Case report

Transapical off-pump aortic valve-in-a-valve implantation in two elderly patients with a degenerated porcine bioprosthesis

Luis C. Maroto a,*, José E. Rodríguez a, Javier Cobiella a, Pedro Marcos b

a Department of Cardiac Surgery, Hospital Clínico San Carlos, Madrid, Spain
b Cardiac Image Unit, Hospital Clínico San Carlos, Madrid, Spain

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Abstract

Re-operative heart-valve replacement is a high-risk procedure and even more so in elderly patients. Another option in high-risk patients with a degenerated aortic xenograft is the implant of a second aortic bioprosthesis using a transcatheter approach. We report two cases of patients with a severely degenerated porcine aortic bioprosthesis who were successfully treated by a transapical valve-in-a-valve implantation.

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1. Introduction

In current clinical practice, patients with severe symptomatic aortic stenosis considered very high risk or non-surgical candidates are evaluated for percutaneous aortic valve implantation [1]. Elderly patients with aortic stenosis secondary to a degenerated bioprosthesis constitute an especial high-risk subset [2]. To date, there are three published cases of the transcatheter treatment of stenotic pericardial xenografts [3—5]. To the best of our knowledge, however, this is the first report of transapical valve-in-a-valve implants conducted in two degenerated porcine bioprostheses.

2. Case report

The first case was an 84-year-old man with a severely dysfunctioning aortic bioprosthesis admitted to our hospital for replacement of a 25-mm Hancock aortic valve (Medtronic, Minneapolis, MN, USA) implanted in 1992. Transthoracic echocardiography (TTE) revealed severe aortic stenosis (peak gradient of 60 mmHg), moderate insufficiency and moderate left ventricular dysfunction (ejection fraction (EF) 40%). Logistic euroSCORE was 25.1%. The second case was also one of an 84-year-old man with a dysfunctioning 25-mm Hancock aortic bioprosthesis implanted in 1995. A severely calcified bioprosthesis was observed on TTE with severe insufficiency, a peak gradient of 33 mmHg and a normal left ventricle ejection fraction. Logistic euroSCORE was 18%. Given our promising initial experience with the transapical treatment of aortic stenosis (30 cases), both patients were assessed for transapical valve-in-a-valve implantation. In both candidates, a trans-oesophageal echocardiogram (TEE) showed a ring bioprosthesis inner diameter of 21 mm and heavily calcified cusps, so we selected a 23-mm Edwards—Sapien valve (Edwards Lifesciences, Irvine, CA, USA) for the two procedures.

Both procedures were performed in the operating room under TEE and fluoroscopy guidance, without cardiopulmonary bypass. After heparin administration (5000 U), a pigtail catheter was advanced as far as the aortic root through the right femoral artery. A small left anterior minithoracotomy was performed to expose the apex followed by placement of two purse strings using polypropylene 3/0 sutures with pledgets. After puncturing the apex, a stiff guidewire was positioned in the descending aorta. A 26 Fr sheath was introduced and a 23-mm Edwards—Sapien valve was positioned and subsequently expanded (Fig. 1) under rapid pacing (180 bpm). We did not conduct a balloon valvuloplasty because of the risk of embolisation. The valve was correctly positioned guided by three-dimensional (3D) trans-oesophageal echocardiography (Fig. 2), leaving the lower margin of the Sapien prosthesis 1—3 mm below the Hancock prosthesis ring. Intra-operative TEE showed minimal central leakage and peak gradients of 17 and 13 mmHg, respectively (Fig. 2). Both patients had an uneventful postoperative stay, and they were discharged on postoperative day 7 and 8, respectively. Before discharge, TTE revealed excellent valve function.

* Corresponding author. Address: Servicio de Cirugía Cardiovascular, Instituto Cardiovascular, Hospital Clínico San Carlos, Plaza de Cristo Rey, s/n, 28041 Madrid, Spain. Tel.: +34 91 330 36 91; fax: +34 91 330 34 53.
E-mail address: lmarotoc.hcsc@salud.madrid.org (L.C. Maroto).

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3. Discussion

Re-operations to replace degenerated bioprostheses are associated with an increased surgical risk [2]. Transcatheter aortic valve replacement is emerging as an alternative technique in high-risk patients. In this context, valve-in-a-valve implantation may take on a major role. Although described in a few patients, the results are encouraging. The first valve-in-a-valve implantation was published by Wena-weser et al. [3], who treated a degenerated pericardial bioprosthesis using the CoreValve system (Core-Valve, Irvine, CA, USA) through a transfemoral approach. Walther et al. [4] performed the first transapical valve-in-a-valve implant in an 82-year-old woman with a stenotic pericardial xenograft. Recently, Klaaborg et al. [5] published a successful Sapien valve implantation in a degenerated pericardial bioprosthesis. All three patients had an uneventful postoperative course with good valve function reported on last follow-up. As far as we are aware, our two cases are the first porcine xenografts treated successfully using a valve-in-a-valve procedure.

Transcatheter valve implantation is a new therapeutic option for the high-risk group of elderly patients with a degenerated bioprosthesis, but some aspects must be kept in mind [6]. The oversizing needed to achieve good anchorage and minimise periprosthetic leaks could cause underexpansion and valve distortion. Underexpansion can generate a suboptimal peak transvalvular gradient, and distortion can be responsible for premature valve failure and/or compromise its durability. Preclinical tests in a pulse duplicator have indicated the acceptable durability of a 23-mm Sapien valve inside a 21-mm Perimount prosthesis [4]. Nevertheless, durability is not a main issue in elderly high-risk patients. Another aspect to consider is the mechanism of bioprosthesis deterioration. Intense pannus can cause misdeployment, so its presence, as the main mechanism of bioprosthesis stenosis, probably contraindicates the procedure. We do not know whether the different failure modes of porcine versus pericardial bioprostheses (more intense cusp calcification) could increase the risk of embolisation during valve-in-a-valve implantation in a porcine xenograft. We did not perform balloon valvuloplasty before implantation because of the fear of embolisation. In our opinion, it does not increase the risk of misdeployment or valve distortion. The main role of balloon valvuloplasty is to enlarge the valve—orifice area, to allow us to place the prosthesis at the correct level.
In summary, a degenerated Hancock bioprosthesis can be successfully treated using a Edwards–Sapien valve. Clinical experience is still limited, but results so far suggest that valve-in-a-valve implantation could be a good therapeutic option in high-risk patients with a degenerated aortic xenograft. The increasing experience and a longer follow-up of treated patients have yet to reveal the true role of this treatment mode in the challenging field of managing patients with valve disease.

References


