HOW TO PREVENT A PACEMAKER IMPLANTATION AFTER SUTURELESS BIOPROSTHESIS

To the Editor:

The Perceval sutureless aortic valve (Livanova Group, Milano, Italy) currently is routinely used in many European cardiac surgery centers.^{1,2} However, questions remain regarding the incidence of postoperative permanent pacemaker implantation.³⁻⁵ Proper implantation of the Perceval sutureless valve requires attention to exposure, annular debridement, sizing, and depth of insertion of the bioprosthesis. Attention to the appropriate depth of placement of these guiding sutures in relation to the annulus is critical to ensure proper valve

function without additional risks for the conduction system. These sutures are placed at the nadir or mid-point of the insertion of the valve leaflet. Use of a semicircular needle facilitates placement of the guiding sutures beginning no more than 2 mm below the annulus and exiting approximately 2 mm above the annulus, which effectively encircles the annulus with the temporary guiding sutures. Passing these sutures from below to above the annulus has been found to be helpful to control the depth of the guiding suture (Figure 1, A). The depth of the guiding sutures should include enough tissue to ensure stability during prosthesis deployment, while ensuring that the axial position of the valve is maintained so that the collar of the valve inflow matches the nadir of the annulus for each leaflet. Inappropriately deeper placement of the guiding sutures into the left ventricular outflow tract carries the risk of damage to the conduction system (Figure 1, B) once the valve is placed. During valve deployment, particular attention should be put to the angle of the holder with regard to the seating of the valve in the noncoronary sinus. Inappropriate tension of these sutures may cause the valve to be seated too deeply, particularly at the commissure between the right and noncoronary cusps, with potential for damage to the underlying conduction system (Figure 1, B-D). Immediately after valve deployment, the appropriate axial depth of the valve should be assessed by examining

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FIGURE 1. A, Placement of the guiding sutures from the ventricular side to the aortic side. B, Anatomic relationship of the aortic annulus between the right coronary Valsalva sinus and the fibrous interventricular septum where the His bundle is located. C, Inspection of the correct landing of the valve prosthesis in the intra-annular position. D, Inspection of the adequate anatomic relationship between the implanted prosthesis and the fibrous interventricular septum where the His bundle is located. E and F, Optimal angular position of the valve holder during prosthesis release.

Disclosures: T.F., B.G., and S.P. are the Master Proctors for the Perceval sutureless Bioprosthesis (Livanova Group).

the relationship of the inflow collar to the annulus. If appropriately positioned, there should be no annulus visible above the collar or below the collar, which can be examined through the valve with gentle retraction of the leaflets (Figure 1, C). The specific angular position of the valve holder is derived from an anatomic analysis of the 3 Valsalva sinuses: There is often a significant amount of asymmetry among sinuses, with the noncoronary sinus often occupying a lower position relative to the other leaflets compared with the others. The angle of the valve holder different than that depicted in Figure 1, E and F, may lead to an excessively high location of the prosthesis in the noncoronary sinus with the risk of paravalvular leakage, whereas opposite overcorrection near the right coronary sinus may lead to low implantation in the area and compression of the His bundle.

We believe that, if applied by any surgeon, these techniques can standardize the implantation procedure resulting in reduced postoperative permanent pacemaker implantation rates.

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AVOIDING PACEMAKER IMPLANTATION WITH SUTURELESS VALVES: STAYING "ON PACE" IN THE ERA OF TRANSCATHETER AORTIC VALVE

REPLACEMENT

Reply to the Editor:

Sutureless and rapid-deployment aortic valves are being implanted with increasing frequency in Europe and Asia. A similar pattern is expected to occur in the United States, where regulatory approval was granted recently for the Perceval valve (Livanova Group, Milano, Italy) and is likely to be granted for the Intuity Elite valve (Edwards Lifesciences, Irvine, Calif). Although these valves have been demonstrated to facilitate minimal invasive surgery¹ and may represent a viable alternative to transcatheter aortic valve replacement (TAVR) in non-high-risk patients,² some concern exists regarding their associated pacemaker implantation (PMI) rate. The rate of PMI has been reported to be as high as 17% for these devices,³ although it more typically falls in the range of 4%-7%.^{1,2,4} As a comparison, the rates of PMI for balloon-expandable TAVR were recently reported as 8.5% in intermediate-risk patients (compared with 6.9% for conventional surgical AVR).⁵ The rates of PMI for self-expanding TAVR devices are known to be much greater.

If sutureless/rapid-deployment valves are to be seen as an alternative to TAVR, then the rates of PMI should be lower than that achieved with any TAVR device. Such a goal should be achievable given that sutureless/rapid-deployment valves are deployed under direct surgical vision, resulting in more precise placement with regard to the atrioventricular conduction tissue. Some of the variation in reported PMI rates for sutureless and rapid-deployment valves has been the result of controversial indications for pacemaker therapy (eg, left bundle branch block).³ Although differences in valve design (ie, length of the subannular component, balloon deployment stainless-steel vs self-expanding nitinol, balloon inflation volume, and pressure) may also be responsible for some of the variation in observed PMI rates, more data are required in this regard.

In this issue of the *Journal*, Fischlein et al⁶ have described several surgical tips to minimize the risk of PMI post-Perceval implantation. Control of the angle of the valve holder during device deployment to maintain coaxiality with the aortic annulus is particularly crucial. Other factors that may affect the risk of PMI include extent of annular decalcification required, height of the membranous septum, presence of a bicuspid aortic valve (whereby the atrioventricular node location is more variable), and requirement for concomitant mitral or tricuspid valve procedures.