Preservation of the mitral valve apparatus: evidence synthesis and critical reappraisal of surgical techniques

CRD summary
This review concluded that mitral valve replacement with preservation was superior to replacement without preservation for early postoperative low cardiac output that required inotropic support and for early or mid-term survival. Due to possible inappropriate pooling of studies and failure to consider study quality these conclusions may not be reliable.

Authors' objectives
To compare the efficacy of replacement of the mitral valve with preservation of its apparatus (MVR-P) with mitral valve replacement without preservation of its apparatus (MVR-NP).

Searching
MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) and Health Technology Assessment databases and Google Scholar were used to search (1964 to 2007) for studies published in any language. Search terms were reported. References of all cross-references, quoted papers, review articles and meta-analyses were searched for additional studies. The related articles function was also used to broaden the search and abstracts. Citations and studies retrieved were examined.

Study selection
Studies that compared MVR-P, posterior preservation (MVR-PL) or bileaflet preservation (MVR-BL) with MVR-NP or that compared MVR-PL with MVR-BL were eligible for inclusion. Included studies had to report at least one of the following outcomes: 30-day mortality; hazard ratio (HR) of mortality at one year; hazard ratio of mortality at five years; and use of postoperative inotropic support for low cardiac output. Studies where interventions could not be defined and with zero for the outcome of interest in both cells of the cross-tabulation table for the intervention were excluded.

Both prospective and retrospective comparative study designs were included from a range of countries. Mean age appeared to range from 23.2 years to 63 years. The proportion of males ranged from 21% to 80%. All included participants were defined as New York Heart Association class III or IV. In most of the studies the pathology of the included participants was mixed.

The authors stated neither how the papers were selected for the review nor how many reviewers performed the selection.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
Outcome data were extracted by two reviewers independently. Authors were contacted if discrepancies were found. The type of preservation technique used was extracted but not used in the meta-analysis.

Methods of synthesis
Mortality rates and hazard ratios were pooled in a random-effects meta-analysis (to produce odds ratios and pooled hazard ratios) and corresponding 95% confidence intervals were calculated. Statistical heterogeneity was assessed using the X² test and I² statistic. Subgroup analyses were performed for posterior preservation and bileaflet preservation.

Results of the review
Twenty four studies (which related to 17 groups; two authors published the same outcomes at different time points) were included in the review (n=2,933): four prospective randomised studies (n=260); four prospective non-randomised...
MVR-P was associated with significantly lower 30-day perioperative mortality than MVR-NP (OR 0.22, 95% CI 0.14 to 0.35, p< 0.00001; 11 groups). There was a similar significant association for both posterior and bileaflet preservation subgroups. Perioperative mortality was lower with MVR-BL compared with MVR-PL, but this was not statistically significant. Inotropic requirements were significantly lower in the MVR-P group than the MVR-NP group (OR 0.16, 95% CI 0.06 to 0.42).

The risk of overall mortality was higher with MVR-NP than MVR-P at one year (HR 6.16, 95% CI 2.65 to 14.32, p value not reported) and five years (HR 2.80, 95% CI 1.08 to 7.24, p=0.03). This was similar for valve-related mortality at one year (HR 1.95, 95% CI 0.71 to 5.34) and five years (HR 2.21, 1.10 to 4.44).

There was no statistically significant heterogeneity between studies.

**Authors' conclusions**

This review strongly suggested that MVR-P was superior to MVR-NP for early postoperative low cardiac output that required inotropic support and for early or mid-term survival.

**CRD commentary**

The research question was supported by inclusion criteria for intervention and outcomes; however, there were no criteria for participants or study design, which may have led to subjective decisions during study selection. The authors did not report any attempts to retrieve unpublished studies, which may have increased the possibility of publication bias. Studies in all languages were sought, which reduced the risk of language bias. The authors stated that data were extracted in duplicate, but did not report any details for study selection so it is not known whether similar steps were taken to reduce possible reviewer bias and error. No formal validity assessment was undertaken, so the reliability of the included studies was unclear. The primary studies appeared to be clinically diverse in terms of country and participant characteristics, so the appropriateness of pooling was questionable. As the quality of data could not be assessed and given the apparent clinical heterogeneity, pooling may not have been appropriate. This, and the possible risk of bias and error, mean that the authors’ conclusions may not be reliable.

**Implications of the review for practice and research**

**Practice**: The authors did not state any implications for practice.

**Research**: The authors stated that primary data on long-term quality of life after MVR was needed and further research comparing MVR-BL and MVR-PL was required. Other areas of interest are assessment of right ventricular and tricuspid valve function following MVR-BL or MVR-PL compared with MVR-NP. Different subgroups of patients with mitral regurgitation due to varying causes (such as ischaemic disease, re-do surgery or degenerative disease) also needed to be investigated.

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