Reimplantation versus remodeling: a meta-analysis

CRD summary
The review concluded that reimplantation versus remodelling for valve-sparing aortic surgery had a lower risk of long-term reoperation related to aortic insufficiency and no significant difference for 30-day and late mortality. Cardiopulmonary bypass and aortic clamping times were significantly higher for reimplantation. Limitations to the search and evidence presented made the reliability of the authors' conclusions unclear.

Authors' objectives
To compare the efficacy and safety of reimplantation with remodelling for valve-sparing aortic root surgery.

Searching
PubMed was searched. Search terms were reported. Search dates were not stated explicitly, but the included studies were published between 2002 and 2010. The bibliography of each retrieved article was handsearched.

Study selection
Studies that compared reimplantation versus remodelling for valve-sparing aortic surgery were eligible for inclusion if they included at least five patients in each group and had follow-up of at least five years. Eligible aortic pathologies included aortic root aneurism and dissection (chronic or acute) with or without Marfan syndrome (emergent or elective). Primary outcomes were early (30-day) and late mortality, reoperation related to moderate or severe aortic insufficiency, cardiopulmonary bypass and aortic clamping time.

Most studies were of both aneurism and dissection patients; one study was of aneurism patients only and one study of dissection patients only. Almost three-quarters of the studies included Marfan syndrome patients; one study focused on Marfan syndrome patients alone.

Two independent reviewers performed the selection. Disagreements were resolved by a third reviewer.

Assessment of study quality
Criteria assessed were: generation of random allocation sequence; allocation concealment; blinding; incomplete outcome data; selective reporting; and freedom from other biases.

Methodological quality was assessed by two reviewers independently. Disagreements were resolved by consensus.

Data extraction
The numbers of events for each outcome were extracted in order to calculate risk ratios (RR) and 95% confidence intervals (CI). For continuous outcomes, mean differences were calculated with 95% CIs.

The authors did not report how many reviewers performed the extraction.

Methods of synthesis
Risk ratios and mean differences were pooled using a fixed-effect model to give weighted risk ratios and weighted mean differences (WMDs) with 95% CIs. Between-study heterogeneity was assessed using the $\chi^2$ statistic (where significant heterogeneity was indicated, $p<0.1$) and the $I^2$ statistic (where there was a high level of heterogeneity, $I^2>50\%$). Publication bias was assessed visually using funnel plots. It was not possible to perform separate analyses for different aetiologial groups due to the limited number of studies identified. Sensitivity analyses were not performed due to the low quality of the studies.

Results of the review
Seven studies were identified (672 participants, range 17 to 220). All the studies were non-randomised and retrospective. None of the studies was blinded or had adequate sequence generation and allocation concealment. All of the studies addressed incomplete outcome data and all were free of selective reporting or other bias. Maximum follow-
up time ranged from five to 16 years.

Cardiopulmonary bypass time increased significantly in the reimplantation group versus the remodelling group (WMD 14.05 minutes, 95% CI 6.14 to 21.95, I²=29%; three studies). Aortic clamping time increased significantly in the reimplantation group versus the remodelling group (WMD 15.69 minutes, 95% CI 9.66 to 21.72, I²=51%; three studies).

There was no significant difference in 30-day mortality between reimplantation and remodelling (five studies, only three of which contributed to the analysis, I²=0%) or late death (four studies, two contributed to the analysis, I²=0%).

There was a significantly lower reoperation rate related to moderate or severe aortic insufficiency for reimplantation versus remodelling (RR 0.46, 95% CI 0.23 to 0.92, I²=40%; seven studies).

Most analyses showed no evidence of publication bias.

Authors’ conclusions
The reimplantation technique had a lower chance of reoperation related to moderate or severe aortic insufficiency during long-term follow-up than the remodelling technique. There was no significant difference between the two techniques for 30-day mortality and late death.

CRD commentary
The review addressed a well-defined question in terms of participants, interventions, study design and relevant outcomes. Only one database was searched, it appeared that unpublished studies were not included in the search and it was not clear whether language restrictions were applied; therefore, there appeared to be a high likelihood that relevant studies were missed. Publication bias was assessed and little was identified. The assessment of study quality was of limited use as many of the criteria used were relevant for only randomised trials and all of the included studies were observational. Efforts were made to reduce error and bias in study selection and validity assessment; it was not reported whether this process applied to data extraction.

Some relevant study details were reported, but limited details of study design were provided. Statistical heterogeneity was assessed. The statistical method used for the meta-analysis did not include studies where no events occurred, which may have tended to exaggerate the overall effects identified.

Limitations to the search and evidence presented made the reliability of the authors’ conclusions unclear.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors recommended that further studies should be high quality and randomised and provide details of aortic pathologies, postoperative complications, 30-day mortality, late survival outcome and reoperation rates related to moderate or severe aortic insufficiency during follow-up.

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