Modern treatment of juxtarenal abdominal aortic aneurysms with fenestrated endografting and open repair: a systematic review
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CRD summary
The authors stated that selective fenestrated endovascular repair appeared to have a lower peri-operative mortality rate than traditional open surgery for juxtarenal abdominal aortic aneurysm. However, the available evidence was poor quality. In view of the lack of properly controlled data, poor reporting of review methods and lack of information on study validity, these conclusions may not be reliable.

Authors' objectives
To assess the effectiveness of fenestrated endovascular repair (f-EVR) for juxtarenal aneurysms and to compare f-EVR versus open surgical repair.

Searching
PubMed and EMBASE were searched for studies published in English from 2001 to 2008. Search terms were reported. Relevant medical journals were handsearched. Reference lists of eligible studies were checked.

Study selection
Studies that reported outcomes of more than 10 cases of juxtarenal aortic aneurysm following f-EVR or open surgical repair were eligible for inclusion. Outcomes of interest were 30-day mortality, renal impairment, target vessel patency, length of stay and secondary re-intervention rate. Studies of ruptured abdominal aortic aneurysm were excluded.

Mean age of participants was 73.7 years in the f-EVR group and 71.8 years in the open surgery group. Most participants were male. All f-EVR studies used Zenith fenestrated endografts. Indications for secondary re-intervention in the review included endoleak, vessel stenosis, bleeding and embolism. Most studies were set in single specialist centres and had relatively short follow-up; the longest duration of follow-up reported in the review was one year.

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
Event rates and 95% confidence intervals (CIs) were extracted from each study for each outcome. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Summary event rates for each type of intervention were calculated, with 95% CIs. Comparative relative risks (RR) of the two groups were calculated. Fisher's exact test was used to assess heterogeneity within groups (for outcomes) and assess heterogeneity between groups for selected demographic and clinical variables, using contingency tables.

Results of the review
Twenty studies were included (n=1,532, range 13 to 247) reported on eight series of f-EVR (n=368) and 12 series of open surgery (n=1164). Six studies were prospective, 12 were retrospective, one was a case-control study and one was of unreported design.

Thirty-day mortality after f-EVR was 1.4% (95% CI 0.4 to 3.1; eight studies) and after open repair was 3.6% (95% CI 2.7 to 4.9; 12 studies), indicating a significantly increased risk in the open repair group (RR 1.03, 95% CI 1.01 to 1.04). Transient renal impairment after f-EVR was 14.9% (95% CI 11.5 to 18.7; eight studies) and after open repair
was 20% (95% CI 17.9 to 22.5; 10 studies), indicating a significantly increased risk in the open repair group (RR 1.06, 95% CI 1.01 to 1.12). Permanent dialysis dependence after f-EVR was 1.4% (95% CI 0.5 to 3.1; eight studies) and was similar after open repair, at 1.4% (95% CI 0.8 to 2.3; 11 studies). Primary endoleak (type I and III) after f-EVR occurred in 22/368 cases (eight studies). At follow-up after f-EVR, 96.6% of target vessels were patent (95% CI 95.4 to 97.8; seven studies) and at one year 92% were patent (95% CI 90.3 to 94.8; five studies). After open surgery 85% of patients reviewed at follow-up had patent renal arteries (one study, n=14). The secondary intervention rate in the first year of follow-up after f-EVR was 15.0% (95% CI 11.5 to 18.7; seven studies) and after open repair was 2.6% (95% CI 1.5 to 4.4), indicating a significantly lower risk in the open repair group (RR 0.87, 95% CI 0.83 to 0.91).

There was no significant heterogeneity within either group.

**Authors' conclusions**

Selective f-EVR appeared to have a lower peri-operative mortality rate than traditional open surgery for juxtarenal abdominal aortic aneurysm, but evidence was poor quality.

**CRD commentary**

The objectives and inclusion criteria of the review were clear and relevant sources were searched for studies. The restriction to studies in English meant that the review was prone to language bias. It appeared that no specific attempt was made to retrieve unpublished studies. Publication bias was not formally assessed. It was unclear whether steps were taken to minimise the risk of reviewer bias and error by having more than one reviewer independently undertake study processes. It did not appear that study validity was assessed, which made it difficult to determine the reliability of the findings. The statistical techniques used in the review did not appear robust. Pooled event rates were based on simple summing of data without weighting for study variables, indirect comparisons were made between studies which differed widely in design, setting and clinical characteristics and the methods used to calculate relative risks were not described. However, formal testing found no significant statistical heterogeneity within study groups, or between study groups for most of the variables tested. The authors acknowledged several problems with the evidence, which included the small and highly selective nature of available studies and inconsistent definitions of juxtarenal aneurysm. In view of the lack of properly controlled data, poor reporting of review methods and lack of information on study validity, the authors' conclusions may not be reliable.

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

**Practice:** The authors stated that according to short-term studies, f-EVR is a promising technique for management of complex abdominal aneurysms and may be safer than open surgical repair. Use of f-EVR should be considered for large high-risk aneurysms.

**Research:** The authors stated that randomised controlled comparison of f-EVR with open surgery was required, with long-term follow-up to test the durability of f-EVR. A clear stratified classification system for juxtarenal aneurysm morphology was needed. Accurate registries of procedures using advanced vascular surgical technologies are recommended.

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