Case report

Calcified aortic homograft and sutureless valves

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A B S T R A C T

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.

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In the Case report, the authors discuss the use of sutureless valves in the context of heavily calcified aortic homografts. They highlight the technical advantages of using nitinol frames for valve annulus and sinotubular junction fixation, which minimizes the need for complete decalcification or stitches. The report emphasizes the importance of these technical aspects in the management of severely calcified aortic valve stenosis, especially in older and sicker patients, and supports the use of sutureless valves as a safer and more efficient treatment option.
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 cm²/m². 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](image-url) - (A) Perceval S valve. (B) The holder device and valve collapsing. (C) Three guide threads. (D) Completely deployed prosthesis into the annulus.
interference of the metal frame with closure of the aortotomy. The calcified aortic homograft was removed and the aortic annulus was decalcified. After measuring the size of the valve – as the free passage of the transparent portion of the sizer through the annulus into the left ventricle but not free passage of the white portion into the ventricle – the prosthesis “M” was chosen.

During the valve collapse, the three guiding threads were positioned. The release device is inserted into the aorta down to the point where it was blocked by pulling the previously

Fig. 2 – Preoperative CT angiogram showed calcified aortic homograft, root and the ascending aorta.
Discussion

In order to minimize mortality and to extend the indications of surgical treatment for high-risk, otherwise inoperable patients, less invasive alternative approaches using innovative technologies have been developed [6]. Transcatheter aortic valve implantation (TAVI) and sutureless valve represent two of the most important advances in the treatment of aortic valve diseases in recent years [6]. Similar to conventional surgical replacement of the valve, sutureless bioprosthesis requires valve excision (risk reduction of paravalvular insufficiency compared with TAVI) and annular decalcification, but permanent fixation sutures are not required [6]. The possibility of avoiding sutures placement and their tidying may lead to shorter procedural times. In cardiac surgery, prolonged CPB and cross-clamp time duration are strong independent risk factors for postoperative mortality and morbidity [7,8].

These advantages could be of benefit to patients who have no fundamental contraindications for using cardiopulmonary bypass and are undergoing complex, combined procedures or re-operations. Patients with a small aortic annulus or heavy calcification of the annulus and aortic root, where sutures positioning may represent technical problems and complications, are another potential group that could benefit.

Conclusion

Sutureless aortic bioprosthesis represents a new generation of bioprosthesis and another therapeutic option in the spectrum of aortic valve replacement.

They combine the advantages of stentless valves in terms of hemodynamic parameters (a more efficient effective orifice area – EOA) and simple and safe implantation.

The potential to reduce operative time may be beneficial in sicker elderly patients undergoing combined surgeries and reoperation, and their construction enables and supports minimally invasive approaches in cardiac surgery (insertion through the partial sternotomy or right thoracotomy).

Conflict of interest

There are no known conflicts of interest associated with this publication.

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Ethical statement

The case report was written according to ethical standards.

Informed consent

The patient provided the informed verbal consent to participate in the case report.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:10.1016/j.crvasa.2015.02.001.

REFERENCES