complications associated with excessive dissection.⁴ In addition, a suture line close to the individual pulmonary veins is mandatory.

The potential advantage of our technique is that the suture line does not approach the individual pulmonary venous orifice, thereby avoiding trauma to the pulmonary venous endothelium and preventing reactive intimal proliferation, even in the context of a tiny pulmonary venous confluence. Further, limited dissection of the pulmonary venous confluence and the individual pulmonary veins results in maintenance of adequate alignment of the pulmonary veins relative to the atrial wall, thereby avoiding torsion and rotation. In this manner, we are able to choose the best corresponding position of the atrial wall for anastomosis, because the single-ventricle heart has a functional common atrium.

By contrast, Yoshimura and colleagues⁵ performed sutureless pericardial repair of TAPVC associated with right atrial isomerism as a primary operation and reported good results. Primary sutureless repair may seem to be a good option, but because there is considerable variation in this group of diseases, our technique could be considered the

better alternative in some cases. Further analysis is required to determine the best manner to achieve TAPVC repair.

CONCLUSIONS

Our technique for TAPVC repair, which uses a vertical vein without cutting into the pulmonary venous confluence, showed favorable midterm results. This technique may be the strategy of choice for extracardiac type TAPVC repair associated with single-ventricle heart.

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Prosthetic aortic valve–pexy: Stitch closure of the aortic valve in a patient with a ventricular assist device

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Intermittent opening of the mechanical aortic valve after placement of a ventricular assist device (VAD) can lead to an increased risk of thromboembolism. It has been recommended to close the aorta with a patch or replace it with a bioprosthesis.^{1,2} Both these methods, however, increase the ischemic time. A single-stitch method to close the mechanical aortic valve has been described³; however, placement of the suture as illustrated in the article is technically very difficult. We therefore describe our modification as used in a patient with a mechanical aortic valve undergoing VAD placement and include intraoperative photographs and an illustration.

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CLINICAL SUMMARY

A patient with medically refractory congestive heart failure was referred for placement of a VAD as a destination therapy. He had previously undergone ascending aorta replacement with a Dacron polyester fabric tube graft and aortic valve replacement with a St Jude bileaflet mechanical prosthesis (St Jude Medical, St. Paul, Minn). Surgery was conducted with hypothermic cardiopulmonary bypass, and diastolic cardiac arrest was achieved with cold blood cardioplegia after clamping of the ascending aorta. The aorta was opened transversely to gain exposure of the mechanical valve (**Figure 1, A, blue arrows**). A 3-0 GORE-TEX suture (W. L. Gore & Associates, Inc, Flagstaff, Ariz) was inserted at the aortic annulus from the aortic side to the ventricular side. The sewing needle was then retrieved from the gap between the valve leaflet and the sewing ring (**Figure 1, A, white arrow**). This was then repeated on the opposite side. It is essential to do this perpendicular to the opening plane of the leaflets, as depicted in **Figure 1, B and C**. As the suture was pulled, the leaflets closed (**Figure 1, B and C**). Care must be taken to remove any slack of the suture when the

FIGURE 1. Intraoperative photographs depicting the method of suture placement. A detailed description of A through D is available in the text. *White arrow*, Gap between the valve leaflet and the sewing ring; *blue arrows*, mechanical valve.

knot is tied. The desired result was 2 GORE-TEX threads that lie parallel to each other (Figure 1, D) on the aortic side of the prosthesis with the valve in a closed position. Figure 2, A, shows a diagrammatic representation of the stitch. Transesophageal echocardiography was done after separating the patient from cardiopulmonary bypass. The mechanical valve remained in a closed position throughout the cardiac cycle, with trace regurgitation between the leaflet edge and the sewing ring (Figure 2, B, arrows), which had disappeared in the discharge echocardiogram. The total crossclamp time was 90 minutes, because the VAD implantation was done on the arrested heart. The actual procedure on the aortic valve would likely add only 5 to 10 minutes of ischemic time.

DISCUSSION

Tasset and colleagues³ have described passing a 2-0 Ethibond suture (Ethicon Inc, Somerville, NJ) from the aortic

side to the ventricular side and out at the other end. In our experience, however, retrieving the needle from the ventricular side to the aortic side as they describe is difficult if not impossible. It is technically easier to pass the needle from each side separately, as shown in our diagram (Figure 2, B). The 2 parallel threads help strengthen the repair. GORE-TEX suture was preferred because of its elasticity and tensile strength; however, any strong, double-swaged suture material can be used.

The aortic valve would remain variably closed as a result of the continuous high-velocity flow from the inflow cannula of the VAD. Thus there is an equal risk of thrombus formation in this cul-de-sac irrespective of the type of valve: native, bioprosthetic, or mechanical. This potential risk exists in all patients with axial flow devices. The risk of embolism is related to intermittent valve opening.³ Our technique keeps the prosthesis closed during the entire cardiac cycle, and thus the risk would not be greater than with

FIGURE 2. A, A diagrammatic representation of the suture technique. B, Transesophageal echocardiography at the end of the procedure depicts trace regurgitation between the sewing ring and leaflet (arrows). The bileaflet prosthesis is closed throughout the cardiac cycle.

conventional procedures.^{1,2} A possibility of coronary ostial occlusion is present but should not be of clinical consequence with the VAD supporting the native ventricle.

We prefer early anticoagulation with heparin infusion to target an activated partial thromboplastin time of 50 to 70 seconds. We then administer oral warfarin sodium [INN warfarin] to maintain an international normalized ratio between 2.0 and 2.5.

We believe that our simple technique is useful in the management of patients with a mechanical aortic valve who need a VAD implanted. It would especially benefit those

high-risk patients for whom duration of ischemia is an important predictor of well-being.

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