The effect of left subclavian artery coverage on morbidity and mortality in patients undergoing endovascular thoracic aortic interventions: a systematic review and meta-analysis

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CRD summary
This review concluded that very low quality evidence suggested that left subclavian artery coverage increased the risk of arm ischaemia, vertebrobasilar ischaemia and possibly spinal cord ischaemia and anterior circulation stroke. When possible, primary revascularisation procedures may reduce this risk. The authors’ conclusions are suitably cautious, reflect the low quality of the included studies and are probably reliable.

Authors' objectives
To assess the effect of intentional left subclavian artery (LSA) coverage on morbidity and mortality of patients undergoing endovascular thoracic aortic interventions.

Searching
MEDLINE and EMBASE and Science Citation Index were searched from January 1990 to February 2008. References of included trials were checked and experts were contacted to identify additional trials. Search terms were reported. There were no language restrictions.

Study selection
Controlled studies that enrolled patients who received an endovascular device to repair pathologies of the descending thoracic aorta (which included transection, aneurysm and dissection) were eligible for inclusion. Studies were required to compare patients in whom the LSA was intentionally covered with patients in whom the endograft placement did not cover the LSA or who underwent a primary revascularisation procedure such as a carotid-subclavian bypass or transposition.

Outcomes assessed in the review included death, arm ischaemia, vertebrobasilar ischaemia, anterior circulation stroke, transient ischaemic attack, spinal cord ischaemia, myocardial infarction, phrenic nerve paralysis and infection. Definitions of outcomes were reported in the paper. There were no restrictions on sample size or duration of follow-up.

Most of the patients in included studies were male (75%). Mean age was 58 years. A number of different commercial and homemade endografts were employed. Procedures were a mixture of urgent and elective and a variety of indications was represented.

Two reviewers independently assessed studies for inclusion in the review. Disagreements were resolved through consensus or arbitration by a third reviewer.

Assessment of study quality
Two reviewers independently assessed study design, randomisation, use of measures designed to protect against bias, loss to follow-up, funding source, baseline prognostic comparability of groups, determination of exposure and outcomes and blinding of outcome assessors. The quality of evidence was rated using the GRADE methods.

Data extraction
Two reviewers independently extracted data using a standardised form. Authors were contacted for missing data and clarification.

Methods of synthesis
The studies were combined in meta-analyses to calculate Peto odds ratios (OR) with 95% confidence intervals (CI). The $I^2$ statistic was used to assess statistical heterogeneity between studies. A priori subgroup analyses were specified to assess the impact on treatment effect of indication for aortic repair (aneurysm versus dissection versus transection),...
whether the repair was urgent or elective and whether the control group received no coverage or coverage after primary revascularisation. Meta-regression to explore the impact of duration of follow-up was undertaken. A sensitivity analysis that used risk difference as the measure of effect was carried out.

**Results of the review**

Fifty-one studies (n=3,365, mean sample size 70) were included in the review. Five were prospective cohort studies and 46 were retrospective chart reviews. Loss to follow-up was low, being under 10% in all except two studies but study quality was generally low.

LSA coverage was associated with statistically significantly increased incidence of arm ischaemia (OR 47.69, 95% CI 9.92 to 229.34; 19 studies) with high heterogeneity ($I^2=72\%$) and vertebrobasilar ischaemia (OR 10.78, 95% CI 3.17 to 36.69; eight studies) with no evidence of heterogeneity ($I^2=0\%$). There were no other statistically significant differences between treatment groups. Non-significant increases were seen in covered LSA groups for spinal cord ischaemia (eight studies) and anterior circulation stroke (13 studies).

Subgroup analyses revealed no significant differences in treatment effect except for an increased risk of arm ischaemia in comparisons with no coverage versus coverage preceded by primary revascularisation. Results of sensitivity and meta-regression analyses were reported.

**Authors’ conclusions**

Very low-quality evidence suggested that LSA coverage increased the risk of arm ischaemia, vertebrobasilar ischaemia and possibly spinal cord ischaemia and anterior circulation stroke. When possible, primary revascularisation procedures may reduce this risk.

**CRD commentary**

The review question and inclusion criteria were clear. The authors searched two relevant databases without language restrictions and made some attempts to identify additional trials, which reduced the chances of relevant studies being omitted and introduction of language bias. Methods designed to reduce reviewer bias and error were employed at all stages of the review process. A validity assessment used appropriate criteria, although reporting of the results was limited. The use of meta-analysis was reasonable and steps were taken to assess and explore heterogeneity between studies. The authors' conclusions are suitably cautious, reflect the low quality of the included studies and are probably reliable.

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

**Practice:** The authors stated that the increased risk of arm ischaemia, vertebrobasilar ischaemia and possibly spinal cord ischaemia and anterior circulation stroke associated with coverage of the LSA must be weighed against factors such as the urgency of aortic repair, availability of surgical expertise, feasibility of carotid-subclavian bypass or transposition before coverage and patient anatomy.

**Research:** The authors stated that future studies were required to confirm or refute the inferences drawn in this review on the safety of LSA. Multicentre research utilising collaboration between surgeons and researchers should be used to accrue sufficient numbers of patients and events, and random or protocol-driven allocation stratified by procedure urgency and aortic pathology should be used.

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**Bibliographic details**


**PubMedID**
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.