right ventricle overfilling, without any anatomic modification of the pulmonary annulus (due to the sutureless aortic valve).

The patient then underwent a second operation using a 46-minute cardiopulmonary bypass without an aortic crossclamp. A 27-mm sutureless Carpentier Edwards INTUITY Elite valve (Edwards Lifesciences, Irvine, Calif) was implanted in the pulmonary annulus via a vertical pulmonary artery incision (Figure 1).

We modified the implantation technique by putting 3 stitches in the nadir of each cusp as recommended for the standard aortic valve replacement, adding another 3 stitches on the commissures to ensure a better fixation of the prosthesis in a frail and dilated valve ring.

The postoperative course was marked by nonregression of the atrioventricular block necessitating a definitive pacemaker implantation and a bronchial infection treated with amoxicillin. The final echocardiogram showed good valvular performance in both the aortic and pulmonary positions with no regurgitation.

The patient was discharged 21 days after the second intervention. The 6-month follow-up was uneventful (mean pulmonary gradient = 3 mm Hg, a mild paravalvular leakage).

DISCUSSION

Pulmonary valve replacement indications are infective endocarditis on the right ventricle and the previously treated congenital cardiac malformation.⁴ Even if these patients are commonly frail, frequently require reoperation, and have poor right ventricle function, the percutaneous replacement of the pulmonary valve as described by Bonhoeffer and colleagues⁴ in 2000 is not the best treatment because of the

infection or dilated annulus. In these cases, a sutureless valve is a good alternative to surgical bioprosthesis or other valved grafts because they offer an easy deployment and good implantation support for a future percutaneous valve implantation in case of structural valve deterioration. Moreover, a previously implanted aortic valve is not a contraindication for a sutureless pulmonary valve implantation, as proved in this case.

The Edwards INTUITY sutureless valve was more suitable for the pulmonary position than other sutureless valves because of the larger infravalvular stent, fitting perfectly in the right ventricle outflow tract.

CONCLUSIONS

This case report proves the safety and the ease of implantation of the Edwards INTUITY sutureless valve in the pulmonary position. We suggest a simple modification of the recommended implantation technique to prevent any valve distortion in the pulmonary annulus.

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EDITORIAL COMMENTARY

Pulmonary valve replacement: A sutureless, surgical alternative?

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Right ventricular outflow tract pathology necessitating pulmonary valve replacement (PVR) for pulmonary valve stenosis or regurgitation is common. Many patients born with pulmonary valve stenosis or multilevel right ventricular outflow tract obstruction require intervention early in life. Whether percutaneous balloon valvuloplasty or surgical

relief of obstruction—with or without preservation of the pulmonary valve—is initially performed, the patient is at risk of needing a PVR in the future.

Pulmonary valve replacement has traditionally been considered to be either a bioprosthesis implanted into the native outflow tract or a valved conduit replacing the pulmonary valve and outflow tract. McKenzie and colleagues¹ recently reported their experience with 148 surgical PVRs, with no early mortality and a 6% pulmonary valve reintervention rate at 5 years after surgery, reminding us of the excellent results that are obtainable and expected. Percutaneous PVR is an alternative to surgical intervention in selected patients.² Initial procedural results are favorable; long-term durability is currently under study.

Isolated aortic valve replacement (AVR) has evolved greatly in the past decade with the introduction of transcatheter valves. Adapting technology from both transcatheter valves and traditional bioprosthetic valves, use of surgical sutureless valves has gained momentum.^{3,4} The benefits of placing a sutureless aortic valve intraoperatively include shorter cardiac ischemic time, the ability to place an aortic valve in a hostile aorta, and the potential to simplify minimally invasive AVR techniques.

Touati and colleagues⁵ are presented with a complicated situation in which a patient has recently undergone an AVR and mitral valve repair and develops acute significant pulmonary valve regurgitation requiring urgent PVR. Looking to limit cardiopulmonary bypass time and potential morbidity in this complex patient, they introduce an avant-garde technique. Modifying the known surgical techniques of a sutureless AVR, they implant a sutureless valve into the right ventricular outflow tract. The procedure is

performed successfully on a beating heart while minimizing cardiopulmonary bypass time. Finding further use for this cutting-edge technology certainly warrants congratulations.

Knowing that the sutureless valve technique can be utilized successfully in the right ventricular outflow tract is only the first step. Defining appropriate patients, as well as identifying limitations, is critical. Two types of patients come to mind when considering surgical sutureless PVR—both of which are typical in the multi-redo adult congenital surgical discipline. The first is a complex patient requiring an extensive operation including a PVR. When limiting surgical time is critical, this technique could certainly prove helpful. The other type of patient is the multi-redo PVR with right ventricular outflow reconstruction. It is not uncommon to encounter a severely calcified right ventricular outflow tract in which placing a sutureless PVR would be preferable to complete right ventricular outflow tract reconstruction (R. Suri, personal communication). How the sutureless valve will fair in the pulmonary position remains to be seen. However, having an alternative option for PVR in the surgeon's armamentarium is typically a good idea.

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