade cold blood cardioplegia and topical cooling. Direct inspection confirmed the presence of a redundant posterior mitral leaflet, flail of P2 due to ruptured chordae and a dilated annulus. Mitral repair was performed with quadrangular resection and insertion of a 28-mm Sovering band (LivaNova, Saluggia, Italy); the saline test showed

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only trivial residual insufficiency. Subsequently, through a transverse aortotomy, the aortic valve was excised and AVR performed using a size S Perceval prosthesis. After weaning from cardiopulmonary bypass (CPB) the transesophageal echo showed a well-functioning aortic valve (Fig. 1) but a mild to moderate mitral regurgitation such as to consider the repair unsatisfactory. During a second pump run, the left atriotomy was reopened and retracted as gently as possible. The residual mitral incompetence was corrected by direct closure of a cleft of the posterior leaflet and an edge-to-edge suture at the posterior commissure. Following this procedure, intraoperative echo showed not only an optimal mitral valve repair but also the new onset of aortic regurgitation (Fig. 2a, b). The heart was again arrested and, after the aortotomy was reopened, the aortic prosthesis appeared partly displaced. It was, therefore, rinsed in cold water, removed as suggested [5] and correctly repositioned. At the end, the Perceval bioprosthesis was normally functioning with disappearance of the regurgitant jet and a mean gradient of 9 mmHg (Fig. 2c, d). The total CPB time was 198 min; duration of ischemic time was 93, 31 and 21 min for first, second and third pump run, respectively. The patient recovered uneventfully and after 2 months he is in class I with stable mitral repair and normal function of the aortic prosthesis.

Discussion

Biological prostheses are widely used for AVR particularly in elderly patients due to the increasing age and incidence of comorbidities in patients referred for surgery [6]. Sutureless bioprostheses have recently emerged as a significant alternative to standard tissue valves in patients requiring AVR. Among these, the Perceval sutureless valve has demonstrated excellent results up to 5 years after AVR and currently it is increasingly used particularly in high-risk patients and in AVR performed using minimally invasive procedures [1, 3]. Correct implantation of this device requires a short learning curve after which awareness of reported potential complications may contribute to improve the results of AVR in such patients. Recently, the indications for a Perceval bioprosthesis have been extended also to patients requiring AVR and concomitant procedures especially on the mitral valve [1, 2]; these have been also included among the recommendations by an international consensus panel [6]. Indeed, Minh and Schrestha and their colleagues have shown that AVR with a sutureless valve in the setting of mitral valve replacement or repair is effective and reproducible [1, 2]; this is confirmed by the present case where the indication for a Perceval valve was AVR in an octagenarian with an intermediate risk requiring a combined procedure. However, in this patient we observed an intraoperative complication caused by the need to correct a residual regurgitation after mitral valve repair; it appears evident that displacement of the Perceval valve was most likely due to an excessive inadvertent traction on the aortic annulus by the mitral retractor used to achieve an optimal exposure of the mitral valve. Indeed after a sutureless insertion, manipulation of the heart should be avoided [7]; however, in our case mitral valve re-repair necessarily required reopening of the left atriotomy. Thus, in similar situations one should be prepared to face such complication even if particular care is used to retract the superior atriotomy rim. On the other hand, once this occurs, the Perceval valve can be easily retrieved and repositioned without adverse consequence on leaflet or cage integrity and overall valve function, provided that specific suggestions are followed [5].

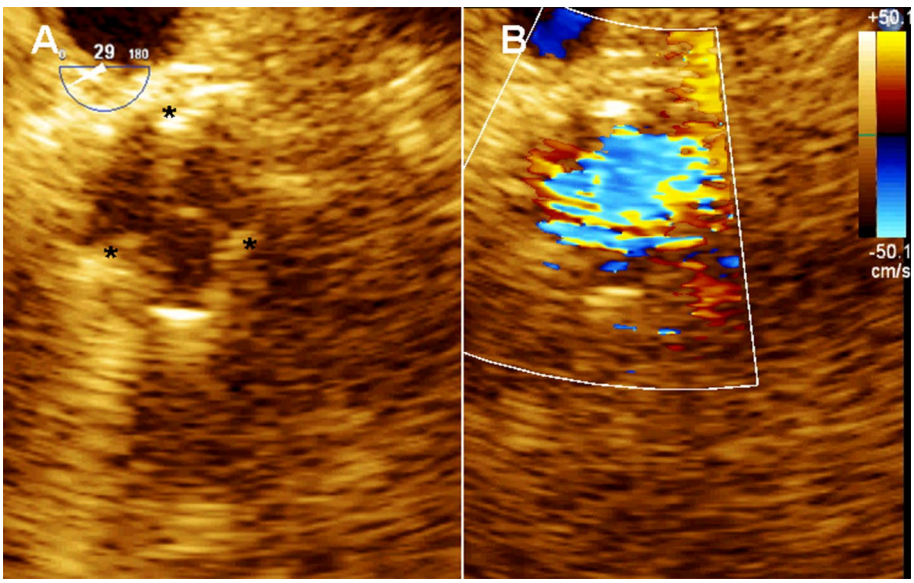

Fig. 1 **a, b** Intraoperative transesophageal 2D echo in the short-axis showing a normally positioned and functioning Perceval aortic valve. Asterisks indicate the three tips of the stent

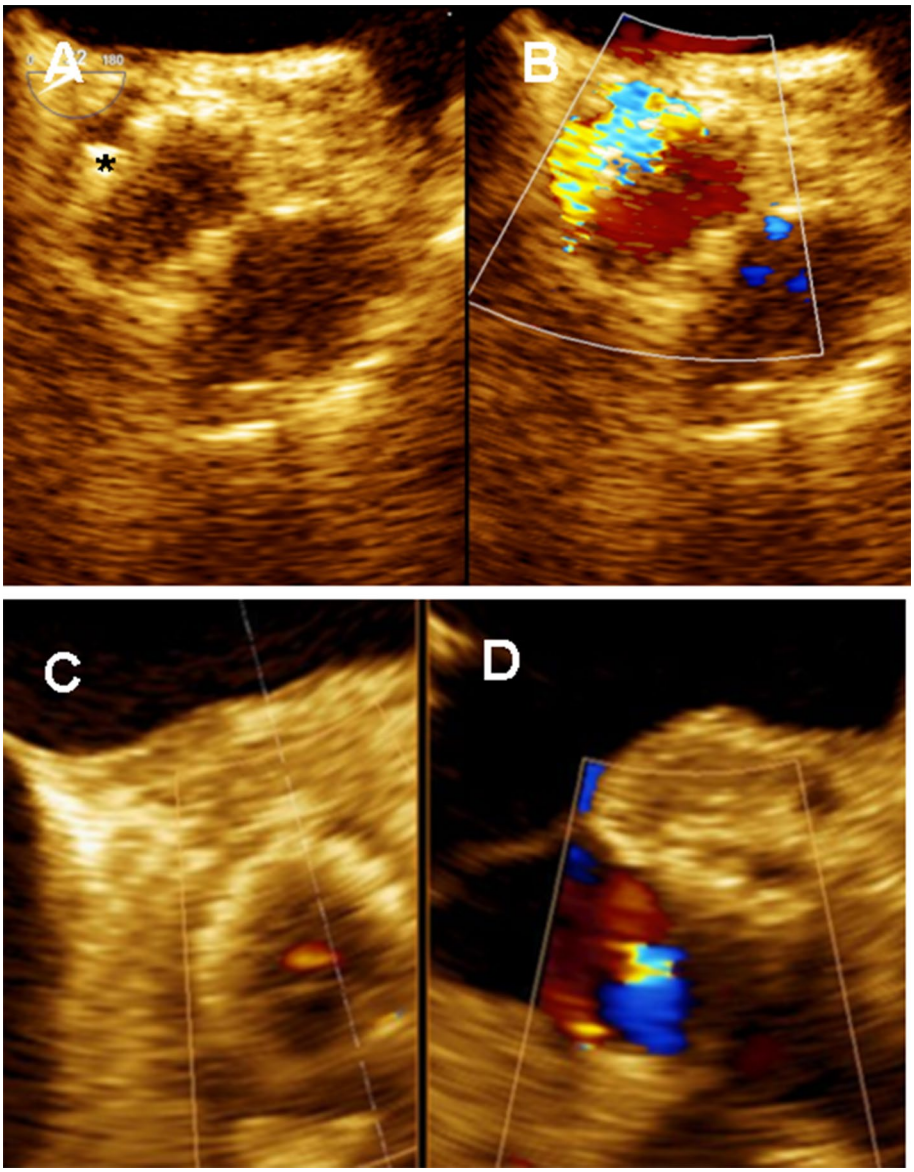

Fig. 2 **a, b** Short-axis view demonstrating deformation of the stent (asterisk) and aortic regurgitation. Following repositioning of the prosthesis, aortic regurgitation is eliminated with a trivial residual central jet as shown in the short- (**c**) and long-axis (**d**) views

Conclusion

Our case confirms that when using a Perceval prosthesis in a patient requiring a combined procedure on the mitral valve, intraoperative displacement of the former may occur under special conditions. In such case, awareness of this potential complication, which can be easily fixed, can help in obtaining a successful outcome.

Compliance with ethical standards

Conflict of interest The authors have declared that no conflict of interest exists.

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