Open versus endovascular stent graft repair of abdominal aortic aneurysms: a meta-analysis of randomized trials


CRD summary
The review concluded that all-cause perioperative mortality and aneurysm-related mortality at short- and intermediate-term follow-up were lower following endovascular repair compared with open surgical repair in patients with abdominal aortic aneurysms. The authors' conclusions appear reasonable and are likely to be reliable.

Authors' objectives
To evaluate the short-, intermediate- and longer-term outcomes after endovascular versus open repair of abdominal aortic aneurysms.

Searching
MEDLINE, EMBASE and Cochrane Central Register of Controlled Trials (CENTRAL) were searched without date or language restrictions; search terms were reported. Bibliographies of identified trials and reviews and proceedings of international conferences were searched.

Study selection
Randomised controlled trials (RCTs) that compared open repair with endovascular repair in patients with abdominal aortic aneurysms were eligible for inclusion. Studies of ruptured abdominal aortic aneurysms were excluded. Outcomes of interest were all-cause mortality, aneurysm-related mortality and rates of re-intervention.

Mean trial group ages ranged from 68.0 to 74.1 years. Almost all patients were male. Just under half of patients had coronary heart disease. It appeared that most studies excluded patients at high surgical risk. A general anaesthetic was used in around three-quarters of endovascular repair patients. Studies were conducted in Europe or North America.

Two reviewers screened abstracts and titles. No details were provided about full-paper screening methods.

Assessment of study quality
Study quality was assessed using the Cochrane risk of bias tool to evaluate the risk of bias arising from methods of randomisation, allocation concealment, blinding of outcome assessors, completeness of outcome data, selective outcome reporting and other sources of bias.

Two reviewers independently assessed risk of bias. Disagreements resolved by discussion or by a third reviewer.

Data extraction
Intention-to-treat data (where possible) were extracted to calculate relative risks (RR) with 95% confidence intervals (CI). Short-term (30-day), intermediate-term (up to two years) and long-term (three years or longer) data were extracted.

The authors did not state how many reviewers extracted data.

Methods of synthesis
Meta-analyses were performed to calculate pooled risk ratios with 95% confidence intervals using a random-effects model. Analyses using a fixed-effect model were also performed. Heterogeneity was assessed using the $I^2$ statistic. Publication bias was assessed using a funnel plot with associated statistical tests. Sensitivity analyses examined the effect of removing individual studies in turn.

Results of the review
Six RCTs were included (2,899 participants, range 40 to 1,252). All studies reported adequate randomisation sequence generation methods but methods of allocation concealment were unclear for five of the trials. All studies were at low
risk of bias for reporting outcome data and for selective outcome reporting. Only two studies reported adequate methods for outcome assessor blinding; reporting was unclear in four studies.

At 30 days the risk of all-cause mortality was lower in the endovascular group than in the open surgery group (RR 0.35, 95% CI 0.19 to 0.64; five trials). At two years the difference was not statistically significantly different (five trials) but abdominal aortic aneurysm-related mortality was significantly lower (RR 0.46, 95% CI 0.28 to 0.74; four trials) and re-intervention rates were higher (RR 1.48, 95% CI 1.06 to 2.08; five trials) in the endovascular group than in the open surgery group. There was no evidence of statistically significant heterogeneity and no evidence of publication bias.

At three years (or longer) there was no significant difference between groups in all-cause mortality and in abdominal aortic aneurysm-related mortality but the significant difference in rate of re-interventions was still evident (RR 2.53, 95% CI 1.58 to 4.05; four trials); statistically significant heterogeneity was evident at three years for the aneurysm-related mortality and re-intervention rates analyses. There was evidence of publication bias for the all-cause mortality analysis.

Sensitivity analysis results were reported.

Authors’ conclusions
All-cause perioperative mortality and aneurysm-related mortality at short-term and intermediate-term follow-up were lower in patients who underwent endovascular repair compared with open surgical repair in patients with abdominal aortic aneurysms. This was associated with greater re-intervention in the endovascular group at intermediate follow-up. Long-term survival appeared to converge between the groups.

CRD commentary
The review addressed a clear question and was supported by reproducible eligibility criteria. Attempts to identify relevant studies in any language were undertaken by searching electronic databases and searches were made specifically for unpublished studies. It was unclear what the most recent search date was. Duplicate processes were employed to reduce the risks of reviewer error and bias during study selection and when assessing study quality; the authors did not report on whether such methods were used during data extraction.

The risk of bias in the included trials was assessed and studies were classed as being at low risk of bias for most domains. Limited trial reporting for allocation concealment and outcome assessment was deemed as being acceptable but no rationale for this was provided. Sufficient study details were provided. Appropriate methods were used to pool data and to assess heterogeneity. Investigations into the causes of heterogeneity appeared limited (heterogeneity measures were not provided with the sensitivity analysis results).

The authors’ conclusions appear reasonable and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors noted that trial data were not generalisable to contemporary practice due to the age of the trials. They suggested that the re-intervention rates seen in the trials were likely to be higher than those seen in routine practice (due to more aggressive follow-up).

Research: The authors did not state any implications for research.

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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.