

3 种不同手术入路椎弓根钉棒系统内固定 治疗胸腰椎骨折的比较研究

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摘要 目的:比较 3 种不同手术入路椎弓根钉棒系统内固定治疗胸腰椎骨折的临床疗效及安全性。**方法:**将 135 例胸腰椎骨折患者随机分为后正中入路组、经皮入路组及椎旁肌间隙入路组, 每组 45 例。3 组患者由同一主刀医生进行手术, 术中分别采用不同的手术入路植入椎弓根钉棒系统, 复位、固定骨折。记录切口长度、手术时间、术中出血量、住院时间及骨折愈合时间。分别于术前和术后 3 个月, 测量伤椎前后缘高度比和伤椎后凸 Cobb 角, 采用 Oswestry 功能障碍指数 (Oswestry disability index, ODI) 评价患者术后行动能力与生活能力。观察术后并发症发生情况。分别于术前和术后当天, 抽取患者外周静脉血, 采用酶联免疫吸附法测定血清肌酸激酶、肌红蛋白和乳酸脱氢酶水平。**结果:**①一般结果。3 组患者切口长度、手术时间、术中出血量、住院时间、骨折愈合时间组间总体比较, 差异均有统计学意义 [(7.96 ± 0.85) cm, (2.11 ± 0.56) cm, (12.13 ± 3.94) cm, $F = 206.542$, $P = 0.000$; (94.87 ± 9.32) min, (66.72 ± 8.49) min, (53.58 ± 9.97) min, $F = 180.208$, $P = 0.000$; (114.87 ± 14.32) mL, (81.29 ± 11.17) mL, (67.23 ± 9.81) mL, $F = 189.815$, $P = 0.000$; (10.17 ± 2.47) d, (7.38 ± 1.88) d, (6.08 ± 1.69) d, $F = 47.207$, $P = 0.000$; (5.85 ± 1.17) 个月, (5.16 ± 1.02) 个月, (4.30 ± 0.89) 个月, $F = 25.429$, $P = 0.000$]。经皮入路组、椎旁肌间隙入路组患者手术时间、住院时间、骨折愈合时间均较后正中入路组短 ($P = 0.000$, $P = 0.000$, $P = 0.002$; $P = 0.000$, $P = 0.000$, $P = 0.000$), 术中出血量均较后正中入路组少 ($P = 0.000$, $P = 0.000$)。椎旁肌间隙入路组患者手术时间、住院时间、骨折愈合时间均较经皮入路组短 ($P = 0.000$, $P = 0.000$, $P = 0.000$), 术中出血量较经皮入路组少 ($P = 0.000$)。经皮入路组患者切口长度较后正中入路组、椎旁肌间隙入路组短 ($P = 0.000$, $P = 0.000$), 后正中入路组患者切口长度较椎旁肌间隙入路组短 ($P = 0.000$)。②疗效评价结果。术前 3 组患者伤椎前后缘高度比、伤椎后凸 Cobb 角、ODI 组间总体比较, 差异均无统计学意义 [(62.15 ± 7.31)%, (61.88 ± 7.45)%, (62.54 ± 6.97)%, $F = 0.094$, $P = 0.910$; 22.15° ± 1.77°, 21.88° ± 1.55°, 21.68° ± 1.38°, $F = 0.970$, $P = 0.382$; (35.62 ± 2.32)%, (36.37 ± 2.57)%, (35.98 ± 2.11)%, $F = 1.155$, $P = 0.318$]。术后 3 个月, 3 组患者伤椎前后缘高度比、伤椎后凸 Cobb 角、ODI 组间总体比较, 差异均有统计学意义 [(84.87 ± 5.49)%, (89.91 ± 4.63)%, (93.38 ± 4.57)%, $F = 34.192$, $P = 0.000$; 7.55° ± 1.13°, 6.43° ± 1.19°, 5.69° ± 1.05°, $F = 28.234$, $P = 0.000$; (5.25 ± 1.33)%, (4.53 ± 1.17)%, (3.82 ± 1.12)%, $F = 15.711$, $P = 0.000$]。经皮入路组、椎旁肌间隙入路组患者伤椎前后缘高度比均较后正中入路组高 ($P = 0.000$, $P = 0.000$), 伤椎后凸 Cobb 角均较后正中入路组小 ($P = 0.000$, $P = 0.000$), ODI 均较后正中入路组低 ($P = 0.008$, $P = 0.000$); 椎旁肌间隙入路组患者伤椎前后缘高度比较经皮入路组高 ($P = 0.000$), 伤椎后凸 Cobb 角较经皮入路组小 ($P = 0.002$), ODI 较经皮入路组低 ($P = 0.004$)。③安全性评价结果。术前, 3 组患者血清肌酸激酶、肌红蛋白、乳酸脱氢酶水平组间总体比较, 差异均无统计学意义 [(160.87 ± 21.32) 单位 · L⁻¹, (162.41 ± 22.57) 单位 · L⁻¹, (161.53 ± 20.97) 单位 · L⁻¹, $F = 0.057$, $P = 0.944$; (100.79 ± 18.31) ng · mL⁻¹, (103.19 ± 17.37) ng · mL⁻¹, (101.89 ± 15.97) ng · mL⁻¹, $F = 0.218$, $P = 0.804$; (108.38 ± 18.77) 单位 · L⁻¹, (111.36 ± 16.35) 单位 · L⁻¹, (113.81 ± 17.08) 单位 · L⁻¹, $F = 1.095$, $P = 0.337$]。术后当天, 3 组患者血清肌酸激酶、肌红蛋白、乳酸脱氢酶水平组间总体比较, 差异均有统计学意义 [(352.77 ± 57.73) 单位 · L⁻¹, (254.39 ± 42.53) 单位 · L⁻¹, (251.08 ± 44.62) 单位 · L⁻¹, $F = 63.193$, $P = 0.000$; (240.55 ± 25.49) ng · mL⁻¹, (192.53 ± 19.63) ng · mL⁻¹, (189.39 ± 20.17) ng · mL⁻¹, $F = 76.981$, $P = 0.000$; (190.55 ± 21.43) 单位 · L⁻¹, (163.23 ± 19.19) 单位 · L⁻¹, (160.33 ± 20.21) 单位 · L⁻¹, $F = 31.292$, $P = 0.000$]。经皮入路组、椎旁肌间隙入路组 3 项指标均较后正中入路组低 ($P = 0.000$, $P = 0.000$, $P = 0.000$; $P = 0.000$, $P = 0.000$, $P = 0.000$), 而这 2 组间比较, 差异均无统计学意义 ($P = 0.728$, $P = 0.456$, $P = 0.487$)。后正中入路组术后并发切口感染 2 例、下肢深静脉血栓 2 例、内固定断裂 1 例, 经皮入路组术后并发切口感染 2 例、下肢深静脉血栓 1 例、内固定断裂 1 例, 椎旁肌间隙入路组术后并发切口感染 1 例、下肢深静脉血栓 2 例、内固定断裂 1 例; 3 组患者并发症发生率比较, 差异无统计学意义 ($\chi^2 = 0.170$, $P = 0.918$)。**结论:**对于胸腰椎骨折患者, 虽然椎旁肌间隙入路切口长度较长, 但采用该入路进行椎弓根钉棒系统内固定手术, 较经皮入路和传统后正中入路出血少、损伤小、恢复快, 更有利于椎体高度和脊柱功能恢复, 安全性高。

关键词 脊柱骨折; 胸椎; 腰椎; 骨折固定术, 内; 手术入路

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A comparative study of three different surgical approaches in pedicle screw – rod system internal fixation for treatment of thoracolumbar fractures

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ABSTRACT Objective: To compare the clinical curative effects and safety of three different surgical approaches in pedicle screw – rod system (PSRS) internal fixation for treatment of thoracolumbar fractures. **Methods:** One hundred and thirty – five patients with thoracolumbar fractures were randomly divided into posterior median approach group, percutaneous approach group and paraspinal approach group, 45 cases in each group, and they were treated with PSRS internal fixation through three different surgical approaches respectively by the same surgeon. The incision length, operative time, intraoperative blood loss, hospital stay and fracture healing time were recorded. The ratio of anterior border height to posterior border height (APR) and kyphotic Cobb angle of injured vertebrae were measured, and the postoperative activities of daily living (ADL) were evaluated by using Oswestry disability index (ODI) before the surgery and at 3 months after the surgery respectively. The blood was drawn from the peripheral vein, and the serum levels of creatine kinase (CK), myoglobin (Myo) and lactate dehydrogenase (LDH) were detected by using enzyme linked immunosorbent assay (ELISA) before the surgery and on the day of the surgery respectively, and the postoperative complications were observed. **Results:** ① There was statistical difference in incision length, operative time, intraoperative blood loss, hospital stay and fracture healing time between the 3 groups in general (7.96 ± 0.85 , 2.11 ± 0.56 , 12.13 ± 3.94 cm, $F = 206.542$, $P = 0.000$; 94.87 ± 9.32 , 66.72 ± 8.49 , 53.58 ± 9.97 minutes, $F = 180.208$, $P = 0.000$; 114.87 ± 14.32 , 81.29 ± 11.17 , 67.23 ± 9.81 mL, $F = 189.815$, $P = 0.000$; 10.17 ± 2.47 , 7.38 ± 1.88 , 6.08 ± 1.69 days, $F = 47.207$, $P = 0.000$; 5.85 ± 1.17 , 5.16 ± 1.02 , 4.30 ± 0.89 months, $F = 25.429$, $P = 0.000$). The operative time, hospital stay and fracture healing time were shorter, and the intraoperative blood loss was less in percutaneous approach group and paraspinal approach group compared to posterior median approach group ($P = 0.000$, $P = 0.000$, $P = 0.002$; $P = 0.000$, $P = 0.000$, $P = 0.000$; $P = 0.000$, $P = 0.000$); and the operative time, hospital stay and fracture healing time were shortest, the intraoperative blood loss was least in paraspinal approach group ($P = 0.000$, $P = 0.000$, $P = 0.000$; $P = 0.000$). The incision length was shorter in percutaneous approach group compared to posterior median approach group and paraspinal approach group ($P = 0.000$, $P = 0.000$), and was longest in paraspinal approach group ($P = 0.000$). ② There was no statistical difference in APR and kyphotic Cobb angle of injured vertebrae and ODI between the 3 groups in general before the surgery (62.15 ± 7.31 , 61.88 ± 7.45 , 62.54 ± 6.97 %, $F = 0.094$, $P = 0.910$; 22.15 ± 1.77 , 21.88 ± 1.55 , 21.68 ± 1.38 degrees, $F = 0.970$, $P = 0.382$; 35.62 ± 2.32 , 36.37 ± 2.57 , 35.98 ± 2.11 %, $F = 1.155$, $P = 0.318$); while the differences between the 3 groups at 3 months after the surgery were statistically significant (84.87 ± 5.49 , 89.91 ± 4.63 , 93.38 ± 4.57 %, $F = 34.192$, $P = 0.000$; 7.55 ± 1.13 , 6.43 ± 1.19 , 5.69 ± 1.05 degrees, $F = 28.234$, $P = 0.000$; 5.25 ± 1.33 , 4.53 ± 1.17 , 3.82 ± 1.12 %, $F = 15.711$, $P = 0.000$). The APR of injured vertebrae was higher in percutaneous approach group and paraspinal approach group compared to posterior median approach group ($P = 0.000$, $P = 0.000$), and was highest in paraspinal approach group ($P = 0.000$). The kyphotic Cobb angle of injured vertebrae was smaller in percutaneous approach group and paraspinal approach group compared to posterior median approach group ($P = 0.000$, $P = 0.000$), and was smallest in paraspinal approach group ($P = 0.002$). The ODI was lower in percutaneous approach group and paraspinal approach group compared to posterior median approach group ($P = 0.008$, $P = 0.000$), and was lowest in paraspinal approach group ($P = 0.004$). ③ There was no statistical difference in the serum levels of CK, Myo and LDH between the 3 groups in general before the surgery (160.87 ± 21.32 , 162.41 ± 22.57 , 161.53 ± 20.97 unit/L, $F = 0.057$, $P = 0.944$; 100.79 ± 18.31 , 103.19 ± 17.37 , 101.89 ± 15.97 ng/mL, $F = 0.218$, $P = 0.804$; 108.38 ± 18.77 , 111.36 ± 16.35 , 113.81 ± 17.08 unit/L, $F = 1.095$, $P = 0.337$); while the differences between the 3 groups on the day of the surgery were statistically significant (352.77 ± 57.73 , 254.39 ± 42.53 , 251.08 ± 44.62 unit/L, $F = 63.193$, $P = 0.000$; 240.55 ± 25.49 , 192.53 ± 19.63 , 189.39 ± 20.17 ng/mL, $F = 76.981$, $P = 0.000$; 190.55 ± 21.43 , 163.23 ± 19.19 , 160.33 ± 20.21 unit/L, $F = 31.292$, $P = 0.000$). The serum levels of CK, Myo and LDH were lower in percutaneous approach group and paraspinal approach group compared to posterior median approach group ($P = 0.000$, $P = 0.000$, $P = 0.000$; $P = 0.000$, $P = 0.000$, $P = 0.000$), while no statistical difference between percutaneous approach group and paraspinal approach group ($P = 0.728$, $P = 0.456$, $P = 0.487$). After the surgery, the incision infection was found in 2 patients in posterior median approach group and percutaneous approach group respectively as well as 1 patient in paraspinal approach group; the lower extremity deep venous thrombosis in 2 patients in posterior median approach group and paraspinal approach group respectively as well as 1 patient in percutaneous approach group; and the breakage of internal fixators in 1 patient in posterior median approach group, percutaneous approach group and paraspinal approach group respectively. There was no statis-

tical difference in complication incidences between the 3 groups ($\chi^2 = 0.170, P = 0.918$). **Conclusion:** PSRS internal fixation through paraspinal approach has such disadvantage as longer incision length, but advantages as less intraoperative blood loss, less injury and faster recovery compared to PSRS internal fixation via percutaneous approach and posterior median approach in treatment of thoracolumbar fractures, and it can be more conducive to the recovery of vertebral height and spinal function with high safety.

Keywords spinal fractures; thoracic vertebrae; lumbar vertebrae; fracture fixation, internal; operative approach

胸腰椎骨折多由交通事故、重物打击、高空坠落等暴力所致^[1-2], 主要采用后路椎弓根内固定术治疗。后正中入路是后路椎弓根内固定术的传统入路, 此入路手术视野开阔, 但需大范围牵拉椎旁肌, 容易引起局部肌肉坏死及神经功能损伤, 术后并发腰背疼痛^[3-4]。随着微创理念的普及, 微创术式也在胸腰椎骨折治疗中得到广泛应用, 其中经皮入路与椎旁肌间隙入路是新兴的后路椎弓根内固定术入路, 采用这两种入路均可避免术中对周围肌肉的广泛剥离与破坏, 降低术后疼痛综合征发生的概率^[5-6]。为进一步明确后正中入路、经皮入路与椎旁肌间隙入路椎弓根钉棒系统内固定术治疗胸腰椎骨折的疗效差异, 2018 年 8 月至 2019 年 9 月, 我们分别采用这 3 种手术入路治疗胸腰椎骨折患者 135 例, 并对临床疗效和安全性进行了比较, 现报告如下。

1 临床资料

1.1 一般资料 胸腰椎骨折患者 135 例, 均为安吉县第三人民医院住院患者。本研究方案经医院医学伦理委员会审查通过。

1.2 纳入标准 ① T₁₀ ~ L₂ 单节段压缩性或爆裂性骨折; ② 胸腰椎损伤分类和损伤程度评分^[7] ≥ 4 分; ③ 骨折时间 < 2 周; ④ 对本研究方案知情同意, 并签署知情同意书。

1.3 排除标准 ① 合并心、脑、肾等重要脏器功能障碍者; ② 合并严重的感染性疾病者; ③ 凝血功能障碍者; ④ 病理性骨折者。

2 方法

2.1 分组方法 根据入组顺序采用随机数字表法分为后正中入路组、经皮入路组及椎旁肌间隙入路组, 每组 45 例。

2.2 手术方法 采用全身麻醉, 患者俯卧位, 腰、腹部垫高。C 形臂 X 线机透视下明确骨折节段后, 常规消毒、铺巾。由同一主刀医生进行手术, 采用不同的手术入路植入钉棒系统, 复位骨折, 在 C 形臂 X 线机透视下确认骨折复位和内固定位置良好后, 冲洗术

野, 放置橡胶引流管, 逐层缝合切口。

2.2.1 后正中入路组 以伤椎为中心, 于后方正中纵行切一 5 ~ 7 cm 长的直切口, 逐层剥离皮肤、皮下组织、筋膜及棘突两侧肌肉。显露伤椎棘突顶点后游离腰背筋膜, 随后剥离骨膜下椎旁肌, 并牵引伤椎两侧关节突关节及横突根部, 直至上下椎体的关节突及椎板充分显露。选择椎弓根置入点, 开口并置入定位针。X 线透视下确认置钉位置, 植入椎弓根螺钉。

2.2.2 经皮入路组 于伤椎对应的皮肤表面确认穿刺点后, 纵行切一长约 1.5 cm 的直切口, 逐层切开肌肉组织, 置入软组织扩张器, 沿工作通道安装椎弓根镜与操作器械。镜下对椎弓根进行穿刺, 植入椎弓根螺钉。

2.2.3 椎旁肌间隙入路组 C 形臂 X 线机透视下定位, 标出手术节段椎体的椎弓根位置, 伤椎正中旁侧纵行切 2 ~ 3 cm 长的切口, 逐层分离, 切开筋膜以显露竖脊肌肌群, 并竖向钝性分离多裂肌和最长肌的肌间隙, 暴露关节突与横突。于上关节突外侧缘和横突中线相交的人字嵴的位置穿刺, 植入椎弓根螺钉。

2.3 疗效及安全性评价方法 记录切口长度、手术时间、术中出血量、住院时间及骨折愈合时间。分别于术前和术后 3 个月, 测量伤椎前后缘高度比和伤椎后凸 Cobb 角, 采用 Oswestry 功能障碍指数 (Oswestry disability index, ODI) 量表^[8] 评价患者术后行动能力与生活能力。观察术后并发症发生情况。分别于术前和术后当天, 抽取患者外周静脉血, 采用酶联免疫吸附法测定血清肌酸激酶、肌红蛋白和乳酸脱氢酶水平。

2.4 数据统计方法 采用 SPSS20.0 统计软件处理数据。3 组患者年龄的组间总体比较采用单因素方差分析; 切口长度、手术时间、术中出血量、住院时间、骨折愈合时间、ODI、伤椎前后缘高度比、伤椎后凸 Cobb 角及血清肌酸激酶、肌红蛋白、乳酸脱氢酶水平的组间总体比较均采用单因素方差分析, 组间两两比较均采用 q 检验; 性别、骨折部位、骨折原因、骨折类型、并发症发生率的组间比较均采用 χ^2 检验。检验

水准 $\alpha = 0.05$ 。

3 结果

3.1 分组结果 3 组患者基线资料比较, 差异无统计学意义, 具有可比性(表 1)。

3.2 一般结果 3 组患者切口长度、手术时间、术中出血量、住院时间、骨折愈合时间组间总体比较, 差异均有统计学意义。经皮入路组、椎旁肌间隙入路组患者手术时间、住院时间、骨折愈合时间均较后正中入路组短($P = 0.000, P = 0.000, P = 0.002; P = 0.000, P = 0.000, P = 0.000$), 术中出血量均较后正中入路组少($P = 0.000, P = 0.000$)。椎旁肌间隙入路组患者手术时间、住院时间、骨折愈合时间均较经皮入路组短($P = 0.000, P = 0.000, P = 0.000$), 术中出血量较经皮入路组少($P = 0.000$)。经皮入路组患者切口长度较后正中入路组、椎旁肌间隙入路组短($P = 0.000, P = 0.000$), 后正中入路组患者切口长度较椎旁肌间隙入路组短($P = 0.000$)。见表 2。

3.3 疗效评价结果 术前 3 组患者伤椎前后缘高度比、伤椎后凸 Cobb 角、ODI 组间总体比较, 差异均无

统计学意义; 术后 3 个月, 3 组患者伤椎前后缘高度比、伤椎后凸 Cobb 角、ODI 组间总体比较, 差异均有统计学意义; 经皮入路组、椎旁肌间隙入路组患者伤椎前后缘高度比均较后正中入路组高($P = 0.000, P = 0.000$), 伤椎后凸 Cobb 角均较后正中入路组小($P = 0.000, P = 0.000$), ODI 均较后正中入路组低($P = 0.008, P = 0.000$); 椎旁肌间隙入路组患者伤椎前后缘高度比较经皮入路组高($P = 0.000$), 伤椎后凸 Cobb 角较经皮入路组小($P = 0.002$), ODI 较经皮入路组低($P = 0.004$)。见表 3、表 4。

3.4 安全性评价结果 术前, 3 组患者血清肌酸激酶、肌红蛋白、乳酸脱氢酶水平组间总体比较, 差异均无统计学意义; 术后当天, 3 组患者血清肌酸激酶、肌红蛋白、乳酸脱氢酶水平组间总体比较, 差异均有统计学意义; 经皮入路组、椎旁肌间隙入路组 3 项指标均较后正中入路组低($P = 0.000, P = 0.000, P = 0.000; P = 0.000, P = 0.000, P = 0.000$), 而这 2 组间比较, 差异均无统计学意义($P = 0.728, P = 0.456, P = 0.487$)。见表 5。术后, 后正中入路组并发切口

表 1 3 组胸腰椎骨折患者基线资料

组别	样本量/ 例	性别/例		年龄/ ($\bar{x} \pm s$, 岁)	骨折部位/例		骨折原因/例			骨折类型/例	
		男	女		胸椎	腰椎	①	②	③	压缩性	爆裂性
后正中入路组	45	24	21	42.32 \pm 3.32	22	23	14	15	16	26	19
经皮入路组	45	26	19	40.89 \pm 3.09	20	25	12	14	19	23	22
椎旁肌间隙入路组	45	25	20	41.15 \pm 3.97	19	26	13	14	18	24	21
检验统计量		$\chi^2 = 0.180$		$F = 0.120$	$\chi^2 = 0.419$		$\chi^2 = 0.465$			$\chi^2 = 0.418$	
P 值		0.914		2.156	0.811		0.977			0.812	

①高处坠落伤;②摔伤;③交通事故伤。

表 2 3 组胸腰椎骨折患者一般情况

组别	样本量/ 例	切口长度/ ($\bar{x} \pm s$, cm)	手术时间/ ($\bar{x} \pm s$, min)	术中出血量/ ($\bar{x} \pm s$, mL)	住院时间/ ($\bar{x} \pm s$, d)	骨折愈合时间/ ($\bar{x} \pm s$, 月)
后正中入路组	45	7.96 \pm 0.85	94.87 \pm 9.32	114.87 \pm 14.32	10.17 \pm 2.47	5.85 \pm 1.17
经皮入路组	45	2.11 \pm 0.56	66.72 \pm 8.49	81.29 \pm 11.17	7.38 \pm 1.88	5.16 \pm 1.02
椎旁肌间隙入路组	45	12.13 \pm 3.94	53.58 \pm 9.97	67.23 \pm 9.81	6.08 \pm 1.69	4.30 \pm 0.89
F 值		206.542	180.208	189.815	47.207	25.429
P 值		0.000	0.000	0.000	0.000	0.000

表 3 3 组胸腰椎骨折患者手术前后伤椎前后缘高度比和伤椎后凸 Cobb 角

组别	样本量/ 例	伤椎前后缘高度比/($\bar{x} \pm s$, %)		伤椎后凸 Cobb 角/($\bar{x} \pm s$, °)	
		术前	术后 3 个月	术前	术后 3 个月
后正中入路组	45	62.15 \pm 7.31	84.87 \pm 5.49	22.15 \pm 1.77	7.55 \pm 1.13
经皮入路组	45	61.88 \pm 7.45	89.91 \pm 4.63	21.88 \pm 1.55	6.43 \pm 1.19
椎旁肌间隙入路组	45	62.54 \pm 6.97	93.38 \pm 4.57	21.68 \pm 1.38	5.69 \pm 1.05
F 值		0.094	34.192	0.970	28.234
P 值		0.910	0.000	0.382	0.000

感染 2 例、下肢深静脉血栓 2 例、内固定断裂 1 例,经皮入路组并发切口感染 2 例、下肢深静脉血栓 1 例、内固定断裂 1 例,椎旁肌间隙入路组并发切口感染 1 例、下肢深静脉血栓 2 例、内固定断裂 1 例。3 组患者并发症发生率比较,差异无统计学意义 ($\chi^2 = 0.170, P = 0.918$)。

3.5 典型病例 典型病例图片见图 1、图 2、图 3。

4 讨论

胸腰椎骨折好发部位主要集中于胸椎后凸与腰椎前凸的交界点,由于该点屈伸曲度与承受压力较大,导致其椎体磨损程度较一般部位严重,在遭受暴力时易发生椎体断裂、移位。胸腰椎骨折若不及时治疗,会导致脊柱难以完成屈伸和侧屈运动,严重影响

患者生活质量^[9-10]。因此,针对暴力损伤导致的胸腰椎骨折,应及时复位骨折、恢复椎体的稳定以最大程度地避免骨折块移动造成的其他损伤。

传统后正中入路是后路椎弓根螺钉内固定术最常用的入路,能充分显露手术节段,可直接进行椎管减压和椎体固定。但同时,该入路须对两侧关节突周围的椎旁肌进行广泛分离,极易导致小血管受损而引发大出血,致使椎旁肌肌肉缺血坏死和失神经支配,从而产生术后腰背无力、僵硬等并发症。随着微创技术的快速发展,为减小对椎旁肌的损伤和保护神经功能,经皮入路与椎旁肌间隙入路在临床的应用逐渐增多^[11-14]。椎旁肌间隙入路以最长肌与多裂肌间隙作为入路,分离可直达手术节段关节突,无需广泛剥离

表 4 3 组胸腰椎骨折患者手术前后 Oswestry 功能障碍指数

组别	样本量/例	Oswestry 功能障碍指数/ $(\bar{x} \pm s, \%)$	
		术前	术后 3 个月
后正中入路组	45	35.62 \pm 2.32	5.25 \pm 1.33
经皮入路组	45	36.37 \pm 2.57	4.53 \pm 1.17
椎旁肌间隙入路组	45	35.98 \pm 2.11	3.82 \pm 1.12
F 值		1.155	15.711
P 值		0.318	0.000

表 5 3 组胸腰椎骨折患者手术前后血清肌酸激酶、肌红蛋白和乳酸脱氢酶水平

组别	样本量/例	肌酸激酶/ $(\bar{x} \pm s, \text{单位} \cdot \text{L}^{-1})$		肌红蛋白/ $(\bar{x} \pm s, \text{ng} \cdot \text{mL}^{-1})$		乳酸脱氢酶/ $(\bar{x} \pm s, \text{单位} \cdot \text{L}^{-1})$	
		术前	术后当天	术前	术后当天	术前	术后当天
后正中入路组	45	160.87 \pm 21.32	352.77 \pm 57.73	100.79 \pm 18.31	240.55 \pm 25.49	108.38 \pm 18.77	190.55 \pm 21.43
经皮入路组	45	162.41 \pm 22.57	254.39 \pm 42.53	103.19 \pm 17.37	192.53 \pm 19.63	111.36 \pm 16.35	163.23 \pm 19.19
椎旁肌间隙入路组	45	161.53 \pm 20.97	251.08 \pm 44.62	101.89 \pm 15.97	189.39 \pm 20.17	113.81 \pm 17.08	160.33 \pm 20.21
F 值		0.057	63.193	0.218	76.981	1.095	31.292
P 值		0.944	0.000	0.804	0.000	0.337	0.000

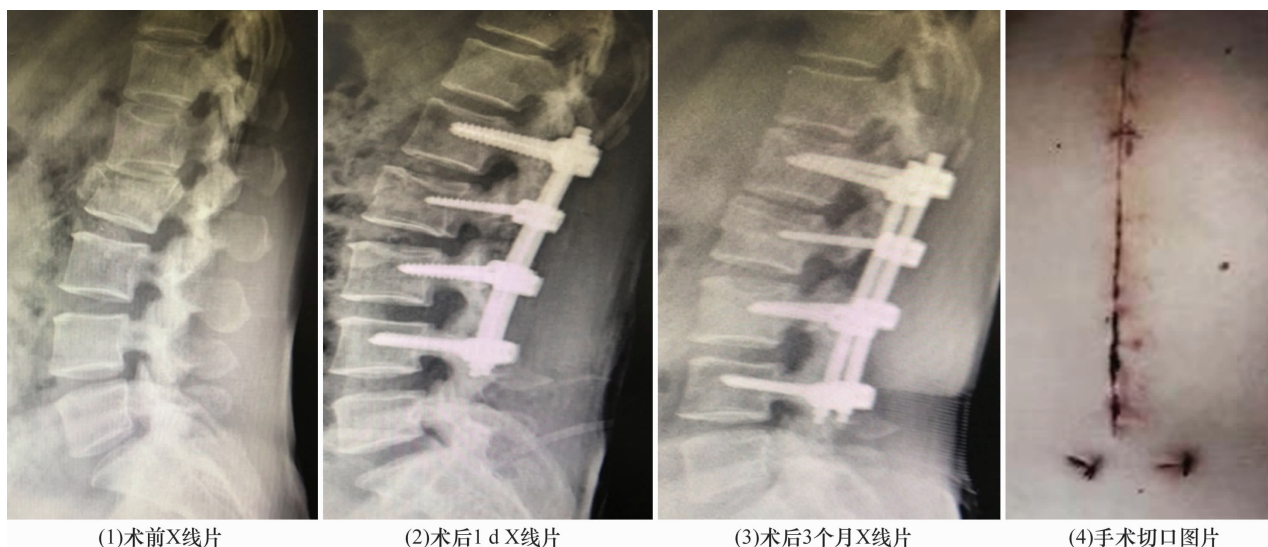


图 1 L₂ 椎体爆裂性骨折后正中入路椎弓根钉棒系统内固定手术前后图片

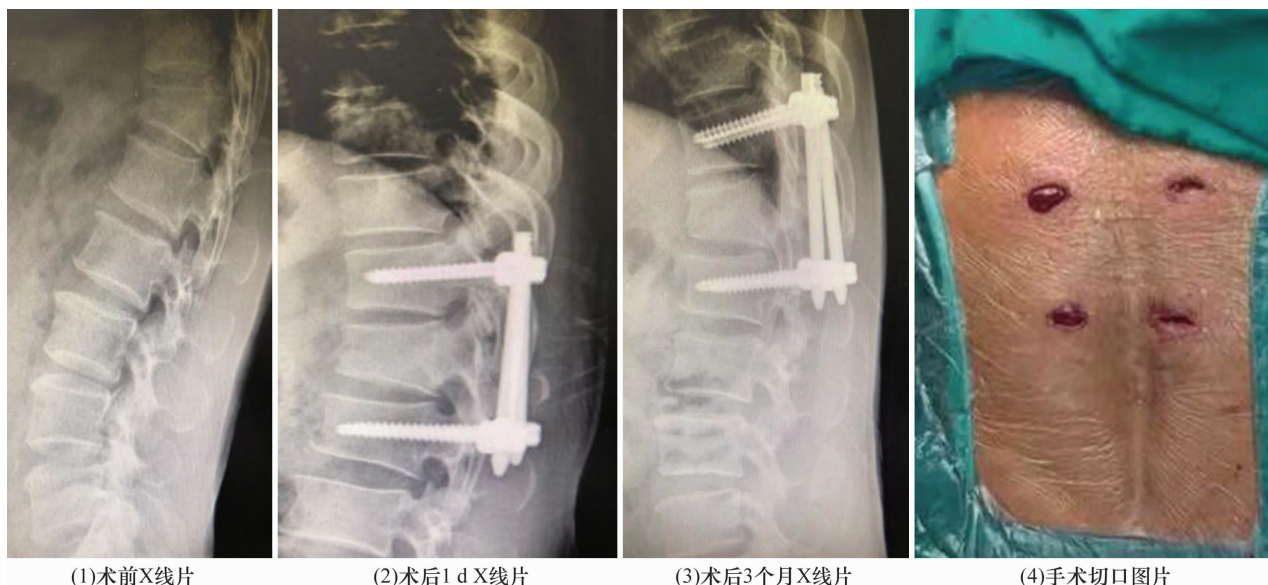


图 2 T₁₂ 椎体压缩性骨折经皮入路椎弓根钉棒系统内固定手术前后图片

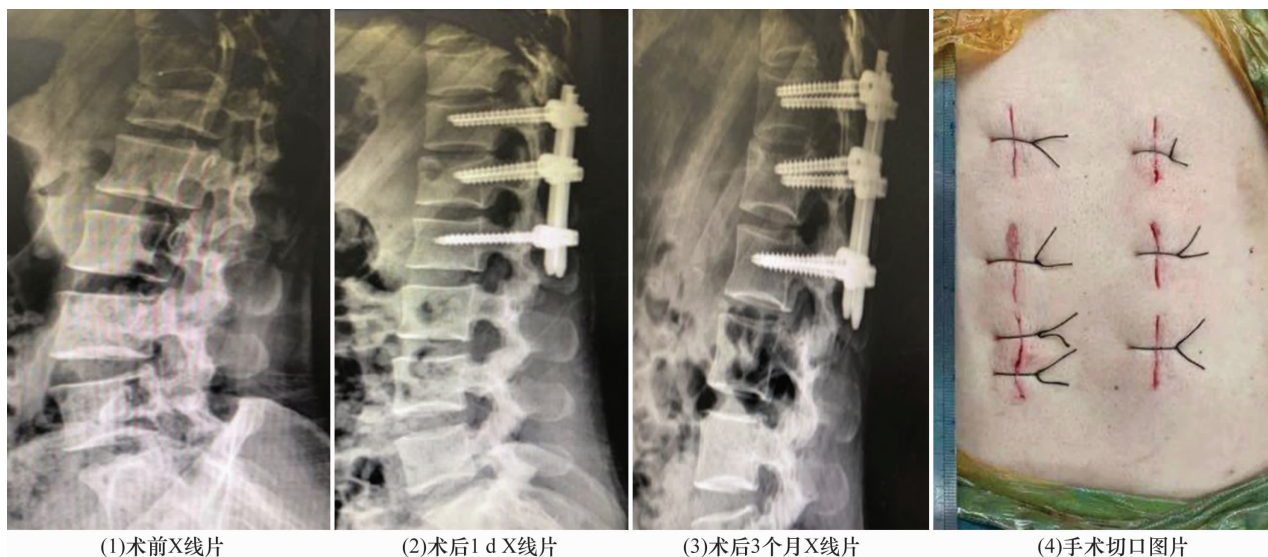


图 3 L₁ 椎体压缩性骨折椎旁肌间隙入路椎弓根钉棒系统内固定手术前后图片

肌肉组织,还可较大程度保留后方韧带复合体的完整性。经皮入路是通过多个小型切口,置入扩张管建立工作通道,避免了对椎旁肌肉的破坏和损伤^[15]。张富国等^[16]的研究结果显示,进行后路椎弓根内固定手术,采用经皮入路与椎旁肌间隙入路较传统后正中入路手术时间短、术中出血量少。

研究表明^[17-18],血清肌酸激酶、肌红蛋白、乳酸脱氢酶均为介导骨骼肌细胞能量代谢调节的重要因子,当椎旁肌剥离时,肌细胞膜发生损伤导致膜通透性增加,血清肌酸激酶、肌红蛋白、乳酸脱氢酶进入血液循环,血清水平呈上升趋势。因此,这 3 个指标的变化可反映肌肉组织损伤程度。传统后正中入路置钉时需剥离肌肉组织直至伤椎上下 2 个椎板,对椎旁肌损伤及后路稳定结构破坏影响较大;另外,患者创伤大,术后

康复时间长,不利于脊柱功能恢复。而经皮入路与椎旁肌间隙入路仅小范围剥离肌肉,无需剥离对侧椎旁肌及切除棘上、棘间韧带,术后肌肉可及时回位,对椎管内结构的稳定性干扰较小,从而能够较大程度避免空腔及血肿形成,有利于患者术后功能恢复^[19-20]。

本研究结果表明,对于胸腰椎骨折患者,虽然椎旁肌间隙入路切口长度较长,但采用该入路进行椎弓根钉棒系统内固定手术,较经皮入路和传统后正中入路出血少、损伤小、恢复快,更有利于椎体高度和脊柱功能恢复,安全性高。

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