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Living FRIendly Summaries of the Body of Evidence using Epistemonikos (FRISBEE)
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Conservative versus operative treatment for thoracolumbar burst fractures without neurologic deficit

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Abstract

Thoracolumbar burst fractures account for up to 17% of major spinal fractures. Both conservative and operative treatments are widely used in clinical practice to manage thoracolumbar burst fractures. Previous studies showed good functional results with both treatments, but surgical approach has been associated with higher cost and risks of causing unnecessary adverse effects. Searching in Epistemonikos database, which is maintained by screening 30 databases, we identified six systematic reviews including four randomized trials We combined the evidence using meta-analysis and generated a summary of findings table following the GRADE approach. We concluded that operative treatment may decrease the risk of neurologic impairment, but in turn, could increase the risk of general complications. It is unclear whether there are differences in pain reduction, improvement in function and quality of life, need for subsequent surgery or radiographic progression of kyphosis in both groups.

Problem

Thoracolumbar burst fractures account for 17% of major spinal fractures [1]. Burst fractures are produced by axial compression load resulting in failure of the anterior and middle columns of the spine. The incidence of neurological deficit caused by thoracolumbar burst fractures is estimated to be 50% to 60% [1],[2]. Although many injuries of the thoracolumbar spinal cord do not result in paralysis, they may leave an unstable spinal segment due to disruption of bone elements and soft tissues, which can cause late paralysis[1]. There are controversial opinions on the ideal treatment of patients with thoracolumbar burst fractures without neurological deficit. Both conservative and surgical treatments are widely used in clinical practice. Previous studies have shown that conservative treatment with early mobilization achieved good functional results, even in fractures with posterior column compromise. Surgical treatment has also shown favorable radiographic results and same functional results than the orthopedic treatment, but at a higher cost and with the risk of exposing patients to unnecessary adverse consequences.

Methods

We used Epistemonikos database, which is maintained by screening more than 30 databases, to identify systematic reviews and their included primary studies. With this information, we generated a structured summary using a pre-established format, which includes key messages, a summary of the body of evidence (presented as an evidence matrix in Epistemonikos), meta-analysis of the total of studies, a summary of findings table following the GRADE approach and a table of other considerations for decision-making.

Key messages

- Operative treatment of thoracolumbar burst fractures may reduce the risk of neurologic impairment, but in turn, could increase the risk of general complications.
- It is unclear whether there are differences in pain reduction, improvement in function and quality of life, need for subsequent surgery or radiographic progression of kyphosis in both groups because the certainty of the evidence is very low.
- The findings of this summary partially agree with the results of identified systematic reviews and the recommendations of the main guidelines.

About the body of evidence for this question

What is the evidence. See evidence matrix in Epistemonikos later	We found six systematic reviews [3],[4],[5],[6],[7],[8], including four randomized controlled trials [9],[10],[11],[12].
What types of patients were included	All studies included adult patients (age 18-65 years) with no pathologic thoracolumbar burst fractures without neurological deficit [9],[10],[11],[12]. One study included patients with CT concordant with retropulsion of the vertebral body into the medullar canal [11], one study included patients with CT that ruled out dislocations, with pedicles and facet joints intact despite the fracture of the pedicle [10], one study included patients with CT concordant with residual spinal canal > 50% of normal [9], and one study did not discriminate by type of canal compromise [12].
What types of interventions were included	All studies compared conservative versus surgical management independent of the type of treatment [9],[10],[11],[12]. As conservative treatment two studies used brace [9],[10], one used brace or cast [11] and one used corset [12]. As surgical treatment two studies used fixation with instrumentation [10],[11], one study used posterior stabilization with transpedicular graft or posterolateral fusion [12] and one study did not specify [9].
What types of outcomes were measured	Reduction of pain by visual analog scale (VAS), Oswestry back pain questionnaire, Short Form-36 and Greenough Low Back Outcome Score (GLBOS); improvement in function and quality of life by Roland Morris Disability Questionnaire (RMDQ); need for subsequent surgery; neurologic impairment and general complications were measured. Other outcomes measured were time to return to work, progression of spinal canal stenosis, radiographic progression of kyphosis (degrees), treatment costs and duration of hospitalization.

Summary of findings

Information on conservative versus surgical treatment in thoracolumbar burst fractures without neurological deficit is based on four randomized controlled trials that included 201 patients. Three studies evaluated pain reduction by visual analog scale (VAS) [10],[11],[12], two studies assessed improvement in function and quality of life by Roland Morris Disability Questionnaire (RMDQ) [9],[10],[11],[12], all studies reported radiographic progression of kyphosis (degrees) and neurologic impairment [9],[10],[11],[12] and three studies evaluated subsequent surgery and general complications [10],[11],[12].

- Operative treatment of thoracolumbar burst fractures may reduce the risk of neurologic impairment compared with conservative treatment. The certainty of the evidence is low.
- Operative treatment of thoracolumbar burst fractures could be associated with higher overall complications compared with conservative treatment. The certainty of the evidence is low.
- It is unclear whether there are differences in pain reduction between operative and conservative treatment of thoracolumbar burst fractures because the certainty of the evidence is very low.

- It is unclear whether there are differences in improvement in function and quality of life between operative and conservative treatment of thoracolumbar burst fractures because the certainty of the evidence is low.
- It is unclear whether there are differences in need for subsequent surgery between operative and conservative treatment of thoracolumbar burst fractures because the certainty of the evidence is low.
- It is unclear whether there are differences in radiographic progression of kyphosis between operative and conservative treatment of thoracolumbar burst fractures because the certainty of the evidence is very low.

Conservative versus operative treatment for thoracolumbar burst fractures without neurologic deficit				
Patients	Thoracolumbar burst fractures without neurologic deficit			
Intervention	Operative treatment			
Comparison	Conservative treatment			
Outcomes	Absolute effect*		Relative effect (95% CI)	Certainty of the evidence (GRADE)
	WITHOUT surgery	**WITH surgery**		
	Difference: patients per 1000			
Reduction in pain (VAS scale, 0 to 100 points)	On average improved in 0 points	On average improved in 2 points	MD -2,03 (-11.41 to 7.36)	⨁◯◯◯[1,2,3] Very low
	Difference: 2 points less (Margin of error: 11.41 points less to 7.36 points more)			
Improvement in function and quality of life (RMDQ scale)	On average improved in 0 points	On average improved in 0.2 points	MD -0,21 (-3.02 to 2.61)	⨁◯◯◯[1,2,3] Very low
	Difference: 0.21 points less (Margin of error: 3.02 points less to 2.61 points more)			
Radiographic Progression of kyphosis (grades)	On average improved in 0 points	On average improved in 7.5 points	MD -7.48 (-10.92 to -4.03)	⨁◯◯◯[1,4] Very low
	Difference: 7.5 points less (Margin of error: 10.92 points less to 4.03 points less)			
Neurologic impairment	24 per 1000	4 per 1000	RR 0.18 (0.01 to 3.43)	⨁⨁◯◯[1] Low
	Difference: 19 patients less per 1000 (Margin of error: 23 less to 57 more)			
Need for subsequent surgery (for complications)	0 per 1000	195 per 1000	RR 8.39 (1.12 to 62.87)	⨁◯◯◯[1,2] Very low
	Difference: 195 patients more per 1000 (Margin of error: 29 to 1000 more)			
General complications	35 per 1000	154 per 1000	RR 4.36 (1.47 to 12.93)	⨁⨁◯◯[1] Low
	Difference: 119 patients more per 1000 (Margin of error: 17 to 421 more)			

MD: Mean difference.
RR: Relative risk.
Margin of error = 95% confidence interval (CI).
GRADE: evidence grades of the GRADE Working Group (see later in this article)
VAS: visual analogue scale
RMDQ: Roland Morris Disability Questionnaire

* The risk WITHOUT surgery is based on the risk in the control group of the trials. The risk WITH surgery (and its margin of error) is calculated from relative effect (and its margin of error)

1 There is high risk of bias in the studies because a description is missing of randomization sequence concealment, there is no double blind or this is not explicit, the reported results are incomplete and there was loss to follow.
2 It is considered that there is imprecision because the confidence interval is too wide.
3 It is considered that there is inconsistency, because some studies show benefit and others risk (I2 = 80%).
4 We considered there was inconsistency (I2=88%) with some studies showing benefit and others no effect.

About the certainty of the evidence (GRADE)*

⊕⊕⊕⊕
High: This research provides a very good indication of the likely effect. The likelihood that the effect will be substantially different† is low.

⊕⊕⊕◯
Moderate: This research provides a good indication of the likely effect. The likelihood that the effect will be substantially different† is moderate

⊕⊕◯◯
Low: This research provides some indication of the likely effect. However, the likelihood that it will be substantially different† is high.

⊕◯◯◯
Very low: This research does not provide a reliable indication of the likely effect. The likelihood that the effect will be substantially different† is very high.

*This concept is also called 'quality of the evidence' or 'confidence in effect estimates'.
† Substantially different = a large enough difference that it might affect a decision.

Other considerations for decision-making

To whom this evidence does and does not apply

- The included studies evaluated adult patients with traumatic thoracolumbar burst fractures without neurological deficit. Patients with pathological vertebral fracture in osteoporotic or tumor bone (metastasis or primary) or neurological deficit at admission are therefore excluded. There was no restriction of patients according to comorbidities or medication use.

About the outcomes included in this summary

- Outcomes considered critical for decision making in the view of the authors of this summary were included. These coincide with those presented in the main systematic reviews identified.

Balance between benefits and risks, and certainty of the evidence

- The evidence shows a possible benefit of operative treatment regarding neurologic impairment, but an increased risk of general complications.
- The main advantage of conservative treatment is to prevent perioperative complications, including infection, iatrogenic neurological injury, non-union, instrumentation failure and anesthesia-related complications.
- There is not an option clearly preferable, so it is essential to stimulate shared decision-making with the patient to assess the risks and benefits of surgical versus conservative treatment.

What would patients and their doctors think about this intervention

- It is possible that many patients would give more value to the prevention of neurological impairment and prefer operative treatment despite the low certainty of the evidence.
- Risk-averse patients or those at higher operative risk may prefer a conservative management.

Resource considerations

- Due to the high level of uncertainty about the benefits and risks, it is not possible to make an adequate balance. Whereas both alternatives have superiority over the other in terms of a critical outcome for decision-making, a formal cost-benefit assessment is needed, as well as a better evidence base, to determine which option is superior.

Differences between this summary and other sources

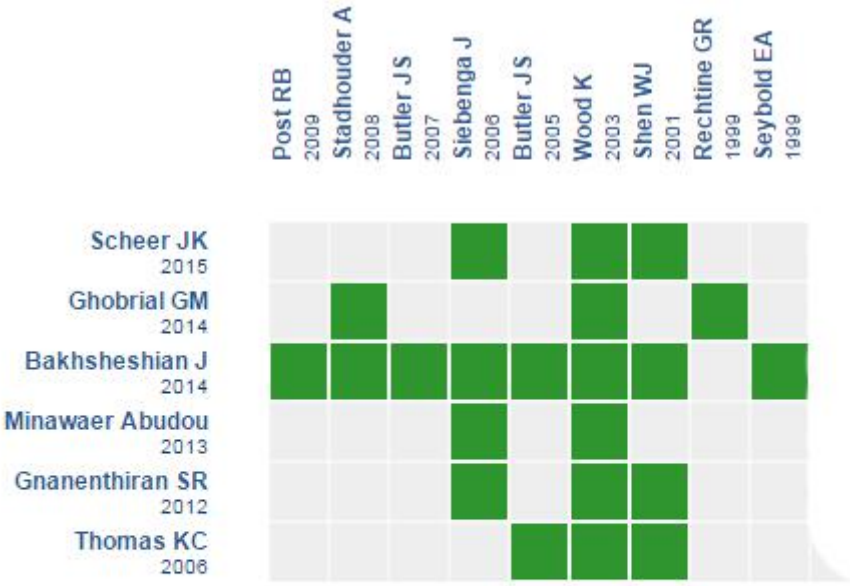
- The findings of this summary partially agree with the results of most recent systematic reviews.
- The findings of this summary are in partial agreement with the recommendations of the main clinical guidelines [13]. The guideline of the American Academy of Orthopaedic Surgeons (AAOS) suggests conservative treatment should be considered as the initial method of choice even in borderline cases where the absence of neurological injury or instability is not entirely clear, on the basis that the benefits of surgery are not well defined. It is important to note this guide includes a low proportion of the evidence identified in this summary, in part because it was not available at the time of its publication.

Could this evidence change in the future?

- The probability that future evidence change the conclusions of this summary is moderate due to the low certainty of the evidence.
- There are no new or ongoing studies regarding this matter.

How we conducted this summary

Using automated and collaborative means, we compiled all the relevant evidence for the question of interest and we present it as a matrix of evidence.



Starting from any systematic review, Epistemonikos builds a matrix based on existing connections in the database.
The author of the matrix can select relevant information for a specific health question (typically in PICO format) in order to display the information set for the question.
The *rows* represent systematic reviews that share at least one primary study, and *columns* display the studies.
The boxes in green correspond to studies included in the respective reviews.

Follow the link to access the **interactive version:** Conservative versus operative treatment for thoracolumbar burst fractures without neurologic deficit

Notes

The upper portion of the matrix of evidence will display a warning of "new evidence" if new systematic reviews are published after the publication of this summary. Even though the project considers the periodical update of these summaries, users are invited to comment in *Medwave* or to contact the authors through email if they find new evidence and the summary should be updated earlier. After creating an account in Epistemonikos, users will be able to save the matrixes and to receive automated notifications any time new evidence potentially relevant for the question appears.

The details about the methods used to produce these summaries are described here http://dx.doi.org/10.5867/medwave.2014.06.5997.

Epistemonikos foundation is a non-for-profit organization aiming to bring information closer to health decision-makers with technology. Its main development is Epistemonikos database (www.epistemonikos.org).

These summaries follow a rigorous process of internal peer review.

Conflicts of interest
The authors do not have relevant interests to declare.

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