Ruptured abdominal aortic aneurysms: endovascular repair versus open surgery. Systematic review


CRD summary
The authors concluded that, after adjusting for the patients' haemodynamic condition at hospital admission, there was a non-statistically significant reduction in the 30-day mortality for patients with a ruptured abdominal aortic aneurysm undergoing endovascular repair compared with open surgery. A more cautious conclusion would have been more appropriate since the evidence was based on observational studies of uncertain quality.

Authors' objectives
To compare endovascular repair with open surgery in patients with a ruptured abdominal aortic aneurysm (AAA).

Searching
MEDLINE and the Cochrane Library were searched for studies published in English between 1994 and March 2006; the search terms were reported. In addition, reference lists of identified studies and five specified journals (1994 to 2006) were screened, and ISI Web of Knowledge: Web of Science used to track citations of identified studies. Abstracts of meetings, unpublished data and theses were excluded.

Study selection
Study designs of evaluations included in the review
Prospective and retrospective comparative studies with at least 5 patients per treatment group were eligible for inclusion.

Specific interventions included in the review
Studies that compared endovascular repair with open surgery were eligible for inclusion. Where reported, the included studies used different types of anaesthesia (including regional and/or epidural and general anaesthesia) and different types of graft (aorto-uni-iliac or bifurcated grafts for endovascular repairs and mainly tubular grafts for open surgery). Reasons for selecting open surgery instead of endovascular surgery varied across the primary studies and included haemodynamic instability, anatomical factors and logistic reasons (equipment and staff not available).

Participants included in the review
Studies of patients with a ruptured AAA were eligible for inclusion if they reported the haemodynamic condition of the patient at presentation to hospital. In most studies the majority of the patients were male.

Outcomes assessed in the review
Studies that assessed 30-day mortality in each treatment group were eligible for inclusion. The review also assessed the amount of blood loss, duration of procedure, intensive care unit stay and hospital stay, and systemic aneurysm-related complications (defined as the sum of cardiac, pulmonary, cerebrovascular and renal complications, multi-organ failure and sepsis) during follow-up.

How were decisions on the relevance of primary studies made?
One reviewer selected studies for inclusion.

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

Data extraction
Two reviewers independently extracted the data onto a standard form; any discrepancies were resolved with the aid of a third reviewer. Where possible, data were preferentially extracted from concurrent rather than historical control groups; for 2 studies the data were extracted for both types of control groups combined.
Methods of synthesis

How were the studies combined?
The studies were pooled in a meta-analysis using the random-effects model of DerSimonian and Laird. Weighted means were used to summarise data about patient and aneurysm characteristics and for continuous outcomes of interest. In addition, crude odds ratios (ORs) for 30-day mortality and ORs adjusted for the patients’ haemodynamic condition at presentation to the hospital were calculated, along with 95% CIs. Publication bias was visually assessed using a funnel plot.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the chi-squared statistic (p<0.05 indicated significant heterogeneity). Differences between the studies were discussed in the text of the review.

Results of the review

Ten comparative observational studies were included (478 procedures: 148 endovascular repair and 330 open surgery).

The pooled 30-day mortality rate was 22% (95% CI: 16, 29) for endovascular repair and 38% (95% CI: 32, 45) for open surgery.

The crude 30-day OR for mortality showed a significant reduction in mortality in patients undergoing endovascular repair compared to open surgery (OR 0.45, 95% CI: 0.28, 0.72). There was significant heterogeneity among studies in the haemodynamic condition of the patient at presentation to hospital for both treatment groups (p<0.01). After adjusting for the patients’ haemodynamic condition, there was no statistically significant difference in 30-day mortality between treatment groups (OR 0.67, 95% CI: 0.31, 1.44, p=0.37).

The pooled percentage of patients with systemic complications was 28% (95% CI: 17, 48) for endovascular repair and 56% (95% CI: 37, 85) for open surgery.

The funnel plot was asymmetrical, suggesting the possibility of publication bias.

The results for other outcomes were also reported.

Authors' conclusions

After adjusting for the patients’ haemodynamic condition at hospital admission, there was a non-statistically significant reduction in 30-day mortality for patients with a ruptured AAA undergoing endovascular repair compared with open surgery.

CRD commentary

The review addressed a clear question that was defined in terms of the participants, intervention, outcomes and study design. Inclusion criteria for the study design were broad, but this seems appropriate in view of the nature of the identified studies. Several relevant sources were searched but no attempts were made to minimise publication or language bias; the potential for publication bias was assessed and some suggestion of bias was found. Study validity was not assessed, thus the results from these studies and any synthesis may not be reliable. Methods were used to minimise reviewer error and bias in the extraction of data, but not in the selection of studies. The studies were combined using meta-analysis and forest plots were presented. Differences between the studies were described and an adjusted analysis performed. Since the evidence was based on potentially biased observational studies, a more cautious conclusion would have been more appropriate.

Implications of the review for practice and research

Practice: The authors stated that more research is required to determine the optimal mode of surgery (endovascular repair or open surgery) for patients with a ruptured AAA.

Research: The authors stated the need for larger studies with longer follow-up to compare endovascular repair and open surgery for patients with a ruptured AAA. Future studies should describe the characteristics of the patients and the criteria used to select patients for endovascular repair.
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