

网络出版时间: 2017-6-16 11:46:00 网络出版地址: http://kns.cnki.net/kcms/detail/34.1065.R.20170616.1146.029.html

## 单一后路减压联合前-中柱重建治疗严重胸腰椎爆裂性骨折

董福龙, 宋旆文, 葛 鹏, 章仁杰, 申才良, 杨庆国, 张建湘, 江 曙

**摘要** **目的** 探讨单一后路减压联合前-中柱重建治疗严重胸腰椎爆裂性骨折的临床效果。**方法** 对 29 例胸腰椎爆裂性骨折患者进行回顾性分析, 所有患者经单一后路手术进行减压、复位并行椎体前-中柱支撑重建。采用美国脊髓损伤学会评分来评判患者的神经功能状态。通过术前、术后 1 周、术后 1 个月及末次随访时的 X 线片测量患者的椎间高度及后凸 Cobb 角, 以此来评估骨折复位及脊柱前-中柱的重建及维持情况。**结果** 术中无重要血管以及医源性神经损害发生, 亦无死亡病例。术后有 2 例合并腰背部皮肤挫伤的患者并发切口浅表感染, 经扩创换药后愈合。患者术后神经功能除了 6 例 A 级的无恢复外, 其他患者均较术前有不同程度的改善。患者术前、术后 1 周、术后 1 个月以及末次随访时的椎间高度分别为 33.6、57.9、56.2、54.8 mm; 后凸 Cobb

角分别为 20.1°、4.3°、4.6°、5.1°。患者术后的椎间高度及后凸 Cobb 角均较术前有明显改善 ( $P < 0.01$ ); 术后 1 周、术后 1 个月、末次随访时的椎间高度及后凸 Cobb 角之间差异无统计学意义。**结论** 单一后路减压联合前-中柱重建治疗严重胸腰椎爆裂性骨折可以有效恢复和维持椎体间的高度, 重建脊柱的稳定性, 是一种安全有效的手术方式。

**关键词** 胸腰椎; 爆裂性骨折; 前-中柱重建

**中图分类号** R 683.2; R 687.3

**文献标志码** A **文章编号** 1000-1492(2017)08-1231-05  
doi: 10.19405/j.cnki.issn1000-1492.2017.08.029

2017-04-24 接收

基金项目: 安徽省自然科学基金面上项目(编号: 1508085MH151)

作者单位: 安徽医科大学第一附属医院骨科, 合肥 230022

作者简介: 董福龙, 男, 博士, 副主任医师, 副教授, 责任作者, E-mail: dongfulong@sina.com;

申才良, 男, 主任医师, 教授, 责任作者, E-mail: shencailiang1616@163.com

胸腰椎爆裂性骨折是一种常见创伤, 在高空作业增多和交通日趋发达的现代社会其发病率正逐年上升<sup>[1]</sup>。其中严重的胸腰椎爆裂性骨折常累及前-中-后三柱, 有时合并脱位, 从而造成脊髓或马尾神经损害, 致残率较高, 迟发后凸畸形较多, 治疗也较为棘手<sup>[2]</sup>。随着脊柱外科学技术的进步以及材料科学的发展, 单一后路手术日趋成熟, 该术式在传统后路手术的基础上进行骨折脱位的复位减压, 必要

*pylori* (*H. pylori*) detection in gastric precancerous lesions. **Methods** The levels of serum PGI, PGII and G17 were detected by ELISA in 424 patients of gastric precancerous lesions (case group) and 646 patients of non-precancerous lesions (control group). <sup>13</sup>C urea breath test was used to detect *H. pylori* infection. The levels of PG and G17 between the two groups were compared, and the changes of PG and G17 in different degrees of atrophy, intestinal metaplasia and intraepithelial neoplasia in the case group were compared. Receiver operating characteristic (ROC) curve was used to calculate the optimal cut-off value of sensitive indicator in the diagnosis of precancerous lesions. **Results** The levels of serum PG and G17 were associated with gender, age and *H. pylori* infection. The level of serum PGII in the case group was higher than that in the control group ( $P = 0.005$ ), and the level of PGI/PGII ratio (PGR) was lower than that in the control group ( $P = 0.015$ ). The level of serum PGI of severe atrophy group was lower than that in the control group ( $P = 0.013$ ) and the levels of PGII and G17 in the low-grade intraepithelial neoplasia group and the high-grade intraepithelial neoplasia group increased significantly ( $P < 0.05$ ). The levels of PGR decreased significantly in atrophy group, intestinal metaplasia group and intraepithelial neoplasia group ( $P_{all} < 0.05$ ). The optimal cut-off value of PGR in the diagnosis of gastric precancerous lesions was 8.75 (sensitivity 70.0%, specificity 58.0%); when *H. pylori* positive, the optimal cut-off value was 7.70 (sensitivity 75.6%, specificity 73.7%); when *H. pylori* negative, the optimal cut-off value was 9.50 (sensitivity 57.5%, specificity 58.2%). **Conclusion** Low serum PGR combined with *H. pylori* detection has an important clinical value in the diagnosis of gastric precancerous lesions. The levels of serum PGII and G17 increase significantly in the intraepithelial neoplasia group, which could become important indicators of gastric precancerous lesions.

**Key words** pepsinogen; gastrin; *Helicobacter pylori*; precancerous lesions

时进行损伤椎间盘和(或)骨折椎体的次全切除,并通过后路将椎间融合器或人工椎体等支撑物置入脊柱前方完成对前中柱的重建,从而完成脊柱的减压、复位和三柱固定融合<sup>[3]</sup>。该科采用该术式治疗上述骨折共 29 例,经长期随访效果满意,报道如下。

### 1 材料与方 法

**1.1 病例资料** 选取 2014 年 1 月~2016 年 12 月收治的胸腰椎爆裂性骨折患者共计 29 例,其中男 18 例,女 11 例,年龄 12~62(44.6±14.8)岁。致伤原因中平地跌倒或高空坠落伤 20 例、重物砸伤 5 例、交通意外伤 4 例。骨折部位以胸腰段和腰椎为主。患者中合并肋骨骨折和创伤性胸腔积液 10 例、四肢骨折 3 例、颅脑损伤 2 例、腹部脏器损伤 1 例。患者的神经功能状态评价按照美国脊髓损伤学会(America spinal injury association, ASIA)评分进行,其中 A 级共 8 例、B 级共 5 例、C 级共 6 例、D 级共 8 例、E 级共 2 例。术前所有患者进行 X 线片、3D CT 及核磁共振检查,证实骨折均为爆裂性,累及脊柱前-中柱或前-中-后三柱。在 X 线侧位片上测量椎间高度(椎间高度定义为 ab 间的距离:a 点为骨折椎体的上位正常椎体下终板中点,b 点为骨折椎体的下位正常椎体上终板中点)以及后凸 Cobb 角(骨折椎体的上位正常椎体上终板与下位正常椎体下终板所形成的夹角)。

**1.2 手术方法** 采用静-吸全身麻醉,患者俯卧于硅胶复位枕上,避免腹部受压(合并脱位的患者俯卧于 U 型软垫上以免产生剪切力加重脱位)。做后侧正中切口,视骨折脱位情况决定上下显露范围。根据术前影像学检查提示的骨折脱位特点及椎管占位情况进行椎板切除减压,必要时切除部分突入椎管内的骨折椎体,同时探查保护脊髓及神经根。充分减压,去除影响复位的因素后,利用椎弓根钉棒系统进行撑开、提拉复位、固定,透视证实骨折复位满意、椎间高度及序列恢复后,锁紧一侧的临时棒。对于仅累及椎体上终板且伤椎高度恢复满意的病例切除伤椎上位椎间盘,清除软骨终板,置入填充自体骨的椎间融合器 Cage。对于同时累及椎体上下终板且骨折椎体破碎严重无法有效支撑的病例行伤椎椎体的次全切除,同时切除伤椎上下位椎间盘,置入合适长度及直径的钛笼或羟基磷灰石-聚酰胺复合物人工椎体。经透视位置满意后安装两侧的棒,椎体间适度加压。术中椎管减压前静滴甲强龙 1 g 保护脊髓功能。

**1.3 术后处理** 术后常规使用抗生素、营养神经及脱水剂。术后 24~48 h 视引流量多少拔除负压引流管。床上行双下肢按摩及主被动康复训练,预防下肢深静脉血栓。患者术后 2~3 d 即可开始功能康复治疗。

**1.4 随访评价指标** 分别在术前、术后 1 周、术后 1 个月及末次随访时观察记录患者神经功能变化情况,并行 X 线摄片检查,分别测量记录椎间高度及后凸 Cobb 角。

**1.5 统计学处理** 采用 SPSS 19.0 软件对测量结果进行方差分析,所有的测量数据采用  $\bar{x} \pm s$  表示, $P < 0.05$  为差异有统计学意义。

### 2 结果

**2.1 患者手术一般资料及神经功能变化情况** 本组患者手术用时 1.5~7.0(3.4±1.6)h;出血 200~3 500(600±520)ml,术后有 2 例合并腰背部皮肤挫伤的患者并发切口浅表感染,经扩创换药后愈合。所有患者术后随访 1~26(7.5±6.2)个月。患者术后神经功能除了 6 例 A 级的无恢复外,其他患者均较术前有不同程度的改善,见表 1。

**2.2 患者术前、术后椎间高度及后凸 Cobb 角比较** 患者术前、术后 1 周、术后 1 个月以及末次随访时的椎间高度分别为 33.6、57.9、56.2、54.8 mm;后凸 Cobb 角分别为 20.1°、4.3°、4.6°和 5.1°,见表 2。患者术后的椎间高度及后凸 Cobb 角均较术前有明显改善( $P < 0.01$ );术后 1 周、术后 1 个月、末次随访时的椎间高度及后凸 Cobb 角之间差异无统计学意义。

表 1 患者术前、术后末次随访的 ASIA 评分(n=29)

ASIA	术前 (n)	术后(n)				
		A	B	C	D	E
A	8	6	2	-	-	-
B	5	-	-	3	2	-
C	6	-	-	-	4	2
D	8	-	-	-	-	8
E	2	-	-	-	-	2

表 2 患者术前、术后椎间高度及后凸 Cobb 角(n=29,  $\bar{x} \pm s$ )

时间	椎间高度(mm)	后凸 Cobb 角(°)
术前	33.6±12.7	20.1±11.6
术后 1 周	57.9±10.4	4.3±3.4
术后 1 个月	56.2±9.8	4.6±3.1
末次随访	54.8±10.2	5.1±3.4

### 3 讨论

**3.1 术式选择及优点** 严重的胸腰椎爆裂性骨折

伤椎压缩常超过 1/2,多累及前-中-后三柱,治疗较为棘手。前路、后路以及前后路联合术式的选择上也一直存在较多争议<sup>[4-5]</sup>。Parker et al<sup>[6]</sup>认为载荷分享评分可以用于指导手术入路的选择。担心椎管减压不彻底和前中柱支撑不足是某些学者选择前路手术的原因。但前路手术解剖位置相对深入复杂,并发症时有发生<sup>[7]</sup>。对于合并椎体侧方和(或)前后方脱位及关节突的绞锁的患者而言,前路手术复位会非常困难。同时前路手术只能固定融合前-中柱,无法达到生物力学上稳定的三柱固定<sup>[8]</sup>。

近些年来,随着脊柱外科学术的进步,单一后路手术日趋成熟<sup>[9]</sup>。本研究采用单一后路减压联合前-中柱重建手术,达到了前后联合入路所能达到的手术效果。该术式的优点:①手术创伤小,患者恢复快;通过单一后路手术完成减压、复位、支撑、重建、固定、融合;术中可充分减压前方的致压物,通过椎弓根钉也便于纠正脊柱侧方和(或)前后方的脱位,恢复脊柱序列。②术后稳定性好;脊柱的前-中柱承受了约 80%的压力负荷,骨折会造成椎体与椎间盘的损伤,严重时会造成前-中柱的缺失,导致载荷分布重新分配,如不进行前-中柱的有效重建,压力负荷将全部集中在后方的钉棒上,造成内固定疲劳断裂,最终造成后凸畸形和迟发性神经损害。本术式重视前-中柱的重建支撑,使载荷得以均匀的分布在脊柱的前-中-后三柱上。因此,较单纯前路或后路手术而言,其抗旋转和抗屈曲能力更强,稳定性更好,更符合脊柱的生理载荷状态,能够提供很好的术后初始稳定性。

**3.2 重建材料的种类及选择** 临床上常见的椎间支撑重建材料经历了从最初的自体髂骨到异体骨、PEEK 椎间融合器 Cage、钛笼、羟基磷灰石-聚酰胺复合物人工椎体,再到可调式金属人工椎体的发展过程。上述材料各有优缺点,临床上应根据重建的需要加以选择。自体髂骨受自身长度形状的限制,植骨后稳定性差,易吸收造成支撑强度下降,且易引起取骨区疼痛感染等问题,目前临床应用已不多。PEEK 制成的椎间融合器弹性模量适中,是较好的选择,但受其高度的限制,多用于单椎间的支撑融合,见图 1。钛笼的粗细种类较多,价格较低,术中可灵活的根据重建高度任意裁剪,其缺点是弹性模量较高,有切割终板之虞<sup>[10]</sup>,近年来的部分产品增宽了笼体边缘设计,减少了下沉的发生,见图 2。羟基磷灰石-聚酰胺复合物是一种模拟人骨结构的仿生合成材料,其弹性模量接近皮质骨,且具有成骨活性,非常适合用于椎体次全切除后前-中柱的重建支撑<sup>[11-12]</sup>,见图 3。可调式金属人工椎体能更好的适应上下终板的不同方向,但价格昂贵,限制了其在临床的应用。

**3.3 注意事项** ①此类患者多为高能损伤、复合伤,术前应详细评估头胸腹部有无合并伤,并予必要处理;对于严重脱位的患者还应行 CTA 检查,排除胸腹腔重要血管损伤,以免漏诊。②术中对于骨折椎体破碎严重,确实无法有效支撑的应果断行椎体次全切除,以免术后前-中柱缺乏有效支撑造成内固定断裂及后凸畸形。Parker et al<sup>[6]</sup>提出的脊柱载荷分享评分 $\geq 7$ 分提示椎体破碎严重,本研究显示

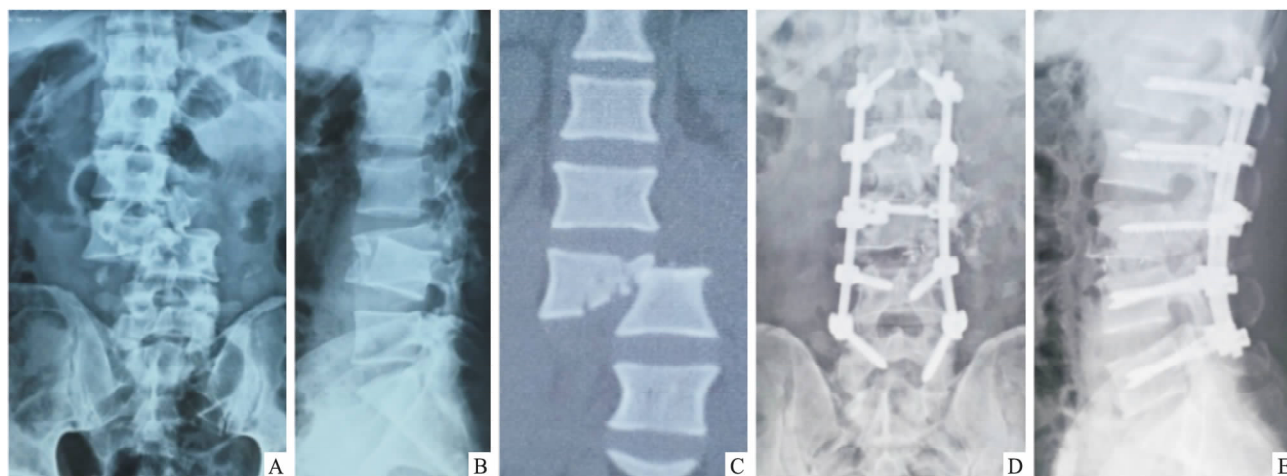


图 1 椎间融合器 Cage 重建前中柱

注:男性,44岁,重物砸伤,L3爆裂性骨折,ASIA 分级 A; A:术前正位 X 线片; B:术前侧位 X 线片; C:术前三维 CT; D:术后正位 X 线片; E:术后侧位 X 线片

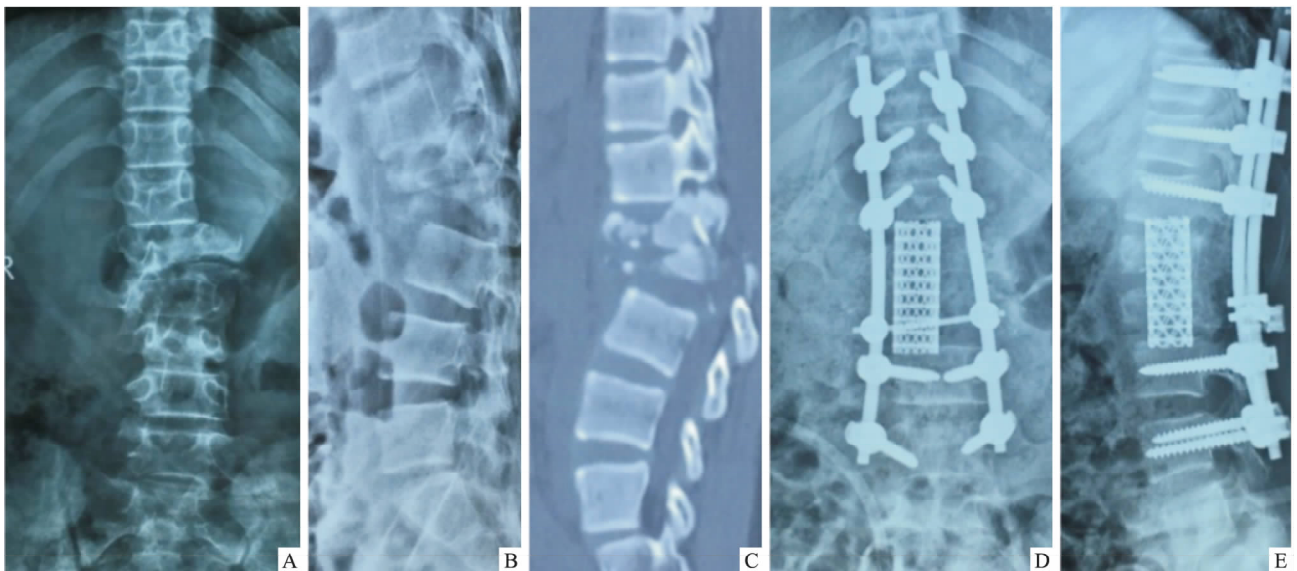


图2 钛笼重建前中柱

注: 女性, 12岁, 高处坠落伤, L1-2爆裂性骨折, ASIA 分级 A; A: 术前正位 X 线片; B: 术前侧位 X 线片; C: 术前三维 CT; D: 术后正位 X 线片; E: 术后侧位 X 线片

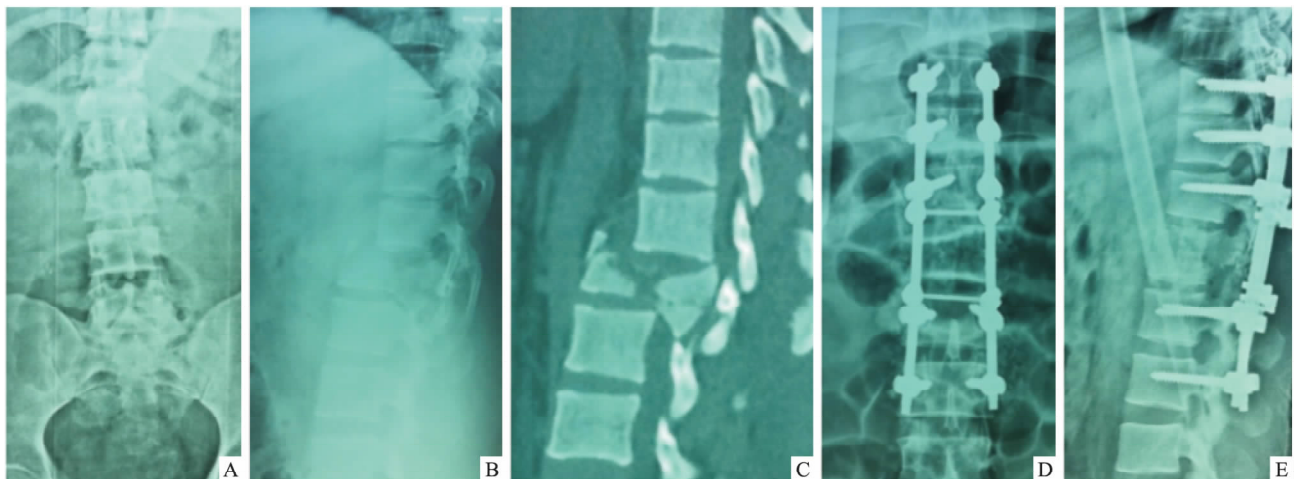


图3 纳米羟基磷灰石/聚酰胺 66 复合物人工椎体重建前中柱

注: 男性, 30岁, 交通事故伤, T12爆裂性骨折, ASIA 分级 B; A: 术前正位 X 线片; B: 术前侧位 X 线片; C: 术前三维 CT; D: 术后正位 X 线片; E: 术后侧位 X 线片

可以作为骨折椎体次全切除的参考指征。③ 术中复位和椎体切除时应用短棒临时固定, 避免术中脊柱不稳造成医源性的神经损害。④ 椎间重建支撑材料在不影响安放的情况下应尽可能选择粗大的以增大融合面积和支撑效果。⑤ 术中根据情况采用自体血回输装置, 可减少输血量, 降低输血相关并发症。

参考文献

[1] Pneumaticos S G, Triantafyllopoulos G K, Giannoudis P V. Ad-

vances made in the treatment of thoracolumbar fractures: current trends and future directions [J]. Injury, 2013, 44(6): 703-12.

[2] Joaquim A F, Ghizoni E, Tedeschi H, et al. Clinical results of patients with thoracolumbar spine trauma treated according to the thoracolumbar injury classification and severity score [J]. J Neurosurg Spine, 2014, 20(5): 562-7.

[3] Haiyun Y, Rui G, Shucai D, et al. Three-column reconstruction through single posterior approach for the treatment of unstable thoracolumbar fracture [J]. Spine (Phila Pa 1976), 2010, 35(8): E295-302.

[4] Wu H, Fu C, Yu W, et al. The options of the three different surgical approaches for the treatment of Denis type A and B thoraco-

- lumbar burst fracture [J]. *Eur J Orthop Surg Traumatol*, 2014, 24(1): 29–35.
- [5] Aebli N, Timm K, Patrick M, et al. Short-segment posterior instrumentation combined with anterior spondylodesis using an autologous rib graft in thoracolumbar burst fractures [J]. *Acta Orthop*, 2014, 85(1): 84–90.
- [6] Parker J W, Lane J R, Kamikovic E E, et al. Successful short-segment instrumentation and fusion for thoracolumbar spine fractures: a consecutive 41/2-year series [J]. *Spine (Phila Pa 1976)*, 2000, 25(9): 1157–70.
- [7] Rehman L, Mohammad Hashim A S, Qayoom Khan H A, et al. Anterior decompression and fixation with Webb-Morley procedure in dorsolumbar spinal injury [J]. *J Coll Physicians Surg Pak*, 2013, 23(5): 330–3.
- [8] Langrana N A, Harten R D R D, Lin D C, et al. Acute thoracolumbar burst fractures: a new view of loading mechanisms [J]. *Spine(Phila Pa 1976)*, 2002, 27(5): 498–508.
- [9] Athanasakopoulos M, Mavrogenis A F, Triantafyllopoulos G, et al. Posterior spinal fusion using pedicle screws [J]. *Orthopedics*, 2013, 36(7): e951–7.
- [10] Chen Y, Chen D, Guo Y, et al. Subsidence of titanium mesh cage: a study based on 300 cases [J]. *J Spinal Disord Tech*, 2008, 21(7): 489–92.
- [11] Wang H, Li Y, Zuo Y, et al. Biocompatibility and osteogenesis of biomimetic nano-hydroxyapatite/polyamide composite scaffolds for bone tissue engineering [J]. *Biomaterials*, 2007, 28(22): 3338–48.
- [12] Ripamonti U, Crooks J, Khoali L, et al. The induction of bone formation by coral-derived calcium carbonate/hydroxyapatite constructs [J]. *Biomaterials*, 2009, 30(7): 1428–39.

## Decompression combined reconstruction anterior-center columns of spine through single posterior approach for the treatment of severe thoracolumbar burst fracture

Dong Fulong, Song Peiwen, Ge Peng, et al

(*Dept of Orthopedics, The First Affiliated Hospital of Anhui Medical University, Hefei 230022*)

**Abstract Objective** To explore the curative effect of decompression combined reconstruction anterior-center columns of spine through single posterior approach for the treatment of severe thoracolumbar burst fracture. **Methods** The data of 29 patients with severe thoracolumbar burst fractures were retrospective studied. All patients underwent decompression combined reconstruction anterior-center columns of spine through single posterior approach. **Results** Neurological status of spinal cord at pre-operation, 1 week and 1 month post-operation and final follow-up were reviewed by America spinal injury association(ASIA) scoring system respectively. The intervertebral height and kyphosis Cobb angle were measured on the lateral X-ray films. There was no important blood vessel or nerve injury, no death case in this study. Incision infection in 2 cases, cured through debridement. The neuronal function of all patients was recovered at different degrees in final follow-up except 6 patients with grade A of ASIA. The average intervertebral height pre-operation, 1 week and 1 month post-operation, final follow-up was 33.6, 57.9, 56.2 and 54.8 mm respectively. The average kyphosis Cobb angle was 20.1°, 4.3°, 4.6°, 5.1° respectively. Both the intervertebral height and kyphosis Cobb angle were significantly improved at post-operation compared with pre-operation ( $P < 0.01$ ). However, there was no statistically significant differences at 1 week and 1 month post-operation, final follow-up in intervertebral height and kyphosis Cobb angle. **Conclusion** Treatment by decompression combined reconstruction anterior-center columns of spine through single posterior approach can restore and maintain the intervertebral height, reconstruct stability of spine, which is a safe and practical method for severe thoracolumbar burst fracture.

**Key words** thoracolumbar vertebra; burst fracture; anterior-center columns reconstruction