Editorial comment

A mechanical prosthesis for pulmonary valve replacement?

Usually, for pulmonary valve replacement and RVOT reconstruction, homografts or valved xenografts are used. This is true both for pediatric and adult patients.

Pediatric cardiac surgeons have a tradition of using homografts or biological valved conduits and are inclined to choose the same type of prosthesis when performing pulmonary valve replacement in adult patients with congenital heart disease. The choice for a homograft or xenograft is based on various arguments.

Mechanical valve prostheses carry a life-long risk of thrombo-embolic events even with proper anticoagulative therapy. At the same time anticoagulation has a certain incidence of bleeding complications. Young female patients with child wish are better off without anticoagulation. Furthermore, several reports have reported thrombosed mechanical valves in pulmonary position. The risk of one or more reoperations to replace the homograft or xenograft is usually considered to be sufficiently low to justify the decision of not using a mechanical prosthesis.

The number of grown-up patients with congenital heart disease (GUCH's) is expected to grow in the near future. A major part of the reoperations in the GUCH population will consist of pulmonary valve implantations or conduit replacements. Therefore, it is important to know whether the pulmonary valve is best replaced by a homo- or xenograft or by a mechanical prosthesis.

Long-term survival and event-free survival rates of right-sided homo- and xenografts have been reported extensively. In contrast, the reported number of patients with right-sided mechanical prostheses is still too limited and the follow-up duration is too short to permit any firm conclusions on the safety and durability of mechanical valves in the RVOT.

Waterbolk et al. provocatively report a series of 27 pulmonary valve replacements by mechanical prostheses with early mortality in one and late fatal anticoagulation-related pulmonary hemorrhage in another patient. One mechanical prosthesis had to be replaced 14 years after insertion as a result of fibrous tissue overgrowth. The mean follow-up was 5.5 years in their series and ranged from 2 months to 18 years.

The authors have demonstrated that pulmonary valve replacement can be performed safely using a mechanical prosthesis. They have also shown that thrombo-embolic events and prosthetic thrombosis do not occur when a proper anticoagulation regimen is maintained [1].

However, the key question is whether patients have better survival and event-free survival rates with mechanical valves than with the currently used homo- and xenografts. This question will remain unanswered for the moment as experience with right-sided mechanical valves is scarce and true long-term follow-up is not available.

To minimize the risk of valve thrombosis and other thrombo-embolic events, patients with a mechanical valve in pulmonary position must maintain a strict regime of anticoagulation. Thrombosed mechanical prostheses have been reported in the past but in some of these series anticoagulative therapy was lacking or not properly maintained. Minor thrombo-embolic events are probably better tolerated on the right side as the emboli are directed towards the lungs, contrary to emboli from mechanical valves in mitral or aortic position. Anticoagulative therapy is responsible for hemorrhagic complications and the risk is cumulative. As the majority of GUCH patients are young adults this should be taken in consideration when deciding on the type of prosthesis. As for homografts in the RVOT, echocardiographic follow-up has to be performed on a regular basis. Fibrous paraprosthetic pannus formation should preferably be discovered before the mechanical valve becomes obstructive. A right-sided mechanical valved conduit carries the risk of fibrous peel formation inside the conduit and the technique that is described by Waterbolk et al. is to be preferred: the mechanical prosthetic valve is sutured to the original insertion of the pulmonary valve and, if necessary, the RVOT is reconstructed on the anterior side with a diamond-shaped patch.

Nevertheless, in selected patients, the use of a mechanical prosthesis should be given consideration.

In some categories the risk of another reoperation can be much higher than normal. Patients with multiple previous operations and patients with predicted or reported cardiovascular lacerations at sternal re-entry are candidates for a mechanical RVOT prosthesis. Obstructed homografts or conduits that are firmly adhered to the lateral chest wall can pose such formidable technical difficulties that a mechanical prosthesis should seriously be considered in an effort to avoid any further reoperations.

Patients that use anticoagulative medication for other reasons form another group that may be better off with a mechanical prosthesis in pulmonary position.

Some authors mention older age as another selection criterium for the use of a right-sided mechanical prosthesis [2]. However, hemorrhagic complications of anticoagulation have been reported to occur more frequently in the elderly [3]. Furthermore, homograft or xenograft degeneration progresses at a much slower rate in older patients. Older age is therefore no valid reason to prefer a mechanical prosthesis in pulmonary position.

In conclusion, insufficient evidence is available at present to state that right-sided mechanical valves do better than homo- or xenografts. However, in some patient categories the choice for a mechanical prosthesis should seriously be considered.
References


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