Comparison of anterior and posterior approaches for thoracolumbar burst fracture: a meta-analysis on Cobb angle loss, Frankel grading improvement and vertebral height loss

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Abstract

BACKGROUND: Although there are many studies comparing different surgical approaches for the patients with thoracolumbar burst fracture who need a surgical treatment, there are no multi-center large-scale randomized controlled studies to reach a conclusion with high evidence level. This makes it necessary to do a meta-analysis with the existing studies to compare anterior and posterior approaches in treatment of thoracolumbar burst fracture.

OBJECTIVE: To analyze the differences of anterior and posterior approaches for thoracolumbar burst fracture and provide guidance for the further operative treatments through a literature retrieval.

METHODS: An online retrieval of PubMed, Medline, Elsevier, Wanfang and CNKI databases was performed for articles about the anterior and posterior approaches for thoracolumbar burst fracture, with the key words of "thoracolumbar fracture, randomized controlled trial, spinal fracture, RCT, anterior and posterior" in English, and "thoracolumbar fracture, anterior, posterior, spine" in Chinese. We compared the operative time, total blood loss, loss of Cobb angle, improvement in Frankel grading, and loss of the vertebral height between the anterior and posterior surgical approaches.

RESULTS AND CONCLUSION: Finally 18 randomized controlled trials with a total of 925 patients were included. There were 459 cases in anterior approach group and 466 cases in posterior approach group. The anterior approach cost 36.47 minutes longer than posterior approach and the blood loss in the anterior approach group was 432.58 mL more than the posterior approach group. Compared with the posterior approach group, the loss of Cobb angle was 3.41° lower, the improvement of Frankel grading was 0.33° higher, and the loss of vertebral height was 1.76 mm lower in the anterior approach group. There were significant differences in the operative time, total blood loss, loss of Cobb angle, improvement in Frankel grading and loss of vertebral height between the anterior and posterior surgical approaches ($P < 0.01$). Although the anterior approach has disadvantages such as long operative time, more intraoperative blood loss, and high technical requirement, the good short-term and long-term results make it worthwhile to apply for the treatment of thoracolumbar burst fractures.

Subject headings: Spine Fracture; Lumbar Vertebrae; Thoracic Vertebrae; Meta-Analysis

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INTRODUCTION

With the fast growing economy in China, the quality of life of our citizens has significantly improved. More and more heavy vehicles and high buildings have come to the lives of common people. While these changes have provided convenience, it lead to more and more high energy trauma involving vehicle and fall from a height. These high energy traumas always accompany with the injury of the thoracolumbar spine.

The burst fracture of the spine is always the result of hit in axial direction such as crash by a heavy object fallen to head, nape or shoulder, or landing on one's foot or hip when fallen from a height. Sudden axial pressure on the spine on these occasions can lead to the fracture of spinal body, shattering of the intervertebral disk and cause serious damage to the anterior and central column, and the fracture of the central column is what distinguishes burst fracture from the compression fracture of the spinal body. As for patients with stable spinal fracture with no injury to the nerves or the spinal cord, external brace fixation and bed rest combined with exercise can always gain satisfying results. However, for those with two or

three column fractures or with spinal cord or nerve injury, early surgical decompression with internal fixation is necessary along with pulse methylprednisolone therapy, and treatment with gangliosides and neurotropic factors, to achieve decompression and spinal reconstruction to alleviate secondary injury. In the clinical practice, with the kyphosis exceeding 20 degrees, a loss of spinal column height by more than 50% or the spinal canal occupation of more than 50% are the indications for surgical treatment.

More than 90% of the spinal injuries occur in the thoracolumbar region, among which 10%–20% is burst fractures[1]. There are many surgical approaches to achieve adequate decompression and stabilization such as anterior, posterior and anterior-posterior approach. Posterior approach is believed to be a simpler approach with shorter intraoperative time and less hemorrhage, however, it may cause disruption to the posterior column and lead to instability of the spine and back pain. With development of instrumentation and minimally invasive surgical techniques, these disadvantages of such method are gradually being conquered. The anterior approach can be more complicated, time-consuming and more dangerous because of the intraoperative hemorrhage, but these problems are being solved by the improvement of surgical technique. Although there are many studies comparing different surgical approaches for the patients who need surgical treatment, there are no multi-center randomized controlled studies to reach a conclusion with high evidence level.

In the current study, we did a meta-analysis on current publications comparing the operative time, total blood loss, loss of Cobb angle, improvement in Frankel grading and loss of the vertebral height between anterior and posterior approaches to thoracolumbar burst fractures, to come up with evidence of higher quality, and guide clinical work in the future.

DATA AND METHODS

Inclusion criteria

***Study design*:** Randomized controlled trials, semi-randomized controlled studies, prospective cohort studies.

***Objective*:** Thoracolumbar burst fractures that needed decompression and instrumentation.

***Intervention methods*:** Anterior or posterior decompression and instrumentation.

***Outcome indicators*:** Operation time, total blood loss during operation, improvement in Frankel grade after surgery comparing to before surgery, loss of Cobb angle at the last follow-up comparing to after the surgery, and loss of the vertebral height at the last follow-up comparing to after the surgery.

Exclusion criteria

Patients with degenerative spinal diseases, infection, spinal tumor, tuberculosis, osteoporosis; papers in languages other than English and Chinese; reviews, expert opinions, lectures.

Literature retrieval

Two independent reviewers underwent a computerized search of databases as PubMed (1990–2014), Medline (1990–2014), Embase (1990–2014), Elsevier (1990–2014), Cochrane library (2008–2014), CNKI (China National Knowledge Infrastructure) (1990–2014) with the mesh words of “thoracolumbar fracture”, “randomized controlled trial”, “spinal fracture”, “RCT”, “anterior” and “posterior” in English and Chinese. A total of 2 324 papers were screened and 18 of them were involved in the final results according to the inclusion criteria (**Figure 1**). For the papers whose eligibility for the inclusion criteria failed to reach consensus between the two authors, a third authors was invited to settle the dispute.

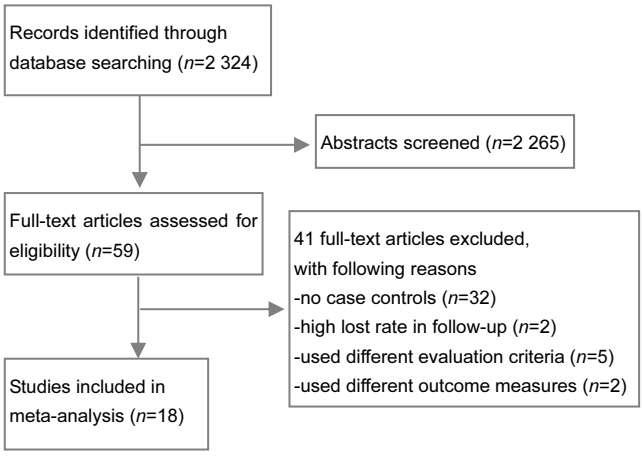

Figure 1 Flowchart of the literature screening

Quality assessment

Two authors independently assessed the quality of the included studies by the 12 criteria recommended by the Cochrane Back Review Group[2]. Each study was scored by “+” (positive), “–” (negative) and “?” (unclear). In the case of disputes, a third author made the final decisions. Studies scores less than 6 “+” were recognized as with low methodological quality and high risk of bias. The methodological quality of the included trials is outlined in **Table 2**.

Data extraction

Data in the included trails were extracted by two independent reviewers. Authors of each study, study design, patient size, patients’ age, origin, time of follow-up as well as intervention methods. Study results such as time needed for the operation, total blood loss during the operation, improvement in Frankel grade after the surgery comparing to before the surgery, loss of Cobb angle at the last follow-up comparing to right after the surgery, and loss of the vertebral height at the last follow up comparing to right after the surgery were extracted and recorded in specific tables. In the cases that the same patients were analyzed in more than one study, they were extracted and analyzed as one patient population.

Table 1 Demographic information of included studies

Study	Group	Case	Average age	Position of fracture			Design	Time	Follow-up time (month)	Publication journal
				Above T_{11}	T_{11}–L_3	Below L_3				
An[8]	Anterior	18	51.5±3.6	0	48	0	Case controlled	2006.1–2010.1	6	Zhongguo Jiceng Yiyao
	Posterior	30	51.5±3.6							
Bin[16]	Anterior	32	18,68	0	64	0	Randomized controlled	2004.1–2008.6	24–72	J Spinal Disord Tech
	Posterior	32	18,68							
Feng[17]	Anterior	30	37.2(19,59)	2	56	0	Case controlled	2001.7–2007–7	8–49	Zhiye Weisheng yu Bingshang
	Posterior	28	37.2(19,59)							
Hu[9]	Anterior	19	38.3(21,64)	0	39	0	Case controlled	1996.7–2004.3	6–12	ZhonghuaChuangshangGuke Zazh
	Posterior	20	39.9(18,68)							
Hu[5]	Anterior	18	41(26,55)	4	31	3	Case controlled	2005.1–2008.1	6–36	Lingnan Xiandai Linchuang Waike
	Posterior	20	41(26,55)							
Jiao[7]	Anterior	44	33.7±6.3	0	100	0	Case controlled	2009.3–2010.8	6–24	Shandong Yiyao
	Posterior	56	33.7±6.3							
Li[4]	Anterior	26	35.4±14.3	0	56	0	Case controlled	2000.06–2006.12	24–48	ZhongguoYishi Zazhi
	Posterior	30	37.2±19.6							
Li[11]	Anterior	17	34.3(25,46)	0	38	0	Case controlled	2001.7– 2007.1	6–24	Shengwu Guke Cailiao yu Linchuang Yanjiu
	Posterior	21	34.3(25,46)							
Ma[12]	Anterior	19	36.3(24,52)	0	41	0	Case controlled	2003.1– 2005.12	24–48	Zhonghua Chuangshang Zazhi
	Posterior	22	38.6(22,57)							
Patrick[20]	Anterior	38	42±15	0	63	0	Randomized controlled	1992.7–2005.4	6–96	J Neurosurg Spine
	Posterior	25	42±11							
Qin[10]	Anterior	18	18,62	0	42	2	Case controlled	2002.12–2006.11	9–36	Linchuang Guke Zazhi
	Posterior	24	18,62							
Rick[18]	Anterior	40	40.2(15,67)	0	64	0	Randomized controlled	1992–1998	6	J Spinal Disord Tech
	Posterior	24	34(16,59)							
Wang[13]	Anterior	26	31.2(20,53)	1	47	0	Case controlled	2000.9–2007.3	9–52	Shiyong Guke Zazhi
	Posterior	18	31.2(20,53)							
Wood[19]	Anterior	31	39(18,56)	0	73	0	Randomized controlled	1995.5–2001.3	24–108	J Spinal Disord Tech
	Posterior	42	42(19,68)							
Yin[6]	Anterior	33	37.2(21,57)	0	61	0	Case controlled	2005.3–2009.3	12	Fujian Zhongyiyao Daxue Shuoshi Lunwen
	Posterior	28	39.4(23,58)							
Yuan[14]	Anterior	31	33.5(22,58)	3	69	1	Case controlled	1998.3–2007.10	43	Zhiye Weisheng yu Sunshang
	Posterior	42	33.5(22,58)							
Zhao[15]	Anterior	19	39.4±12.8	17	17	0	Case controlled	2005.1–2010.1	None	Fujian Zhongyiyao Daxue Shuoshi Lunwen
	Posterior	15	39.5±7.8							
Zhou[3]	Anterior	11	41.1±10.5	0	45	3	Case controlled	2005.12–2008.12	14–36	Zhejiang Chuangshang Waike
	Posterior	13	43.5±13.4							

Data was analyzed and processed in Review Manager 5.3 as supplied by the Cochrane Collaboration (Oxford, UK). Two authors checked the data input to make sure that no errors were made. Considering that there can be publication bias between the papers, the analyses were performed using random effect models. I^2 test was used to test the heterogeneity. Studies were considered to have significant heterogeneity if I^2 > 50%. Subgroup or sensitivity analysis was used at the incidence of significant heterogeneity due to methodological quality of included trials. The differences in each study were defined by standard mean difference with 95% confidence intervals (95%*CI*) for continuous value and the odds ratio (*OR*) with 95%*CI* of the categorical outcome frequencies in the study groups and the control groups, respectively. Standard mean difference and *OR* of each individual trial were showed in a forest plot.

RESULTS

Results of literature retrieval

Among the 2 324 papers screened, 18 papers were chosen for the final analysis[3-20] (**Figure 1**), including 4 English language papers and 14 Chinese language papers. The meta-analysis included a total number of 925 patients, 459 of whom were treated by anterior approach and 466 were treated with posterior approach (**Table 1**).

Table 2 The Dephli list assessing the risk of bias in all included papers

Studies	An[8]	Bin[16]	Feng[17]	Hu[9]	Hu[5]	Jiao[7]	Li[4]	Li[11]	Ma[12]	Patrick[20]	Qin[10]	Rick[18]	Wang[13]	Wood[19]	Yin[6]	Yuan[14]	Zhao[15]	Zhou[3]
Adequate random sequence generation?	+	?	+	+	?	+	?	?	+	+	+	?	?	?	+	+	−	?
Adequate allocation concealment?	+	+	+	+	+	+	−	?	+	+	+	+	+	+	+	+	+	+
Adequate blinding of patients?	−	+	+	+	?	−	+	−	+	+	+	+	+	?	−	+	−	+
Adequate blinding of care providers?	−	−	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−
Adequate blinding of outcome assessment?	?	+	+	+	+	+	+	?	+	+	+	+	?	+	+	+	−	+
Incomplete outcome data addressed? (loss to follow-up)	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	−	+	+
Intention-to-treat analysis?	+	+	+	?	+	?	?	−	−	−	?	?	−	−	−	−	−	−
Groups similar at baseline?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Influence of Cointerventions unlikely?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	?	+	+
Adequate compliance with primary intervention?	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Timing of outcome assessments similar?	+	+	−	+	+	+	+	+	+	−	+	+	?	+	+	+	+	−
Absence of other bias?	?	?	−	+	?	+	?	?	+	+	−	?	−	?	?	+	?	+
Total score	8	8	9	9	8	9	7	6	10	9	9	8	6	7	8	8	6	8

Note: The quality of the included studies was assessed with Dephli list and most of the studies are in high quality.

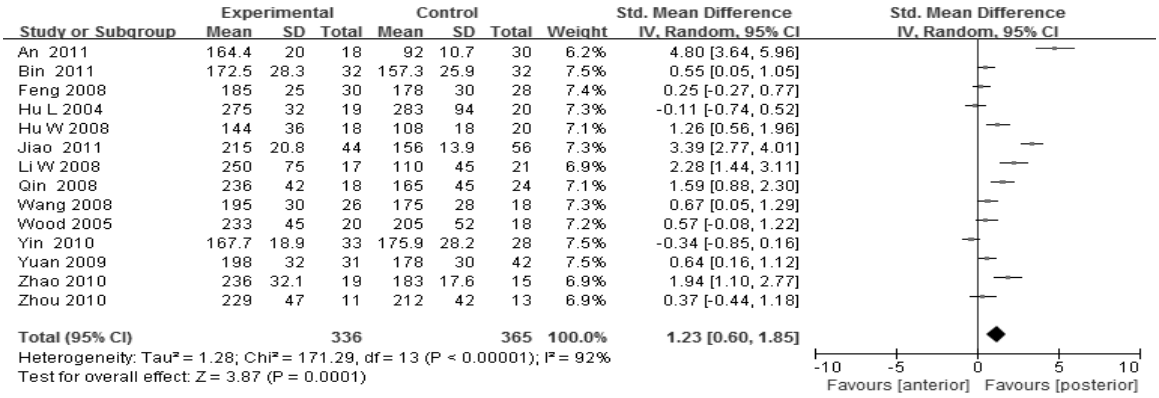

Figure 2 Comparison of operation time between anterior and posterior approaches

Note: The standard mean difference and 95%*CI* between two groups is 1.23 (0.60, 1.85). Patients underwent anterior approach spent significantly more time than those with posterior approach ($P < 0.01$).

Most studies were proved to be of relatively high quality assessing according the Dephli list of Cochrane Back Review Group[20] (**Table 2**).

Meta-analysis on the operation time

Fourteen studies[3, 5-11, 13-17, 19] including 736 patients (347 patients underwent anterior approach and 389 patients underwent posterior approach) have reported the time spent on the surgery. The standard mean difference and 95%*CI* between two groups is 1.23 (0.60, 1.85). Patients underwent anterior approach spent significantly more time than those with posterior approach ($P < 0.01$; **Figure 2**).

Meta-analysis of the total intraoperative blood loss

Fourteen studies[3, 5-11, 13-17, 19] including 707 patients (336 patients underwent anterior approach and 371 patients underwent posterior approach) have reported the total intraoperative hemorrhage. The standard mean difference and 95%*CI* between two groups is 2.2 (1.29, 3.11). Patients with anterior approach had more loss of blood

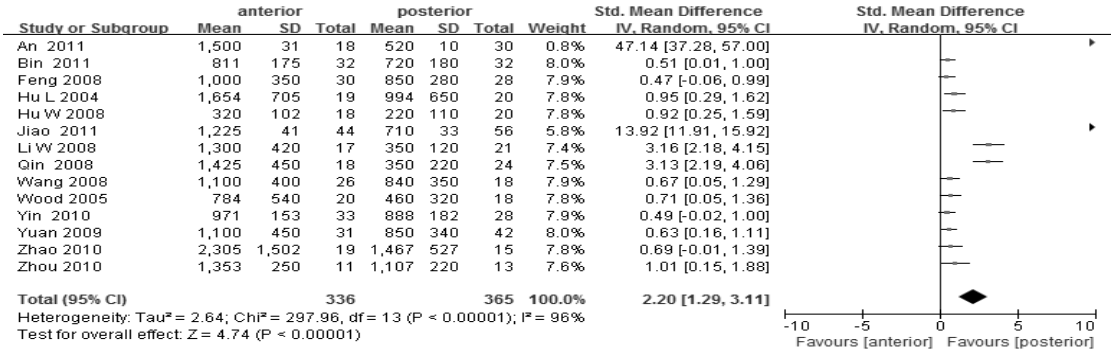

Figure 3 Comparison of total intraoperative blood loss between anterior and posterior approaches

Note: The standard mean difference and 95%*CI* between two groups is 2.20 (1.29, 3.11). Patients with anterior approach had more loss of blood than the posterior approach group ($P < 0.01$).

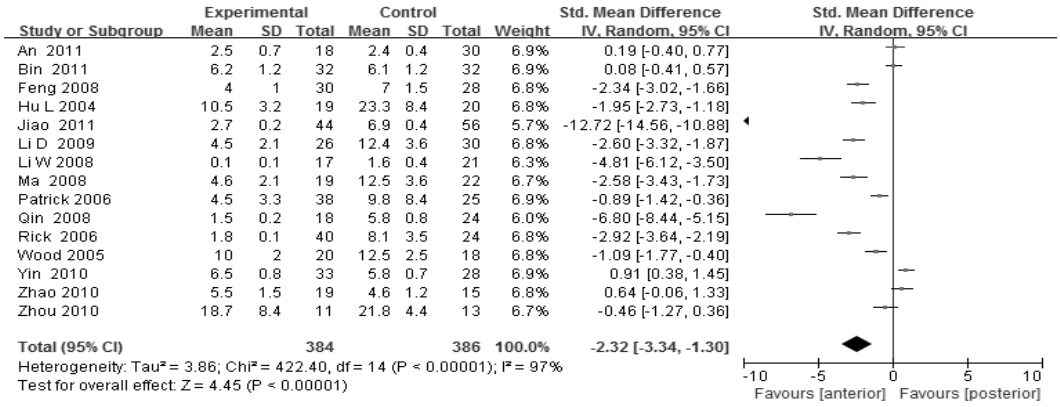

Figure 4 Comparison of the loss of Cobb angle between anterior and posterior approaches

Note: The standard mean difference and 95%*CI* between two groups is 2.32 (1.30, 3.34). Patients with anterior approach had significantly less loss of Cobb angle than that of posterior approach group ($P < 0.01$).

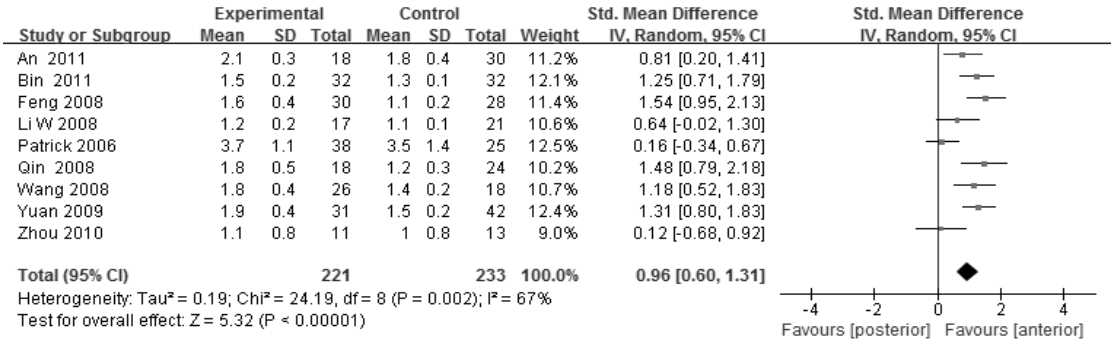

Figure 5 Comparison of the improvement of Frankel grading between anterior and posterior approaches

Note: The standard mean difference and 95%*CI* between two groups is 0.96 (0.60, 1.31). Patients with anterior approach has significantly better improvement of Frankel grading than that of posterior approach group ($P < 0.01$).

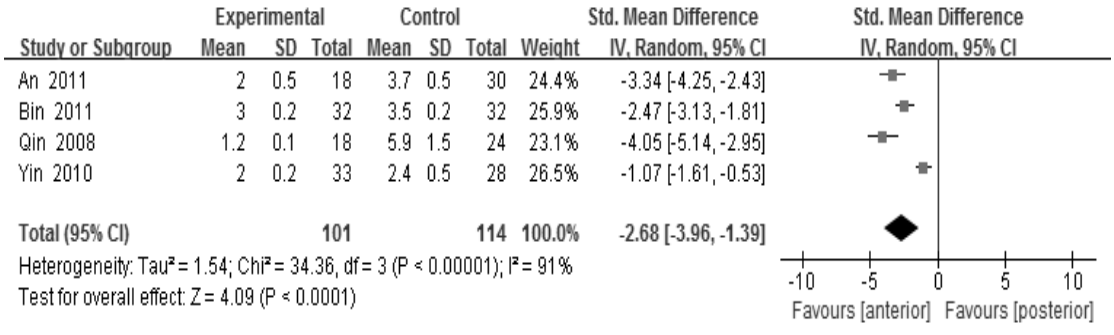

Figure 6 Comparison of the loss of vertebral height at the last follow-up between anterior and posterior approaches

Note: The standard mean difference and 95%*CI* between two groups is 2.68 (1.39, 3.96). Patients with anterior approach had significantly less loss of body height at the last follow-up than that of posterior approach group ($P < 0.01$).

than the posterior approach group (P < 0.01; **Figure 3**).

Meta-analysis of the loss of Cobb angle at the last follow-up

Fifteen studies[3-4, 6-12, 15-20] including 770 patients (384 patients applied anterior approach and 386 patients applied posterior approach) have reported the loss of Cobb angle at the last follow-up. The standard mean difference and 95%*CI* between two groups is 2.32 (1.30, 3.34). Patients with anterior approach had significantly less loss of Cobb angle than that of posterior approach group (P < 0.01; **Figure 4**).

Meta-analysis of the improvement of Frankel grading

Nine studies[3, 8, 10-11, 13-14, 16-17, 20] including 444 patients (221 patients applied anterior approach and 223 patients applied posterior approach) have reported the improvement of Frankel grading after the surgery. The standard mean difference and 95%*CI* between two groups is 0.96 (0.60, 1.31). Patients with anterior approach had significantly better improvement of Frankel grading than that of posterior approach group (P < 0.01; **Figure 5**).

Meta-analysis of the loss of vertebral height at the last follow-up

Four studies[6, 8, 10, 16] including 225 patients (101 patients applied anterior approach and 114 patients applied posterior approach) have reported the loss of spinal body height at the last follow-up. The standard mean difference and 95%*CI* between two groups is 2.68 (1.39, 3.96). Patients with anterior approach had significantly less loss of vertebral height at the last follow-up than that of posterior approach group (P < 0.01; **Figure 6**).

In addition, three papers mentioned the changes in ASIA score after the surgery[2, 5, 15], all indicating that improvement of ASIA score after the surgery was significantly better in the anterior approach than the posterior approach; another study has reported significantly less loss of spinal canal volume at long-term follow visits in patients underwent anterior approach than those with posterior approach[5].

DISCUSSION

Surgical treatment on thoracolumbar burst fracture patients is to gain reduction and rigid fixation at the site of injury to gain persisting mechanical stabilization of the spine, achieve decompression of the nerves and restore nerve function.

As the traditional way of surgery, posterior approach is an approach which is relatively simple and has small surgical trauma and little surgical complications. Analyzing from our meta-analysis, total time spent for the operation and hemorrhage during operation with the posterior approach were significantly less than that of the anterior approach.

Vertebral pedicle has the special anatomical structure of cortical bone surrounding the small amount of cancellous bone in the center. Posterior segment of the pedicle is composed of only cortical bone, which made it the strongest part in the vertebra, and pedicle screw fixation can enhance the stability of the vertebral body.

Posterior approach can recover the vertebral body height by stretching the posterior longitudinal ligament and the posterior fibrous ring and can achieve decompression of the canal by pushing back the bone block projecting into the spinal canal by the tension produced by the posterior longitudinal ligament. With the anterior pathway, on the other hand, internal fixation on the anterior and central pillar of the spine and intervertebral bone grafting can effectively restore the stress pathway of the spine and increases the fusion rate of the bone graft. Although pedicle screw fixation with posterior approach can reduce the bone block projecting into the spinal canal temporarily, supporting structure of bone trabecula in the vertebral body is not restored and doesn't have weight bearing ability, which leads to loss of vertebral body height gradually. That may explain the result of the current meta-analysis that, loss of Cobb angle and vertebral body height at the last follow up is significantly higher with the posterior approach than the anterior approach. As the posterior approach may fail to construct the central pillar of the spine precisely, stress that was originally on the spinal column will concentrate on the internal fixation devise after the surgery, which leads to the break or loosening of the pedicle screw.

Moreover, posterior approach destroys the bony part of the posterior column, which decreases the spinal stability even further and leads to tardive kyphosis. Anterior approach can achieve thorough decompression and preserve the integrity of the posterior column. In the meanwhile, injured spinal column can be taken out and replaced by a bone graft to make sure that stable fusion at the injury site is achieved.

The current meta-analysis revealed that improvement in Frankel scores in the anterior approach group of patients is significantly better that of posterior approach group. Spinal cord injury after the thoracolumbar burst fracture is not only resulted from the primary violence, but also from the compression of anterior intervertebral disk tissue. Surgical decompression with posterior approach repositions the disk by stretching the anterior and posterior longitudinal ligament or gain indirect decompression by cutting off part of the lamina vertebra. This surgical procedure often results in the destruction of posterior longitudinal ligament, which leads to inadequate decompression of the spinal canal[21]. Anterior reconstruction and internal fixation method makes it possible to remove what is compressing the spinal cord and avoids destroying spinal structures that play crucial role in protecting the stability of the spinal body. For similar reasons, anterior approach can also avoid stretching the dual sac and nerve root and iatrogenic injury to the spinal

cord and facilitate the recovery of the nerve function after the spinal cord injury.

To our knowledge, the current meta-analysis is so far the study with the largest sample size. Although most of the studies included were published in Chinese language, the quality of those studies were tested by the Dephli list and proved to be qualified enough to be included in the meta-analysis.

CONCLUSION

Results of this meta-analysis reveals that although posterior approach for the surgical treatment of thoracolumbar burst fractures needs less operation time and has less blood loss, it is still inferior to anterior approach in respect of loss of Cobb angle, loss of the height of spinal body, improvement in Frankel and ASIA scores. Medical centers with adequate equipment and surgical technique can consider using anterior approach for the treatment of thoracolumbar burst fractures.

REFERENCES

[1] Muller U, Berlemann U, Sledge J, et al. Treatment of thoracolumbar burst fractures without neurologic deficit by indirect reduction and posterior instrumentation: bisegmental stabilization with monosegmental fusion. Eur Spine J.1999;8:284-289.

[2] Furlan AD, Pennick V, Bombardier C, et al. 2009 updated method guidelines for systematic reviews in the Cochrane Back Review Group. Spine (Phila Pa 1976). 2009;34(18): 1929-1941.

[3] Zhou JH, Ceng HB, Xu LF, et al. Comparative study of posterior 270° decompression and reconstruction via a posterior small incision approach and simple anterior decompression and fixation approach in treatment of severe thoracolumbar spine fracture. Zhejiang Chuangshang Waike. 2010;15(6):708-712.

[4] Li DY, Yang XJ, Zhou Z, et al. Comparison on the restoration of Cobb angle on patient with thoracolumbar burst fracture after anterior vs posterior surgical treatment. Zhongguo Yishi Zazhi. 2009;11(7):952-953.

[5] Hu WB, Huang WD, Su PQ. Surgical treatment of thoracolumbar vertebral burst fracture: anterior approach versus posterior approach. Lingnan Xiandai Linchuang Waike. 2008;8(4):267-273.

[6] Yin ZK. Comparative study about posterior and anterior approach for spine reconstruction with subtotal vertebretomy, decompreion and internal fixation for thoracolumbar vertebra burst fractures with spinal cord injuries. Fujian Zhongyiyao Daxue Shuoshi Lunwen, 2010.

[7] Jiao JB. Comparative study of anterior versus posterior surgical approach for the thoracolumbar burst fracture. Shandong Yiyao. 2011;51(20):93-94.

[8] An LY, Chen XH, Liu ZY, et al. Comparison on anterior versus posterior surgical approach for the thoracolumbar burst fracture. Zhongguo Jiceng Yiyao. 2011;18(16): 2227-2228.

[9] Hu L, Tian W, Liu B, et al. Selection of operation for old thoracolumbar fracture: anterior fixation versus posterior vertebral osteotomy. Zhonghua Chuangshang Guke Zazhi. 2004;6(11):1223-1225.

[10] Qin RJ, Li Y, Song B, et al. Comparison between anterior and posterior decompression and internal fixation in treatment of thoracolumbar burst fractures. Linchuang Guke Zazhi. 2008;11(2):115-118.

[11] Li WJ, Xie SW, Ma H, et al. Comparison between anterior and Posterior decompression and internal fixation in treatment of thoracolumbar burst fractures. Shengwu Guke Cailiao yu Linchuang Yanjiu. 2008;5(3):42-45.

[12] Ma H, Zhao J, Yu BQ, et al. Treatment of unstable thoracolumbar burst fractures: a comparison between anterior approach and posterior approach. Zhonghua Chuangshang Zazhi. 2008;24(8):602-604.

[13] Wang Z, Ouyang YC, Zhou Y, et al. Comparison between anterior and posterior surgical treatments of thoracolumbar burst fractures. Shiyong Guke Zazhi. 2008;14(11):641-643.

[14] Yuan XP, Zhang WJ, Liu W, et al. Comparison between anterior and posterior surgical treatments of thoracolumbar fractures. Zhiye Weisheng yu Sunshang. 2009;24(1):13-15.

[15] Zhao L. Comparative analysis on efficacy and posterior corpectomy for thoracic vertebral fractures. Fujian Zhongyiyao Daxue Shuoshi Lunwen, 2010.

[16] Lin B, Chen ZW, Guo ZM, et al. Anterior approach versus posterior approach with subtotal corpectomy, decompression, and reconstruction of spine in the treatment of thoracolumbar burst fractures a prospective randomized controlled study. J Spinal Disord Tech. 2011: 1-9.

[17] Feng J, Liang WJ, Li LF, et al. Comparison between anterior or posterior approach surgical treatment of thoracolumbar vertebra burst fractures. Zhiye Weisheng yu Bingshang. 2008;23(3):141-143.

[18] Rick CS, Ken R, Hanson D. Unstable thoracolumbar burst fracture: anterior-only versus short-segment posterior fixation. J Spinal Disord Tech. 2006;19(4):242-248.

[19] Wood KB, Bohn D, Mehbod A. Anterior versus posterior treatment of stable thoracolumbar burst Fractures without neurologic deficit: a prospective, randomized study. J Spinal Disord Tech. 2005;18(1):15-23.

[20] Patrick WH, James T, Eichholz K, et al. Comparison of anterolateral and posterior approaches in the management of thoracolumbar burst fractures. J Neurosurg Spine. 2006; 5: 117-125.

[21] Mahar A, Kim C, Wedemeyer M, et al. Short-segment fixation of lumbar burst fractures using pedicle fixation at the level of the fracture. Spine. 2007;32(14):1503-1507.

胸腰段脊柱爆裂性骨折植入物前路与后路修复比较：Cobb 角丢失、Frankel 功能分级改善以及椎体高度丢失的 Meta 分析

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文章亮点：

1 大多数脊柱损伤发生在胸腰段，而其中相当一部分是爆裂性骨折，目前对于胸腰段骨折的修复方式尚无统一标准。文章通过分析近 10 年国内外有关胸腰段爆裂性骨折前路及后路手术比较的文献，对两种修复方式进行系统评价，以指导胸腰段爆裂性骨折修复方式的选择。

2 文章为迄今为止在胸腰段爆裂性骨折前后路修复方案比较方面包含研究论文数量以及患者数量最多的 Meta 分析论文。

3 文章所得到的统计结果将为以后的临床实践提供较高等级的循证医学依据。

关键词：

植入物；脊柱植入物；胸腰段脊柱爆裂骨折；前路；后路；Meta 分析

主题词：

脊柱骨折；腰椎；胸椎；Meta 分析

摘要

背景：对于需要手术修复的胸腰段脊柱爆裂骨折患者，虽然目前有大量的研究比较脊柱前路手术与后路手术的效果，但还没有大规模多中心随机对照研究证明其优劣。这使胸腰段爆裂骨折前后路手术比较的 Meta 分析研究成为必要。

目的：通过分析胸腰段爆裂性骨折前路及后路手术的文献，对两种修复方式进行系统评价，以指导胸腰段爆裂性骨折修复方式的选择。

方法：检索 Pubmed、Medline、Elseveir、万方、CNKI 等数据库，以“thoracolumbar fracture”，“randomized controlled trial”，“spinal fracture”，“RCT”，“anterior”，“posterior”，“胸腰段骨折”，“前路”，“后路”，“脊柱”等关键词查找脊柱胸腰段骨折前后路手术比较的研究论文，并利用 Revman 5.3 荟萃分析软件对文献中手术时间、术中出血量、Cobb 角丢失角度、Frankel 分级改善程度以及椎体高度丢失率等数据进行系统评价。

结果与结论：最后筛选的文献有 18 篇，总病例 925 例，其中前路手术组 459 例，后路手术组 466 例。前路手术时间较后路手术时间平均多 36.47 min，前路手术组出血量较后路手术组平均高出 432.58 mL，前路手术组 Cobb 角丢失角度较后路手术组平均低 3.41°，前路手术组 Frankel 分级改善程度较后路手术组平均高 0.33 级，前路手术组椎体高度丢失程度较后路手术组椎体高度丢失平均少 1.76 mm，两组手术时间、术中出血量、Cobb 角丢失角度、Frankel 功能分级改善程度以及椎体高度丢失率差异均有显著性意义($P < 0.01$)。提示前路手术虽然有手术时间长、术中出血量多、技术难度大等缺点，但因其优良的近期与远期效果，在有条件的医院应该优先应用于胸腰段脊柱爆裂性骨折的修复。

作者贡献：第一、二作者负责通过盲法独立进行资料整理、数据提出与计算，以及论文撰写；文献分析时第一、二作者出现意见不统一时由第三、四作者评估做出最后决定。

利益冲突：文章及内容不涉及相关利益冲突。

伦理要求：无涉及伦理冲突的内容。

学术术语：Meta分析-以综合研究结果为目的而对大量单项研究结果进行统计分析，即汇总相同研究目的的多项研究结果并分析评价其合并效应量，通过综合多项研究结果而提供一个量化的平均效果的一系列过程。

作者声明：文章为原创作品，无抄袭剽窃，无泄密及署名和专利争议，内容及数据真实，文责自负。

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