Pararenal aortic aneurysm repair using fenestrated endografts

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CRD summary
This review found that fenestrated endovascular aortic aneurysm repair appeared to be feasible, safe and effective, in relatively high-risk patients, with pararenal abdominal aortic aneurysms, at up to two years after surgery. Given the high likelihood of bias in the included studies and the absence of any comparator therapies, the reliability of the authors' conclusions is uncertain.

Authors' objectives
To assess the immediate and longer term results of fenestrated endovascular aortic aneurysm repair in patients with juxtarenal or Crawford type IV aortic aneurysms.

Searching
MEDLINE, EMBASE and the Cochrane Database of Systematic Reviews were searched from January 2000 to May 2011 for published studies. Search terms were reported. Electronic links to related articles and references lists of relevant studies were checked. The search was restricted to articles published in English, German or Dutch.

Study selection
Retrospective and prospective studies were eligible, if they investigated totally endovascular repair of juxtarenal (adjacent to renal artery) or Crawford type IV aortic aneurysms, using fenestrated endografts. They had to include at least 10 patients, have a mean or median follow-up of at least six months, report the aneurysm morphology, and state the number of target vessels and their status. Where the results from one study were in more than one publication, the report with the most complete outcomes was included. Outcomes of interest included technical success, 30-day mortality, all-cause mortality, branch vessel patency, renal impairment, and secondary interventions.

The included studies enrolled patients between 1997 and 2010, in Europe, USA or Australia. The mean or median patient age ranged from 70.5 to 75.5 years, and the percentage of male patients ranged from 80 to 96. All studies used Zenith fenestrated endografts. The number of graft fenestrations (openings) per patient ranged from 2.0 to 3.0. Further details of the stents were poorly described in the original studies. Procedural outcomes were reported. Where reported, the mean or median proximal neck length ranged from 3.6 to 9.2mm, and the aneurysm size ranged from 55.1 to 68mm. Most patients had significant co-morbidities, were deemed at high risk for open repair, and were not eligible for conventional endovascular aortic aneurysm repair. Nearly 5% of patients had undergone open aortic aneurysm repair, and nearly 2% had undergone endovascular aortic aneurysm repair, previously.

Two reviewers independently selected studies for inclusion. Disagreements were resolved by discussion with all five authors.

Assessment of study quality
Quality appears to have been assessed in two stages.

The first used eight MOOSE criteria (see Other Publications of Related Interest), covering whether the study reported a consecutive or prospective series of patients, excluded patients, the indication for intervention, and a detailed description of target vessels, complications, and mortality. Each criterion was scored from 0 to 2, giving a maximum score of 16. Studies which scored less than 8 were excluded from the review.

At the second stage, the included studies were assessed on eight further criteria, devised by the Dutch Cochrane Centre. These were: clear definition of study population, whether selection bias could be sufficiently excluded, clear definition of intervention, clear definition of outcome and outcome assessment, independent assessment of outcome parameters, sufficient follow-up, no selective loss to follow-up, important confounders, and prognostic factors identified. Each criterion was assigned yes, no, or uncertain.

Two reviewers independently assessed study quality. Disagreements were resolved by discussion with all authors.
Data extraction
Data were extracted to calculate the risk of outcomes, with 95% confidence intervals. Technical success was defined as successfully completed fenestrated endovascular aortic aneurysm repair, with endograft patency, preservation of target vessels, and no evidence of type I or type II endoleak upon imaging after the procedure. Definitions of all other outcomes were given.

Two reviewers independently extracted the data. Disagreements were resolved by discussion with all authors.

Methods of synthesis
The estimates were pooled using a fixed-effect (Mantel-Haenszel method) or random-effects (DerSimonian and Laird) model. Heterogeneity was investigated using $I^2$. A fixed-effect model was used when $I^2$ was less than 25%, and a random-effects model was used when $I^2$ was between 25% and 50%.

Results of the review
Nine studies (629 patients) were included in the review; two were prospective and seven were retrospective. Study size ranged from 29 to 134 patients. Across all studies, 1,622 target vessels were incorporated in an endograft design, with the renal artery included 1,144 times. Quality assessment showed suspected selection bias in most studies. The MOOSE quality score ranged from 10 to 16. Follow-up ranged from 15 to 25 months.

Technical success was 90.4% (95% CI 87.7 to 92.5; $I^2=20\%$). Thirty-day mortality was 2.1% (95% CI 1.2 to 3.7; $I^2=0\%)$. The causes of death were described.

At the end of follow-up, the all-cause mortality was 16% (95% CI 12.5 to 20.4; $I^2=29\%$), branch vessel patency was 93.2% (95% CI 90.4 to 95.3; $I^2=41\%$), renal impairment was 22.2% (95% CI 16 to 30.1; $I^2=39\%$; six studies) and reintervention was 17.8% (95% CI 13.5 to 22.6; $I^2=34\%$). Six patients (2.1%) required dialysis. None required renal transplantation, and no fatal outcomes after renal impairment were reported.

Authors’ conclusions
Fenestrated endovascular aortic aneurysm repair appeared to be feasible, safe and effective, in relatively high-risk patients, with pararenal abdominal aortic aneurysms, at up to two years after surgery.

CRD commentary
The review question was clear. The patient, intervention and design inclusion criteria were clear, and the outcome criteria were broad. The search included several databases, but the restrictions mean that the results may have been affected by language or publication bias. Attempts were made to reduce reviewer error and bias during study selection, data extraction and quality assessment. The meta-analysis was appropriate for the type of data presented.

As all the included studies were case series and most of them had small samples, the risk of selection bias within the studies was high. The authors noted that it was not clear in the included studies whether the same aneurysm morphology was compared. Since the review only included patients who underwent fenestrated repair, inferences about the effectiveness of this approach relative to other treatments, should be interpreted with caution.

Given the high likelihood of bias in the included studies and the absence of any comparator therapies, the reliability of the authors’ conclusions is uncertain.

Implications of the review for practice and research
Practice: Fenestrated endovascular aortic aneurysm repair, performed by an experienced surgeon, could be a viable alternative to open abdominal aortic aneurysm repair, and might be the only option for patients at too high a risk of complications for open repair.

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.