

单侧双通道内镜辅助后路腰椎椎间融合术与 微创经椎间孔腰椎椎间融合术治疗腰椎 退变性疾病临床疗效比较

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【摘要】目的:比较单侧双通道内镜辅助后路腰椎椎间融合术(unilateral biportal endoscopic assisted posterior lumbar interbody fusion, UBE-PLIF)与微创经椎间孔腰椎椎间融合术(minimally invasive transforaminal lumbar interbody fusion, MIS-TLIF)治疗腰椎退行性疾病的临床疗效。**方法:**回顾性分析 2020 年 1 月~2021 年 1 月我院收治的 60 例腰椎退变性疾病患者临床资料, 其中 UBE-PLIF 组 27 例, MIS-TLIF 组 33 例。两组性别、年龄、病程、主要诊断、合并慢性疾病及手术节段等一般资料比较, 差异均无统计学意义($P>0.05$)。统计两组手术时间、术中失血量、术后引流量、住院天数, 术前、术后 3 个月、术后 6 个月及末次随访的腰痛疼痛视觉模拟评分(visual analogue scale, VAS)、腿痛 VAS 评分、Oswestry 功能障碍指数(ODI), 术前和术后 3d、3 个月、6 个月及末次随访的手术节段椎间隙高度(intervertebral disc height, IDH), 术后 6 个月椎间融合情况、术后 1 年椎旁肌脂肪浸润分级及手术并发症。**结果:**两组患者均获随访, UBE-PLIF 组随访 12~15 个月(13.3 ± 1.0 个月), MIS-TLIF 组随访 12~16 个月(13.4 ± 1.2 个月), 差异无统计学意义($P>0.05$)。UBE-PLIF 组手术时间 274.3 ± 88.2 min、术中出血量 261.1 ± 207.7 ml、术后引流量 95.7 ± 79.7 ml, MIS-TLIF 组分别为 181.8 ± 58.7 min、 331.8 ± 247.1 ml、 125.4 ± 113.1 ml, 两组比较均有统计学差异($P<0.05$); UBE-PLIF 组住院天数 7.4 ± 2.3 d, MIS-TLIF 组 7.5 ± 1.0 d, 无统计学差异($P>0.05$)。两组患者腰痛、腿痛 VAS 评分及 ODI 在术后 3 个月、6 个月及末次随访均较术前明显改善($P<0.05$); 两组患者术前、术后 6 个月及末次随访的腰痛及腿痛 VAS 评分差异均无统计学意义($P>0.05$), 术后 3 个月腰痛及腿痛 VAS 评分 UBE-PLIF 组优于 MIS-TLIF 组($P<0.05$); 术前、术后 3 个月、术后 6 个月及末次随访 ODI 两组患者间差异无统计学意义($P>0.05$)。两组患者术后 3d、3 个月、6 个月及末次随访 IDH 均较术前有所改善, 差异有统计学意义($P<0.05$); 术前和术后 3d、3 个月、6 个月及末次随访 IDH 两组间比较均无统计学差异($P>0.05$)。术后 6 个月植骨融合评估, UBE-PLIF 组 I 级融合 23 例、II 级 4 例, MIS-TLIF 组 I 级 28 例、II 级 5 例, 两组比较无统计学差异($P>0.05$)。术后 1 年椎旁肌脂肪浸润分级, UBE-PLIF 组 1 级 2 例、2 级 18 例、3 级 7 例, MIS-TLIF 组 1 级 0 例、2 级 15 例、3 级 18 例, 两组间比较有统计学差异($P<0.05$)。两组患者均未发生手术相关并发症。**结论:**UBE-PLIF 治疗腰椎退变性疾病临床疗效与 MIS-TLIF 相近, 术后 3 个月 UBE-PLIF 组腰腿痛症状较 MIS-TLIF 组明显改善, 并且 UBE-PLIF 具有创伤小、术中出血少、术后引流少等优点。

【关键词】单侧双通道内镜辅助后路腰椎椎间融合术; 微创经椎间孔腰椎椎间融合术; 腰椎退变性疾病; 疗效比较

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【Abstract】 Objectives: To compare the clinical outcomes of unilateral biportal endoscopic assisted posterior

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lumbar interbody fusion(UBE-PLIF) with minimally invasive transforaminal lumbar interbody fusion(MIS-TLIF) in the treatment of lumbar degenerative diseases. **Methods:** A retrospective case-control study was performed to analyze the clinical data of 60 patients with lumbar degenerative diseases who were admitted and treated in our hospital between January 2020 and January 2021, including 27 patients in UBE-PLIF group and 33 patients in MIS-TLIF group. There were no statistical differences($P>0.05$) in the general data such as gender, age, surgical segment, disease duration, main diagnosis, and comorbid chronic diseases between the two groups. The operative time, intraoperative blood loss, postoperative drainage volume, and hospital stays were compared between the two groups. The visual analogue scale(VAS) scores for low back pain and leg pain, and Oswestry disability index(ODI) were collected preoperatively, at postoperative 3 months, 6 months, and final follow-up. The intervertebral disc height(IDH) of the operated segments was calculated before operation, at postoperative 3 days, 3 months, 6 months, and final follow-up. And the status of interbody fusion at 6 months after operation, fat infiltration grade of paraspinal muscles at 1 year after surgery, and complications were counted. **Results:** Patients in UBE-PLIF group were followed up for 12–15 months (13.3 ± 1.0 months), and patients in MIS-TLIF group were followed up for 12–16 months(13.4 ± 1.2 months), and the differences were not statistically significant ($P>0.05$). The operative time, intraoperative blood loss, and postoperative drainage volume in UBE-PLIF group and MIS-TLIF group were respectively 274.3 ± 88.2 min and 181.8 ± 58.7 min, 261.1 ± 207.7 ml and 331.8 ± 247.1 ml, and 95.7 ± 79.7 and 125.4 ± 113.1 ml, and the differences between groups were with statistical significance ($P<0.05$); Hospitalization days were 7.4 ± 2.3 days in the UBE-PLIF group and 7.5 ± 1.0 days in the MIS-TLIF group, and there was no statistical difference($P>0.05$). The low back pain VAS score, leg pain VAS score, and ODI of patients in both groups at postoperative 3 months, 6 months, and final follow-up all improved significantly($P<0.05$) from their preoperative values; the VAS scores of low back pain and leg pain at preoperation, postoperative 6 months, and final follow-up were with no statistical differences between groups ($P>0.05$), while those at 3 months of follow-up in UBE-PLIF group were superior than in MIS-TLIF group($P<0.05$); There was no significant difference in ODI between the two groups at preoperation, 3 months, 6 months, and final follow-up($P>0.05$). IDH of all groups of patients at 3 days, 3 and 6 months after surgery, and final follow-up was improved compared with the preoperative values, with significant differences ($P<0.05$), while there was no statistical difference between the two groups at such time points($P>0.05$). For the bone graft fusion conditions at 6 months after surgery, 23 patients were of grade I and 4 of grade II in the UBE-PLIF group, and 28 patients were of grade I and 5 of grade II in the MIS-TLIF group, respectively($P>0.05$). As for the grades of paraspinal muscle fatty infiltration at 1 year after surgery, there were 2 patients of grade 1, 18 patients of grade 2, and 7 patients of grade 3 in the UBE-PLIF group and 0 patients of grade 1, 15 patients of grade 2, and 18 patients of grade 3 in the MIS-TLIF group, respectively, and the differences were with statistical significance($P<0.05$). No patient in both groups developed operation related complications. **Conclusions:** Comparing with MIS-TLIF, UBE-PLIF has similar clinical efficacy in treating lumbar degenerative diseases, and the symptoms of low back and leg pain at 3 months after surgery are significantly improved, which also has the advantages such as less trauma, less intraoperative bleeding and less postoperative drainage.

【Key words】 Unilateral biportal endoscopic assisted posterior lumbar interbody fusion; Minimally invasive transforaminal lumbar interbody fusion; Lumbar degenerative disease; Efficacy comparisons

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腰椎退变性疾病是目前老龄化社会中常见的疾病, 腰椎椎间融合术是治疗此类疾病的经典术式, 疗效确切, 但传统手术方式具有对肌肉损伤大、术后恢复时间长等缺点^[1]。随着微创理念和技术及术后快速康复理念的发展, 脊柱内镜微创手

术在临床获得广泛应用。单侧双通道内镜辅助后路腰椎椎间融合术(unilateral biportal endoscopic assisted posterior lumbar interbody fusion, UBE-PLIF) 作为近年来兴起的一种治疗腰椎退变性疾病的新方法, 具有对椎旁肌肉损伤小、出血少等优

点^[2]。微创经椎间孔腰椎椎间融合术(minimally invasive transforaminal lumbar interbody fusion, MIS-TLIF)作为治疗腰椎退变性疾病的标准微创术式之一,取得了良好的临床疗效^[3],然而目前对于 UBE-PLIF 与 MIS-TLIF 的临床疗效对比分析的报道较少。本研究旨在比较 UBE-PLIF 与 MIS-TLIF 治疗腰椎退变性疾病的临床疗效,为临床选择合理的手术方式提供参考依据。

1 资料与方法

1.1 一般资料

纳入标准:①经过 6 个月以上严格保守治疗无明显疗效;②腰椎管狭窄伴腰椎不稳;③腰椎间盘突出伴腰椎不稳。

排除标准:①腰椎滑脱 $\geq$ Ⅱ度;②合并有脊柱骨折(新鲜或陈旧性)、肿瘤、感染、结核、畸形、重度骨质疏松、强直性脊柱炎等病史;③腰椎侧凸 $\geq 10^\circ$;④融合节段 ≥ 2 。

回顾分析我院自 2020 年 1 月~2021 年 1 月行 UBE-PLIF 手术治疗腰椎退变性疾病患者的临床资料,并与同期行 MIS-TLIF 手术治疗腰椎退变性疾病患者比较,共纳入腰椎退变性疾病患者 60 例,其中 UBE-PLIF 组 27 例,通道辅助下 MIS-TLIF 组 33 例。两组患者一般资料比较,差异均无统计学意义($P>0.05$),具有可比性(表 1)。

1.2 手术方法

1.2.1 UBE-PLIF 组 全麻插管后,取俯卧位,C 型臂 X 线机透视引导下进行节段确认,将定位针插入所需手术节段中心的椎旁肌,确认定位针位于目标水平的中心,常规消毒铺巾。两个入口在定位针标记所在中心 1cm 以上和 1cm 以下,两个通道之间的距离取决于患者的高度和水平,靠近横突但在椎弓根以下,距离椎弓根外侧 2cm 左右。当在 L5/S1 水平采用椎间孔入路时,通道的位置略有不同,近端通道的位置与其他水平的定位相同,但远端通道位于骶翼外侧缘 1cm,防止髂嵴妨碍器械的插入,生理盐水输入泵水压保持在 30mmHg 以下,内镜置入观察通道,手术器械置入工作通道,关节镜下使用克氏钳和骨刀进行同侧椎板部分切除,然后进行关节面部分切除,在同侧部分椎板和关节面切除后,进行对侧椎板下减压。手术过程中所获得的骨粒用于椎间植骨。在同侧小关节突切除后,取得进入椎间孔的通道。覆盖硬

脊膜和出口神经根的黄韧带,在同侧和对侧骨性狭窄减压完成后予以切除。

使用射频探针或关节镜刀头在出口根和行走根之间的椎间孔间隙对椎间盘进行切开,使用髓核钳和特殊刮匙进行椎间盘切除。关节镜进入椎间隙后,处理软骨终板,在放大的关节镜视野下直视椎间隙,显露软骨下骨。在椎体间植骨时采用专门的导管进行植骨以防持续灌注到最后骨丢失。植骨完成后,在两个小牵开器进行出口根和行走根的保护下放入椎间融合器,C 型臂 X 线机透视确认融合器位置良好。之后切开对侧皮肤及筋膜,透视引导下置入椎弓根螺钉,同侧的两枚经皮椎弓根螺钉通过两个之前使用的入口置入,安装连接棒并置入顶丝固定手术节段。放置负压引流一根,清点器械敷料无误,追层缝合关闭伤口。无菌敷料包扎。

1.2.2 通道辅助下 MIS-TLIF 组 全麻插管后,取俯卧位,C 型臂 X 线机透视定位确定目标椎弓根及椎间隙,常规消毒铺巾。取目标椎间隙棘突水平旁 3cm 直切口,长约 3cm,依层切开皮肤、皮下组织、腰背筋膜,经多裂肌和最长肌间隙,置入可

表 1 两组患者一般资料比较

Table 1 Comparison of general data between the two groups

	UBE-PLIF 组 (n=27) UBE-PLIF group	MIS-TLIF 组 (n=33) MIS-TLIF group
性别 Gender		
男 Male	9	15
女 Female	18	18
年龄(岁) Age	50.4 $\pm$ 11.4	53.4 $\pm$ 13.5
病变节段 Lesion segments		
L2/3	2	0
L3/4	0	3
L4/5	18	21
L5/S1	7	9
主诊断 Primary diagnosis		
腰椎间盘突出伴腰椎不稳 Lumbar disc herniation with instability	15	21
腰椎管狭窄伴腰椎不稳 Lumbar spinal stenosis with instability	12	12
慢性疾病 Chronic disease		
高血压病 Hypertension	8	14
糖尿病 Diabetes	6	7
冠心病 Coronary heart disease	1	3

扩张通道逐级扩张,连接冷光源,充分显露关节突及椎板,通道直视下使用枪钳切除目标椎间隙上椎体部分下关节突及下椎体部分上关节突及部分椎板,切除增生肥厚的黄韧带,充分减压扩大神经根管,显露硬脊膜和行走根,切除病变椎间盘,松解受压的行走神经根,彻底处理终板并在椎间隙植入自体骨及椎间融合器,C型臂X线机透视确认融合器位置良好。经通道置入椎弓根螺钉及椎间融合器,经连接棒固定,之后切开对侧皮肤及筋膜,透视引导下置入椎弓根螺钉,安装连接棒并置入顶丝固定手术节段。放置负压引流一根,清点器械敷料无误,逐层缝合关闭伤口。无菌敷料包扎。

1.3 术后处理

两组术后常规应用抗生素预防感染,同时给予对症治疗,加强营养。术后第2天鼓励患者佩戴支具下床活动,24h引流量小于30ml时拔除引流管,术后3d复查腰椎正侧位X线片,出院后继续佩戴支具至术后3个月。

1.4 随访及评价指标

记录手术时间、术中出血量、术后引流量及住院天数。分别于术前、术后3个月、术后6个月、末次随访时通过腰痛视觉模拟评分(visual analogue scale,VAS)VAS评分、腿痛VAS评分、Oswestry功能障碍指数(ODI)进行临床疗效评估。

术前、术后3d、术后3个月、术后6个月及末次随访进行影像学评估。在腰椎正侧位X线片上评估内固定有无松动、移位,使用Synapse软件测量手术节段椎间隙高度(intervertebral disc height,IDH)。术后6个月进行CT检查,按照Eck等^[4]植骨融合标准评价植骨融合效果:I级,明确融合,植骨间隙完全由骨小梁桥接且重新塑形;II级,可能融合,植骨上下缘出现骨小梁,无裂隙,植骨缘未彻底重塑;III级,可能未融合,植骨的上缘或下缘因骨小梁未桥接而出现裂隙;IV级,因植骨吸收或塌陷明确未融合;V级,不能评价。术后1年对患者进行MRI检查,按Solgaard等提出的标准^[5],根据椎旁肌脂肪浸润占比大小将脂肪浸润程度分为3级:1级,正常/轻度肌肉退变,脂肪浸润占比0~20%;2级,中度肌肉退变,脂肪浸润占比21%~50%;3级,重度肌肉退变,脂肪浸润占比大于50%。

1.5 统计学方法

应用SPSS 28.0统计软件进行统计分析,采

用Shapiro-Wilk法对数据进行正态性检验,符合正态分布的计量资料以 $\bar{x} \pm s$ 表示,组间比较采用两独立样本 t 检验;组内不同时间点比较采用重复测定的方差分析,进一步两两比较采用配对 t 检验。计数资料采用 χ^2 检验。等级资料采用秩和检验。检验水准 $\alpha=0.05$ 。

2 结果

两组患者均获随访,UBE-PLIF组12~15个月(13.3 ± 1.0 个月),MIS-TLIF组12~16个月(13.4 ± 1.2 个月),差异无统计学意义($P>0.05$)。

2.1 手术情况及住院天数

与MIS-TLIF组相比,UBE-PLIF组手术时间更长,但术中失血量、术后引流量更少,差异均有统计学意义($P<0.05$);两组患者住院天数相比无统计学差异($P>0.05$,表2)。

2.2 临床疗效评估

①组内比较:两组患者腰痛、腿痛VAS评分及ODI在术后3个月、6个月及末次随访时均较术前明显改善,末次随访、术后6个月较术后3个月及末次随访较术后6个月均明显改善($P<0.05$,表3)。②组间比较:两组患者术前、术后6个月及末次随访的腰痛、腿痛VAS评分差异均无统计学意义($P>0.05$),术后3个月腰痛及腿痛VAS评分UBE-PLIF组优于MIS-TLIF组($P<0.05$);术前、术后3个月、术后6个月及末次随访ODI两组患者差异均无统计学意义($P>0.05$,表3)。

2.3 影像学评估

(1)手术节段IDH:两组患者术后3d、3个月、6个月及末次随访的IDH均较术前改善,差异有

表2 两组患者手术相关资料比较 ($\bar{x} \pm s$)

Table 2 Comparison of surgical data between the two groups

	UBE-PLIF 组 (n=27) UBE-PLIF group	MIS-TLIF 组 (n=33) MIS-TLIF group
手术时间(min) Operative time	274.3±88.2	181.8±58.7 ^①
术中出血量(ml) Intraoperative blood loss	261.1±207.7	331.8±247.1 ^①
术后引流量(ml) Postoperative drainage volume	95.7±79.7	125.4±113.1 ^①
住院天数(d) Hospital stays	7.4±2.3	7.5±1.0

注:①与UBE-PLIF组比较 $P<0.05$

Note: ①Compared with UBE-PLIF group, $P<0.05$

统计学意义 ($P<0.05$, 表 4); 术前、术后 3d、术后 3 个月、术后 6 个月及末次随访时的 IDH, 两组间比较均无统计学差异 ($P>0.05$, 表 4)。(2) 两组患者术后 6 个月植骨融合效果比较: UBE-PLIF 组 I 级融合 23 例(图 1)、II 级 4 例, MIS-TLIF 组 I 级 28 例(图 2)、II 级 5 例, 差异无统计学意义 ($P>0.05$)。(3) 两组患者术后 1 年椎旁肌脂肪浸润分级比较: UBE-PLIF 组 1 级 2 例、2 级 18 例、3 级 7 例, MIS-TLIF 组 1 级 0 例、2 级 15 例、3 级 18 例, 差异有统计学意义 ($P<0.05$)。

2.4 并发症

两组患者术中及术后未出现硬脊膜撕裂、脊髓硬膜外血肿、神经根损伤及感染等并发症。

表 3 不同时间点腰痛和腿痛 VAS 评分及 ODI ($\bar{x}\pm s$)

Table 3 Comparison of low back pain and leg pain VAS scores and ODI at different time points

	UBE-PLIF 组 (n=27) UBE-PLIF group	MIS-TLIF 组 (n=33) MIS-TLIF group
腰痛 VAS 评分(分) Low back pain VAS score		
术前 Preoperation	6.3±1.3	6.4±1.2
术后 3 个月 3-month follow-up	4.6±0.9 ^①	5.2±0.9 ^{①②}
术后 6 个月 6-month follow-up	2.6±0.8 ^{①③}	2.7±0.9 ^{①③}
末次随访 Final follow-up	1.2±0.7 ^{①③④}	1.3±1.0 ^{①③④}
腿痛 VAS 评分(分) Leg pain VAS score		
术前 Preoperation	5.8±1.6	5.8±1.5
术后 3 个月 3-month follow-up	3.3±1.2 ^①	4.0±1.1 ^{①②}
术后 6 个月 6-month follow-up	2.3±0.8 ^{①③}	2.0±0.7 ^{①③}
末次随访 Final follow-up	1.2±0.8 ^{①③④}	1.2±0.7 ^{①③④}
ODI (%)		
术前 Preoperation	58.0±4.4	63.1±7.5
术后 3 个月 3-month follow-up	49.6±4.9 ^①	50.2±7.2 ^①
术后 6 个月 6-month follow-up	33.4±4.7 ^{①③}	31.4±4.6 ^{①③}
末次随访 Final follow-up	24.9±3.3 ^{①③④}	25.6±3.4 ^{①③④}

注: ①与术前比较 $P<0.05$; ②与同时时间点 UBE-PLIF 组比较 $P<0.05$; ③与术后 3 个月比较 $P<0.05$; ④与术后 6 个月比较 $P<0.05$

Note: ①Compared with preoperation, $P<0.05$; ②Compared with UBE-PLIF group, $P<0.05$; ③Compared with 3-month postoperatively, $P<0.05$; ④Compared with 6-month postoperatively, $P<0.05$

3 讨论

后路腰椎间融合术 (posterior lumbar interbody fusion, PLIF) 是最初的腰椎间融合术方法之一, 自 PLIF 手术开展以来, 被公认为是临床治疗腰椎退变性疾病“金标准”^[6], 显示良好的临床疗效和影像学结果^[7]。然而传统术式需要大量的解剖和牵拉软组织, 特别是对椎旁肌肉破坏较大, 使椎旁肌肉的生物力学功能严重受损, 影响了腰椎稳定性, 容易导致术后矢状位失平衡、邻近节段退变等并发症的发生, 进而导致术后疼痛加重, 延迟恢复。因此, 为了减少对椎旁肌肉及脊柱周围软组织的术中损伤, 促进患者术后早期康复, 1982 年, 由 Harms 和 Rolinger 提出经椎间孔腰椎椎间融合 (transforaminal lumbar interbody fusion, TLIF) 手术方式^[8]。然而, 研究报道传统的 TLIF 手术仍需较大范围分离及牵拉椎旁肌, 导致局部肌肉坏死和术后肌纤维瘢痕形成, 引起术后腰背部疼痛^[1], 为了减少和避免术中过多椎旁肌的剥离和拉伸, Foley 等^[9]提出了 MIS-TLIF 的概念。MIS-TLIF 这种手术可以通过钝性分离肌肉, 扩大肌肉间隙, 在保证神经充分减压以及椎体间融合效果的前提下, 尽可能地减少椎旁肌肉的损伤, 较为完整地保留椎旁肌肉的生物力学功能, 从而减少相应并发症的发生, 改善腰椎疾病患者的预后。微创脊柱外科和新型微创装置的发展促进了 MIS-TLIF 在腰椎退行性疾病中的应用^[10]。MIS-TLIF 与传统的 TLIF 相比对椎旁肌损伤较少, 具有相似的融合率和长期随访结果^[3]。然而, 一部分研究也报道了 MIS-TLIF 手术方式的不足, 如减压不完全,

表 4 两组患者术前术后椎间隙高度比较 (mm, $\bar{x}\pm s$)

Table 4 Comparison of the intervertebral disc height between the two groups before and after surgery

	UBE-PLIF 组(n=27) UBE-PLIF group	MIS-TLIF 组(n=33) MIS-TLIF group
术前 Preoperation	7.99±1.27	9.87±1.31 ^①
术后 3d 3-day follow-up	11.77±1.57 ^②	12.13±1.23 ^{①②}
术后 3 个月 3-month follow-up	11.51±1.55 ^②	11.89±1.24 ^{①②}
术后 6 个月 6-month follow-up	11.34±1.56 ^②	11.72±1.21 ^{①②}
末次随访 Final follow-up	11.28±1.54 ^②	11.55±1.18 ^{①②}

注: ①与 UBE-PLIF 组比较 $P>0.05$; ②与术前比较 $P<0.05$

Note: ①Compared with UBE-PLIF group, $P>0.05$; ②Compared with preoperation, $P<0.05$



图 1 UBE-PLIF 组患者，男，55 岁，L2/3 椎间盘突出伴腰椎不稳 **a, b** 术前腰椎正侧位 X 线片示 L2/3 椎间隙变窄 **c, d** 术前矢状位及横轴位 CT 示 L2/3 椎间盘突出 **e** 术中定位手术节段 **f, g** 术后 3d 腰椎正侧位 X 线片示 L2/3 椎间隙高度较术前好转 **h, i** 术后 3 个月腰椎正侧位 X 线片示 L2/3 椎间隙高度与术后 3d 比较无明显变化 **j, k** 术后 6 个月腰椎正侧位 X 线片示 L2/3 椎间隙高度较术后 3d 无明显变化，内固定未见明显松动及移位 **l** 术后 6 个月矢状位 CT 示 L2/3 椎间达到 I 级骨性融合

Figure 1 A 55-year-old male patient with L2/3 intervertebral disc herniation with lumbar instability in UBE-PLIF group **a, b** Anteroposterior and lateral X-ray films of the lumbar spine before surgery showed the narrowing of the L2/3 intervertebral space **c, d** Sagittal and axial CT images before surgery showed the protrusion of L2/3 intervertebral disc **e** Intraoperative location of the surgical segment **f, g** Anteroposterior and lateral X-ray films of the lumbar spine 3 days after surgery showed the IDH was better than that before operation **h, i** Anteroposterior and lateral X-ray films of the lumbar spine 3 months after surgery showed there was no significant change in the height of L2/3 intervertebral space with that at 3 days after surgery **j, k** Anteroposterior and lateral X-ray films of the lumbar spine 6 months after surgery showed there was no significant change in the height of L2/3 intervertebral space with that at 3 days after surgery, and no obvious loosening and displacement were observed in internal fixation **l** Sagittal CT at 6 months postoperatively showed grade I bony fusion at L2/3

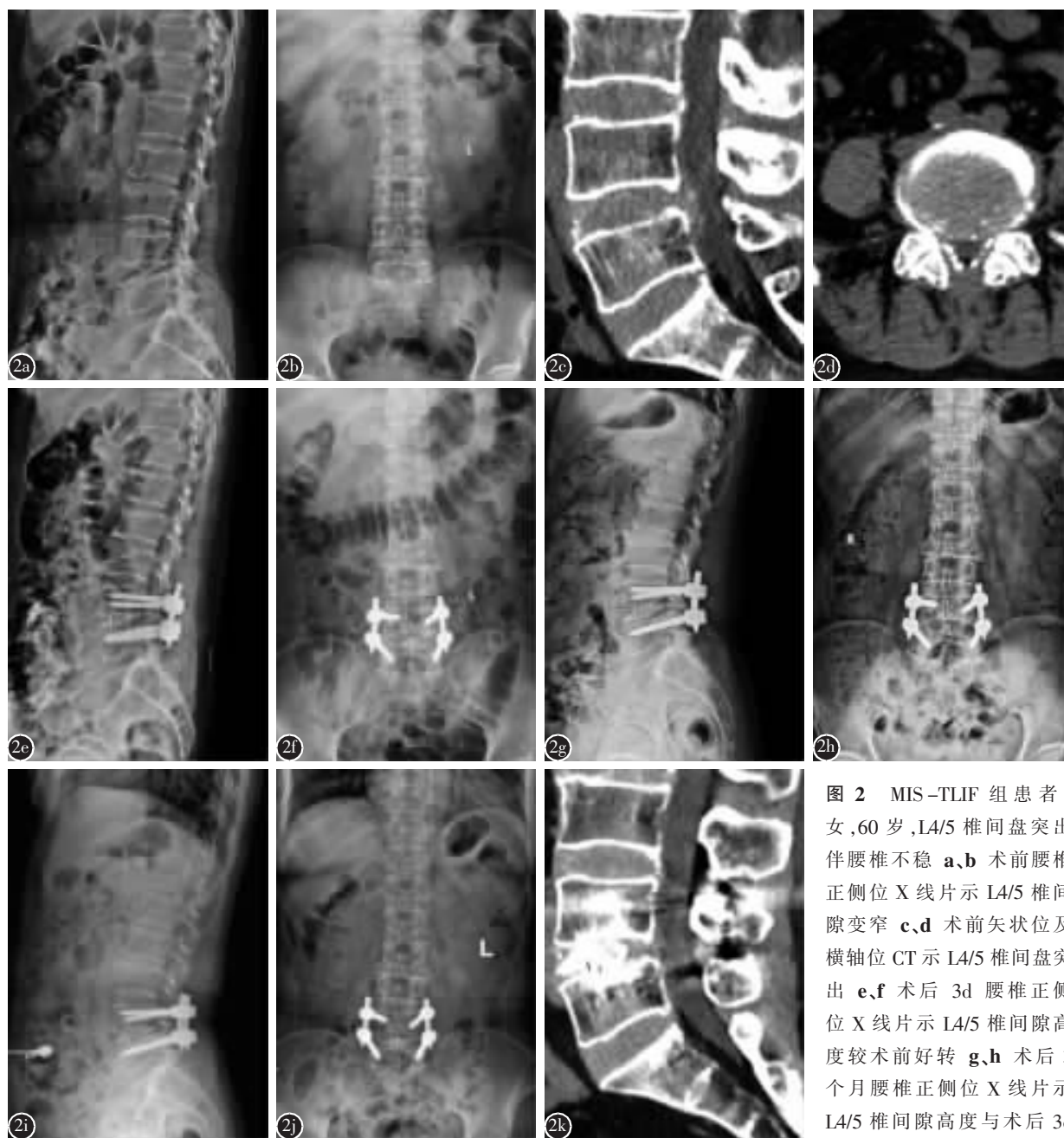


图 2 MIS-TLIF 组患者，女，60 岁，L4/5 椎间盘突出伴腰椎不稳 a、b 术前腰椎正侧位 X 线片示 L4/5 椎间隙变窄 c、d 术前矢状位及横轴位 CT 示 L4/5 椎间盘突出 e、f 术后 3d 腰椎正侧位 X 线片示 L4/5 椎间隙高度较术前好转 g、h 术后 3 个月腰椎正侧位 X 线片示 L4/5 椎间隙高度与术后 3d 比较无明显变化 i、j 术后 6 个月腰椎正侧位 X 线片示 L4/5 椎间隙高度与术后 3d 比较无明显变化 k 术后 6 个月矢状位 CT 示 L4/5 椎间达到 I 级骨性融合

个月腰椎正侧位 X 线片示 L4/5 椎间隙高度与术后 3d 比较无明显变化，内固定未见明显松动及移位 k 术后 6 个月矢状位 CT 示 L4/5 椎间达到 I 级骨性融合

Figure 2 A 60-year-old female patient with L4/5 intervertebral disc herniation with lumbar instability in MIS-TLIF group a, b Anteroposterior and lateral X-ray films of the lumbar spine before surgery showed the narrowing of the L4/5 intervertebral space c, d Sagittal and axial CT before surgery showed the protrusion of L4/5 intervertebral disc e, f Anteroposterior and lateral X-ray films of the lumbar spine 3 days after surgery showed the IDH was better than before operation g, h Anteroposterior and lateral X-ray films of the lumbar spine 3 months after surgery showed there was no significant change in the height of L4/5 intervertebral space with that of postoperative 3 days i, j Anteroposterior and lateral X-ray films of the lumbar spine 6 months after surgery showed there was no significant change in the height of L4/5 intervertebral space with that at 3 days after surgery, and no obvious loosening and displacement were observed in internal fixation k Sagittal CT at 6 months postoperatively showed grade I bony fusion at L4/5

手术时间及辐射暴露时间长,置管困难及软组织遮挡视野等^[11]。

为了减小对软组织损害及视野遮挡,脊柱内镜技术得以充分发展。UBE-PLIF 是新兴的脊柱内窥镜技术,具有以下优点:①具有独立的内窥镜和器械通道,增大了镜头和手术器械的移动角度与空间范围,减压范围可探及同侧椎弓根内壁,对侧可通过切除部分棘突根部越过中线到达侧隐窝,减压后完整显露硬膜囊、双侧神经根走行根及对侧出口根,直视下实现椎管内目标区域神经精细探查、松解和减压术中视野清晰^[2];②允许使用关节镜和常规脊柱手术器械,操作方便;③对椎旁肌破坏较小,无需过度剥离多裂肌;④创伤小,术后能较好维持脊柱和运动系统稳定性等优点^[2]。Choi 等^[12]的一项研究比较了 UBE-PLIF 与其他 3 种微创手术方法治疗退行性腰椎疾病,结果证实 UBE-PLIF 是一种可行的腰椎手术选择,对于短期腰背痛改善具有优越性。本研究中结果显示,UBE-PLIF 组患者术后 3 个月腰痛及腿痛 VAS 评分较 MIS-TLIF 组改善更明显,这与 UBE-PLIF 对于神经根牵拉损伤较小,对于神经根及根管周围组织损伤较小,同时镜下操作可达到减压更充分、更彻底有关。术后所有患者腰腿痛症状均较术前明显改善,末次随访时腰腿痛症状较术前及术后 3 个月、6 个月好转明显,未出现复发情况。UBE-PLIF 组患者术后 1 年椎旁肌脂肪浸润分级较 MIS-TLIF 组低,说明 UBE-PLIF 对于椎旁肌的破坏更小。

两组患者手术顺利,术中神经均获得充分减压。UBE-PLIF 组患者手术时间较 MIS-TLIF 组手术时间长,与该技术具有一定学习曲线有关,有研究报道 UBE-PLIF 治疗腰椎退变性疾病至少需要 34 例才能达到相对熟练操作^[13];但与 MIS-TLIF 组相比,UBE-PLIF 组术中出血量及术后引流量更少,与其可以把手术视野放大有关,更有利于止血,同时,UBE-PLIF 操作过程中在水介质中进行,能够更清晰显示出出血点,因此术中止血更充分。

UBE-PLIF 常见的并发症包括硬脊膜撕裂、脊髓硬膜外血肿、减压不充分、医源性不稳定、神经根损伤、感染、术后麻木等。硬脊膜撕裂是腰椎退变性疾病手术常见的并发症,有研究报道在使用 UBE-PLIF 治疗腰椎退变性疾病手术中硬脊膜

撕裂的发生率为 2.9%~5.8%^[14]。Kim 等^[15]认为即使发生硬脊膜撕裂也不需要做任何处理,因为 UBE-PLIF 对于腰背肌损伤较小,保护了腰背肌功能,因此当发生硬脊膜撕裂时,腰背肌可以起到防止脑脊液连续渗漏的作用。UBE-PLIF 术后脊髓硬膜外血肿属于手术之后诸多并发症中的一种较为少见的并发症,但是由于其进展迅速,若不能得到及时有效的处置对脊髓功能会造成毁灭性的损害。UBE-PLIF 术后复发需要再次手术 89% 因减压不充分或椎间盘切除不足^[15]。UBE-PLIF 手术医源性不稳的发生率(0.6%)明显低于其他手术方式医源性不稳的发生率(3.95%~9.5%)^[16],但是由于其可出现进行性腰椎滑脱和神经系统症状,严重影响患者生活质量,甚至需要再次手术治疗,所以医源性不稳定这一并发症也不容忽视;神经根损伤、感染、术后麻木等并发症相关报道较少。但在本研究当中,两组患者均未发生上述并发症。本研究末次随访未发现螺钉松动、移位、断裂等情况,术后 6 个月时复查 CT 显示所有患者达到骨性融合。

本研究为单中心的回顾性研究,病例数较少,可能存在统计偏倚,其临床疗效还需多中心、大样本前瞻性随机对照研究,且本研究随访时间较短,其远期临床疗效还需进一步证实。

综上所述,UBE-PLIF 治疗腰椎退变性疾病,可获得与 MIS-TLIF 相近的临床效果,虽然手术时间相对较长,具有相对陡峭的学习曲线,但通过一定的手术量积累,可以缩短手术时间。并且 UBE-PLIF 具有创伤小、术中出血少、术后引流少等优点,为手术治疗腰椎退行性疾病提供了新的选择。

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