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Editorial

Sutureless valves fit/perform well in a small aortic annulus

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Aortic valve replacement (AVR) in patients with severe aortic disease and a small aortic annulus (SAA) represents a clinical challenge, especially in the setting of aortic stenosis. The optimal valvular substitute for treating these patients remains controversial.

The exact definition of SAA is not well established, and no cut-off value has been recognized. Generally, we defined a SAA as an annulus in which only a prosthesis of ≤21 mm in size can be inserted or an aortic annulus ≤23 mm, measured either preoperatively by echocardiography or intraoperatively by direct sizing. In the United States and Northern Europe, the prevalence of patients receiving a prosthesis size ≤21 mm varies from 22% to 44%. In comparison with Northern Europe, patients from Southern European countries more frequently received a prosthesis ≤21 mm and therefore are at an increased risk (almost 7 times) of receiving a smaller size aortic valve (1).

Many variables may affect the hemodynamic performance of the aortic prosthesis, but generally most of the valvular substitutes offer an effective orifice area (EOA) smaller than the native valve. This is due to the area being reduced by the stent and sewing ring design for the stented prosthesis or due to the amount of calcification of the native valve and annulus for the transcatheter valves; indeed calcification may not facilitate the proper deployment of the valve. Patients with a SAA are more prone to receiving smaller prostheses and therefore are at higher risk of developing a patient-prosthesis mismatch (PPM), in which the EOA of a normally functioning heart valve prosthesis is too small in relation to the patient's body surface area and therefore too small for the cardiac output requirements. It is considered not clinically significant when the indexed EOA (iEOA) is >0.85 cm^2/m^2, moderate when it is between 0.65 and 0.85 cm^2/m^2 and severe when <0.65 cm^2/m^2 (2). PPM has been associated with reduced left ventricular mass regression, reduced freedom from heart failure, less symptomatic improvement and a risk of early and late morbidity and mortality (3). Many surgical techniques or specific prostheses have been developed to improve EOA, including aortic annulus enlargement, aortic root replacement and the use of stentless bioprostheses. These procedures significantly increase the complexity of the operation and consequently the cardiopulmonary bypass time and aortic cross-clamp. The clinical outcomes are contradictory and may enhance morbidity and mortality, and due to these reasons, they are not widely used.

Sutureless and rapid deployment (SURD) valves are the latest generation of surgical biological prostheses that have been developed to have short procedural times and easy implantation in a minimally invasive surgical approach. Their design is based on the technological innovation of the transcatheter aortic valve implantation (TAVI). In comparison to a stented valve, the absence of a sewing ring offers a larger functional valvular diameter and improved valve hemodynamics for any given valve size. In comparison to the TAVI, the removal of the diseased aortic leaflet and annular calcification are done to avoid inadequate deployment that can lead to a decrease EOA and the risk of perivalvular leak (PVL). Nevertheless, a drawback of SURD valves is the increased incidence of postoperative conduction disorders and pacemaker implantation and therefore, unlike the TAVI, a systematic oversizing must be avoided. Considering these specific attributes and their facility and rapidity of implantation, the SURD valves appear to be specially adapted for SAA. An international expert consensus in 2015 recommended the use of SURD valves as the first choice of valve prosthesis when involving cases of SAA (4).

The two current commercially available prostheses on the market are the self-expanding Perceval S (Livanova PLC, London, UK) and the rapid-deployment Intuity Elite (Edwards Lifesciences, Irvine, California, USA) where both have demonstrated improved hemodynamic performance. Two studies have analysed the performance of the smallest size (a prosthesis size ≤21 mm) and both showed a low rate of PPM (5,6). Two other studies have directly compared hemodynamic performance in the short and mid-term of SURD valves and of stented bioprostheses. A lower postoperative peak transvalvular gradient and a greater EOA were in favour of SURD valves (7,8). Nonetheless, a different result has been reported in a comparative study among four different surgical options with similar hemodynamic performance of SURD valves compared to stented valves (9).

The hemodynamic of SURD valves has been also compared with TAVI but the results remain limited and discordant with accepted similar iEOA. However, in a recent meta-analysis, not specific for SAA patients, results showed an improved early and mid-term outcome in patients undergoing SURD-AVR compared with TAVI, with rates of pacemaker implant comparable between procedures, but a higher incidence of moderate and severe paravalvular leak (10).

An unquestioned advantage of SURD prostheses is the reduced cardiopulmonary bypass and aortic cross-clamping procedure times that can decrease morbidity and mortality, especially in elderly patients, as well as the facilitation of minimal invasive surgery.

In conclusion, the SURD aortic prostheses are associated, in patients with SAA, with an improved hemodynamic performance and a lower incidence of PPM when compared to stented valves. Similar hemodynamic performance was found in a same study comparing SURD valves with TAVI, but no randomised controlled trials have been performed to date especially in SAA patients. SURD valves can be considered as the first choice of valve prosthesis to surgical AVR in patients with a SAA. They provide improved EOA, clinical outcomes and reduced implantation time, which is of interest in geriatric patients.

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Footnote

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References

1 Freitas-Ferraz AB, Tirado-Conte G, Dagenais F, et al. Aortic Stenosis and Small Aortic Annulus. Circulation 2019;139:2685-702.
2 Pibarot P, Dumesnil JG. Hemodynamic and clinical impact of prosthesis-patient mismatch in the aortic valve position and its prevention. J Am Coll Cardiol 2000;36:1131-41.
3 Walther T, Rastan A, Falk V, et al. Patient prosthesis mismatch affects short- and long-term outcomes after aortic valve replacement. Eur J Cardiothorac Surg 2006;30:15-9.
4 Gersak B, Fischlein T, Folliguet TA, et al. Sutureless, rapid deployment valves and stented bioprosthesis in aortic valve replacement: recommendations of an International Expert Consensus Panel. Eur J Cardiothorac Surg 2016;49:709-18.
5 Villa E, Messina A, Laborde F, et al. Challenge for perceval: aortic valve replacement with small sutureless valves--a multicenter study. Ann Thorac Surg 2015;99:1248-54.
6 Theron A, Gariboldi V, Grisoli D, et al. Rapid Deployment of Aortic Bioprosthesis in Elderly Patients With Small Aortic Annulus. Ann Thorac Surg 2016;101:1434-41.
7 Shalabi A, Spiegelstein D, Sternik L, et al. Sutureless Versus Stented Valve in Aortic Valve Replacement in Patients With Small Annulus. Ann Thorac Surg 2016;102:118-22.
8 Shrestha M, Maeding I, Höffler K, et al. Aortic valve replacement in geriatric patients with small aortic roots: are sutureless valves the future? Interact Cardiovasc Thorac Surg 2013;17:778-82; discussion 782.
9 Ghoneim A, Bouhout I, Demers P, et al. Management of small aortic annulus in the era of sutureless valves: A

comparative study among different biological options. J Thorac Cardiovasc Surg 2016;152:1019-28.
10 Meco M, Miceli A, Montisci A, et al. Sutureless aortic valve replacement versus transcatheter aortic valve implantation: a meta-analysis of comparative matched studies using propensity score matching. Interact Cardiovasc Thorac Surg 2018;26:202-9.

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