Meta-analysis of clinical outcomes following surgical mitral valve repair or replacement

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CRD summary
This review concluded that mitral valve repair was more beneficial than replacement surgery in patients with non-ischaemic mitral valve disease. There were no differences in total mortality between repair and replacement of the ischaemic mitral valve in the long term. In view of the methodological weaknesses of the review, the authors' conclusions may not be reliable.

Authors' objectives
To compare clinical outcomes following surgical mitral valve repair or replacement.

Searching
PubMed and EMBASE were searched for studies published in English from 1960 to September 2005; the search terms were reported. Bibliographies were also screened for relevant studies.

Study selection

Study designs of evaluations included in the review
Inclusion criteria were not specified in terms of the study design.

Specific interventions included in the review
Studies assessing repair or replacement of the mitral valve were eligible for inclusion.

Participants included in the review
Studies of patients in one of five aetiological categories of mitral valve disease were eligible for inclusion: chords, degenerative/myxomatous, ischaemic, rheumatic or mixed. The average age of the patients was between 50 and 70 years. Most of the studies were largely comprised of males; the proportion of males ranged from 15 to 85% across studies. Risk factors of patients undergoing mitral valve treatment included New York Heart Association (NYHA) class II or IV, prior history of hypertension, diabetes, atrial fibrillation and previous cardiac operations.

Outcomes assessed in the review
Studies reporting survival information (total survival, time to development of thromboembolism, time to reoperation) and occurrence rates (early mortality) were eligible for inclusion. To be included, studies needed to report sufficient data for meta-analysis.

How were decisions on the relevance of primary studies made?
Two reviewers independently selected studies from full papers.

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

Data extraction
Summary hazard ratios (HRs) for total survival, reoperation and thromboembolism, and the summary odds ratio (OR) for 30-day survival were extracted as weighted averages from the individual studies. When only graphical survival curves and baseline sample sizes in the comparison groups were provided, HRs were estimated using published methodology. Outcomes labelled 'early mortality', 'hospital label', 'operative mortality' and '30-day mortality' were considered to be early mortality. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
How were the studies combined?
Pooled HRs and ORs and corresponding 95% confidence intervals (CIs) were calculated (the authors reported using a 'mixed' model).
How were differences between studies investigated?
Statistical heterogeneity was assessed using a chi-squared test (Cochran's Q statistic). Subgroup analyses were conducted by the aetiology of mitral valve disease.

**Results of the review**
Twenty-nine studies (n=10,154) were included. The authors did not report details of the study designs.

**Total survival.**

Patients undergoing mitral valve replacement had a 58% increased risk of dying compared with those undergoing mitral valve repair (21 studies; HR 1.58, 95% CI: 1.41, 1.78). There was no significant heterogeneity (p=0.23). The subgroup analysis showed a similar trend favouring repair for patients with degenerative/myxomatous aetiology (4 studies; HR 1.68, 95% CI: 1.39, 2.02), mixed aetiology (10 studies; HR 1.49, 95% CI: 1.24, 1.78) and rheumatic aetiology (2 studies; HR 2.33, 95% CI: 1.59, 3.43). However, differences between repair and replacement groups were not statistically significant for patients undergoing surgery on chordae tendineae (1 study) or those with ischaemic aetiology (4 studies).

**Early mortality.**

There was evidence showing a greater benefit for repair compared with replacement for early mortality (28 studies; OR 2.24, 95% CI: 1.78, 2.80). There was no evidence of statistical heterogeneity among studies (p=0.52). The subgroup analysis showed a similar trend favouring repair for patients with degenerative/myxomatous aetiology (4 studies; OR 1.93, 95% CI: 1.08, 3.44), ischaemic aetiology (6 studies; OR 2.01, 95% CI: 1.19, 3.40), mixed aetiology (14 studies; OR 2.39, 95% CI: 1.76, 3.26) and rheumatic aetiology (3 studies; OR 2.98, 95% CI: 1.45, 6.15). There were no difference between repair and replacement groups for patients undergoing surgery on chordae tendineae (1 study).

**Reoperation and post-operative thromboembolism.**

Reoperation rates were lower after replacement of the mitral valve than following repair, however, the difference was not statistically significant (6 studies; HR 0.88, 95% CI: 0.48, 1.62). Reasons for reoperation included technical mistakes and valve-related causes such as infection, progression of disease and thrombosis. The risk of developing post-operative thromboembolism was higher for replacement than for repair (5 studies; HR 1.86, 95% CI: 1.24, 2.81).

**Authors' conclusions**

Evidence provided support for repair compared with replacement surgery in patients with non-ischaemic mitral valve disease. There were no differences in total mortality between repair and replacement of the ischaemic mitral valve in the long term. Repair appeared to present a lower risk of developing thromboembolism. Treatment-related differences for the risk of reoperation are uncertain and require further trials.

**CRD commentary**

The inclusion criteria were clear in terms of the participants, intervention and outcomes, but were not explicit for the study design. Since only two databases were searched and only studies in English were included, it is highly likely that other relevant studies were omitted. Methods were used to reduce reviewer error and bias at the study selection stage, but the number of reviewers involved in the data extraction was not described. Some details of the individual studies were reported, but not the study designs. In addition, no quality assessment was performed, thus the results from these studies and any synthesis might not be reliable. There was no evidence of statistical heterogeneity but there is likely to have been clinical differences between the studies (e.g. in the surgical procedures). In view of these limitations and the absence of details of the study designs, it is not possible to determine whether a meta-analysis was appropriate, hence the 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 further longitudinal studies are needed to assess treatment-related differences in...
relation to the risk of reoperation. Studies that comprehensively document aetiology categories and modality of surgical therapy are also required.

**Funding**
Not stated.

**Bibliographic details**

**PubMedID**
17175161

**DOI**
10.1016/j.ejcts.2006.11.014

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Heart Valve Diseases /etiology /surgery; Heart Valve Prosthesis Implantation /adverse effects; Humans; Mitral Valve /surgery; Postoperative Complications; Reoperation; Survival Analysis; Thromboembolism /etiology; Treatment Outcome

**AccessionNumber**
12007000786

**Date bibliographic record published**
07/01/2008

**Date abstract record published**
09/08/2008

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.