

·临床研究·

经椎旁肌间隙入路短节段结合伤椎固定治疗胸腰椎骨折

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【摘要】 目的:探讨椎旁肌间隙入路短节段固定结合伤椎固定在胸腰椎手术中的优越性和临床应用价值。**方法:**2007年1月至2010年3月,采用椎旁肌间隙入路短节段固定结合伤椎固定胸腰椎骨折患者27例,男19例,女8例;年龄21~57岁,平均36.3岁。按照Magerl等分型:A2型5例,A3型14例,B1型3例,B2型5例。按Frankel神经功能分级:D级6例,E级21例。比较术前、术后及末次随访时X线片及CT,对伤椎椎体压缩百分率、Cobb角、椎管占位等情况进行随访;通过Frankel标准对神经功能进行评定。**结果:**所有病例获得随访,时间12~28个月,平均19.6个月。椎体压缩百分率由术前的(46.6±10.5)%恢复至术后的(5.2±3.7)%,末次随访时的(6.7±4.6)%,术后与术前比较差异有统计学意义($P<0.05$),末次随访时与术后比较差异无统计学意义($P>0.05$);伤椎Cobb角由术前的(18.3±7.2)°矫正至术后(5.3±5.1)°,末次随访时的(7.1±3.1)°,术后与术前比较差异有统计学意义($P<0.05$),末次随访时与术后比较差异无统计学意义($P>0.05$);椎管占位率由术前的(30.2±7.2)%恢复至术后的(6.3±4.2)%,末次随访时的(7.2±4.5)%,术后与术前比较差异有统计学意义($P<0.05$),末次随访与术后比较差异无统计学意义($P>0.05$)。其中3例神经功能D级患者恢复至E级。**结论:**经椎旁肌间隙入路短节段结合伤椎固定治疗胸腰椎骨折具有操作简单,置钉容易,手术时间短,出血少,同时复位良好,术后稳定可靠,是治疗胸腰椎骨折的有效方法。

【关键词】 胸椎; 腰椎; 脊柱骨折; 外科手术

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Surgical treatment of thoracolumbar fractures using reduction and short-segment pedicle screw at the fracture level with the approach through para-vertebral muscles DONG Yi-long, PENG Mao-xiu, HUANG Yi-jiang, LIN Li-xing, TANG Cheng-xuan, YANG Guo-jing. Department of Orthopaedics, the Third Affiliated Hospital of Wenzhou Medical College, Rui'an 325200, Zhejiang, China

ABSTRACT Objective:To evaluate the efficacy and clinical outcome of reduction and pedicle screws fixation at the fracture level with the approach through para-vertebral muscles in treating thoracolumbar fractures. **Methods:**From January 2007 to March 2010, 27 patients with thoracolumbar fractures were treated with posterior open reduction and internal fixation with the approach through para-vertebral muscles. There were 19 males and 8 females with the mean age of 36.3 years old (ranged, 21 to 57). According to Magerl type, type A2 was in 5 cases, A3 in 14, B1 in 3, B2 in 5. According to Frankel classification of spinal cord injury: grade D was in 6 cases and grade E in 21 cases. X-rays and CT scans were performed after operation. Cobb angle of the injured vertebral segment, the percentage of vertebral compression, and sagittal diameter stenosis rate of the injured spinal canal were observed by radiographic data. Neurological function was evaluated by the Frankel grade. **Results:**All patients were followed up from 12 to 28 months with an average of 19.6 months. The percentage of vertebral compression, Cobb angle of the injured vertebral segment, spinal canal sagittal diameter stenosis rate were respectively corrected from (46.6±10.5)%, (18.3±7.2)°, (30.2±7.2)% to postoperative (5.2±3.7)%, (5.3±5.1)°, (6.3±4.2)% and (6.7±4.6)%, (7.1±3.1)°, (7.2±4.5)% at last follow-up. There were significant difference in above items between preoperation and postoperation ($P<0.05$); and there was no significant difference in above items between postoperation and last follow-up ($P>0.05$). In aspect of nerve function, 3 cases with Frankel grade D recovered to grade E. **Conclusion:**Using reduction and short-segment pedicle screws fixation at the fracture level through para-vertebral muscles approach is an effective method in treating thoracolumbar fractures. The method has advantages of simple operation, easy establishing screw, short operative time, less blood loss, which can obtain good reduction and stable, reliable fixation after operation.

KEYWORDS Thoracic vertebrae; Lumbar vertebrae; Spinal fractures; Surgical procedures, operative

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后路短节段椎弓根螺钉内固定是目前国内外治疗胸腰椎骨折常用的、传统的手术方式^[1]。但是跨伤椎短节段复位固定术中复位较难,术后存在一定程度的内固定松动或断裂、椎体高度和矫正度的继发性丢失等风险^[2],并且传统手术入路广泛剥离椎旁肌,术后易导致椎旁肌失神经萎缩纤维化^[3]。2007 年 1 月至 2010 年 3 月,采用经椎旁肌间隙入路短节段结合伤椎固定治疗胸腰椎骨折 27 例,取得良好疗效,现报告如下。

1 资料与方法

1.1 临床资料 本组 27 例,男 19 例,女 8 例;年龄 21~57 岁,平均 36.3 岁;均为新鲜骨折。受伤原因:高处坠落 16 例,交通事故 7 例,重物压伤 4 例。单椎体 22 例:T₁₁ 2 例,T₁₂ 6 例,L₁ 9 例,L₂ 4 例,L₃ 1 例;双椎体 5 例:T₁₂、L₁ 邻近双椎 2 例,L₁、L₂ 邻近双椎 3 例。按照 Magerl 等^[4]分型:A2 型 5 例,A3 型 14 例,B1 型 3 例,B2 型 5 例。按 Frankel 等^[5]神经功能分级:D 级 6 例,E 级 21 例。伤后至手术时间 2~7 d,平均 3.5 d。

1.2 入选和排除标准 入选标准:年龄 18~60 岁;胸腰椎骨折(T₁₁~L₃);手术时间为伤后 7 d 内;手术均由同一组医生完成;随访时间在 12 个月以上。排除标准:严重骨质疏松;行椎板开窗探查、减压;严重椎体退行性病;跳跃性双椎骨折。

1.3 器械与材料 美敦力枢法模 CD 系列椎弓根螺钉系统。

1.4 治疗方法

1.4.1 手术方法 患者全麻成功后,取俯卧位,取后正中纵切口入路,以骨折平面为中心显露。切开皮肤、皮下、浅筋膜,在腰背筋膜表面向两侧分离牵开,在棘突旁 2 cm 处纵向切开腰背筋膜,从最长肌与多裂肌间隙进入暴露各椎弓根钉进针点。在伤椎的上下节段常规置入椎弓根螺钉。并在伤椎椎弓根相对完好侧置入 1 枚椎弓根螺钉固定,其螺钉适当增加腰骶角,以避免椎体的骨折部位。预弯钛棒,使之稍大于受伤节段生理弧度,予以适当加以撑开,透视见螺钉的位置良好、伤椎高度及脊柱生理曲度恢复佳,紧锁固定钉棒连接(见图 1)。

1.4.2 术后康复训练 术后常规予抗生素预防感染,切口引流管于 48 h 内拔除。术后第 2 天嘱患者主动抬高双下肢功能锻炼,6 周后在

胸腰支具保护下站立或行走,术后 3 个月去除腰背支具,加强腰背肌功能锻炼。

1.5 观察项目及方法 ①观察手术时间、术中出血量、切口并发症;②通过 X 线侧位片测量椎体高度及 Cobb 角,并计算手术前后椎体压缩百分率;③通过 CT 测量手术前后椎管阻塞面积;④按 Frankel 分级标准对神经功能进行评定。

1.6 统计学处理 应用 SPSS 12.0 统计软件包进行统计学分析,分别对手术前后及末次随访时的椎体压缩百分率、Cobb 角和椎管阻塞面积进行配对 *t* 检验,以 $P < 0.05$ 为差异有统计学意义。

2 结果

本组患者均置钉顺利。手术时间 40~85 min,平均 52.8 min。术中出血量 10~35 ml,平均 18 ml。术中电生理监视未发现医源性神经损伤,术中未出现螺钉误入椎管、椎弓根骨折、伤椎螺钉松动等并发症。所有患者均获得随访,时间 12~28 个月,平均 19.6 个月。术后无切口感染、螺钉弯曲、断裂等并发症,并均获得骨性融合,无假关节形成。手术前后及末次随访时的椎体压缩百分率、Cobb 角及椎管占位率见表 1,术后与术前比较差异有统计学意义 ($P < 0.05$),末次随访时与术后比较差异无统计学意义 ($P > 0.05$)。其中 3 例神经功能 D 级患者恢复至 E 级。典型病例见图 1-2。

3 讨论

3.1 椎旁间隙入路的优点 Wiltse 等^[6]提出从内侧的多裂肌与外侧的最长肌和髂肋肌(最长肌)之间的肌间隙钝性分开可以进入直达关节突。起初应用于椎间融合,由于该入路可以很容易的暴露 T₁₀~S₁ 的横突及关节突并保持棘间和棘上韧带的完整性,临

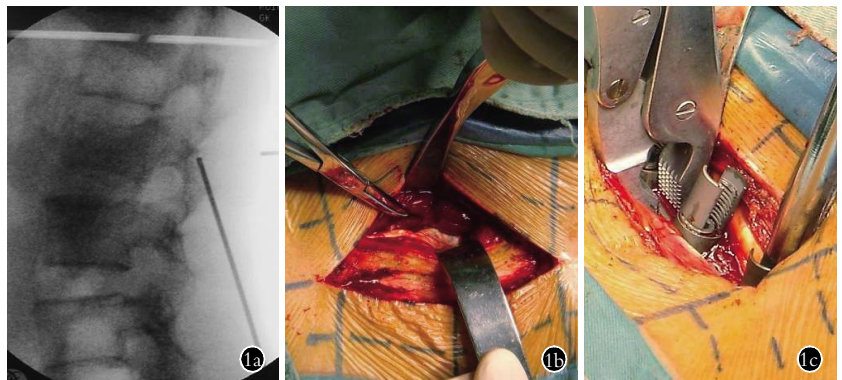


图 1 患者,男,52 岁,T₁₁ 爆裂性骨折 1a. 术中 C 形臂 X 线明确骨折节段 1b. 棘突旁 2 cm 处纵向切开腰背筋膜,从最长肌与多裂肌间隙进入暴露 T₁₀ 与 T₁₂ 椎弓根钉进针点 1c. 在伤椎的上下节段常规置入椎弓根螺钉

Fig. 1 52-year-old man with T₁₁ burst fracture 1a. Using C-arm X-ray to confirm fracture segment 1b. Vertical incision to cut lumbodorsae fascia at the 2 cm place of the spinous process, from space of the longest muscle and multifidus muscle got in and exposed the needed point of T₁₀ and T₁₂ pedicle screws 1c. Routine pedicle screw placement in the upper and lower vertebral segment

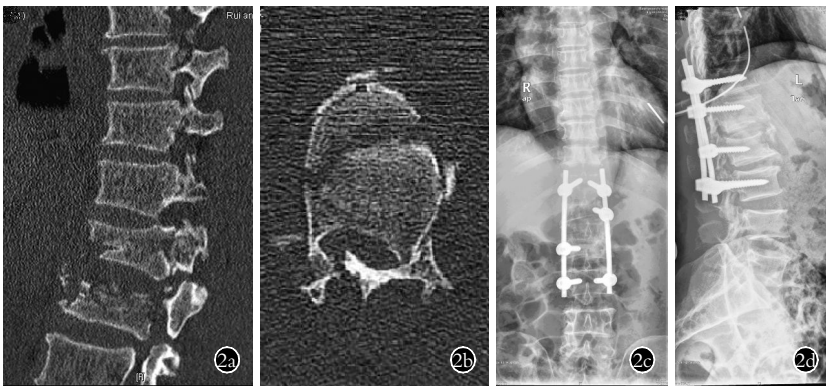


图 2 患者,男,62 岁, L₁、L₂ 爆裂性骨折 2a, 2b. 术前腰椎 CT 示 L₁、L₂ 爆裂性骨折,后凸畸形 2c, 2d. 术后 3 d 腰椎正侧位 X 线片示椎体高度恢复

Fig.2 A 62-year-old man with burst fracture in L₁, L₂ 2a, 2b. Preoperative CT scan showed burst fracture and kyphosis in L₁, L₂ 2c, 2d. At the 3rd day after operation, AP and lateral X-rays showed vertebral height recovery

表 1 27 例患者手术前后及末次随访时椎体压缩百分率、Cobb 角及椎管占位率($\bar{x}\pm s$)

Tab.1 The percentage of vertebral compression, Cobb angle of the injured vertebral segment, spinal canal sagittal diameter stenosis rate in 27 patients at preoperative, postoperative and final follow-up($\bar{x}\pm s$)

时间	椎体压缩百分率(%)	Cobb 角(°)	椎管占位率(%)
术前	46.6±10.5	18.3±7.2	30.2±7.2
术后	5.2±3.7*	5.3±5.1 [○]	6.3±4.2 [◇]
末次随访	6.7±4.2	7.1±4.6	7.2±4.5

注:与术前比较, * $t=32.58, P<0.05$; [◇] $t=26.68, P<0.05$; [○] $t=32.98, P<0.05$; 与末次随访比较, * $t=1.32, P>0.05$; [◇] $t=0.93, P>0.05$; [○] $t=0.13, P>0.05$

Note: Compared with preoperative data, * $t=32.58, P<0.05$; [◇] $t=26.68, P<0.05$; [○] $t=32.98, P<0.05$; Compared with data of final follow-up, * $t=1.32, P>0.05$; [◇] $t=0.93, P>0.05$; [○] $t=0.13, P>0.05$

床实践^[7-8]显示适用于各年龄段的大部分腰椎后路手术,尤其对于不需减压的胸腰椎骨折更是显示极大的优势。目前认为^[7-10]相对于传统的后正中入路,椎旁入路有以下优点:①创伤小,出血量少,符合微创原理;②减少肌肉剥离,手术时间短;③视野暴露良好,能清晰显露关节突,椎弓根螺钉置入方便;④避免侧方牵拉、剥离等损伤椎旁肌,不易损伤腰神经后支;⑤术后出血少,肌肉水肿轻,康复快。本组患者在手术时间、术中出血量及术后并发症与文献报道也有相同的结果。

3.2 结合伤椎短节段固定的优点 传统的后路短节段椎弓根螺钉固定是利用相邻跨椎体间撑开间接复位及固定,由于其间接复位不仅对伤椎高度的复位效果不理想,易造成椎间盘高度增加而损伤椎间盘;同时由于系间接固定,对伤椎椎体的稳定控制不够理想,易发生四边形效应,即侧向不稳,而且由于间接固定,伤椎缺少支点,易产生悬挂效应,所以术

后椎体高度丢失率高,甚至出现断钉可能^[11-13]。目前认为^[14-16]对于椎弓根基本完整的胸腰椎骨折,采用经伤椎固定是可行的,因椎弓根提供了至少 60% 的拔出力强度及 80% 的轴向刚度,而椎体松质骨仅提供了 15%~20% 的拔出力强度,可见椎弓根对螺钉的把持起主要作用;经伤椎固定有利于直接恢复伤椎高度,同时在复位撑开时选择终板损伤侧撑开,避免了对正常椎间盘牵张,减少了椎间盘的损伤;经伤椎直接固定相对增加了一个支点,有利于分散内固定的负荷并使螺钉的负荷均匀,故可增加内固

定的载荷能力及脊柱的稳定性,增加内固定系统强度与把持力,为骨折愈合提供更好的条件。本组患者在随访过程中椎体压缩百分比、伤椎 Cobb 角、椎管阻塞率及神经功能均获得了良好改善,未出现内固定松动或断裂的现象,且内固定取出后脊柱矫正度及伤椎高度基本无丢失现象。

3.3 手术注意事项 本组病例笔者采用经椎旁肌间隙入路短节段结合伤椎固定治疗,在手术中应注意:① T₁₂ 处容易探查骶棘肌的多裂肌与最长肌的肌间隙,而在 L₄ 处需找到骶棘肌的外缘切开深筋膜,自肌束间隙钝性分离进入深层即可见到多裂肌与最长肌的自然肌间隙,在寻找肌间隙困难时,可以插入食指钝性分离,避免使用血管钳分离;②椎旁间隙入路不容易损伤脊神经内侧支和腰动脉后支的降肌支,造成椎旁肌的失神经支配萎缩和缺血性萎缩,但是术中应注意间隙中的小血管,应仔细结扎止血;③由于传统入路置钉时受椎旁肌强大回缩力的影响,置钉角度往往偏小,改由椎旁入路后,少了椎旁肌回缩影响,应注意置钉角度,避免破入椎管,术中应以正位 C 形臂 X 线确认;④对于胸椎或脊柱退行性变时,难以确定椎弓根进针钉时,可应用漏斗技术^[17]确认椎弓根进针点;⑤伤椎螺钉应尽量选用万向螺钉,以方便棒置入,同时尽量选用相对长的椎弓根螺钉,因钉过短力臂有限,导致复位有限,钉过长占据椎体空间,影响椎体前方爆裂骨块的复位;⑥伤椎螺钉的置入顺序应是对侧钉棒系统完成撑开固定后,这样保证椎体后方爆裂骨块复位后再行椎螺钉固定;⑦若在置钉过程中发现患者骨质疏松,可予以骨水泥强化。

综上所述,经椎旁肌间隙入路短节段结合伤椎固定治疗胸腰椎骨折具有操作简单,置钉容易,手术

时间短,出血少,同时复位良好,术后稳定可靠,是治疗胸腰椎骨折的有效方法。

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