

经椎弓根打压植骨与经后路椎体次全切除 治疗Ⅲ期 Kümmell 病的对比研究

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摘要 **目的:**比较经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定术和经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗Ⅲ期 Kümmell 病的临床疗效和安全性。**方法:**收集 2010 年 8 月至 2015 年 10 月在郑州市骨科医院住院治疗的Ⅲ期 Kümmell 病患者的病例资料进行回顾性研究。符合要求的患者共 46 例, 其中 24 例采用经伤椎椎弓根打压植骨术治疗(椎弓根植骨组)、22 例采用经后路椎体次全切除术治疗(椎体次全切组), 同时两组均行后路长节段椎弓根螺钉内固定术。比较 2 组患者的手术时间、术中出血量、疼痛视觉模拟量表(visual analogue scale, VAS)评分、脊柱后凸 Cobb 角、日本整形外科学会(Japanese orthopaedic association, JOA)腰痛疾患评分、JOA 腰痛疾患恢复率, 以及治疗和随访期间的并发症发生情况。**结果:**所有患者均顺利完成手术, 椎弓根植骨组的手术时间、术中出血量均小于椎体次全切组[(98 ± 11) min, (192 ± 26) min, $t = 5.624$, $P = 0.003$; (290 ± 26) mL, (890 ± 95) mL, $t = 2.638$, $P = 0.028$]。2 组患者均获得随访, 随访时间 16 ~ 63 个月, 中位数 34 个月。椎弓根植骨组 2 例患者术后出现手术切口延迟愈合, 经换药及应用抗生素治疗后愈合。椎体次全切组 2 例术中发生硬膜撕裂, 术中未进行硬膜缺损修补, 术后 6 ~ 8 d 脑脊液漏自行停止; 1 例发生短暂性神经损伤, 2 周后完全恢复。2 组均未发现内固定松动断裂、脊柱后凸矫正丢失等并发症。2 组患者的并发症发生率比较, 差异无统计学意义($\chi^2 = 0.011$, $P = 0.918$)。术前 2 组患者的疼痛 VAS 评分比较, 差异无统计学意义($t = 0.829$, $P = 0.412$); 术后 3 个月时, 2 组患者的疼痛 VAS 评分均降低[(9.20 ± 0.60) 分, (2.70 ± 0.50) 分, $t = 40.771$, $P = 0.000$; (8.70 ± 0.50) 分, (2.90 ± 0.70) 分, $t = 31.625$, $P = 0.000$], 2 组患者疼痛 VAS 评分的差异无统计学意义($t = 0.583$, $P = 0.667$)。术前 2 组患者的 JOA 评分比较, 差异无统计学意义($t = 0.817$, $P = 0.416$); 术后 3 个月时, 2 组患者的 JOA 评分均增加[(13.20 ± 2.90) 分, (27.20 ± 1.50) 分, $t = 21.007$, $P = 0.000$; (12.60 ± 2.40) 分, (27.60 ± 1.80) 分, $t = 23.452$, $P = 0.000$], 2 组患者 JOA 评分的差异无统计学意义($t = 0.679$, $P = 0.593$)。术后 3 个月时, 2 组患者 JOA 腰痛疾患恢复率的差异无统计学意义[(83.20 ± 11.50)%, (81.70 ± 10.80)%, $t = 0.385$, $P = 0.617$]。术前 2 组患者的脊柱后凸 Cobb 角比较, 差异无统计学意义($t = 0.735$, $P = 0.455$); 术后 3 个月时, 2 组患者的脊柱后凸 Cobb 角均减小(32.5° ± 2.3°, 7.60° ± 0.60°, $t = 51.319$, $P = 0.000$; 37.40° ± 2.80°, 0.80° ± 0.30°, $t = 60.962$, $P = 0.000$), 椎体次全切组的脊柱后凸 Cobb 角小于椎弓根植骨组($t = 3.506$, $P = 0.008$)。**结论:**经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定术和经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗Ⅲ期 Kümmell 病, 均能有效减轻患者的疼痛症状、纠正脊柱后凸畸形、改善脊柱功能, 并且均具有较好的安全性; 后者纠正脊柱后凸畸形的效果优于前者, 但前者的手术时间短、术中出血量少。

关键词 脊柱骨折; 骨质疏松性骨折; Kümmell 病; 骨移植; 骨折固定术, 内; 椎体次全切除

A comparative study of transpedicular impaction bone grafting versus subtotal vertebrectomy through posterior approach for treatment of phase III Kümmell's diseases

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ABSTRACT Objective: To compare the clinical curative effects and the safety of combination therapy of transpedicular impaction bone grafting and long-segment internal fixation with pedicle screws through posterior approach versus combination therapy of subtotal vertebrectomy and long-segment internal fixation with pedicle screws through posterior approach in the treatment of phase III Kümmell's diseases.

Methods: The medical records of patients with phase III Kümmell's diseases who were treated in Zhengzhou Orthopedic Hospital from August 2010 to October 2015 were collected and retrospectively studied. Forty-six patients enrolled in the study were treated with long-segment internal fixation with pedicle screws through posterior approach, moreover, 24 patients were treated with transpedicular impaction bone

基金项目: 河南省郑州市科技人才队伍建设项目——科技领军人才项目(131PLJRC673); 河南省郑州市普通科技攻关项目(141PPTGG327)

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grafting (group A), and the others were treated with subtotal vertebrectomy through posterior approach (group B). The operative time, intraoperative blood loss, pain visual analogue scale (VAS) scores, Cobb angle of kyphotic deformity, Japanese orthopaedic association (JOA) low back pain scores, JOA low back pain recovery rate and complications during treatment period and follow-up period were compared between the 2 groups. **Results:** The surgeries were finished successfully in all patients. The operative time was shorter and the intraoperative blood loss was less in group A compared to group B (98 ± 11 vs 192 ± 26 min, $t = 5.624$, $P = 0.003$; 290 ± 26 vs 890 ± 95 mL, $t = 2.638$, $P = 0.028$). All patients in the 2 groups were followed up for 16–63 months with a median of 34 months. Delayed healing of surgical incisions were found in 2 patients in group A after surgery, and the incisions healed after dressing change and antibiotic treatment. Intraoperative dural tear (2) and transient nerve injury (1) were found in patients in group B, and no dural defect repairing was performed during the surgery and the cerebrospinal fluid leakage stopped at 6–8 days after surgery, and the transient nerve fully recovered from injury 2 weeks later. No complications such as loosening or breakage of internal fixators and loss of kyphotic correction were found in the 2 groups. There was no statistical difference in complication incidences between the two groups ($\chi^2 = 0.011$, $P = 0.918$). There was no statistical difference in pain VAS scores between the 2 groups before surgery ($t = 0.829$, $P = 0.412$). The pain VAS scores decreased in both of the 2 groups at 3 months after the surgery (9.20 ± 0.60 vs 2.70 ± 0.50 points, $t = 40.771$, $P = 0.000$; 8.70 ± 0.50 vs 2.90 ± 0.70 points, $t = 31.625$, $P = 0.000$), and there was no statistical difference in pain VAS scores between the 2 groups ($t = 0.583$, $P = 0.667$). There was no statistical difference in JOA scores between the 2 groups before surgery ($t = 0.817$, $P = 0.416$). The JOA scores increased in both of the 2 groups at 3 months after the surgery (13.20 ± 2.90 vs 27.20 ± 1.50 points, $t = 21.007$, $P = 0.000$; 12.60 ± 2.40 vs 27.60 ± 1.80 points, $t = 23.452$, $P = 0.000$), and there was no statistical difference in JOA scores between the 2 groups ($t = 0.679$, $P = 0.593$). There was no statistical difference in JOA low back pain recovery rate between the 2 groups at 3 months after the surgery (83.20 ± 11.50 vs $81.70 \pm 10.80\%$, $t = 0.385$, $P = 0.617$). There was no statistical difference in Cobb angle of kyphotic deformity between the 2 groups before surgery ($t = 0.735$, $P = 0.455$). The Cobb angle of kyphotic deformity decreased in both of the 2 groups at 3 months after the surgery (32.5 ± 2.3 vs 7.60 ± 0.60 degrees, $t = 51.319$, $P = 0.000$; 37.40 ± 2.80 vs 0.80 ± 0.30 degrees, $t = 60.962$, $P = 0.000$), and the Cobb angle of kyphotic deformity was smaller in group B compared to group A ($t = 3.506$, $P = 0.008$). **Conclusion:** Both the combination therapy of transpedicular impaction bone grafting and long-segment internal fixation with pedicle screws through posterior approach and the combination therapy of subtotal vertebrectomy and long-segment internal fixation with pedicle screws through posterior approach can effectively alleviate pain, correct kyphotic deformity and improve spinal function in the treatment of phase III Kümmell's diseases, and both of them have high safety. However, the latter surpasses the former in correcting kyphotic deformity, while the former has the advantages of shorter operative time and less intraoperative blood loss compared to the latter.

Keywords spinal fractures; osteoporotic fractures; Kümmell's disease; bone transplantation; fracture fixation, internal; subtotal vertebrectomy

随着社会人口老龄化的不断进展,骨质疏松性椎体压缩骨折的发生率逐年增高^[1]。Kümmell 病也称为创伤后椎体迟发性骨坏死,作为一种特殊类型的骨质疏松性椎体压缩骨折,其发病机制目前仍未完全明确^[2]。由于该病早期临床症状及影像学表现缺乏特异性,很容易误诊,待后期发生椎体塌陷、椎体内假关节形成、脊柱后凸畸形时就会出现严重的腰背部疼痛,甚至出现脊髓压迫症状^[3]。

经皮椎体成形术 (percutaneous vertebroplasty, PVP) 或经皮椎体后凸成形术 (percutaneous kyphoplasty, PKP) 对不合并神经系统损伤症状的 Kümmell 病有良好的疗效^[4–5]。椎体后方皮质破裂合并脊髓压迫,被认为是 PVP 或 PKP 治疗的相对禁忌证^[6],多建议行前路减压植骨融合术^[7]、后路椎体次全切除内固定术^[8]、前后路联合手术^[9]。为比较经伤椎椎弓根打压

植骨联合后路长节段椎弓根螺钉内固定术和经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗 III 期 Kümmell 病的临床疗效和安全性,我们进行了一项回顾性研究,现总结报告如下。

1 临床资料

1.1 一般资料 收集 2010 年 8 月至 2015 年 10 月在郑州市骨科医院住院治疗的 Kümmell 病患者的病例资料进行回顾性研究。试验方案经医院医学伦理委员会审查通过。

1.2 诊断标准 采用 Li 等^[10]制定的 Kümmell 病诊断标准:①患者多在轻微外伤史后出现疼痛,数日或数周后疼痛逐渐缓解或消失,经历一段症状隐匿期后再度复发并加重,出现迟发性椎体塌陷伴脊柱后凸畸形。②X 线片可见伤椎椎体压缩改变,椎体内部呈现“真空征”或“裂隙征”;CT 图像可见椎体内“空壳样

改变”;病变在 MRI T1WI 呈低信号改变,在 T2WI 及脂肪抑制像呈界限清晰的高信号区域。

1.3 纳入标准 ①符合上述诊断标准;②按 Li 等^[10]的 Kummell 病分期标准属于Ⅲ期;③以双能 X 线吸收法测定的腰椎及髋部骨密度 T 值 ≤ -2.5 SD;④采用经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定术治疗或经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗;⑤治疗及随访资料完整。

1.4 排除标准 ①合并其他脊柱病变,可能影响疗

效评价者;②有脊柱骨折史或手术史者。

2 方法

2.1 分组方法 纳入研究的患者共 46 例,其中 24 例采用经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定术治疗者纳入椎弓根植骨组、22 例采用经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗者纳入椎体次全切组。2 组患者的基线资料比较,差异均无统计学意义,有可比性(表 1)。

表 1 2 组Ⅲ期 Kummell 病患者的基线资料比较

组别	样本量(例)	性别(例)		年龄 ($\bar{x} \pm s$, 岁)	骨折椎体(例)		
		男	女		T ₁₂	L ₁	L ₂
椎弓根植骨组	24	3	21	68.5 \pm 3.5	10	12	2
椎体次全切组	22	3	19	66.3 \pm 2.9	10	11	1
检验统计量		$\chi^2 = 0.000$		$t = 1.435$			
P 值		1.000		0.162		1.000	

2.2 治疗方法

2.2.1 椎弓根植骨组 采用全身麻醉,患者俯卧,在胸部和骨盆下放置海绵垫使腹部悬空。C 形臂 X 线机透视定位后,经脊柱后正中入路,以伤椎为中心显露上、下各 2 个正常节段,向两侧暴露椎板至关节突关节外缘。分别在伤椎上、下各 2 个节段置入椎弓根螺钉(重度骨质疏松患者,先经椎弓根注射 1.5 mL 骨水泥,然后置入椎弓根螺钉)。透视下于伤椎两侧椎弓根入钉点部位经椎弓根进入椎体骨坏死部位[图 1(1)],后用直径 5.0 mm 椎弓根钉扩大经椎弓根通道[图 1(2)]。植骨通道建立后,用直径 3.0 mm 刮匙清理椎体内坏死松质骨组织及肉芽组织,尽可能显露出椎体内周壁的健康骨组织,并用刮匙向伤椎上下两个终板方向进行撬拨[图 1(3)、图 1(4)、图 1(5)]。此时可看到伤椎上下终板的距离增加,后凸畸形部分改善。用直径 4.0 mm 的导棒将 3 mm \times 3 mm \times 3 mm 大小的同种异体骨粒经椎弓根植骨通道推入椎体内,并不断打击骨粒,使伤椎前、后缘高度逐渐一致[图 1(6)、图 1(7)]。放置双侧预弯的连接棒,并逐个拧紧螺帽。透视确认伤椎椎体内植骨充填良好、植骨颗粒未进入椎管,切口内无活动性出血,逐层缝合切口。术后 2~3 d(24 h 引流量 < 50 mL 时)拔除引流管,常规使用抗骨质疏松药物,配合综合康复治疗。

2.2.2 椎体次全切组 采用全身麻醉,患者俯卧。C

形臂 X 线机透视定位后,经脊柱后正中切口,以伤椎为中心至少显露上、下各 2 个正常节段,并分别在伤椎上、下各 2 个节段置入椎弓根螺钉。切除伤椎棘突和单侧椎板、伤椎上下关节突、伤椎上一椎体同侧下关节突及伤椎下一椎体同侧上关节突,显露脊髓及神经根。经同侧切除伤椎上下软骨终板及椎间盘,经椎弓根骨膜下剥离至椎体前方,并切除伤椎大部分椎体及椎间孔内的黄韧带结构,测量伤椎上下椎间高度,置入填满碎骨粒的钛笼,放置双侧预弯连接棒并适当加压固定。术后处理同椎弓根植骨组。

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、疼痛视觉模拟量表(visual analogue scale, VAS)评分、脊柱后凸 Cobb 角、日本整形外科学会(Japanese orthopaedic association, JOA)腰痛疾患评分^[11]、JOA 腰痛疾患恢复率,以及治疗和随访期间的并发症发生情况。JOA 腰痛疾患恢复率 = (术后 JOA 评分 - 术前 JOA 评分) / (29 - 术前 JOA 评分) \times 100%^[6]。

2.4 数据统计方法 采用 SPSS19.0 软件进行数据统计分析。2 组患者性别、并发症发生率的组间比较均采用连续校正 χ^2 检验,骨折椎体的组间比较采用 Fisher 确切概率法,年龄、手术时间、术中出血量、JOA 腰痛疾患恢复率的组间比较及疼痛 VAS 评分、JOA 评分、脊柱后凸 Cobb 角的组间和组内比较均采用 t 检验。检验水准 $\alpha = 0.05$ 。

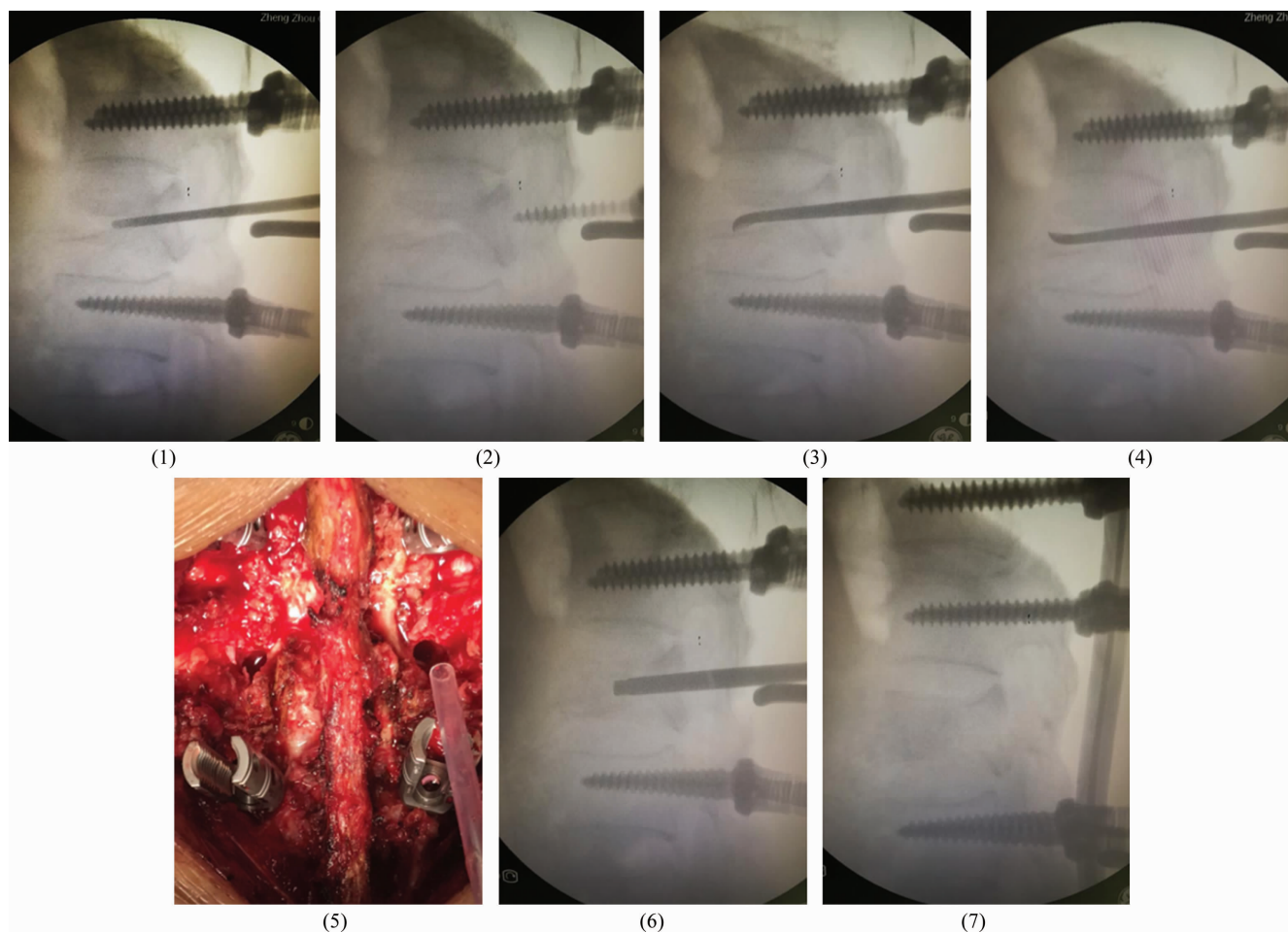


图1 经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定治疗Ⅲ期 Kümmell 病手术图片

3 结 果

所有患者均顺利完成手术,椎弓根植骨组的手术时间、术中出血量均小于椎体次全切组 $[(98 \pm 11) \text{ min}, (192 \pm 26) \text{ min}, t = 5.624, P = 0.003; (290 \pm 26) \text{ mL}, (890 \pm 95) \text{ mL}, t = 2.638, P = 0.028]$ 。2组患者均获得随访,随访时间16~63个月,中位数34个月。椎弓根植骨组2例患者术后出现手术切口延迟愈合,经换药及应用抗生素治疗后愈合。椎体次全切组2例术中发生硬膜撕裂,术中未进行硬膜缺损修补,严密缝合肌层及筋膜,放置引流管并局部加压包扎,术后6~8 d脑脊液漏自行停止;1例发生短暂性神经损伤,2周后完全恢复。2组均未发现内固定松动断裂、脊柱后凸矫正丢失等并发症。2组患者的并发症发生率比较,差异无统计学意义($\chi^2 = 0.011, P = 0.918$)。

术前2组患者的疼痛VAS评分比较,差异无统计学意义;术后3个月时,2组患者的疼痛VAS评分均降低,2组患者疼痛VAS评分的差异无统计学意义(表2)。术前2组患者的JOA评分比较,差异无统计

学意义;术后3个月时,2组患者的JOA评分均增加,2组患者JOA评分的差异无统计学意义(表3)。术后3个月时,2组患者JOA腰痛疾患恢复率的差异无统计学意义 $[(83.2 \pm 11.5) \%, (81.7 \pm 10.8) \%, t = 0.385, P = 0.617]$ 。术前2组患者的脊柱后凸Cobb角比较,差异无统计学意义;术后3个月时,2组患者的脊柱后凸Cobb角均减小,椎体次全切组的脊柱后凸Cobb角小于椎弓根植骨组(表4)。典型病例影像资料见图2、图3。

4 讨 论

Kümmell病由德国外科医生Hermann Kümmell于1895年首次报道。该病主要表现为不同程度脊柱创伤后出现轻微疼痛,经过长短不一的无症状期后出现明显的腰背部疼痛及脊柱后凸畸形,影像学检查可见迟发性椎体塌陷和特征性的椎体内真空裂隙改变。Kümmell病病理机制复杂,目前对其病因、发病机制及治疗方法尚未达成共识^[12-13]。

2004年Li等^[10]根据129例Kümmell病患者的X线、MRI特征及临床表现,将该病分为3期,并认为应



图 2 经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定治疗Ⅲ期 Kümmell 病手术前后影像图片

(1)(2) 术前 X 线片示 L₁ 椎体压缩骨折, 椎体前缘高度降低, 脊柱后凸畸形; (3)(4)(5) 术前 CT 显示病变呈现典型 Kümmell 病影像学表现; (6) 术前 MRI 示 L₁ 椎体内低信号, 积气征; (7)(8) 术后 3 个月 X 线片见 L₁ 椎体高度恢复, 钉道内见骨水泥强化影; (9)(10)(11) 术后 3 个月 CT 可见椎体内骨粒打压结实, 分布均匀

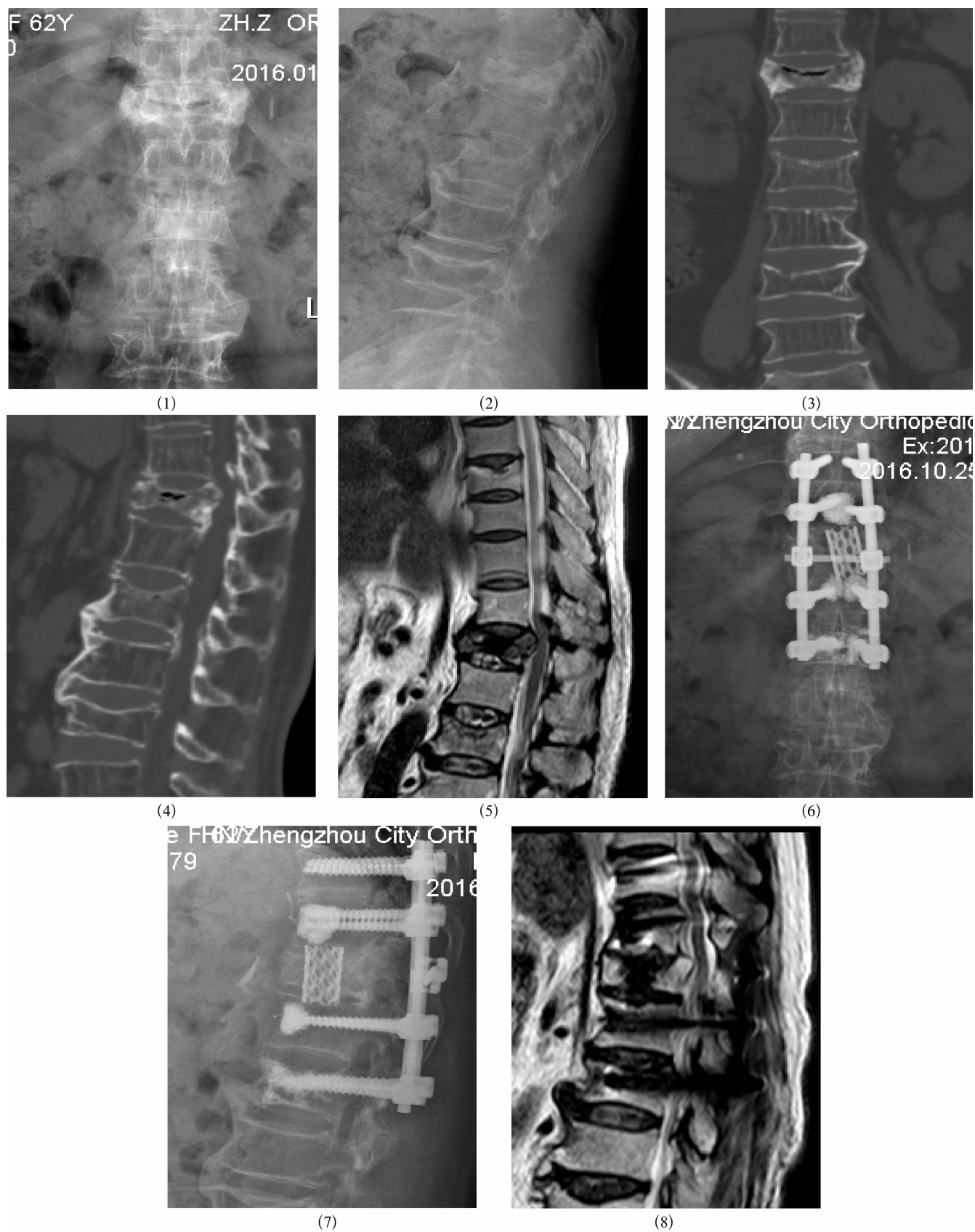


图3 经后路椎体次全切除联合后路长节段椎弓根螺钉内固定治疗Ⅲ期 Kümmell 病手术前后影像图片

(1)(2)术前X线片示T₁₂椎体压缩骨折,椎体前缘高度降低,脊柱后凸畸形;(3)(4)术前CT显示病变呈现典型 Kümmell 病影像学表现;(5)术前MRI示T₁₂椎体内低信号,积气征,椎体后壁向后压迫脊髓;(6)(7)术后10个月X线片可见T₁₂椎体高度恢复,内固定位置良好,部分骨性融合,钉道内见骨水泥强化影;(8)术后10个月MRI示脊髓不受压迫

表 2 2 组Ⅲ期 Kümmell 病患者的疼痛视觉模拟量表评分 $\bar{x} \pm s$, 分

组别	样本量(例)	术前	术后 3 个月	<i>t</i> 值	<i>P</i> 值
椎弓根植骨组	24	9.20 ± 0.60	2.70 ± 0.50	40.771	0.000
椎体次全切组	22	8.70 ± 0.50	2.90 ± 0.70	31.625	0.000
<i>t</i> 值		0.829	0.583		
<i>P</i> 值		0.412	0.667		

表 3 2 组Ⅲ期 Kümmell 病患者的日本整形外科学会腰痛疾患评分 $\bar{x} \pm s$, 分

组别	样本量(例)	术前	术后 3 个月	<i>t</i> 值	<i>P</i> 值
椎弓根植骨组	24	13.20 ± 2.90	27.20 ± 1.50	21.007	0.000
椎体次全切组	22	12.60 ± 2.40	27.60 ± 1.80	23.452	0.000
<i>t</i> 值		0.817	0.679		
<i>P</i> 值		0.416	0.593		

表 4 2 组Ⅲ期 Kümmell 病患者的脊柱后凸 Cobb 角 $\bar{x} \pm s$, °

组别	样本量(例)	术前	术后 3 个月	<i>t</i> 值	<i>P</i> 值
椎弓根植骨组	24	32.50 ± 2.30	7.60 ± 0.60	51.319	0.000
椎体次全切组	22	37.40 ± 2.80	0.80 ± 0.30	60.962	0.000
<i>t</i> 值		0.735	3.506		
<i>P</i> 值		0.455	0.008		

采用该分期诊治。PVP 和 PKP 对 I、II 期 Kümmell 病有着良好的疗效,其原因可能在于骨水泥的注入不仅能使椎体获得良好的强化与稳定,并能烧灼椎体内末梢神经,以缓解疼痛^[14]。但这 2 种手术对脊柱后凸畸形的纠正有限,对存在神经压迫者也无法进行有效减压,而且存在较高的骨水泥渗漏率^[15-16],因而被视为Ⅲ期 Kümmell 病的相对禁忌证^[17]。

对于伴有神经症状的 Kümmell 病患者,手术的目的在于彻底脊髓减压,恢复脊柱生理曲度,并维持脊柱稳定。2002 年 Suk 等^[18]首次报道以后路椎体全切除术治疗严重脊柱畸形,并取得了良好的疗效。目前该手术已成为纠正严重脊柱畸形最为有效的手术方法^[19]。随着椎体塌陷的加重,Kümmell 病患者后期会出现严重的脊柱后凸畸形,治疗不仅要矫正后凸畸形,还要保证椎体的骨性愈合,治疗难度较大。Yang 等^[8]采用改良经后路椎体全切除术治疗 10 例 Kümmell 病患者,术后平均随访 15 个月,结果表明应用该手术治疗 Kümmell 病安全有效,尤其是适用于脊柱后凸畸形明显、合并神经受压症状的患者。后路椎体全切除术矫正脊柱畸形的优势在于通过单个节段获得显著的矫形效果,而不是依靠长节段固定中各个节段分担的矫形力。Kümmell 病多发生于重度骨质疏松患者,采用后路椎体全切除术治疗Ⅲ期 Kümmell 病,需要完全切除后侧骨性结构,术后应力将全部集中在前路人工椎体和后路钉棒结构上。而后路椎体

次全切除术在保留一部分后侧及椎体结构的前提下,术后应力将不会完全集中在前路人工椎体和后路钉棒结构上,有助于减少内固定失败的发生率。另外,后路椎体全切除术创伤较大,也极易导致严重的脊髓损伤。

近年来有文献报道采用后路椎弓根钉棒固定联合骨水泥强化治疗 Kümmell 病可取得明显疗效。黎一兵等^[20]采用椎体内骨水泥强化结合后路短节段固定治疗 Kümmell 病 43 例,术后疗效显著,但 5 年随访结果显示椎体平均高度、Cobb 角等与术前比较无统计学差异,认为该方法不能为伤椎提供长期有效的支撑。相比之下,在椎体内植入自体或异体颗粒骨,组织反应小且易于诱导骨形成、促进骨融合。植骨充分打压后,在恢复骨折椎体高度的同时恢复了其内部的骨性结构,避免了“蛋壳现象”。生物力学研究结果显示,通过椎弓根向骨折椎体内打压植骨,可增加骨量,从而产生容积效应,可以很好地改善骨折椎体的力学性能,恢复其强度及刚度^[21]。2013 年 Lee 等^[22]报道采用后路短节段固定结合伤椎打压植骨治疗 Kümmell 病患者 36 例,术后 5 年随访发现患者疼痛缓解未得到维持,且仅有 1 例患者获得良好骨性愈合。基于此,在经伤椎椎弓根打压植骨恢复脊柱前中柱支撑的前提下,我们更加强调后路长节段固定,以减少内固定应力集中的问题。对于严重骨质疏松的 Kümmell 病患者,我们还采用了骨水泥强化椎弓根钉

道来增加螺钉与骨界面间的把持力,以防止后期螺钉松动、拔出等并发症。

笔者认为在行经椎弓根打压植骨过程中有以下几点值得注意:①术前须先确认伤椎椎弓根的完整性;②术前体位复位,建立通道后用刮匙进行松解撬拨及利用打压的力量恢复椎体高度,避免术后因应力集中而引起椎弓根螺钉拔出;③术中尽可能用刮匙将椎体内坏死松质骨组织及肉芽组织彻底清除,为后期植骨愈合提供条件;④异体骨骨粒不宜过大,以免打压植骨过程中损伤椎弓根内壁;⑤术中确保足量植骨,将植骨颗粒打压结实,不留空腔,避免后期发生椎体塌陷;⑥根据矫形后的情况,预弯连接棒,使棒和椎弓根螺钉间不产生应力。

本研究的结果提示,经伤椎椎弓根打压植骨联合后路长节段椎弓根螺钉内固定术和经后路椎体次全切除联合后路长节段椎弓根螺钉内固定术治疗Ⅲ期 Kummell 病,均能有效减轻患者的疼痛症状、纠正脊柱后凸畸形、改善脊柱功能,并且均具有较好的安全性;后者纠正患者脊柱后凸畸形的效果优于前者,但前者的手术时间短、术中出血量少。

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(收稿日期:2018-03-25 本文编辑:李晓乐)

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(收稿日期:2018-03-29 本文编辑:时红磊)