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Case report

Calcified aortic homograft and sutureless valves

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ABSTRACT

The use of sutureless valves in the case of a heavily calcified aortic homograft allows for relatively quick and safe replacement. Due to the nitinol frame, which is self-anchored in the aortic valve annulus and in the sinotubular junction (STJ), no complete annular decalcification or fixation with stitches is required. In conditions of significant calcification this may represent a technical problem.

Introduction

Aortic valve stenosis is the most common valve disease in Europe and North America. Calcified aortic stenosis occurs in 2–7% of the population older than 65 years. According to various literature data up to 30–60% of symptomatic patients with significant aortic stenosis are not indicated for surgical intervention, most often due to old age or associated comorbidities [1–3]. In this case, the prognosis of untreated patients with symptomatic severe aortic stenosis is poor; the 5-year survival rate is between 15 and 50% [1,3]. The only effective and efficient treatment of symptomatic aortic valve stenosis is valve replacement (class I recommendation, ESC/EACTS guidelines on the management of valvular heart disease (2012)) [4].

The conventional treatment of severe aortic stenosis is surgical replacement of the valve through a median sternotomy using cardiopulmonary bypass (CPB). In order to minimize periprocedural risks and to accelerate postoperative rehabilitation, less invasive approaches have been developed and are increasingly used while maintaining quality and safety. At the same time the occurrence of older and sicker patients is also increasing [5,6]. The current patients are often with a heavily calcified valve, aortic root or diffuse atherosclerosis of the aortic wall after a previous aortic valve replacement. This has led to the development of less invasive therapeutic

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concepts, including transcatheter aortic valve implantation (TAVI) and sutureless bioprosthesis.

Case report

We describe the case of a 70-year-old female patient with hypertension, dyslipidemia, hypothyroidism on replacement therapy for thyroid lobectomy in 2012 and severe stenosis of the aortic homograft. In 2005 the patient underwent persistent foramen ovale (PFO) closure and aortic valve replacement with an aortic homograft due to infective endocarditis. The patient was admitted to our department in March 2014 for worsening dyspnea, NYHA II–III. She was without chest pain and syncope. An echocardiographic examination confirmed severe stenosis of the aortic homograft, with peak gradient (PG) 100 and mean gradient (MG) 58 mmHg and indexed aortic valve area (AVAi) 0.35 cm^2/m^2. Coronary angiogram examination excluded significant coronary artery disease. The logistic EuroSCORE was 10.77%. The patient was indicated for valve replacement. Because of the higher operative risk, during the decision-making process the patient was considered for transcatheter aortic valve implantation (TAVI) or implantation of a sutureless bioprosthesis. Based on preoperative CT scans of the aorta, which revealed a significant calcification of the valve, aortic root and ascending aorta, we decided to use the sutureless valve (Fig. 2). A major reason was the high calcium score and in our opinion it was also due to the higher risk of paravalvular insufficiency in TAVI.

Surgical procedure

The procedure was performed in a standard operating room; general anesthesia and systemic heparinization were performed. The heart was exposed through a median sternotomy because of reoperation. The ascending aorta and right atrium appendage were cannulated and the patient was placed on cardiopulmonary bypass (CPB). After aortic cross-clamping the antegrade infusion of cold blood cardioplegia was delivered.

The aortic bioprosthesis Perceval S is made from a bovine pericardial valve mounted on a compressible and expandable metal frame in nitinol, with unique features and mechanical behavior (Fig. 1A). The valve prosthesis is loaded and collapsed into a delivery device (Fig. 1B). Collapsing increases the visibility and preserves the integrity of the valve leaflets.

The reduced collapsed profile prevents trauma to the aortic wall, enabling a full and direct view. To ensure correct positioning of the prosthesis, three guiding threads are temporarily positioned in the lowest part of the native leaflet insertion line for each valve sinus and the corresponding part of the bioprosthesis as reference points for accurate alignment of the inflow section of the prosthesis with the insertion plane of the native leaflets (Fig. 1C). The temporary guiding threads suture the valve by guiding it along the annulus axis even in narrow spaces. Once the prosthesis is deployed and released, the guiding threads are removed (Fig. 1D) [5].

A transverse aortotomy was done 1 cm distal to the sinotubular junction so as to leave an edge free for closure of the aortotomy after implantation of the device and to prevent

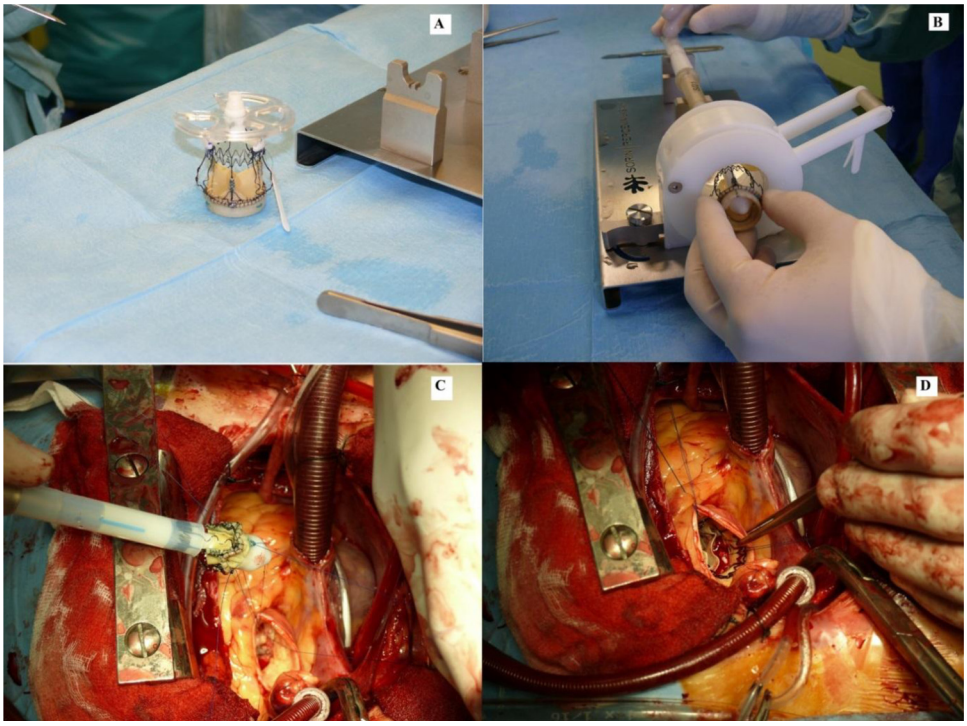

Fig. 1 – (A) Perceval S valve. (B) The holder device and valve collapsing. (C) Three guide threads. (D) Completely deployed prosthesis into the annulus.