Expanding the results of the Ross operation

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In this issue of the *Journal*, Ratschiller and colleagues¹ have reported an interesting series of more than 150 patients who underwent the Ross operation with the freestanding root technique in their institution during the last 20 years. The study cohort was fairly young (because they also included pediatric patients) but was also fairly sick, with a number of patients with acute infective endocarditis and a number of reoperations. With a mean follow-up of 12 years, their report confirms the excellent results of the Ross procedure in terms of survival and freedom from valve-related complications such as bleeding and embolic events, but it also confirms that the main drawback of the procedure is the risk of reoperation on the autograft and, to a much lower extent, on the pulmonary homograft. With a freedom from autograft reoperation of only around 75% at 15 years, the freestanding root technique has shown suboptimal results.

Late autograft failure usually presents with significant aortic regurgitation and is due mainly to autograft dilatation, cusp prolapse, or dilatation of the ascending aorta. Addressing these 3 potential mechanisms of failure can definitely improve the results: late autograft dilatation can be prevented with an autograft as short as possible and protected by the native aorta (root inclusion) or by inclusion into a vascular prosthesis (graft inclusion), particularly in cases of bicuspid aortic valve, which is invariably associated with a dilatation of the ventriculoaortic junction; dilatation of the ascending aorta (which can occur particularly in patients with bicuspid aortopathy or with an enlarged aorta at time of the procedure) can be prevented with more extensive aortic replacement at time of the first procedure; cusp prolapse can probably be prevented with intensive blood pressure control in the postoperative period.

Further, although this was not confirmed in the report of Ratschiller and colleagues,¹ in which more than 50% of patients were operated on for aortic regurgitation, other series²⁻⁴ have identified in preoperative aortic regurgitation (through dilatation of the ventriculoaortic junction) a significant predictor of late autograft failure. Nowadays, aortic regurgitation with or without root dilatation can be

Inclusion of the autograft inside a vascular graft prevents late dilatation and failure.

Central Message

The Ross operation can be improved by surgical technique and patient selection. Valve-sparing procedures can be used in cases of late failure and extend the longevity of the autograft.

See Article page 2390.

effectively treated with valve repair or valve-sparing procedures; the Ross operation should therefore usually be reserved for patients with severe valve stenosis. In this setting, freedom from reoperation can be a sky-high 98% at 15 years.⁴

Nonetheless, at reoperation Ratschiller and colleagues¹ were able to spare the autograft with a Yacoub or David operation in 77% of cases and therefore recorded a stunning freedom from valve replacement of 92% at 15 years, extending the scope of the Ross procedure. Moreover, we should note that Ratschiller and colleagues¹ performed a valve-sparing procedure only in patients with normal valve leaflets, and cusp repair was added only in 2 of these cases. Probably in centers with more experience with cusp repair, the percentage of spared autograft could be even higher.² In addition, if the autograft can be spared, valve sparing with the reimplantation technique has to be preferred to the remodeling technique for the circumferential annular support that it provides, preventing further dilatation of the ventriculoaortic junction and recurrence of valve regurgitation. Finally, although Ratschiller and colleagues¹ observed in their cohort a worse late survival than that in a matched general Austrian population, in our opinion an 85% survival at 20 years is by far better than survival with any other aortic valve substitute.

In conclusion, the Ross operation has shown excellent results, despite the risk of reoperation with time. Improved results may be achieved with further improvements in patient selection, surgical technique, and postoperative management. Valve-sparing procedures in cases of late failure

can be used in a high proportion of reoperations and further extend the longevity of the autograft.

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