

· 临床研究 ·

经伤椎置钉治疗胸腰椎骨折的临床研究

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【摘要】目的:探讨经伤椎椎弓根置钉复位固定治疗胸腰椎骨折的临床效果。方法:2006 年 3 月至 2009 年 5 月,应用后路短节段固定结合伤椎椎弓根螺钉固定治疗胸腰椎骨折 27 例,男 19 例,女 8 例;年龄 24~68 岁,平均 36 岁。致伤原因:交通伤 11 例,高处坠落 9 例,重物砸伤 5 例,其他伤 2 例。骨折根据 Gertibein 分类:A1 型 2 例,A2 型 3 例,A3 型 12 例,B1 型 5 例,B2 型 5 例。受伤部位:T₁₁ 5 例,T₁₂ 11 例,L₁ 8 例,L₂ 3 例。27 例中 14 例伴有脊髓损伤,神经功能损伤按 Frankel 分级:B 级 5 例,C 级 3 例,D 级 6 例。术前腰痛 Denis 分级均为 P₅。受伤至手术时间:2~15 d,平均 4 d。按 Frankel 分级、腰痛 Denis 分级对神经功能及腰痛情况进行评估;手术前后及末次随访时通过影像学资料评价矫正及维持复位效果。结果:27 例患者均获随访,时间 14~17 个月,平均 15.5 个月。末次随访时,神经功能 Frankel 分级:B 级 2 例,C 级 4 例,D 级 3 例,E 级 5 例。腰痛 Denis 分级:P₁(无痛)17 例,P₂(偶有微痛,不需治疗)8 例,P₃(中度痛,偶服药)2 例。伤椎椎体前缘高度(AVH)与后缘高度(PVH)的比值由术前 0.32±0.14 增加到术后 0.85±0.03;矢状位后凸 Cobb 角由术前(25.3±7.8)°减少至术后(11.1±1.5)°,差异均有统计学意义(P<0.01)。末次随访时,伤椎椎体前后缘高度的比值和后凸 Cobb 角分别为 0.81±0.06 和(11.8±1.9)°,与术后比较差异均无统计学意义(P>0.05)。无感染、内固定失败、术中神经损伤等并发症。结论:伤椎置钉是治疗胸腰椎骨折的一种有效方法,可以维持脊柱复位效果。

【关键词】 胸椎; 腰椎; 脊柱骨折; 骨折固定术,内

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Treatment of thoracolumbar fractures with pedicle-screw placement on the level of injured vertebrae DENG Wan-xiang, ZHAO Hu-rui, LIU Hua, DONG Hui, YE Si-bo, SUN Hu. Department of Orthopaedics, the 474th Hospital of the CPLA, Urumqi 830013, Xinjiang, China

ABSTRACT Objective: To investigate the clinical results of pedicle-screw placement and reduction on the level of injured vertebrae in treating thoracolumbar fractures. **Methods:** From March 2006 to May 2009, 27 patients with thoracolumbar fractures were treated with short-segment fixation system and pedicle-screw placement on injured vertebrae through posterior approach. There were 19 males and 8 females with an average age of 36 years old ranging from 24 to 68 years. Eleven patients were injured by traffic accident, 9 patients were injured by falling from high, 5 patients were injured by crush from weighty object, 2 patients were others injuries. Thoracolumbar fractures were classified according to Gertibein classification; 2 cases were of type A1, 3 cases A2, 12 cases A3, 5 cases B1, 5 cases B2. Among them, 14 cases were accompanied with spinal cord injuries, functional assessment of nerves was assessed according to Frankel criteria; 5 cases were of grade B, 3 cases C, 6 cases D. Lumbago according to Denis standard, grade P₅ was in all cases. The injured level of 5 cases was in T₁₁, 11 cases in T₁₂, 8 cases in L₁, 3 cases in L₂. From injury to operation it was 2-15 days with an average of 4 days. The ratio of vertebral height between anterior and posterior border, anteroposterior Cobb angle were compared before and after operation. Function of nerves and index of lumbago were evaluated by Frankel and Denis classification. **Results:** All patients were followed up from 14 to 17 months with the mean of 15.5 months. At final follow-up, according to Frankel score system to evaluate function of nerve, 2 cases were of grade B, 4 case grade C, 3 cases grade D, 5 cases grade E; according to Denis score system to evaluate index of lumbago, there was P₁(without pain) in 17 cases, P₂(betweenwhiles minute pain, need not treatment) in 8 cases, P₃(moderate pain, betweenwhiles need medication) in 2 cases. The ratio of vertebral height between anterior and posterior border from preoperatively 0.32±0.14 to postoperatively 0.85±0.03 (P<0.01); anteroposterior Cobb angle from preoperatively (25.3±7.8)° to postoperatively (11.1±1.5)° (P<0.01). At final follow-up, the ratio of vertebral height between anterior and posterior border, anteroposterior Cobb angle were respectively 0.81±0.06 and (11.8±1.9)°, there was no significant difference between postoperative and at final follow-up (P>0.05). No complications such as infection, internal fixation failure, nerve injuries were found during follow-up. **Conclusion:** Posterior short-segment fixation system and pedicle-screw placement on level of injured vertebrae is one kind of effective method in treating thoracolumbar fracture, which can maintain corrective effect and obtain better clinical outcomes.

KEYWORDS Thoracic vertebrae; Lumbar vertebrae; Spinal fractures; Fracture fixation, internal

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胸腰椎爆裂性骨折在脊柱创伤中较为常见,其损伤机制复杂,损伤类型呈多样化,也为治疗带来多元化。2006 年 3 月至 2009 年 5 月,我们采用经伤椎置钉治疗胸腰椎骨折 27 例,术后均获得了临床满意效果,报告如下。

1 资料与方法

1.1 临床资料 本组 27 例,男 19 例,女 8 例;年龄 24~68 岁,平均 36 岁。致伤原因:交通伤 11 例,高处坠落 9 例,重物砸伤 5 例,其他伤 2 例。骨折按 Gertibein 综合分类法^[1]:A1 型 2 例,A2 型 3 例,A3 型 12 例;B1 型 5 例,B2 型 5 例。受伤部位:T₁₁ 5 例,T₁₂ 11 例,L₁ 8 例,L₂ 3 例。27 例中伴有脊髓损伤 14 例,神经功能损伤按 Frankel 分级^[1]:B 级 5 例,C 级 3 例,D 级 6 例。术前腰痛 Denis 分级^[1]均为 P₅。受伤至手术时间:2~15 d,平均 4 d。

1.2 治疗方法 手术均在全麻下进行,患者俯卧位于脊柱支架托,腹部悬空,以病变椎体为中心作正中切口,显露出伤椎及相邻的上下椎体后方椎板、关节突及横突近端。确定伤椎后置钉并同时常规置入上下相邻的两侧椎弓根钉。合并神经症状时可根据神经损伤情况采用全椎板或半椎板减压探查。根据脊柱生理弧度预弯钛棒,棒的放置应与脊柱弧度方向相反呈反弓状,利用钛棒对伤椎进行顶推,加之弓的两端螺钉向后牵拉,这样可有效恢复椎体高度。钛棒放置后先拧紧伤椎螺母,将上下位螺钉撑开,锁紧上位螺母,再对中下位螺钉加压锁紧。合并单侧椎弓根骨折时,可在正常一侧置钉。伤椎为椎体上缘压缩,置钉时钉尾稍向头侧倾斜,椎体钉经椎弓根后会向椎体中下部倾斜。完成固定后透视观察复位及置钉情况,在横突间和椎板间植骨。

1.3 观察项目与方法 手术前后及末次随访时通过影像学资料测量伤椎椎体前后缘高度和矢状位后凸 Cobb 角,并计算伤椎椎体前后缘高度的比值,评价矫正效果和维持复位效果;按 Frankel 分级、腰痛 Denis 分级对神经功能及腰痛情况进行评估。

1.4 统计学处理 采用 SPSS 13.0 统计软件,对手术前后和末次随访时的伤椎椎体前后缘高度的比值及矢状位后凸 Cobb 角进行配对 *t* 检验,以 $P < 0.01$ 为差异有统计学意义。

2 结果

27 例均获随访,时间 8 个月~4 年,平均 2.5 年。术后切口均 I 期愈合,骨折愈合时间 3~6 个月,无感染、内固定失败、术中神经损伤等并发症。末次随访时 Frankel 分级: B 级 2 例,C 级 4 例,D 级 3 例,E

级 5 例;腰痛 Denis 分级:P₁(无痛)17 例,P₂(偶有微痛,不需治疗)8 例,P₃(中度痛,偶服药)2 例。

影像学评估:伤椎椎体前后缘高度的比值由术前 0.32 ± 0.14 增加到术后 0.85 ± 0.03 ,差异有统计学意义 ($t = -16.919, P < 0.01$);后凸 Cobb 角由术前 $(25.3 \pm 7.8)^\circ$ 减少至术后 $(11.1 \pm 1.5)^\circ$,差异有统计学意义 ($t = 52.272, P < 0.01$)。末次随访时,伤椎椎体前后缘高度的比值为 0.81 ± 0.06 ,与术后比较差异无统计学意义 ($t = 1.365, P > 0.05$);后凸 Cobb 角为 $(11.8 \pm 1.9)^\circ$,与术后比较差异无统计学意义 ($t = 0.712, P > 0.05$)。对统计学处置结论,作者认为:伤椎高度明显得到恢复,压缩畸形得到矫正,末次随访,显示第 1 次恢复椎体高度无明显回缩;术后椎体后凸畸形得到明显矫正,末次随访显示矫正角度无明显再丢失。

3 讨论

胸腰段是位于相对固定的胸椎和活动度较大的腰椎交汇处,是应力集中的部位,也是易损伤的部位。损伤的稳定程度与脊柱所承受的生理载荷应力有关,临床中发生的胸腰椎骨折大部分属于 A 型和 B1、B2 型,其共同特点是伤椎的前柱高度短缩,后柱相对延长,前柱承受压缩应力,后柱承受牵张应力,符合脊柱的生物力学。根据生物原理,经后路椎弓根螺钉内固定已成为治疗胸腰椎骨折的一种理想有效方法,后路椎弓根螺钉内固定具有三维矫正和三柱固定稳定作用,能使伤椎压缩高度和矢状面成角获得良好恢复。跨节段椎弓根螺钉内固定容易出现矫正角度丢失及后凸畸形等并发症^[2-4]。采用伤椎置钉克服了传统后路置钉出现的弊端,并能获得较好的即时复位效果。

3.1 传统后路固定技术的不足 在伤椎上下相邻椎体置入 4 枚螺钉,通过椎弓根钉与纵向固定杆之间撑开力,恢复压缩的椎体高度,提供三维矫正固定,但其条件是骨折椎与上下相邻椎相连的前后纵韧带和纤维环大部分完整,否则,伤椎不易恢复高度和形态,而且容易出现撑开过度或脱位,同时由于内固定物承载应力增大可导致螺钉松动或断裂^[5-6]。在椎体复位及稳定方面是间接性,可能发生复位力度不足及稳定程度欠佳,术后椎体高度及 Cobb 角丢失。胸腰椎骨折发生后凸畸形时,要想获得良好复位及牢靠固定,需 6 枚以上椎弓根螺钉固定,这样可为脊柱节段固定提供稳定的生物力学作用, Mahar 等^[7]通过成人脊柱生物力学实验,也证实此种观点。

3.2 伤椎置钉优点 伤椎置钉的力学特点首先是螺钉通过对伤椎椎弓根的作用来顶推椎体,这是直

接作用下的复位方式,只要椎弓根完整,受伤时间在 2 周内,利用顶推作用还是比较明显,同时结合上下相邻椎弓根置入的螺钉、固定杆间的撑开、压缩等合力而形成强有力的反弓力,这样可更好地起到复位效果。固定棒预弯后放置方向与脊柱生理弧度相反,可为复位提供一个杠杆支点,加之两端螺钉向后的牵拉力,借助预弯的弧形弓固定杆,使压缩、移位、变形的椎体得到有效恢复,提高了其抗应力的能力,更加符合复位的力学机制,显著增强了脊柱的稳定性。

采用伤椎置钉可以减少 4 钉所承受的抗弯矩负载力,改善螺钉的应力分布,降低平行四边形的效应,增加了稳定性^[8-9],有利于椎体形态的恢复,保证和维护了脊柱的正常形态及序列,防止了术后发生后凸畸形及 Cobb 角丢失,重建了脊柱的稳定性,与传统的 4 钉固定相比较,具有复位效果好、术后椎体高度和后凸矫正丢失少等优点,而且内固定失败发生率也显著降低^[10-11]。

3.3 手术操作要点 术中俯卧位于脊柱支架托,腹部悬空,放低支架腰桥,使胸腰段处于紧张的生理前凸力学环境,椎体前柱的压缩及后凸畸形能自动通过体位得到部分复位及矫正,加之利用钉棒的顶推及牵拉,可使伤椎得到有效恢复。螺钉应选用短钉,钉尾稍高于相邻的上下螺钉,这样可增加顶推力度。对于是否椎板减压应根据术前有无神经症状及椎管变形受压情况决定。临床实践证明,伤椎置钉是安全可靠的,严格手术适应证及手术操作可有效降低并发症,提高复位质量,增加固定强度及应力分布,促进骨折愈合及维持矫正效果,是目前治疗胸腰椎骨折的理想方法。

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