

过伸复位联合经皮椎体后凸成形术 治疗椎体后壁破裂的骨质疏松性椎体压缩骨折

李永革

(濮阳市人民医院, 河南 濮阳 457000)

摘要 **目的:**比较过伸复位联合经皮椎体后凸成形术(percutaneous kyphoplasty, PKP)与单纯 PKP 治疗椎体后壁破裂的骨质疏松性椎体压缩骨折(osteoporotic vertebral compression fracture, OVCF)的临床疗效及安全性。**方法:**回顾性分析 70 例椎体后壁破裂的 OVCF 患者的病例资料,其中采用过伸复位联合 PKP 治疗 38 例(联合组),采用 PKP 治疗 32 例(PKP 组)。男 38 例,女 32 例。年龄 40~80 岁,中位数 60 岁。均为单节段骨折,其中 T₁₁28 例、T₁₂22 例、L₁11 例、L₂9 例。骨质疏松症病程 6 个月至 7 年,中位数 3 年。骨折至就诊时间 1~21 d,中位数 11 d。比较 2 组患者的手术时间、术中出血量、术后住院时间,术后 12 h、24 h、48 h 的胸腰背部疼痛视觉模拟量表(visual analogue scale, VAS)评分,复位前、复位后即刻、术后即刻、术后 3 个月、术后 6 个月的伤椎后凸 Cobb 角及伤椎前缘高度,术前、术后 6 个月的 Oswestry 功能障碍指数(Oswestry disability index, ODI)及日常生活活动能力量表(activity of daily living scale, ADL)评分。随访观察并发症发生情况。**结果:**①一般情况。2 组患者的手术时间、术中出血量、术后住院时间比较,组间差异均无统计学意义[(52.7±5.8)min, (53.1±4.9)min, $t=0.308$, $P=0.759$; (7.4±1.0)mL, (7.2±1.1)mL, $t=0.796$, $P=0.429$; (9.7±1.3)d, (9.5±1.2)d, $t=0.664$, $P=0.509$]。②胸腰背部疼痛 VAS 评分。时间因素和分组因素存在交互效应($F=78.973$, $P=0.000$);2 组患者胸腰背部疼痛 VAS 评分总体比较,组间差异有统计学意义,即存在分组效应($F=5.945$, $P=0.000$);术后不同时间点胸腰背部疼痛 VAS 评分的差异有统计学意义,即存在时间效应($F=61.974$, $P=0.000$);2 组患者胸腰背部疼痛 VAS 评分随时间变化均呈下降趋势,但 2 组的下降趋势不完全一致[(6.8±1.0)分, (5.1±0.9)分, (4.2±0.7)分, $F=56.134$, $P=0.000$; (7.5±1.2)分, (6.7±1.0)分, (5.9±0.8)分, $F=13.878$, $P=0.000$];术后 12 h、24 h、48 h,联合组的胸腰背部疼痛 VAS 评分均低于 PKP 组($t=2.777$, $P=0.007$; $t=7.016$, $P=0.000$; $t=9.060$, $P=0.000$)。③伤椎后凸 Cobb 角。时间因素和分组因素存在交互效应($F=56.075$, $P=0.000$);2 组患者伤椎后凸 Cobb 角总体比较,组间差异有统计学意义,即存在分组效应($F=11.289$, $P=0.000$);手术前后不同时间点伤椎后凸 Cobb 角的差异有统计学意义,即存在时间效应($F=45.201$, $P=0.000$);2 组患者伤椎后凸 Cobb 角随时间变化均呈减小趋势,但 2 组的减小趋势不完全一致(18.7°±2.4°, 6.3°±1.2°, 6.1°±1.3°, 6.2°±1.3°, 6.4°±1.2°, $F=22.397$, $P=0.000$; 18.6°±2.2°, 7.9°±1.3°, 7.8°±1.2°, 7.9°±1.3°, 7.8°±1.3°, $F=15.986$, $P=0.000$);复位前,2 组患者伤椎后凸 Cobb 角的组间差异无统计学意义($t=0.180$, $P=0.857$);复位后即刻、术后即刻、术后 3 个月、术后 6 个月,联合组的伤椎后凸 Cobb 角均小于 PKP 组($t=5.350$, $P=0.000$; $t=5.644$, $P=0.000$; $t=5.450$, $P=0.000$; $t=4.681$, $P=0.000$)。④伤椎前缘高度。时间因素和分组因素存在交互效应($F=36.975$, $P=0.000$);2 组患者伤椎前缘高度总体比较,组间差异有统计学意义,即存在分组效应($F=15.302$, $P=0.000$);手术前后不同时间点伤椎前缘高度的差异有统计学意义,即存在时间效应($F=22.041$, $P=0.000$);2 组患者伤椎前缘高度随时间变化均呈增高趋势,但 2 组的增高趋势不完全一致[(12.3±2.0)mm, (20.6±2.2)mm, (20.4±2.1)mm, (20.5±2.1)mm, (20.7±2.0)mm, $F=18.957$, $P=0.000$; (12.5±2.2)mm, (18.7±2.0)mm, (18.9±2.2)mm, (18.8±2.1)mm, (18.9±2.0)mm, $F=16.093$, $P=0.000$];复位前,2 组患者伤椎前缘高度的组间差异无统计学意义($t=0.398$, $P=0.692$);复位后即刻、术后即刻、术后 3 个月、术后 6 个月,联合组的伤椎前缘高度均高于 PKP 组($t=3.751$, $P=0.000$; $t=2.913$, $P=0.005$; $t=3.374$, $P=0.001$; $t=3.751$, $P=0.000$)。⑤ODI。术前 2 组患者的 ODI 比较,差异无统计学意义($t=0.178$, $P=0.860$);术后 6 个月,2 组患者的 ODI 均较术前降低[(64.3±4.6)%, (19.7±2.3)%, $t=53.458$, $P=0.000$; (64.1±4.8)%, (23.6±2.9)%, $t=40.853$, $P=0.000$],联合组的 ODI 低于 PKP 组($t=6.274$, $P=0.000$)。⑥ADL 评分。术前 2 组患者的 ADL 评分比较,差异无统计学意义($t=0.235$, $P=0.815$);术后 6 个月,2 组患者的 ADL 评分均较术前增高[(41.6±3.5)分, (71.8±5.0)分, $t=30.503$, $P=0.000$; (41.4±3.6)分, (66.2±5.2)分, $t=22.182$, $P=0.000$],联合组的 ADL 评分高于 PKP 组($t=4.584$, $P=0.000$)。⑦安全性。联合组 1 例出现骨水泥渗漏,PKP 组 1 例出现骨水泥渗漏、1 例出现骨折畸形愈合。2 组患者并发症发生率比较,差异无统计学意义($\chi^2=0.023$, $P=0.879$)。**结论:**过伸复位联合 PKP 与单纯 PKP 治疗椎体后壁破裂的 OVCF,二者在手术时间、术中出血量、术后住院时间及安全性方面无明显差异,但前者的临床疗效优于后者。

关键词 脊柱骨折;胸椎;腰椎;骨质疏松性骨折;骨折,压缩性;椎体后凸成形术;过伸复位;临床试验

Hyperextension reduction combined with percutaneous kyphoplasty for treatment of osteoporotic vertebral compression fracture with cracked posterior vertebral body wall

LI Yongge

The People's Hospital of Puyang City, Puyang 457000, Henan, China

ABSTRACT Objective: To compare the clinical curative effects and safety of combination therapy of hyperextension reduction and percutaneous kyphoplasty (PKP) versus monotherapy of PKP for treatment of osteoporotic vertebral compression fracture (OVCF) with cracked posterior vertebral body wall (PVBW). **Methods:** The medical records of 70 OVCF patients with cracked PVBW were analyzed retrospectively. Thirty-eight patients were treated with hyperextension reduction combined with PKP (combination group), and the other patients were treated with monotherapy of PKP (PKP group). The patients consisted of 38 males and 32 females, and ranged in age from 40 to 80 years (Median = 60 yrs) and in disease course of osteoporosis from 6 months to 7 years (Median = 3 yrs). All of the fractures belonged to single-segment fracture, which located at T₁₁ (28), T₁₂ (22), L₁ (11) and L₂ (9). The duration from fracture to visit ranged from 1 to 21 days (Median = 11 days). The operative time, intraoperative blood loss, postoperative hospital stay, thoracolumbar pain visual analogue scale (VAS) scores measured at 12, 24 and 48 hours after the surgery, kyphotic Cobb's angle and anterior border height of injured vertebrae measured before reduction, immediately after reduction, immediately after surgery and at 3 and 6 months after the surgery, Oswestry disability index (ODI) before surgery and at 6 months after the surgery and activity of daily living scale (ADL) scores were compared between the 2 groups. The complications were also observed. **Results:** There was no statistical difference in operative time, intraoperative blood loss and postoperative hospital stay between the 2 groups (52.7 ± 5.8 vs 53.1 ± 4.9 minutes, $t = 0.308$, $P = 0.759$; 7.4 ± 1.0 vs 7.2 ± 1.1 mL, $t = 0.796$, $P = 0.429$; 9.7 ± 1.3 vs 9.5 ± 1.2 days, $t = 0.664$, $P = 0.509$). There was interaction between time factor and group factor in thoracolumbar pain VAS scores ($F = 78.973$, $P = 0.000$). There was statistical difference in thoracolumbar pain VAS scores between the 2 groups in general, in other words, there was group effect ($F = 5.945$, $P = 0.000$). There was statistical difference in thoracolumbar pain VAS scores between different timepoints after the surgery, in other words, there was time effect ($F = 61.974$, $P = 0.000$). The thoracolumbar pain VAS scores presented a time-dependent decreasing trend in both of the 2 groups, while the 2 groups were inconsistent with each other in the decreasing tendency (6.8 ± 1.0, 5.1 ± 0.9, 4.2 ± 0.7 points, $F = 56.134$, $P = 0.000$; 7.5 ± 1.2, 6.7 ± 1.0, 5.9 ± 0.8 points, $F = 13.878$, $P = 0.000$). The thoracolumbar pain VAS scores were lower in combination group compared to PKP group at 12, 24 and 48 hours after the surgery ($t = 2.777$, $P = 0.007$; $t = 7.016$, $P = 0.000$; $t = 9.060$, $P = 0.000$). There was interaction between time factor and group factor in kyphotic Cobb's angle of injured vertebrae ($F = 56.075$, $P = 0.000$). There was statistical difference in kyphotic Cobb's angle of injured vertebrae between the 2 groups in general, in other words, there was group effect ($F = 11.289$, $P = 0.000$). There was statistical difference in kyphotic Cobb's angle of injured vertebrae between different timepoints before and after the surgery, in other words, there was time effect ($F = 45.201$, $P = 0.000$). The kyphotic Cobb's angle of injured vertebrae presented a time-dependent decreasing trend in both of the 2 groups, while the 2 groups were inconsistent with each other in the decreasing tendency (18.7 ± 2.4, 6.3 ± 1.2, 6.1 ± 1.3, 6.2 ± 1.3, 6.4 ± 1.2 degrees, $F = 22.397$, $P = 0.000$; 18.6 ± 2.2, 7.9 ± 1.3, 7.8 ± 1.2, 7.9 ± 1.3, 7.8 ± 1.3 degrees, $F = 15.986$, $P = 0.000$). There was no statistical difference in kyphotic Cobb's angle of injured vertebrae between the 2 groups before reduction ($t = 0.180$, $P = 0.857$). The kyphotic Cobb's angles of injured vertebrae were smaller in combination group compared to PKP group immediately after reduction, immediately after surgery and at 3 and 6 months after the surgery ($t = 5.350$, $P = 0.000$; $t = 5.644$, $P = 0.000$; $t = 5.450$, $P = 0.000$; $t = 4.681$, $P = 0.000$). There was interaction between time factor and group factor in injured vertebrae anterior border height ($F = 36.975$, $P = 0.000$). There was statistical difference in injured vertebrae anterior border height between the 2 groups in general, in other words, there was group effect ($F = 15.302$, $P = 0.000$). There was statistical difference in injured vertebrae anterior border height between different timepoints before and after the surgery, in other words, there was time effect ($F = 22.041$, $P = 0.000$). The injured vertebrae anterior border height presented a time-dependent increasing trend in both of the 2 groups, while the 2 groups were inconsistent with each other in the increasing tendency (12.3 ± 2.0, 20.6 ± 2.2, 20.4 ± 2.1, 20.5 ± 2.1, 20.7 ± 2.0 mm, $F = 18.957$, $P = 0.000$; 12.5 ± 2.2, 18.7 ± 2.0, 18.9 ± 2.2, 18.8 ± 2.1, 18.9 ± 2.0 mm, $F = 16.093$, $P = 0.000$). There was no statistical difference in injured vertebrae anterior border height between the 2 groups before reduction ($t = 0.398$, $P = 0.692$). The injured vertebrae anterior border heights were higher in combination group compared to PKP group immediately after reduction, immediately after surgery and at 3 and 6 months after the surgery ($t = 3.751$, $P = 0.000$; $t = 2.913$, $P = 0.005$; $t = 3.374$, $P = 0.001$; $t = 3.751$, $P = 0.000$). There was no statistical difference in ODI between the 2 groups before the surgery ($t = 0.178$, $P = 0.860$). The ODI decreased in both of the

2 groups at 6 months after the surgery compared to pre-surgery (64.3 ± 4.6 vs $19.7 \pm 2.3\%$, $t = 53.458$, $P = 0.000$; 64.1 ± 4.8 vs $23.6 \pm 2.9\%$, $t = 40.853$, $P = 0.000$), and was lower in combination group compared to PKP group ($t = 6.274$, $P = 0.000$). There was no statistical difference in ADL scores between the 2 groups before surgery ($t = 0.235$, $P = 0.815$). The ADL scores increased in both of the 2 groups at 6 months after the surgery compared to pre-surgery (41.6 ± 3.5 vs 71.8 ± 5.0 points, $t = 30.503$, $P = 0.000$; 41.4 ± 3.6 vs 66.2 ± 5.2 points, $t = 22.182$, $P = 0.000$), and were higher in combination group compared to PKP group ($t = 4.584$, $P = 0.000$). The bone cement leakage was found in 1 patient in combination group and 1 patient in PKP group, and the fracture malunion was found in 1 patient in PKP group. There was no statistical difference in complication incidences between the 2 groups ($\chi^2 = 0.023$, $P = 0.879$). **Conclusion:** There is no significant difference in operative time, intraoperative blood loss, postoperative hospital stay and safety between combination therapy of hyperextension reduction and PKP and monotherapy of PKP for treatment of OVCF with cracked PVBW, however, the former surpasses the latter in clinical curative effects.

Keywords spinal fractures; thoracic vertebrae; lumbar vertebrae; osteoporotic fractures; fractures, compression; kyphoplasty; hyperextension reduction; clinical trial

骨质疏松性椎体压缩骨折 (osteoporotic vertebral compression fracture, OVCF) 临床较为常见, 病情严重时多采用手术方法治疗^[1]。椎体后壁破裂的 OVCF 患者, 胸腰背部疼痛较为明显, 治疗相对困难^[2-3]。经皮椎体后凸成形术 (percutaneous kyphoplasty, PKP) 是治疗 OVCF 的常用方法, 但采用该法治疗椎体后壁破裂的 OVCF, 术后患者的伤椎后凸 Cobb 角、伤椎前缘高度及脊柱功能等恢复效果欠佳^[4-5]。有研究发现, 过伸复位联合 PKP 治疗 OVCF 的效果良好^[6-7], 但目前有关该法治疗椎体后壁破裂的 OVCF 的临床报道相对较少。为了比较过伸复位联合 PKP 与单纯 PKP 治疗椎体后壁破裂的 OVCF 的临床疗效及安全性, 我们回顾性分析了分别采用这 2 种方法治疗的 70 例椎体后壁破裂的 OVCF 患者的病例资料, 现报告如下。

1 临床资料

1.1 一般资料 纳入研究的患者共 70 例, 男 38 例、女 32 例。年龄 40 ~ 80 岁, 中位数 60 岁。均为 2016 年 1 月至 2018 年 1 月在濮阳市人民医院住院治疗的椎体后壁破裂的 OVCF 患者。均为单节段骨折, 其中 T₁₁ 28 例、T₁₂ 22 例、L₁ 11 例、L₂ 9 例。骨质疏松症病程 6 个月至 7 年, 中位数 3 年。骨折至就诊时间 1 ~ 21 d, 中位数 11 d。试验方案经医院医学伦理委员会审查通过。

1.2 纳入标准 ①符合 OVCF 的诊断标准^[8], 且合并椎体后壁破裂; ②单节段椎体骨折; ③采用过伸复位联合 PKP 或单纯 PKP 治疗; ④病例资料完整。

1.3 排除标准 ①合并脊柱陈旧性骨折者; ②合并脊柱结核、多发性骨髓瘤、脊髓神经损伤者; ③椎管内

骨折块占位者; ④合并严重肝肾功能障碍、心脑血管疾病者; ⑤合并其他部位骨折者; ⑥精神病患者。

2 方法

2.1 分组方法 按照治疗方法不同将 70 例椎体后壁破裂的 OVCF 患者分为联合组和 PKP 组。

2.2 治疗方法 联合组采用过伸复位联合 PKP 治疗, PKP 组采用单纯 PKP 治疗。

2.2.1 过伸复位 患者取俯卧位, 胸部、骨盆部用海绵垫高, 腹部悬空, 使胸腰段脊柱保持过伸位。C 形臂 X 线机透视观察复位情况, 复位效果不佳时用海绵垫高肩部及骨盆部, 透视确定胸腰段脊柱处于最大过伸位时停止操作。

2.2.2 PKP 手术 采用局部麻醉, 患者取俯卧位。在透视状态下穿刺, 穿刺位置合适后拔出针芯, 置入工作套管, 用球囊扩张复位, 逐渐撑开塌陷的椎体。透视确定球囊扩张及椎体复位效果良好后, 分 2 次低压灌注骨水泥, 每次先向椎体左侧注入 1 mL、再向椎体右侧注入 1 mL。骨水泥弥散至椎体后 1/4 时停止注射, 取出工作套管, 继续俯卧 10 min 后翻身。术后常规应用抗生素及抗骨质疏松药物。

2.3 疗效及安全性评价方法 比较 2 组患者的手术时间、术中出血量、术后住院时间, 术后 12 h、24 h、48 h 的胸腰背部疼痛视觉模拟量表 (visual analogue scale, VAS) 评分, 复位前、复位后即刻、术后即刻、术后 3 个月、术后 6 个月的伤椎后凸 Cobb 角及伤椎前缘高度, 术前、术后 6 个月的 Oswestry 功能障碍指数 (Oswestry disability index, ODI)^[9] 及日常生活活动能力量表 (activity of daily living scale, ADL)^[10] 评分。随访观察并发症发生情况。

2.4 数据统计方法 采用 SPSS25.0 软件对所得数据进行统计学分析。2 组患者性别、骨折节段的组间比较均采用 χ^2 检验, 2 组患者年龄、骨质疏松症病程、手术时间、术中出血量、术后住院时间以及 ODI、ADL 评分的组间、组内比较均采用 t 检验, 2 组患者胸腰背部疼痛 VAS 评分、伤椎后凸 Cobb 角、伤椎前缘高度的比较均采用重复测量资料的方差分析, 检验水准 $\alpha = 0.05$ 。

3 结果

3.1 分组结果 联合组 38 例, PKP 组 32 例。2 组患者基线资料比较, 差异无统计学意义, 有可比性(表 1)。

3.2 一般情况 2 组患者的手术时间、术中出血量、术后住院时间比较, 组间差异均无统计学意义(表 2)。典型病例影像学图片见图 1。

3.3 疗效及安全性评价结果

3.3.1 胸腰背部疼痛 VAS 评分 时间因素和分组因素存在交互效应; 2 组患者胸腰背部疼痛 VAS 评分总体比较, 组间差异有统计学意义, 即存在分组效应; 术后不同时间点胸腰背部疼痛 VAS 评分的差异有统计学意义, 即存在时间效应; 2 组患者胸腰背部疼痛 VAS 评分随时间变化均呈下降趋势, 但 2 组的下降趋势不完全一致; 术后 12 h、24 h、48 h, 联合组的胸腰背

部疼痛 VAS 评分均低于 PKP 组(表 3)。

3.3.2 伤椎后凸 Cobb 角 时间因素和分组因素存在交互效应; 2 组患者伤椎后凸 Cobb 角总体比较, 组间差异有统计学意义, 即存在分组效应; 手术前后不同时间点伤椎后凸 Cobb 角的差异有统计学意义, 即存在时间效应; 2 组患者伤椎后凸 Cobb 角随时间变化均呈减小趋势, 但 2 组的减小趋势不完全一致; 复位前, 2 组患者伤椎后凸 Cobb 角的组间差异无统计学意义; 复位后即刻、术后即刻、术后 3 个月、术后 6 个月, 联合组的伤椎后凸 Cobb 角均小于 PKP 组(表 4)。

3.3.3 伤椎前缘高度 时间因素和分组因素存在交互效应; 2 组患者伤椎前缘高度总体比较, 组间差异有统计学意义, 即存在分组效应; 手术前后不同时间点伤椎前缘高度的差异有统计学意义, 即存在时间效应; 2 组患者伤椎前缘高度随时间变化均呈增高趋势, 但 2 组的增高趋势不完全一致; 复位前, 2 组患者伤椎前缘高度的组间差异无统计学意义; 复位后即刻、术后即刻、术后 3 个月、术后 6 个月, 联合组的伤椎前缘高度均高于 PKP 组(表 5)。

3.3.4 ODI 术前 2 组患者的 ODI 比较, 差异无统计学意义; 术后 6 个月, 2 组患者的 ODI 均较术前降低,

表 1 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者基线资料

组别	样本量 (例)	性别(例)		年龄 ($\bar{x} \pm s$, 岁)	骨质疏松症病程 ($\bar{x} \pm s$, 年)	骨折节段(例)			
		男	女			T ₁₁	T ₁₂	L ₁	L ₂
联合组	38	21	17	57.2 \pm 7.6	3.3 \pm 1.0	15	12	6	5
PKP 组	32	17	15	56.9 \pm 7.4	3.4 \pm 1.0	13	10	5	4
检验统计量		$\chi^2 = 0.032$		$t = 0.167$	$t = 0.417$	$\chi^2 = 0.263$			
P 值		0.858		0.868	0.678	0.792			

PKP: 经皮椎体后凸成形术



患者, 男, 66 岁, T₁₂ 椎体骨质疏松性压缩骨折, 采用过伸复位联合经皮椎体后凸成形术治疗

图 1 椎体后壁破裂的骨质疏松性椎体压缩骨折手术前后图片

联合组的 ODI 低于 PKP 组(表 6)。

3.3.5 ADL 评分 术前 2 组患者的 ADL 评分比较, 差异无统计学意义; 术后 6 个月, 2 组患者的 ADL 评分均较术前增高, 联合组的 ADL 评分高于 PKP 组(表 7)。

3.3.6 安全性 联合组 1 例出现骨水泥渗漏, PKP 组 1 例出现骨水泥渗漏、1 例出现骨折畸形愈合。2 组患者并发症发生率比较, 差异无统计学意义($\chi^2 = 0.023, P = 0.879$)。

表 2 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者手术时间、术中出血量、术后住院时间

组别	样本量(例)	手术时间($\bar{x} \pm s$, min)	术中出血量($\bar{x} \pm s$, mL)	术后住院时间($\bar{x} \pm s$, d)
联合组	38	52.7 ± 5.8	7.4 ± 1.0	9.7 ± 1.3
PKP 组	32	53.1 ± 4.9	7.2 ± 1.1	9.5 ± 1.2
<i>t</i> 值		0.308	0.796	0.664
<i>P</i> 值		0.759	0.429	0.509

PKP: 经皮椎体后凸成形术

表 3 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者术后胸腰背部疼痛 VAS 评分

组别	样本量(例)	胸腰背部疼痛 VAS 评分($\bar{x} \pm s$, 分)				<i>F</i> 值	<i>P</i> 值
		术后 12 h	术后 24 h	术后 48 h	合计		
联合组	38	6.8 ± 1.0	5.1 ± 0.9	4.2 ± 0.7	5.4 ± 0.9	56.134	0.000
PKP 组	32	7.5 ± 1.2	6.7 ± 1.0	5.9 ± 0.8	6.7 ± 1.0	13.878	0.000
合计	70	7.1 ± 1.1	5.9 ± 1.0	4.9 ± 0.8	6.0 ± 0.9	61.974 ¹⁾	0.000 ¹⁾
检验统计量		<i>t</i> = 2.777	<i>t</i> = 7.016	<i>t</i> = 9.060	5.945 ¹⁾	<i>F</i> = 78.973 ²⁾ ,	
<i>P</i> 值		0.007	0.000	0.000	0.000 ¹⁾	<i>P</i> = 0.000 ²⁾	

VAS: 视觉模拟量表; PKP: 经皮椎体后凸成形术; 1) 主效应的 *F* 值和 *P* 值; 2) 交互效应的 *F* 值和 *P* 值

表 4 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者手术前后伤椎后凸 Cobb 角

组别	样本量(例)	伤椎后凸 Cobb 角($\bar{x} \pm s$, °)						<i>F</i> 值	<i>P</i> 值
		复位前	复位后即刻	术后即刻	术后 3 个月	术后 6 个月	合计		
联合组	38	18.7 ± 2.4	6.3 ± 1.2	6.1 ± 1.3	6.2 ± 1.3	6.4 ± 1.2	8.7 ± 1.5	22.397	0.000
PKP 组	32	18.6 ± 2.2	7.9 ± 1.3	7.8 ± 1.2	7.9 ± 1.3	7.8 ± 1.3	10.0 ± 1.5	15.986	0.000
合计	70	18.7 ± 2.3	7.0 ± 1.2	6.9 ± 1.3	7.0 ± 1.3	7.0 ± 1.2	9.3 ± 1.5	45.201 ¹⁾	0.000 ¹⁾
检验统计量		<i>t</i> = 0.180	<i>t</i> = 5.350	<i>t</i> = 5.644	<i>t</i> = 5.450	<i>t</i> = 4.681	11.289 ¹⁾	<i>F</i> = 56.075 ²⁾ ,	
<i>P</i> 值		0.857	0.000	0.000	0.000	0.000	0.000 ¹⁾	<i>P</i> = 0.000 ²⁾	

PKP: 经皮椎体后凸成形术; 1) 主效应的 *F* 值和 *P* 值; 2) 交互效应的 *F* 值和 *P* 值

表 5 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者手术前后伤椎前缘高度

组别	样本量(例)	伤椎前缘高度($\bar{x} \pm s$, mm)						<i>F</i> 值	<i>P</i> 值
		复位前	复位后即刻	术后即刻	术后 3 个月	术后 6 个月	合计		
联合组	38	12.3 ± 2.0	20.6 ± 2.2	20.4 ± 2.1	20.5 ± 2.1	20.7 ± 2.0	18.9 ± 2.1	18.957	0.000
PKP 组	32	12.5 ± 2.2	18.7 ± 2.0	18.9 ± 2.2	18.8 ± 2.1	18.9 ± 2.0	17.6 ± 2.1	16.093	0.000
合计	70	12.4 ± 2.1	19.7 ± 2.1	19.7 ± 2.1	19.7 ± 2.1	19.9 ± 2.0	18.3 ± 2.1	22.041 ¹⁾	0.000 ¹⁾
检验统计量		<i>t</i> = 0.398	<i>t</i> = 3.751	<i>t</i> = 2.913	<i>t</i> = 3.374	<i>t</i> = 3.751	15.302 ¹⁾	<i>F</i> = 36.975 ²⁾ ,	
<i>P</i> 值		0.692	0.000	0.005	0.001	0.000	0.000 ¹⁾	<i>P</i> = 0.000 ²⁾	

PKP: 经皮椎体后凸成形术; 1) 主效应的 *F* 值和 *P* 值; 2) 交互效应的 *F* 值和 *P* 值

表 6 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者手术前后 ODI

组别	样本量(例)	ODI($\bar{x} \pm s$)		<i>t</i> 值	<i>P</i> 值
		术前	术后 6 个月		
联合组	38	(64.3 ± 4.6)%	(19.7 ± 2.3)%	53.458	0.000
PKP 组	32	(64.1 ± 4.8)%	(23.6 ± 2.9)%	40.853	0.000
<i>t</i> 值		0.178	6.274		
<i>P</i> 值		0.860	0.000		

PKP: 经皮椎体后凸成形术; ODI: Oswestry 功能障碍指数

表 7 2 组椎体后壁破裂的骨质疏松性椎体压缩骨折患者手术前后 ADL 评分

组别	样本量(例)	ADL 评分($\bar{x} \pm s$, 分)		<i>t</i> 值	<i>P</i> 值
		术前	术后 6 个月		
联合组	38	41.6 ± 3.5	71.8 ± 5.0	30.503	0.000
PKP 组	32	41.4 ± 3.6	66.2 ± 5.2	22.182	0.000
<i>t</i> 值		0.235	4.584		
<i>P</i> 值		0.815	0.000		

PKP:经皮椎体后凸成形术; ADL:日常生活活动能力量表

4 讨 论

骨质疏松症是一种以骨量减少、骨组织显微结构破坏为特征,导致脆性增加及易于骨折的代谢性骨病。引起椎体压缩骨折的原因较多,骨质疏松是重要原因之一,对于合并骨质疏松症的患者,低能量损伤即可造成椎体压缩骨折^[11-14]。椎体后壁破裂的 OVCF,手术治疗难度相对较大,骨水泥渗漏风险较高,脊柱功能及日常生活活动能力恢复相对缓慢^[15-17]。PKP 治疗 OVCF 效果良好,但是 PKP 治疗椎体后壁破裂的 OVCF,术中穿刺难度较大,且容易发生骨水泥渗漏^[7,18]。

PKP 主要通过球囊扩张恢复塌陷椎体的高度,通过向球囊扩张后形成的空腔内注入骨水泥恢复椎体的强度^[19-20]。对于椎体后壁破裂的 OVCF,PKP 术前进行过伸复位有利于手术操作,且不会造成不必要的损伤^[21-22]。研究表明,过伸复位可以增加受伤椎体前纵韧带的张力,有利于恢复椎体高度;可以增加受压骨组织的体积,有利于术中穿刺及注入骨水泥;可以改善脊柱畸形,有利于术后脊柱功能恢复^[23-26]。PKP 术中应注意低压灌注骨水泥、控制骨水泥的注入量、认真观察骨水泥弥散情况,降低骨水泥渗漏的风险。

本研究结果显示,过伸复位联合 PKP 与单纯 PKP 治疗椎体后壁破裂的 OVCF,二者在手术时间、术中出血量、术后住院时间及安全性方面无明显差异,但前者的临床疗效优于后者。

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