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Nov 18, 2021

🌐 Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit: A systematic review and meta-analysis V.1

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The aim of this systematic review is to compare the outcomes of burst fracture between non-operative treatments and operative treatments.

DOI

dx.doi.org/10.17504/protocols.io.bz5cp82w

Tzu-Yi Chou, Fon-yih Tsuang, Chung Liang Chai 2021. Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit: A systematic review and meta-analysis. **protocols.io**
<https://dx.doi.org/10.17504/protocols.io.bz5cp82w>



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Nov 16, 2021

Nov 18, 2021

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1 Review Title

Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit: A systematic review and meta-analysis

2 Anticipated or actual start date

16 November 2021

3 Anticipated completion date

31 January 2022

4 Stage of review at time of this submission.

Review stage	Started	Completed
Preliminary searches	Yes	Yes
Piloting of the study selection process	No	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

5 Review team members and their organisational affiliations

Dr. Tzu-Yi Chou. School of Medicine, National Taiwan University

Dr. Chung Liang Chai. Yee Zen General Hospital

Dr. Fon-Yih Tsuang. National Taiwan University Hospital

6 Funding sources/sponsors

None

7 Conflicts of interest

None

8 Review question

Participants:

Adults with a radiologically confirmed, acute thoracolumbar burst fracture without neurological deficit.

Intervention:

Any surgical treatment

Comparator:

Non-surgical treatment, supportive bracing

Outcomes:

1. Patient reported outcome (PRO): Visual Analog Score 0-100 mm (VAS) at 1 month
2. PRO: VAS at 3 month
3. PRO: VAS at 6 month or beyond
4. PRO: Oswestry Disability Index 0-100 % (ODI) at 1 month
5. PRO: ODI at 3 month
6. PRO: ODI at 6 month or beyond
7. Kyphotic angle at 6 month or beyond

9 Searches

We designed a search strategy using MEDLINE, EMBASE, Web of Science, and Google Scholar (with the key article of Wood 2003).

Wood K, G Buttermann G, A Mehbod A, et al. Operative compared with nonoperative treatment of a thoracolumbar burst fracture without neurological deficit. A prospective, randomized study. *Bone Joint Surg Am*. 2003 May;85(5):773-81. doi: 10.2106/00004623-200305000-00001.

*We did not restrict our searches in terms of language and publication year.

10 Participants/population

Adults with a radiologically confirmed, acute thoracolumbar burst fracture without neurological deficit.

Adults were defined by the age of 18 or above.

Acute stage was defined by those within 4 weeks.

Burst fracture were defined by AO thoracolumbar system Type A3 or A4, and other equivalent systems.

Without neurological deficit were defined by AO thoracolumbar system Type N0 or N1, and other equivalent systems.

Inclusion criteria:

1. Thoracolumbar fracture with A3 and A4 with N0 or N1.
2. Underwent either surgical or non-surgical treatment

Exclusion criteria:

1. Not thoracolumbar burst fracture
2. Metastatic lesions
3. Osteoporotic is the primary cause of fracture, such as compression fracture.

*We do not exclude study according to population age, sample size, and trauma severity.

References:

1. Catphuong Vu, David Gendelberg. Classifications in Brief: AO Thoracolumbar Classification System. Clin Orthop Relat Res (2020) 478:434-440. doi:10.1097/CORR.0000000000001086

11 Intervention(s), exposure(s)

Any surgical treatment (any internal instrument fixation systems), including percutaneous vertebroplasty.

Timing: acute fracture within 4 weeks

12 Comparator(s)/control.

Supportive care, such as bracing or pain medications with or without pain interventions. With no surgical intervention.

Timing: acute fracture within 4 weeks

13 Types of study to be included

Included:

randomized controlled trials

non-randomized studies (definition according to Cochrane Handbook Chapter 24)

Excluded:

population studies that are subject to ecological fallacy

national database studies that are subject to ecological fallacy

Studies with no control

Studies other than English, Chinese, or languages that uninterpretable via Google Translate

14 Context

Tertiary spine institutions that can provide surgical fixation of spine fractures.

15 Main outcome(s)

1. Visual Analog Score (VAS) at 1 month

2. VAS at 3 month

3. VAS at 6 month or beyond

4. Oswestry Disability Index (ODI) or other equivalent at 1 month

5. ODI or other equivalent at 3 month

6. ODI or other equivalent at 6 month or beyond

7. Kyphotic angle at 6 month or beyond

* Measures of effect

1. VAS: Means difference, random-effects model. For the minimal importance difference, we

define as 11 (Masoudi 2017)

2. ODI or other equivalent, we consider using standardized mean difference, random-effects model. For the minimal importance difference of ODI, we define as 7.8 (Masoudi 2017)

3. Kyphotic angle: Means difference, random-effects model. For the minimal importance difference, we define as 3.8 degrees (Kado 2013)

Reference:

Masoudi MS, Haghnegahdar A, Ghaffarpasand F, Functional Recovery Following Early Kyphoplasty Versus Conservative Management in Stable Thoracolumbar Fractures in Parachute Jumpers. Clin Spine Surg 2017;30:E1066–E1073

Kado DM, Huang MH, Karlamangla AS, et al. Factors Associated With Kyphosis Progression in Older Women: 15 Years' Experience in the Study of Osteoporotic Fractures. Journal of Bone and Mineral Research, 28(1), January 2013, pp 179–187, doi: 10.1002/jbmr.1728

16 Additional outcome(s)

None

17 Data extraction (selection and coding)

Dr. Chou and Dr. Chai work independently on study selection according to the aforementioned inclusion and exclusion criteria. Dr. Chou and Dr. Chai work independently on extraction of data from included studies using a pre-piloted form. Where Dr. Tsuang will resolve disagreements and oversees the accuracy of the process.

18 Risk of bias (quality) assessment

Dr. Chou and Dr. Chai work independently on risk of bias (limitations) assessment for individual outcomes and body of evidence according to ROBINS-I (Sterne 2016).

Outcomes listed below is specified to be assessed using GRADE for quality of evidence and presented in the summary of findings (Guyatt, 2011).

1. VAS
2. ODI or equivalent
3. Kyphotic angle

The funnel plot will be performed to assess publication bias if feasible.

All disagreement and accuracy will be resolved by discussion between Chou and Chai

References:

Gordon H. Guyatt et al. GRADE guidelines: 1. Introduction GRADE evidence profiles and summary of findings tables. Journal of Clinical Epidemiology 64 (2011) 383e394 doi: 10.1016/j.jclinepi.2010.04.026

Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-

19 Strategy for data synthesis

Qualitative:

GRADE for the certainty of evidence. ROBINS-I will be integrated into GRADE according to the dedicated guideline (Schünemann 2019).

Quantitative:

Meta-analysis is provided if data is appropriate for pooling. Consequently, both fixed-effects and random-effects meta-analysis will be checked, although the random-effects reasonably reflects the reality of the clinical situation. If data is not suitable for pooling, a narrative synthesis will be performed.

Randomized and non-randomized studies are separately pooled. Randomized data are pooled as intention-to-treat.

The definitions of confidence interval (CI), heterogeneity, and P value are conventional (CI 95%; $I^2 < 40\%$: unimportant; 30%–60%: moderate; 50%–90%: substantial, 75%–100%: considerable; P value < 0.05 : significant; P interaction < 0.1 : significant). Web-based GRADEpro GDT was utilized for GRADE. Review Manager 5.3.5 (Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014) was used for meta-analysis. Comprehensive Meta-Analysis (CMA v3; Biostat, Englewood, NJ) was used for funnel plot and Egger's regression test.

Schünemann HJ, Cuello C, Akl EA, Mustafa RA, Meerpohl JJ, Thayer K, et al; GRADE Working Group. GRADE guidelines: 18. How ROBINS-I and other tools to assess risk of bias in nonrandomized studies should be used to rate the certainty of a body of evidence. J Clin Epidemiol. 2019;111:105–114. doi: 10.1016/j.jclinepi.2018.01.012

20 Analysis of subgroups or subsets

Subgroup analysis on study that compares non-operative treatment with vertebroplasty (including alternatives such as kyphoplasty) and those with instrumentations.

Meta-regression for study mean age

21 Type and method of review

Meta-analysis, Neurological

22 Language

English

23 Reference and/or URL for published protocol

This protocol will also be registered in PROSPERO with details updated when available.

24 Dissemination plans

Do you intend to publish the review on completion?

Yes

25 Keywords

Burst fracture, thoracolumbar fracture, neurological deficit, surgical intervention

26 Current review status.

Have not started