Comparative effectiveness of the treatments for thoracic aortic transection


CRD summary
This review concluded that very low quality evidence suggested that, compared to open repair or non-operative management, endovascular repair of thoracic aortic transection was associated with better survival and decreased risk of spinal cord ischaemia, renal injury and graft or systemic infections. Non-operative management was associated with least favourable outcomes. The authors' conclusions are suitably conservative.

Authors' objectives
To assess the evidence regarding outcomes associated with non-operative management, open repair and endovascular repair of thoracic aortic transection.

Searching
MEDLINE, EMBASE, The Cochrane Library, Web of Science and Scopus were searched from 1990 to June 2009. The search terms were reported. No language restrictions were applied. Experts were contacted, bibliographies of included studies checked and ISI Citations Index used to track papers citing included studies.

Study selection
Studies of any design that included participants with thoracic aortic transection who were treated non-operatively via endovascular or open repair were eligible for inclusion. The outcomes of interest were death, anterior circulation stroke, posterior circulation stroke, any stroke, spinal cord ischaemia, end-stage renal disease, procedural failure (defined as need for secondary procedure or conversion to open repair) and systemic or graft infection. Case series of fewer than 10 participants were excluded.

In the included studies 77% of participants were men. Average age was 39 years for those treated non-operatively, 39 for endovascular repair and 36 for open repair. Some participants additionally had other traumatic injuries. Median Injury Severity Score was 36 for those treated non-operatively, 40 for endovascular repair and 34 for open repair. The median time lag between injury and procedure was 16 hours for open repair and 19 hours for endovascular repair. The left subclavian artery (LSA) was covered in 30% of those who received endovascular repair.

Two reviewers independently assessed studies for inclusion. Disagreements were resolved by consensus, or where necessary a third reviewer.

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

Data extraction
Two reviewers independently extracted data in order to calculate event rates and 95% confidence intervals (CIs) in uncontrolled studies and risk ratios (RR) and 95% CIs in controlled studies.

Methods of synthesis
Pooled event rates and risk ratios, together with 95% CIs, were calculated using a random-effects model. Heterogeneity was assessed using I^2. Meta-regression using a mixed-effects model was used to determine any relationship between independent variables and the logit event rate. Independent variables used were year of publication, ISS, age, time lag between injury and procedure and percentage of LSA coverage. Subgroup analyses were used to investigate the effect of early versus later repair on mortality.

Publication bias was assessed using funnel plots and Egger's test.

Results of the review
One hundred and thirty-nine studies (7,768 participants) were included: 27 comparative observational studies and 112 case series. Eight were prospective studies and the rest were retrospective. Median study size was 15 participants.
Median follow up was two years.

Tests indicated the presence of publication bias for the outcome of mortality, which suggested that studies with higher event rates may have been missing.

There was a statistically significant difference in mortality rate between groups, endovascular repair group 9% event rate, open repair 19% and non-operative 46% (p<0.01). There were no statistically significant differences between the groups for anterior stroke, posterior stroke and any stroke. The risk of spinal cord ischaemia and end stage renal disease were higher in the open repair group compared to the other two groups (p=0.01). Compared to endovascular repair, open repair was associated with an increase in graft infection (p=0.01) and systemic infections (p=0.01).

In the comparative studies, compared to open repair, endovascular repair was associated with a statistically significant reduction in mortality (RR 0.61, 95% CI 0.46 to 0.80, I²=0%; 25 studies) and spinal cord ischaemia (RR 0.34, 95% CI 0.16 to 0.74, I²=0%; 13 studies). There were no statistically significant differences for other outcomes.

Meta-regression suggested that people who survived longer after their injury had better outcomes regardless of procedure. The Injury Severity Score correlated with mortality after open repair (p=0.01), but not endovascular repair (p=0.68). There were no other statistically significant associations between death, stroke or procedural failure and other a priori covariates. In subgroup analyses there were no statistically significant differences in mortality for urgent versus delayed repair (two studies).

Authors' conclusions

Very low quality evidence suggested that, compared to open repair or non-operative management, endovascular repair of thoracic aortic transection was associated with better survival and decreased risk of spinal cord ischaemia, renal injury and graft or systemic infections. Non-operative management was associated with the least favourable outcomes.

CRD commentary

The aims of the review were clearly stated in terms of the inclusion criteria. The search covered several relevant sources. No language restrictions were applied and this was likely to have reduced any effect of language bias. It was not clear that unpublished studies were eligible; tests indicated the possibility of publication bias. The methods of study selection and data extraction were aimed at reducing reviewer error and bias. Study validity was not assessed. The methods of synthesis appeared appropriate and heterogeneity was assessed.

The authors commented that thoracic aortic transection is relatively rare and therefore the availability of data assessing outcomes was limited to observational studies. These are considered of lower quality as confounding factors (such as surgeons’ choice of treatment or severity of illness) might affect the results. The authors' conclusions were suitably conservative.

Implications of the review for practice and research

Practice: The authors stated that data from this review were used to inform practice guidelines (see Other Publications of Related Interest).

Research: The authors stated that future research should be undertaken in collaborating multiple centres to allow for larger number of events and for stratified analyses according to prognostic factors including age, injury severity and aortic pathology. Prospective meta-analysis was strongly recommended.

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Other publications of related interest

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