

· 临床研究 ·

经皮椎间孔镜 TESSYS 技术治疗单节段双侧 腰椎间盘突出症

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【摘要】 目的: 探讨经椎间孔镜 TESSYS (transforaminal endoscopic spine system) 技术治疗单节段双侧腰椎间盘突出症患者的早期临床效果。方法: 对 2016 年 2 月至 2018 年 2 月行经皮椎间孔镜 TESSYS 技术治疗的单节段双侧腰椎间盘突出症 38 例患者进行回顾性分析, 男 26 例, 女 12 例; 年龄 30~55 (35.2±6.4) 岁; L_{3,4} 6 例, L_{4,5} 22 例, L₅S₁ 10 例。使用德国 Joimax GmbH 公司椎间孔镜, 局部麻醉, 透视下双侧穿刺至病变节段的椎间孔外侧, 应用 4 级扩张导管逐级完成椎间孔扩大成形, 环锯逐级扩大椎间孔, 双侧置入椎间孔镜, 摘除突出髓核, 直至神经根完全松解。术后对患者进行定期的门诊复查、电话随访, 分别比较术前、术后 1、3、6、12 个月的双下肢疼痛的视觉模拟疼痛评分 (VAS)、Oswestry 功能障碍指数 (Oswestry Disability Index, ODI), 末次随访应用改良的 MacNab 标准进行疗效评定。结果: 36 例患者手术顺利且获得 12 个月以上的随访。术后 1、3、6、12 个月的双下肢疼痛 VAS 评分和 ODI 评分较术前均有明显改善 ($P < 0.05$), 术后 1、3 个月与术后 6、12 个月双下肢疼痛的 VAS 评分和 ODI 评分差异均有统计学意义 ($P < 0.05$), 而术后 1 个月与 3 个月、术后 6 个月与 12 个月双下肢疼痛 VAS 评分和 ODI 评分差异无统计学意义 ($P > 0.05$), 末次随访根据改良 MacNab 评价标准, 优 14 例, 良 16 例, 可 4 例, 差 2 例。结论: 运用经皮椎间孔镜 TESSYS 技术从双侧摘除突出髓核的同时能够充分对神经根进行减压, 可以有效应用于单节段双侧腰椎间盘突出症的患者。

【关键词】 椎间盘移位; TESSYS 技术; 外科手术, 微创性

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Percutaneous transforaminal endoscopic TESSYS technique for the treatment of bilateral lumbar disc herniation in single segment DENG Hong-li, GAO Wen-jie, ZHU Jin-wen, WANG Xiao-dong, and ZHOU Jin-song. Spinal Minimally Invasive Department, Xi'an Honghui Hospital Xi'an 710054, Shaanxi, China

ABSTRACT Objective: To investigate the early clinical effects of transforaminal endoscopic spine system (TESSYS) for the treatment of bilateral lumbar disc herniation in single segment. **Methods:** The clinical data of 38 patients with single-segment bilateral lumbar disc herniation treated by TESSYS technique from February 2016 to February 2018 were retrospectively analyzed. There were 26 males and 12 females, aged from 30 to 55 years old with an average of (35.2±6.4) years, 6 cases of L_{3,4}, 22 cases of L_{4,5}, and 10 cases of L₅S₁. Using the intervertebral foramen endoscope produced by Joimax GmbH, Germany, under local anesthesia, bilateral puncture to the outside of the intervertebral foramen of the diseased segment, four-stage dilatation catheter to complete the progressive enlargement of the intervertebral foramen, and the ring saw progressively enlarge the intervertebral foramen. The bilateral foramen was placed and the herniated nucleus was removed until the nerve root was completely released. Postoperatively, the patients were reviewed on regular outpatient visits and telephone follow-ups. Visual analogue scale (VAS) and Oswestry Disability Index (ODI) were compared before operation and after operation at 1, 3, 6, 12 months respectively. At the final follow-up, according to modified MacNab criteria to evaluate the clinical effect. **Results:** Thirty-six patients underwent successful surgery and were followed up for more than 12 months. The ODI score and VAS score of the lower extremities pain at 1, 3, 6, 12 months after operation were obviously improved ($P < 0.05$), there was significant difference between 1, 3 months and 6, 12 months after operation ($P < 0.05$), there was no significant difference between 1 and 3 months, between 6 and 12 months after operation ($P > 0.05$). At the final follow-up, according to MacNab criteria, 14 cases got excellent results, 16 good, 4 fair, 2 poor. **Conclusion:** Using TESSYS technique to remove the bilateral herniated nucleus from single segment can fully decompress for the nerve root, and can be effectively applied to patients with single-segment bilateral lumbar disc herniation.

KEYWORDS Intervertebral disk displacement; TESSYS technique; Surgical procedures, minimally invasive

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椎间孔镜被作为一个实用的替代传统的手术方式来治疗腰椎间盘突出症, 解除神经根压迫, 优势在

于手术所带来的组织损伤小,不影响关节运动及整个脊柱活动性和稳定性^[1-8]。尤其是 Hoogland 等^[9]和 Ruetten 等^[10]设计的经椎间孔于椎管内直接神经根松解和减压的 TESSYS 技术应用越来越广泛。其手术适应证也由单纯的腰椎间盘突出症,发展到治疗伴有钙化的腰椎间盘突出症。2016 年 2 月至 2018 年 2 月,笔者对 38 例单节段双侧椎间盘突出的患者采用椎间孔镜 TESSYS 技术治疗,现报告如下。

1 资料与方法

1.1 病例选择

1.1.1 纳入标准 (1)存在明显的双下肢抽痛或伴有神经支配区域的感觉、肌力的减退。(2)经腰椎 CT 与 MRI 检查表现为双侧的椎间盘软性突出,且影像学表现与病史、查体完全一致的单间隙椎间盘双侧突出。(3)经过半年以上的正规保守治疗症状恢复欠佳,甚至无效。(4)影像学检查显示无椎间失稳、滑脱、骨折、结核、肿瘤等病变。

1.1.2 排除标准 (1)严重的腰椎椎管狭窄、多个节段同时腰椎间盘突出、严重钙化型椎间盘突出、单侧椎间盘突出伴神经根管狭窄。(2)腰椎 X 线片有腰椎节段性不稳、腰椎滑脱。(3)重度游离型椎间盘突出。(4)同时伴脊柱感染、骨折、肿瘤等。

1.2 一般资料

本组 38 例,男 26 例,女 12 例;年龄 30~55(35.2±6.4)岁;均为单间隙突出伴双侧神经根管狭窄,L_{3,4} 6 例,L_{4,5} 22 例,L₅S₁ 10 例。38 例患者术前均行腰椎正侧位、动力位 X 线片、CT、MRI 等影像学检查。

1.3 手术方法

1.3.1 术前操作 患者取俯卧位,L₅S₁ 椎间盘内突出的患者需要将双侧髂棘垫高。正位透视椎间盘上缘并将此上缘的平行线作标记线,侧位透视下经过下位椎体后上缘至上关节突的侧位线作标记线,2 个标记线的交点为穿刺点。或者于 L₃-L₄ 棘突旁开 8~10 cm,于 L₄-L₅ 节段旁开 12~14 cm,L₅S₁ 节段旁开 12~16 cm^[4],对于特殊体型的人进行相应的调整。

1.3.2 术中操作 利多卡因局部麻醉,18G 穿刺针沿标定穿刺线方向穿刺到目标椎间隙下位椎体上关节突,C 形臂 X 线透视正位像见穿刺针位于上关节突尖部,椎间隙上缘,侧位像见位

于上关节突尖部前缘,椎间孔后上缘,为理想位置。取出穿刺针内芯,置入导丝后取出穿刺针保持导丝在位,用尖手术刀在进针点皮肤处做 1 cm 切口,沿导丝方向逐层放入扩张套管扩开软组织。放入 Tomy 针,在 C 形臂 X 线正侧位透视下 Tomy 针的位置,确定为理想位置后,进行逐级的环钻进行椎间孔成形术。确定扩开后,取出环钻,再次置入扩张套管,安置工作通道,C 形臂 X 线透视正位像在椎弓根的内侧缘,侧位像在椎体后缘的后侧,表明工作通道在椎管内、非椎间隙内^[11-12],拔出导丝,置入穿刺针头。先注入碘海醇观察椎间盘破裂情况,再将碘海醇和亚甲蓝混合液 1~3 ml 注射行髓核染色,扩大椎间孔后所有过程双侧操作相同(图 1)。经工作通道置入椎间孔镜,调节黑白平衡度使镜下清晰,可见蓝染的髓核组织、黄色脂肪组织,转动工作通道至神经根受压位置,使用型号不同的髓核钳、钳刀、弹簧髓核钳等工具将压迫神经的髓核、纤维环、增厚的黄韧带等组织取出,松解受压神经根。术中随时用射频刀头止血并对纤维环撕裂口行皱缩成形术,最后再用神经剥离子镜下探查神经根是否减压彻底为手术终止标志。拔出工作通道,丝线缝合后无菌敷料覆盖创面。

1.3.3 术后处理 术后观察下肢屈伸活动及肌力,判断无神经损伤后出手术室,询问双下肢疼痛情况并记录 VAS 评分。卧床休息 1 d,佩戴高腰围 1~3 个月,期间避免久坐久站、经常弯腰负重。

1.4 观察项目与方法

采用视觉模拟疼痛评分(VAS)^[13]和 Oswestry 功

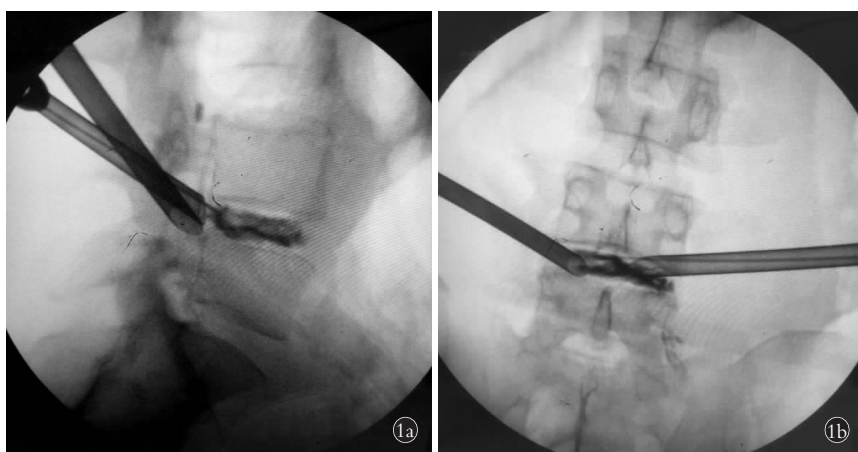


图 1 男性患者,47 岁,L_{4,5} 双侧椎间盘突出症,行双侧经皮椎间孔镜 TESSYS 技术下椎间盘髓核摘除术。图示为置入工作套管透视图像及视频所见 1a. 正位 X 线片示工作套管紧贴棘突外缘 1b. 侧位 X 线片示工作套管超过位于椎体后缘

Fig.1 Patient,male,47 years old,L_{4,5} bilateral disc herniation,bilateral excision of intervertebral disc nucleus pulposus under TESSYS technique. The pictures showed insertion of working sleeve fluoroscopic images and video 1a. The AP film showed the working sleeve close to the outer edge of the spinous process 1b. The lateral film showed the working sleeve over the posterior edge of the vertebral body

能障碍指数 (Oswestry Disability Index, ODI)^[14] 评价术前、术后 1、3、6、12 个月双下肢疼痛和日常生活功能。末次随访采用改良 MacNab^[15] 标准评定疗效: 优, 直腿抬高试验 >70°, 下肢感觉、肌力正常, 腰腿痛消失; 良, 直腿抬高试验较术前增加 30°, 但 <70°, 感觉在神经支配区域仍存在轻微麻木感, 肌力保持在 IV 级, 偶尔伴有轻微腰腿痛; 可, 直腿抬高试验较术前增加 15°, 但 <70°, 肌力保持在 III 级, 感觉在支配区域麻木感较明显, 腰腿痛较术前减轻, 偶尔使用止痛药; 差, 症状于手术前后无明显变化甚至加重。

1.5 统计学处理

采用 SPSS 20.0 统计学软件进行数据处理, 手术前后 VAS、ODI 评分采用均数 ± 标准差 ($\bar{x} \pm s$) 表示, 采用具有两个重复测量因素的两因素设计一元定量资料方差分析。以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 手术情况

1 例患者在处理一侧 L₅S₁ 突出的椎间盘时, 由于髂骨遮挡突出的椎间盘去除不彻底, 术后一侧症状改善不明显, 复查 MRI 证实一侧突出的椎间盘内组织未清除彻底, 于术后第 2 天行开放髓核摘除后缓解。1 例患者 L_{4,5} 双侧突出的椎间盘处理彻底后, 由于术后过度的体力劳动, 椎间盘再次突出, 改行后路开放腰椎椎间融合术, 以上 2 例均未能成功完成椎间孔镜术也未能完成术后随访, 因此为失败及失访病例。余 36 例手术顺利并成功获得 12 个月以上的随访, 手术时间为 (56.00 ± 14.00) min, 术后 1 d 在腰围保护下下床行双下肢功能锻炼, 住院时间 (3.00 ± 0.50) d, 均无硬膜囊破裂、神经根损伤、术后感染等并发症发生。典型病例见图 2。

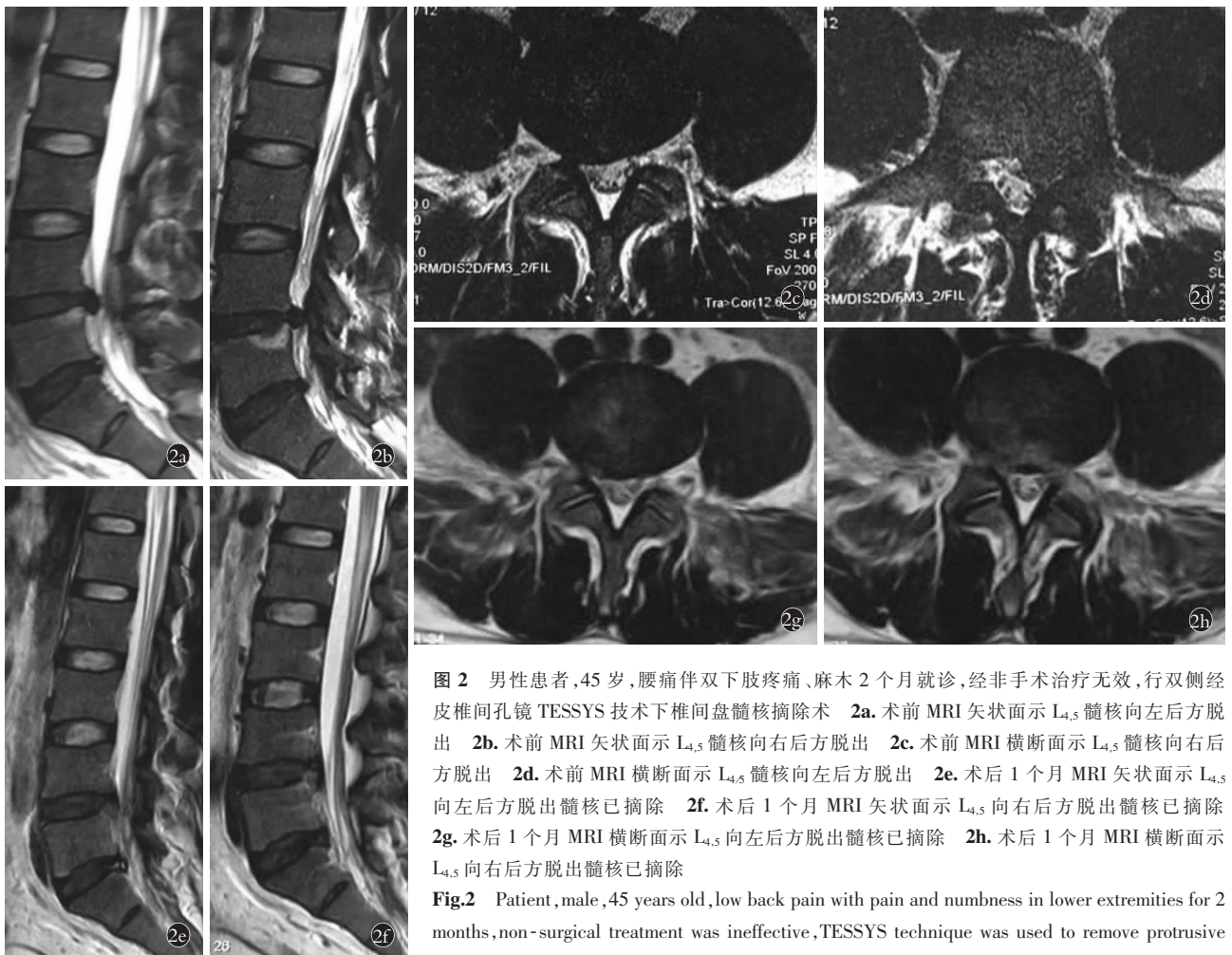


图 2 男性患者, 45 岁, 腰痛伴双下肢疼痛、麻木 2 个月就诊, 经非手术治疗无效, 行双侧经皮椎间孔镜 TESSYS 技术下椎间盘髓核摘除术 2a. 术前 MRI 矢状面示 L_{4,5} 髓核向左后方脱出 2b. 术前 MRI 矢状面示 L_{4,5} 髓核向右后方脱出 2c. 术前 MRI 横断面示 L_{4,5} 髓核向右后方脱出 2d. 术前 MRI 横断面示 L_{4,5} 髓核向左后方脱出 2e. 术后 1 个月 MRI 矢状面示 L_{4,5} 向左后方脱出髓核已摘除 2f. 术后 1 个月 MRI 矢状面示 L_{4,5} 向右后方脱出髓核已摘除 2g. 术后 1 个月 MRI 横断面示 L_{4,5} 向左后方脱出髓核已摘除 2h. 术后 1 个月 MRI 横断面示 L_{4,5} 向右后方脱出髓核已摘除

Fig.2 Patient, male, 45 years old, low back pain with pain and numbness in lower extremities for 2 months, non-surgical treatment was ineffective, TESSYS technique was used to remove protrusive disc nucleus 2a. Preoperative sagittal MRI showed the L_{4,5} nucleus pulposus prolapsed to the left rear 2b. Preoperative sagittal MRI showed the L_{4,5} nucleus pulposus prolapsed to the right rear 2c. Preoperative transverse MRI showed the L_{4,5} nucleus pulposus prolapsed to the right rear 2d. Preoperative transverse MRI showed the L_{4,5} nucleus pulposus prolapsed to the left rear 2e. Sagittal MRI showed L_{4,5} left posterior herniated nucleus pulposus was removed at 1 month after operation 2f. Sagittal MRI showed the L_{4,5} right posterior herniated nucleus pulposus was removed at 1 month after operation 2g. Transverse MRI showed L_{4,5} left posterior herniated nucleus pulposus was removed at 1 month after operation 2h. Transverse MRI showed L_{4,5} right posterior herniated nucleus pulposus was removed at 1 month after operation

2.2 临床效果评估

术后双下肢 VAS、ODI 评分较术前均有改善($P < 0.05$), 术后 6、12 个月双下肢 VAS、ODI 评分较术后 1、3 个月改善明显($P < 0.05$), 术后 1 个月与术后 3 个月以及术后 6 个月与术后 12 个月双下肢 VAS、ODI 评分相比改善不明显 ($P > 0.05$), 见表 1-2。根据改良的 MacNab 标准, 结果优 14 例, 良 16 例, 可 4 例, 差 2 例。

表 1 单间隙突出伴双侧神经根狭窄 36 例患者手术前后左右下肢疼痛 VAS 评分比较 ($\bar{x} \pm s$, 分)

Tab.1 Comparison of pre- and post-operative VAS scores of light and right lower limbs pain in 36 patient with single-segment bilateral lumbar disc herniation ($\bar{x} \pm s$, score)

时间	左下肢	右下肢
术前	6.15±1.14	6.45±1.34
术后 1 个月	2.87±1.12 [▲]	3.07±1.21 [△]
术后 3 个月	2.74±1.08 [■]	2.94±1.08 [□]
术后 6 个月	1.47±1.26 [*]	1.23±1.06 [*]
术后 12 个月	1.28±1.12 [◆]	1.19±1.12 [◇]

注: 左下肢: 与术前比较, [▲] $t=25.109, P=0.006$; [■] $t=26.136, P=0.004$; ^{*} $t=37.128, P=0.000$; [◆] $t=31.804, P=0.000$ 。与术后 1 个月比较, ^{*} $t=5.881, P=0.000$; [◆] $t=6.368, P=0.000$; 与术后 3 个月比较, ^{*} $t=4.965, P=0.000$; [◆] $t=6.523, P=0.000$ 。[▲]与[■]比较, $t=0.388, P=0.701$; ^{*}与[◆]比较, $t=0.456, P=0.675$ 。右下肢与术前比较, [△] $t=21.779, P=0.009$; [□] $t=30.359, P=0.005$; ^{*} $t=32.846, P=0.007$; [◇] $t=30.203, P=0.000$ 。与术后 1 个月比较, ^{*} $t=9.628, P=0.000$; [◇] $t=10.658, P=0.000$; 与术后 3 个月比较, ^{*} $t=4.568, P=0.000$; [◇] $t=5.836, P=0.000$ 。[△]与[□]比较, $t=0.436, P=0.673$; ^{*}与[◇]比较, $t=0.562, P=0.583$

Note: In the left lower limb, compared with preoperative data, [▲] $t=25.109, P=0.006$; [■] $t=26.136, P=0.004$; ^{*} $t=37.128, P=0.000$; [◆] $t=31.804, P=0.000$. Compared with postoperative 1 month, ^{*} $t=5.881, P=0.000$; [◆] $t=6.368, P=0.000$. Compared with postoperative 3 months, ^{*} $t=4.965, P=0.000$; [◆] $t=6.523, P=0.000$. [▲]vs[■], $t=0.388, P=0.701$; ^{*}vs[◆], $t=0.456, P=0.675$. In the right lower limb, compared with preoperative data, [△] $t=21.779, P=0.009$; [□] $t=30.359, P=0.005$; ^{*} $t=32.846, P=0.007$; [◇] $t=30.203, P=0.000$. Compared with postoperative 1 month, ^{*} $t=9.628, P=0.000$; [◇] $t=10.658, P=0.000$. Compared with postoperative 3 months, ^{*} $t=4.568, P=0.000$; [◇] $t=5.836, P=0.000$. [△]vs[□], $t=0.436, P=0.673$; ^{*}vs[◇], $t=0.562, P=0.583$

3 讨论

单节段双侧腰椎间盘突出症一般采用传统后路腰椎融合术治疗, 同时双侧进行椎间孔镜方式治疗是有一定困难的, 采用传统开放手术可以进行椎管的充分扩大减压, 然而术中创伤及脊柱后方结构稳定性破坏较大, 后期可能会导致脊柱失稳及退行性改变等并发症。本研究中治疗方式采用的是经皮椎间孔镜 TESSYS 技术, 该技术主要优势为: (1) 工作通道通过侧后方入路经椎间孔进入椎管, 对腰背部

表 2 单间隙突出伴双侧神经根狭窄 36 例患者手术前后 ODI 评分比较 ($\bar{x} \pm s$, 分)

Tab.2 Comparison of pre- and post-operative ODI scores in 36 patients with single-segment bilateral lumbar disc herniation ($\bar{x} \pm s$, score)

时间	ODI 评分	与术前比较 t 值	与术前比较 P 值
术前	36.50±3.90	-	-
术后 1 个月	26.34±2.50 [▲]	30.101	0.014
术后 3 个月	24.21±1.34 [■]	38.165	0.011
术后 6 个月	16.95±1.57 [*]	70.630	0.000
术后 12 个月	15.54±1.40 [◆]	78.148	0.000

注: 与术后 1 个月比较, ^{*} $t=33.096, P=0.000$; [◆] $t=39.580, P=0.000$; 与术后 3 个月比较, ^{*} $t=31.305, P=0.000$; [◆] $t=50.412, P=0.000$ 。[▲]与[■]比较, $t=0.496, P=0.694$; ^{*}与[◆]比较, $t=0.872, P=0.746$

Note: Compared with postoperative 1 month, ^{*} $t=33.096, P=0.000$; [◆] $t=39.580, P=0.000$. Compared with postoperative 3 month, ^{*} $t=31.305, P=0.000$; [◆] $t=50.412, P=0.000$. [▲]vs[■], $t=0.496, P=0.694$; ^{*}vs[◆], $t=0.872, P=0.746$

肌肉及维持椎体稳定的韧带及小关节无干扰, 手术创伤小, 恢复时间短, 术后短期内即可下床活动。(2) 手术安全性高, 工作通道进入部位在椎间孔下方, 避开了贴近 Kambin 安全三角的出口神经, 另外患者全程局麻, 操作过程中如触及神经根患者可随时对术者进行反馈, 减少了神经根的损伤。(3) 术中直接运用大量生理盐水灌注冲洗, 不仅可使视野更清晰, 并可冲走大量炎性物质及微小碎块样软组织, 术后即刻缓解疼痛, 且可减少炎症的发生。(4) 可直视下应用射频消融技术, 一方面对破损的纤维环结构进行皱缩成形, 减少了残留髓核组织的再次突出, 另一方面可及时对术野出血进行止血, 使术野更清晰。

目前, 国内外对椎间孔镜 TESSYS 技术治疗腰椎间盘突出症已有报道, 并取得了较好的临床效果。任佳彬等^[16]对经皮椎间孔镜下与椎板间开窗椎间盘切除术治疗腰椎间盘突出症进行 Meta 分析, 结果显示椎间孔镜下治疗腰椎间盘突出症与椎板间开窗术效果相当, 但前者具有出血少、创伤小及恢复快等优势。行勇刚等^[17]观察开放手术与经皮椎间孔内视镜手术治疗腰椎神经根孔狭窄的临床效果发现开放组满意率为 70%, 经皮椎间孔镜治疗组满意率为 76.9%。黄克伦等^[18]对 132 例经皮椎间孔镜下腰椎间盘摘除术进行并发症分析中得出经皮椎间孔镜治疗椎间盘突出是安全可靠的。虽然 TESSYS 技术对椎间盘突出的治疗效果是显著的, 然而其针对的症状一般是单侧, 同时双侧进行减压报道相对减少, 本研究应用椎间孔镜 TESSYS 技术治疗单节段双侧腰椎间盘突出症, 结果显示术后双下肢 VAS、ODI 评分较术前均

有改善 ($P < 0.05$), 术后 6、12 个月双下肢 VAS、ODI 评分较术后 1、3 个月改善明显 ($P < 0.05$), 术后 1 个月与术后 3 个月以及术后 6 个月与术后 12 个月双下肢 VAS、ODI 评分相比改善不明显 ($P > 0.05$), 根据改良的 MacNab 标准显示优良率为 83.3%, 提示该手术治疗方式效果显著, 尤其在术后 6 个月较明显。然而, 本研究的局限性是随访时间稍短, 病例数较少, 无法反映长期神经减压的效果。

综上所述, 经皮椎间孔镜 TESSYS 技术治疗单节段双侧腰椎间盘突出症在短期内效果显著, 可减少术后住院时间, 早日恢复工作, 是一种安全有效的治疗手段。

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