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Editorial

Durability or avoiding valve related adverse events – What is more important in elderly patients undergoing aortic root replacement?

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Many studies have previously compared the outcomes following aortic root replacements using biological or mechanical valved conduits [1–6] While mechanical valved conduits because of their durability have been considered to be the gold standard by many, the risk associated with anti-coagulation has remained a major concern [4,5]. The uniqueness of the study by Lechiancole et al. lies in the fact that they have compared the outcomes between biological and mechanical valved conduits in the subset of patients ≥65 years [7].

The authors retrospectively reviewed 282 patients (≥65 years) over a 21-year period across four different institutions. To minimize confounding dissections and destructive endocarditis were excluded. Median follow-up was 77 months for biological and 107 months for mechanical valved conduits and loss to follow up for a retrospective study spanning two decades was exceptionally low [1.77% (5 out of 282)]. Primary-outcome was freedom form all-cause mortality with major adverse events (MAE) being the secondary outcome.

Majority of the patients (61.3%) had biological valved conduit and the authors have demonstrated excellent outcomes with both the conduits. The authors have interpreted their findings and suggested that the type of valved conduit does not affect survival and incidence of adverse events is not influenced by the conduit type in patients ≥65 years. It is this statement that needs closer scrutiny and discussion.

To evaluate the conclusions, it is important to break the outcome into 3-simple questions. Was there a difference in early mortality between the two conduits? Was there a difference in late outcome? Was the major adverse event rate comparable?

The baseline and operative characteristics reveal that even at the very outset, outcome of the biological valved conduit group was heavily tilted towards having a worse outcome. Patients in this cohort were older ($p < 0.001$), had worse NYHA class ($p = 0.001$), had significantly higher incidence of coronary artery disease ($p = 0.02$) and concomitant coronary artery bypass grafting ($p = 0.003$). The operative procedures necessitated significantly longer cross clamp time ($p = 0.001$), cardiopulmonary bypass time ($p = 0.006$) and utilization of circulatory arrest ($p < 0.001$). Almost all of these variables have been reported to be independent predictors of early and late death in patients undergoing aortic root replacements [3,5,6,8]. It would therefore be logical to expect worse early and late outcome in the study patients who received biological conduits. However, there was no difference between the groups in terms of early mortality ($p = 0.2$).

With regards to long term mortality there was no difference between the groups in terms of unadjusted actuarial Kaplan-Meier survival at 4, 8 and 12 years. ($p = 0.09$). The extent of surgery has not been described but going by the significantly higher number of patients requiring circulatory arrest in the biological group [63(36%) vs. 15(14%); $p < 0.001$] one can speculate that patients in the biological group underwent much more extensive procedures and thus may have been pre-disposed to worse short and long term outcomes. The authors have carried out multivariate Cox regression analysis and shown that male gender, age, preoperative serum creatinine and EuroSCORE II were independent risk factors for late death. All these variables were equally distributed in both groups except age. Patients in the biological valved conduit group were significantly older and therefore by their own analysis quite likely to have worse survival in the long term. Despite this no significant survival difference was noted between the groups. There was a non-significant late divergence of survival curves after 10 years. One could argue that one of the reasons for this late divergence could be potential structural valve degeneration (SVD) thus confirming a less durable repair with biological conduits. However, it has to be noted that in the entire study population with very robust follow up data, the authors have not reported a single re-operation that was due to SVD.

What was the incidence of major adverse events (MAE) in the two groups? The authors have reported that long-term MAE free

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survival was similar in the two groups ($p = 0.3$). This is despite the fact that age was reported as an independent predictor of major adverse events and thus once again made the biological valved conduit group more likely to have MAE.

More importantly, one has to closely examine the incidence of some of the individual components of the MAE: thrombo-embolic events (ischaemic stroke +valve thrombosis), stroke and major hemorrhage. The incidence of thrombo-embolic events [5(2.8%) vs. 15(13.7%)]; stroke [1(0.5%) vs. 13(11.9%)]; and major hemorrhage [4(2.3%) vs. 8(7.3%)] all appear significantly more common in patients with mechanical valved conduits. All cases of major hemorrhage ($n = 12$) occurred only in patients who were on warfarin either because they had a mechanical valved conduit or because they developed atrial fibrillation with a biological valved conduit. So even though the unadjusted Kaplan-Meier actuarial curves suggested similar long-term MAE free survival it is hard to ignore the MAE which "actually occurred" significantly more commonly in the mechanical valved conduit group. Thus, it would be erroneous to conclude that adverse events incidence is not influenced by the conduit type in patients ≥65 years.

If a biological valved conduit outlasts an elderly patient the question of SVD remains purely academic. However, the risk of anti-coagulation related morbidity is real with mechanical valved conduits. It would therefore be logical to suggest that obviating the need for anti-coagulation, especially in the elderly patients, maybe a highly acceptable trade-off for the clinically non-significant late reduction in durability of biological valved conduits. With the progress in the valve-in Valve TAVI procedures [9] and overall experience [10] the issue of SVD, should it occur in the lifetime of a patient can be tackled with low associated risk. This lends further support for use of biological conduits for the modified Bentall procedures, especially in the elderly.

In this large series the authors provide excellent outcome data on usage of biological and mechanical valved conduits in these patients. However, interpretation of their data, somewhat contradicts their leaning towards mechanical valved conduits and in fact suggests that owing to the lower incidence of anti-coagulation associated morbidity, the biological valved conduit may be a more attractive option in the elderly.

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Declaration of competing interest

None.

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