Comparison of operative and nonoperative treatment for thoracolumbar burst fractures in patients without neurological deficit: a systematic review

Thomas K C, Bailey C S, Dvorak M F, Kwon B, Fisher C

CRD summary
The authors of the review concluded that there was insufficient evidence to draw conclusions about operative and non-operative management of thoracolumbar burst fractures without neurological deficit, and that further good-quality research is required. There were limitations to this review but, overall, the authors' conclusions are likely to be reliable.

Authors' objectives
To evaluate operative and non-operative management of patients with thoracolumbar burst fractures and no neurological deficit.

Searching
MEDLINE, EMBASE and CINAHL (all from inception to February 2005), DARE and the Cochrane Database of Systematic Reviews were searched using the reported search terms. In addition, reference lists were screened and experts in the field were contacted for additional studies.

Study selection
Study designs of evaluations included in the review
Inclusion criteria for the study design were not specified. The duration of follow-up in the included studies ranged from 5.7 to 118 months.

Specific interventions included in the review
Studies that evaluated surgery (anterior and/or posterior) or non-operative treatment (thoracolumbosacral orthosis, body cast, hyperextension brace or no orthosis) were eligible for inclusion. The studies that were described in the text evaluated thoracolumbosacral orthosis, pedicle screw instrumentation with and without fusion, posterior surgery with and without transpedicular bone graft, hyperextension brace, anterior or posterior surgery, and posterior stabilisation with and without anterior fusion.

Participants included in the review
Studies that evaluated patients aged 16 years or older with T10 to L3 burst fractures and who had no neurological deficit were eligible for inclusion. Studies that evaluated mixed groups of patients were included if the data were reported separately for the population of interest.

Outcomes assessed in the review
Studies that used validated outcome measures to assess radiographic change, health-related quality of life (HRQOL), pain, function or disability were eligible for inclusion. The review also assessed complications. The studies described in the text assessed outcomes using various measures, including visual analogue scales, Greenough Low Back Pain Outcome Score (LBOS), Hanover Spine Score, Short-Form Health Survey 36, Roland-Morris Disability Scale (RMDS) and the Oswestry Disability Index (ODI).

How were decisions on the relevance of primary studies made?
Two reviewers (blinded to author, institution and journal) independently selected the studies. Any disagreements were resolved by consensus.

Assessment of study quality
Retrospective and prospective studies were assessed separately based on specified reported guidelines. Retrospective
studies were assessed using the following criteria: clear reporting of the study objective; study design; blinded assessment; clear description of the sample; reporting of the definition of burst fracture and method of diagnosis; interventions clearly described; use of relevant outcome measures; statistical significance reported; statistical tests appropriate; and results or conclusions clinically significant. Prospective studies were assessed using the above plus three additional criteria: account taken of eligible patients who did not enter the study; less than 25% of patients lost to follow-up; and a priori calculation of sample size. The maximum possible scores were 10 for retrospective studies and 13 for prospective studies. Studies scoring more than 50% of the maximum possible points were rated as ‘very good’ quality, whilst those with lower quality scores were rated as ‘good’ quality.

Two reviewers (blinded to author, institution and journal) independently assessed validity. Any disagreements were resolved by consensus.

**Data extraction**

Two reviewers independently extracted the data using a standardised form and compared the results. Outcomes data and conclusions were extracted for each study.

**Methods of synthesis**

How were the studies combined?

Studies rated as ‘very good’ were grouped by outcome and combined in a narrative.

How were differences between studies investigated?

Differences between the studies were described in the text and were apparent from the tables.

**Results of the review**

Details of 21 studies (n=562) were tabulated. Only the 7 studies (n=277) rated as ‘very good’ were discussed in the text of the review and used to evaluate the level of evidence. The 7 studies comprised 2 randomised controlled trials (RCTs; n=67), 1 quasi-RCT (n=80), 1 retrospective matched study (n=20) and 3 retrospective case series (n=110).

**HRQOL:** 1 RCT and 1 retrospective matched study were found. The RCT (n=47) reported that the non-operative group (thoracolumbosacral orthosis) had statistically significantly improved physical function after at least 24 months compared with the operative group (anterior or posterior surgery). The retrospective matched study (n=20) reported no differences in HRQOL in groups undergoing posterior stabilisation with and without anterior fusion.

**Pain:** 1 RCT, 1 quasi-RCT and 1 retrospective case series were found. The RCT (n=47) reported no significant difference in pain between non-operative and operative treatment after 24 months' follow-up. The quasi-RCT (n=80) reported less pain in the early follow-up period in the operative group compared with the brace-treated group. The retrospective case series (n=36) reported that 49% of non-operatively treated patients had little or no pain at the final assessment.

**Function and disability:** 1 RCT, 1 quasi-RCT and 2 retrospective case series were found. The RCT (n=47) reported that the non-operative group had improved function and disability (RMDS significantly improved and ODI improved) at 2 years compared with the operative group (p=0.02). The quasi-RCT (n=80) reported an improved Greenough LBOS in the operative group compared with the non-operative group at 6 months, but not over a longer period. One retrospective case series (n=24) reported good or excellent results in 62% of operative patients; the other retrospective case series (n=50) reported a final Hanover Spine Score of 81.7 out of 100.

**Sagittal alignment:** 2 RCTs, 1 quasi-RCT, 1 retrospective matched study and 1 retrospective case series were found. All studies reported that kyphosis progressed after treatment was started. One RCT (n=47) reported no difference between non-operative and operative treatment in mean kyphosis values. The quasi-RCT (n=80) reported improved correction of kyphosis in the operative compared with the non-operative group. Two studies (1 RCT, n=20 and 1 retrospective case series, n=50) reported no difference in kyphosis for implantation of posterior hardware with and without transpedicular bone graft. The retrospective matched study (n=20) reported no difference in kyphosis for posterior stabilisation with and without anterior fusion.
Complications: 2 studies (1 RCT, n=47 and 1 quasi-RCT, n=80) reported increased complications in the operative compared with the non-operative groups. None of the 7 'very good' quality studies reported any neurological deterioration from baseline with any treatment.

Authors' conclusions
There was insufficient evidence to draw conclusions. Further good-quality research is required.

CRD commentary
The review question was clear in terms of the participants, intervention and outcomes; inclusion criteria for the study design were not specified and this resulted in the inclusion of studies of varying designs. Several relevant sources were searched but specific attempts to minimise publication and language bias were not reported; this meant that these potential sources of bias could not be excluded. Methods were used to minimise reviewer errors and bias in the study selection, validity assessment and data extraction processes. Validity was assessed using specified criteria and only evidence from studies with higher scores was evaluated in the review. However, the rationale behind including 'very good' quality retrospective studies and excluding 'good' quality prospective studies was not clear.

Information about the included studies was limited: in particular, details of the patients were lacking. The narrative synthesis was appropriate given the differences between the studies, but the results were not discussed with reference to any aspect of study quality (including study design). There were limitations to this review but, overall, the authors' conclusions about the insufficient evidence and the need for further research are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that clinicians should take account of the limited evidence when deciding on the treatment of patients with thoracolumbar burst fractures.

Research: The authors stated the great need for well-designed and well-conducted clinical trials that have a clear objective, adequately describe eligibility criteria for the participants and interventions, and assess outcomes using psychometrically sound generic and disease-specific HRQOL measures. Researchers should seek advice from methodologists before undertaking such studies.

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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.