Chimney technique for aortic valve-on-valve replacement

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Video clip is available online.

For bioprosthetic aortic valve failure, one of the less-invasive treatments is transcatheter aortic valve replacement. Patients with multiple valve disease or with interatrial shunts, however, eventually need to undergo a standard reoperation. Explantation of the old prosthesis involves risks of annular disruption or blockage of conduction. The valve-on-valve technique is an alternative option,¹ but it has not been applied to patients with small bioprostheses.² We describe a modified valve-on-valve procedure for implanting a new valve of equal size with a chimney graft.

CLINICAL SUMMARY

An 82-year-old woman who had undergone aortic valve replacement with a 19-mm bovine bioprosthetic valve (CEP model 2900; Edwards Lifesciences, Irvine, Calif) for bicuspid aortic stenosis and patch augmentation of small aortic annulus (Nicks procedure) presented with heart failure 15 years later because of severe aortic regurgitation caused by failure of the prosthetic valve. Residual left-to-right ventricular shunt was the exclusion criterion for transcatheter aortic valve replacement.

Surgery was performed through a median sternotomy. Because of severe adhesion of the heavily calcified Dacron polyester fabric patch that had been used for augmentation of left ventricular outflow tract, explantation of the old valve would have been very hazardous. Moreover, the valve was too small to facilitate the valve-on-valve procedure in the usual manner. A novel chimney technique was therefore used.

The previous leaflets were removed. To implant a 16-mm mechanical valve (ATS AP360; Medtronic Inc,

The new valve is adequately implanted on the previous valve after the chimney technique.

Central Message

This novel chimney valve-on-valve technique made repeat aortic valve replacement possible for a patient with failure of a small-size bioprosthetic valve.

See Editorial Commentaries pages 70 and 72.

Minneapolis, Minn) onto an 18-mm inner-diameter CEP valve, an 18-mm J-graft vascular prosthesis (Japan Lifeline, Tokyo, Japan) was sewn to the cuff (Figure 1). After that 2-0 Ethibond (Ethicon Inc, Somerville, NJ) mattress sutures were placed equally around the previous ring. All mattress sutures were passed through the chimney graft and were snared before tying to confirm that the valve was adequately seated horizontally and that the chimney graft was well seated on the previous ring and free from folding, deformity, or coronary obstruction (Figure 2). The sutures were tied as soon as free valve leaflet motion was confirmed (Video 1).

FIGURE 1. Schematic of the chimney technique.

FIGURE 2. All mattress sutures were snared before tying to confirm adequate valve seating.

The new valve was adequately implanted. The woman has since been followed up uneventfully for 5 years in our outpatient clinic and is in New York Heart Association class I with normal sinus rhythm. An annual echocardiogram found normal valve function and good left ventricular function (ejection fraction, 77%), with a low-grade pressure gradient (maximum pressure difference of 16 mm Hg and mean difference of 6.4 mm Hg).

DISCUSSION

Our prerequisite for the choice of the valve-on-valve procedure has been the large size of the prosthetic valve inserted at the first operation.³ When implanting the new mechanical valve directly between the struts of the previous bioprosthesis, the size of the new prosthesis must be at least two sizes (6-8 mm) smaller in diameter than the previous valve. Unfortunately, no size-matched prosthesis exists for a 19-mm valve that would facilitate the valve-on-valve procedure in the usual manner. The chimney graft interposition makes it possible to fit a new valve on the ring with the same

VIDEO 1. Only the previous valve leaflets were removed. A new valve with chimney graft was sewn onto the previous ring. All mattress sutures were passed through the graft and were snared before proper seating was checked. Video available at: [http://www.jtcvsonline.org/article/S0022-5223\(17\)31800-7/fulltext](http://www.jtcvsonline.org/article/S0022-5223(17)31800-7/fulltext).

size. It is helpful to secure extra space for the leaflet motion between rings of equal size. The graft also seats better to the sewing cuff of the previous ring, so that there is no possibility of paravalvular leakage.

Evaluation of the proper seating of the chimney valve is mandatory before tying. Reversible tourniquet snaring⁴ is effective in detecting whether the retained subvalvular structures disturb leaflet motion, as well as ensuring that there is no deformity of the chimney graft.

CONCLUSIONS

The chimney valve-on-valve technique made repeat aortic valve replacement possible for a patient with failure of a small bioprosthetic valve. This is a simple and effective procedure, especially for high-risk elderly patients, even today in the transcatheter aortic valve replacement era.

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