Authors' objectives
To compare surgical techniques for traumatic rupture of the thoracic aorta.

Searching
MEDLINE was searched from 1966 to April 2000 using the MeSH terms 'aorta', 'thoracic', 'aortic rupture' and 'aorta thoracic injuries' or the following keywords: 'traumatic rupture aorta' or '(traumatic) transection aorta' or '(traumatic) aortic dissection'. The bibliographies of all relevant articles and reviews, the authors' personal files and the Cochrane Library were also searched.

Study selection
Study designs of evaluations included in the review
Case reports and case series with fewer than ten patients were excluded. All of the included studies were retrospective.

Specific interventions included in the review
Comparisons of the clamp and sew method (CAS) with surgical techniques that use distal perfusion as an adjunct to the aortic repair (Gott shunt, left heart bypass, and partial cardiopulmonary bypass) were eligible. Interventions that could not be described in terms of a single consistent protocol used during a pre-specified time-frame were excluded.

Participants included in the review
Studies that reported chronologically continuous cohorts of patients with acute traumatic rupture of the thoracic aorta, caused by blunt trauma, were eligible. Reports where elective cases could not be separated from emergent cases were excluded, as were reports on penetrating or iatrogenic injuries of the thoracic aorta, injuries of the ascending aorta, and transverse arch or chronic traumatic aneurysms. The mean age of the patients was 33 years and 86% were male. The associated injuries included musculoskeletal, cardiopulmonary, head injuries and abdominal injuries.

Outcomes assessed in the review
Studies that did not report outcome mortality or paraplegia were excluded. The primary outcomes assessed were the mortality rate (combining hospital and 30-day mortality) and the neurological deficit rates.

How were decisions on the relevance of primary studies made?
Potentially relevant studies were identified from the titles and abstracts, and the full reports were obtained. Two authors independently reviewed the studies for relevance.

Assessment of study quality
Validity was assessed using the following criteria: study design (retrospective or prospective); documentation of demographic data; description of the intervention; and assessment of the outcomes. Two reviewers independently assessed validity using standardised forms.

Data extraction
Two reviewers independently extracted the data onto a standardised data extraction form. Data were extracted on the study design, patient selection, baseline characteristics, surgical procedures and outcome assessment. Any disagreements were resolved by consensus.

Methods of synthesis
How were the studies combined?
The studies were grouped according to the surgical intervention and pooled rates for each outcome were estimated, weighted by study size. The odds ratios (ORs) and 95% confidence intervals (CIs) were calculated using logistic regression. A p value of less than 0.05 was considered to be significant.

How were differences between studies investigated?
Differences were discussed in the text of the review. Differences between early and delayed (greater than 24 hours) repair were investigated.

Results of the review
Twenty retrospective studies (618 patients) were included.

Overall, the quality of the studies was poor and none involved an outside assessor. All of the studies adequately described the surgical intervention. Three studies did not adequately describe the patient demographics. Eight studies used a predefined specific technique in all patients. With some exceptions, the power of detecting a statistically-significant difference for mortality and paraplegia was generally low (20 to 60%) because of the small sample size.

The agreement between reviewers on the relevance of the primary studies and for the description of patient demographics was high: kappa was 0.96 for relevance and 0.89 for demographics.

A total of 220 patients underwent CAS, 52 patients underwent the Gott shunt (GS), 100 patients underwent left heart bypass (LHB), and 246 patients underwent partial cardiopulmonary bypass (PCPB).

The mean clamp times with standard deviations (SD) were 24 minutes (SD=5) for CAS, 43.5 minutes (SD=0.7) for GS, 42.8 minutes (SD=8.0) for LHB, and 47.6 minutes (SD=13.5) for PCPB.

The proportion of aortas repaired with interposition graft were 20% (12 out of 59) for CAS, 100% (18 out of 18) for GS, 90% (62 out of 69) for LHB, and 74% (132 out of 178) for PCPB.

There was no significant difference between the surgical techniques in terms of the mortality rates. The cumulative mortality rates were 15% with CAS, 8% with GS, 17% with LHB, and 10% with PCPB. The OR was 2.1 (95% CI: 0.7, 7, p=0.18) for CAS versus GS, 1.7 (95% CI: 1.3, p=0.06) for CAS versus PCPB, and 1.0 (95% CI: 0.5, 2, p=1.0) for CAS versus LHB. CAS had a higher incidence of neurological deficit than the other techniques. The cumulative neurological deficit rates were 7% with CAS, 4% with GS, 0% with LHB, and 2% with PCPB. The OR was 1.8 (95% CI: 0.4, 8, p=0.5) for CAS versus GS, 6.4 (95% CI: 0.8, 50, p=0.07) for CAS versus LHB, and 3.4 (95% CI: 1, 10, p=0.02) for CAS versus PCPB.

Early repair versus delayed repair (10 studies): delay was usually due to associated co-morbidities. There was no significant difference in the mortality and neurological deficit rates between the early and delayed groups when each type of aortic repair was considered separately.

Authors’ conclusions
CAS was associated with a similar mortality rate, but a higher incidence of neurological deficits, than methods with distal aortic perfusion.

CRD commentary
The aims of the review were stated and the inclusion criteria were defined in terms of the participants, intervention and outcome. The methods used to select the studies were described, but restricting the search to only two databases may have resulted in the omission of other relevant publications. It was not stated whether any language restrictions were applied. Validity was assessed using defined criteria, and methodological flaws in the primary studies were discussed. Relevant data were extracted, and the methods used to extract data and assess validity were described. The data were pooled separately for each surgical intervention, but statistical heterogeneity was not assessed.

The authors stated that the review was limited by the small sample size (with consequent lack of power) and by poor
quality studies susceptible to bias. The conclusions were further limited by the lack of any direct comparison between surgical techniques. Hence, any conclusions about the comparative efficacy of different surgical techniques must be treated with caution.

Implications of the review for practice and research
Practice: The authors state that until further evidence is available, LHB and PCPB should be used as a means of preventing paraplegia in the management of traumatic rupture of the thoracic aorta.

Research: The authors did not state any implications for further research.

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Record Status
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.