

· 临床研究 ·

# 极外侧入路腰椎椎间融合术与传统后路术式治疗高位腰椎间盘突出症的病例对照研究

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**【摘要】** 目的:比较极外侧入路腰椎椎间融合术(extreme lateral interbody fusion, XLIF)与传统后路手术治疗高位腰椎间盘突出症的临床疗效。方法:收集 2010 年 6 月至 2014 年 12 月高位腰椎间盘突出症 60 例患者的临床资料,其中极外侧入路椎间植骨椎体钉固定组(XLIF 组)30 例,其中 T<sub>12</sub>L<sub>1</sub> 2 例、L<sub>1,2</sub> 6 例、L<sub>2,3</sub> 10 例、L<sub>3,4</sub> 12 例;后入路椎间植骨椎弓根钉固定组(传统后路组)30 例,其中 T<sub>12</sub>L<sub>1</sub> 1 例、L<sub>1,2</sub> 6 例、L<sub>2,3</sub> 8 例、L<sub>3,4</sub> 15 例。记录手术切口长度、手术时间、术中出血量、术后引流液量、住院时间,比较手术前后腰痛视觉模拟评分(visual analogue score, VAS)和腰椎日本骨科协会(Japanese Orthopedic Association, JOA)评分(29 分法),并根据影像资料,观察椎间融合器有无移位,分析椎间融合率情况。结果:所有患者获得随访,时间 12~48 个月,平均 29 个月。XLIF 组术后股神经损伤 2 例,术后 3 个月内恢复;传统后路组切口浅表感染 1 例,予抗感染治疗治愈。术中、术后均未出现脑脊液漏、马尾损伤以及下肢神经根功能恶化现象。XLIF 组手术时间(65.6±20.5) min,术中出血量(48.8±15.3) ml,术后引流量 0 ml;传统后路组手术时间(135.2±33.9) min,术中出血量(260.3±125.7) ml,术后引流量(207.1±50.2) ml;XLIF 手术时间短于传统后路组,术中出血量、术后引流量也较传统后路组少(P<0.05)。两组随访时的 JOA、VAS 评分均较术前明显改善(P<0.05),但术后 1、6、24 个月 VAS、JOA 评分两组对比差异无统计学意义(P>0.05)。两组术后 6、12 个月随访的融合率比较差异无统计学意义(P>0.05)。结论:应用 XLIF 治疗高位腰椎间盘突出症具有微创、手术时间短、并发症少、术后融合率高的优点,具有更好的临床疗效。

**【关键词】** 椎间盘移位; 腰椎; 外科手术; 病例对照研究

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**Case-control study of therapeutic effects between extreme lateral interbody fusion and conventional posterior operation for the treatment of upper lumbar disc herniation** XU Can-hua, WU Zeng-hui\*, CHEN Rong-chun, ZHONG Hong-fa, ZHANG Qing-shun, LIU Ning, and ZHANG Bi. \*The Second Department of Spinal Surgery, Guangzhou General Hospital of Guangzhou Military Command of PLA, Guangzhou 510010, Guangdong, China

**ABSTRACT Objective:** To evaluate the clinical outcomes between extreme lateral interbody fusion and conventional posterior operation in the treatment of upper lumbar disc herniation. **Methods:** Among 60 patients with upper lumbar disc herniation were treated with extreme lateral interbody fusion (XLIF) or conventional posterior operation from June 2010 to December 2014, 30 patients (19 males and 11 females) were treated with XLIF (XLIF group); and the other 30 patients (17 males and 13 females) were treated with conventional posterior operation (conventional group). In XLIF group, the lesions occurred at T<sub>12</sub>L<sub>1</sub> segments in 2 patients, at L<sub>1,2</sub> segments in 6 patients, at L<sub>2,3</sub> segments in 10 patients, and at L<sub>3,4</sub> segment in 12 patients. In conventional group, the lesions occurred at T<sub>12</sub>L<sub>1</sub> segments in 1 patient, at L<sub>1,2</sub> segments in 6 patients, at L<sub>2,3</sub> segments in 8 patients, and at L<sub>3,4</sub> segment in 15 patients. Operative incision lengths, time, blood loss, postoperative draining volume, hospital stays were recorded. Pre-and post-operative visual analogue score (VAS) and Japanese Orthopedic Association (JOA) were compared between two groups. According to the image data, the intervertebral fusion device was observed to be displaced and the rate of interbody fusion was analyzed. **Results:** All the patients were followed up, and the duration ranged from 12 to 48 months, with an average of 29 months. The complications included 2 femoral nerve damage in XLIF group (postoperative recovery within 3 months) and superficial incision infection in conventional group (cured by anti-infection). There were no patients with cerebrospinal fluid leakage (CSFL), cauda equina injuries or functional deterioration in the nerve root of lower limbs. In the XLIF group: the operative time was (65.6±20.5) minutes, blood loss was (48.8±15.3) ml, postoperative draining volume was 0 ml. In the conventional group: the operative time was (135.2±33.9) minutes, blood loss was (260.3±125.7) ml, postoperative draining volume was (207.1±50.2) ml. The operative time, blood loss, postoperative draining volume in XLIF group were less than

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those in the conventional group ( $P < 0.05$ ). The JOA and VAS score were significantly improved in both groups during the follow-up period compared with those before operation ( $P < 0.05$ ). But the difference of the JOA and VAS score between the two groups 1, 6, and 24 months after surgery had not significant differences ( $P > 0.05$ ). There were no significant differences in the fusion rate between the two groups 6 and 12 months after operation ( $P > 0.05$ ). **Conclusion:** The XLIF fusion for the treatment of upper lumbar disc herniation has several advantages such as minimal invasive, stable vertebral plate, less complications and postoperative fusion rate, which has a better clinical effect.

**KEYWORDS** Intervertebral disc displacement; Lumbar vertebrae; Surgical procedures, operative; Case-control studies  
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腰椎退行变、髓核突出压迫硬膜及神经根是腰椎间盘突出症的发病基础,保守治疗无效的情况下,手术治疗的关键是充分减压、解除压迫及椎间融合维持脊柱的稳定。脊柱融合技术是脊柱外科里程碑式的重大突破,最早文献报道的脊柱融合技术可以追溯到 1911 年<sup>[1]</sup>,经过长期的发展,逐渐成熟的现代脊柱融合技术已广泛应用于临床并取得良好的效果。目前,腰椎融合手术方式主要包括后入路、前入路、极外侧入路腰椎椎体间融合等。传统的后入路腰椎融合技术手术过程显露范围大、软组织显露剥离及牵拉创伤重、小关节破坏影响腰椎后柱的稳定,影响术后恢复<sup>[2]</sup>。极外侧入路腰椎椎间融合术(extreme lateral interbody fusion, XLIF)是指经侧入路,经腹膜后直达腰大肌,显露腰椎及间隙的一种手术方式<sup>[3]</sup>;该术式具有手术损伤小、术中时间短、出血少、脊柱融合效果好等优点。现将 2010 年 6 月至 2014 年 12 月采用 XLIF 或传统后路手术治疗的高位腰椎间盘突出症的对比研究报告如下。

## 1 资料与方法

### 1.1 一般资料

**诊断标准:**有单侧或双侧下肢疼痛、麻木症状的持续腰背部疼痛,腿痛重于腰痛,且 3 个月以上保守治疗不缓解;主要阳性体征为突出节段棘突及棘突旁压痛,伴或不伴放射痛。直腿抬高试验及加强试验阳性,伴有相应感觉减退,伴或不伴相应肌力减退;经腰椎 CT 和 MRI 扫描证实存在单节段腰椎间盘变性以及相应椎间盘突出、脱出,影像学表现与临床症状相符合,无突出椎间盘严重钙化、合并严重椎管狭窄。病例纳入标准:符合腰椎间盘突出症诊断,责任

节段为 T<sub>12</sub>L<sub>1</sub>、L<sub>1,2</sub>、L<sub>2,3</sub>、L<sub>3,4</sub> 单节段患者。排除标准:多节段椎间盘突出,髓核突出游离,腰椎管严重狭窄,腰椎滑脱, L<sub>5</sub>S<sub>1</sub> 椎间盘突出,手术禁忌的系统性疾病,脊柱序列异常等据相关文献报道<sup>[3-6]</sup>XLIF 的禁忌证。选择自 2010 年 6 月至 2014 年 12 月高位腰椎间盘突出症 60 例, XLIF(XLIF 组)与传统后路术(传统后路组)处理患者各 30 例,其中,男 36 例,女 24 例;年龄 42~74 岁,平均 57.2 岁;椎间盘突出节段 T<sub>12</sub>L<sub>1</sub> 3 例, L<sub>1,2</sub> 12 例, L<sub>2,3</sub> 18 例, L<sub>3,4</sub> 27 例。所有患者获得随访,时间 12~48 个月,平均 29 个月,两组患者术前一般资料比较差异无统计学意义,有可比性(见表 1)。

### 1.2 治疗方法

**1.2.1 XLIF 组** 患者全麻下取右侧卧位,将卧侧垫高以增加腹腔与胸腔的距离。在 G 形臂 X 线机透视下定位责任节段,并于腋中线标记,第 2 个标记在后正中患椎棘突与第 1 个标记中点处。常规消毒铺巾后,在第 2 个标记点斜行切口,术者食指插入肌间隙以识别腹膜后间隙,在第 2 个标记点放置扩张器,食指轻轻插入扩张器轻柔地从中间或前 1/3 分离,使腰椎血管神经丛在手术区域后侧(将腰肌从中间向两侧分离的同时,行神经电生理监测,避开腰神经丛,到达椎间盘,再次透视以确认是否位置准确),置入特制扩张器。用髓核钳等取出椎间盘,用环状刮勺刮除椎间盘上下软骨板,融合器试模定形后,取异体骨置入合适椎间融合器(cage)中后置入椎间隙。取合适大小椎体钉置入椎体,连接棒固定上下椎体,生理盐水反复冲洗,逐层缝合,无菌纱布包扎。

**1.2.2 传统后路组** 患者全麻下取俯卧位,定位病变节段,取后正中切口,逐层切开软组织,骨膜下剥

表 1 两组腰椎间盘突出症患者术前临床资料比较

Tab.1 Comparison of clinical data between two groups of patients with lumbar disc herniation before operation

组别	例数	性别(例)		年龄( $\bar{x} \pm s$ , 岁)	手术节段(例)				JOA 评分( $\bar{x} \pm s$ , 分)
		男	女		T <sub>12</sub> L <sub>1</sub>	L <sub>1,2</sub>	L <sub>2,3</sub>	L <sub>3,4</sub>	
XLIF 组	30	19	11	55.3±9.6	2	6	10	12	13.0±5.1
传统后路组	30	17	13	58.1±12.7	1	6	8	15	12.7±4.8
检验值	-	$\chi^2=0.263$		$t=0.916$	$\chi^2=0.889$			$t=0.148$	
P 值	-	0.135		0.524	0.828			0.890	

离椎旁肌,显露椎板和关节突,置入椎弓根螺钉,咬除关节突、椎板、棘突进行后路全椎板减压,显露椎间盘,清理椎间隙,放入置入异体骨的椎间融合器,安装连接棒,放置负压引流。生理盐水反复冲洗,逐层缝合,无菌纱布包扎。

1.2.3 术后处理

术后常规预防感染,小剂量激素、脱水、保护胃黏膜并卧床休息等处理。麻醉苏醒后即嘱患者主动进行双下肢踝关节背伸运动并被动进行双下肢直腿抬高运动,根据引流量(24 h 引流液<50 ml),于术后 48~72 h 拔除切口引流管。XLIF 组患者于术后 1 d 佩戴腰围下床活动,传统后路组患者于术后 3~5 d 佩戴腰围下床活动,进行腰背肌锻炼。

1.3 观察项目与方法

记录手术切口长度、手术时间、术中出血量、术后引流流量及住院时间等围手术期指标;对比术前、术后腰痛视觉模拟评分(VAS)<sup>[7]</sup>和腰椎日本骨科协会(JOA)<sup>[8]</sup>评分(29 分法),评价术后恢复情况。术后复查腰椎 X 线片,依据 Bridwell 的融合分级标准评估融合等级<sup>[4]</sup>。

1.4 统计学处理

应用 SPSS 20.0 软件对数据进行统计学处理。两组患者手术前后及随访收集的参数采用成组设计定量资料的 *t* 检验进行比较分析,同一术式患者手术前后 VAS、JOA 评分采用配对设计定量资料的 *t* 检验比较,融合率比较采用  $\chi^2$  检验。以 *P*<0.05 为差异有统计学意义。

2 结果

2.1 两组患者手术前后一般情况观察

两组患者均获得随访,平均 29 个月(12~48 个月)。XLIF 组手术切口长度、手术时间、术中出血量、术后引流量和住院时间均优于传统后路组(表 2)。

2.2 两组患者腰痛 VAS 及腰椎 JOA 比较

所有患者术后 1、6、24 个月腰痛 VAS 评分较术前明显改善,术后 1、6 个月腰椎 JOA 评分均较术前明显改善;术后 1 个月腰痛 VAS、腰椎 JOA 评分两组间比较差异有统计学意义;术后 6、24 个月腰痛 VAS 评分及术后 6 个月腰椎 JOA 评分两组比较差异均无统计学意义(见表 3-4)。

2.3 两组患者术后融合率比较

术后 6 个月 XLIF 组的 1、2、3 级融合率分别为 57%、40%、3.4%,术后 12 个月 1、2、3 级融合率分别为 96.7%、0%、3.3%,与传统后路组比较差异均无统计学意义(表 5)。

2.4 两组患者术后并发症比较

XLIF 组患者术后第 1 天复查,下床活动;传统后路组术后第 3~5 天复查,下床活动。XLIF 组 2 例发生术后股神经功能损伤,术后 3 个月内完全恢复;传统后路组 1 例发生浅表伤口感染,予抗感染治疗后治愈。两组均未出现断钉、断棒、内置物移位等并发症(图 1-2)。

3 讨论

3.1 高位腰椎间盘突出症及其手术治疗

目前,治疗高位腰椎间盘突出手术入路主要包

表 2 两组腰椎间盘突出症患者一般情况比较( $\bar{x}\pm s$ )

Tab.2 Comparison of general conditions between two groups of patients with lumbar disc herniation( $\bar{x}\pm s$ )

组别	例数	手术时间(min)	切口长度(cm)	术中出血量(ml)	术后引流量(ml)	住院天数(d)
XLIF 组	30	65.6±20.5	4.1±1.2	48.8±15.3	0	6.7±2.5
传统后路组	30	135.2±33.9	6.0±1.8	260.3±125.7	207.1±50.2	10.2±3.9
<i>t</i> 值	-	7.912	4.498	6.774	20.815	2.978
<i>P</i> 值	-	0.00	0.03	0.00	0.00	0.01

表 3 两组腰椎间盘突出症患者术前及术后随访的腰痛 VAS 评分比较( $\bar{x}\pm s$ ,分)

Tab.3 Comparison of VAS scores of patients with lumbar disc herniation between two groups before operation and at the follow-up( $\bar{x}\pm s$ , score)

组别	例数	术前	术后 1 个月	术后 6 个月	术后 24 个月
XLIF 组	30	7.1±2.5	3.3±1.7 <sup>①</sup>	2.7±2.1 <sup>①</sup>	2.3±1.9 <sup>①</sup>
传统后路组	30	7.4±2.7	4.8±1.8 <sup>①</sup>	2.8±2.3 <sup>①</sup>	2.4±2.2 <sup>①</sup>
<i>t</i> 值	-	1.145	3.726	0.901	0.268
<i>P</i> 值	-	0.12	0.00	0.38	0.79

注:①与术前比较,*P*<0.05

Note:①Compared to preoperative score,*P*<0.05

表 4 两组腰椎间盘突出症患者术后 JOA 评分比较 ( $\bar{x}\pm s$ , 分)

Tab.4 Comparison of JOA score of patients with lumbar disc herniation between two groups at different times after operation ( $\bar{x}\pm s$ , score)

项目	XLIF 组 (例数=30)		传统后路组 (例数=30)	
	术后 1 个月	术后 6 个月	术后 1 个月	术后 6 个月
主观症状	6.36±0.83	7.79±0.94	5.48±0.75	7.09±0.87
日常活动受限度	10.57±1.39	11.76±1.49	8.57±1.43	11.09±1.57
临床体征	4.17±0.64	5.09±0.71	3.91±0.86	5.24±0.75
膀胱功能	0	0	0	0
总分	21.5±4.3	24.5±3.6	18.1±4.0	23.9±3.3

注: 术后 1 个月两组总分比较,  $t=1.370, P=0.04$ ; 术后 6 个月两组总分比较,  $t=0.218, P=0.83$

Note: Comparison of total point between two groups 1 month after operation,  $t=1.370, P=0.04$ . Comparison of total point between two groups 6 months after operation,  $t=0.218, P=0.83$



图 1 患者,女,74 岁,腰椎间盘突出症、腰椎退行性变 1a,1b. CT 矢状位和水平位示 L<sub>1,2</sub> 椎间盘退变伴突出,椎体后缘钙化 1c,1d. MRI 矢状位和水平位示 L<sub>1,2</sub> 椎间盘退变伴突出,椎管狭窄 1e,1f. 术后 1 个月腰椎正侧位 X 线片示椎弓根固定, L<sub>1,2</sub> 椎间高度恢复,融合器位置好

Fig.1 Female, 74-year-old, lumbar disc herniation, lumbar degeneration 1a, 1b. Sagittal and horizontal CT showed L<sub>1,2</sub> intervertebral disc degeneration with prominent and vertebral calcification 1c, 1d. Sagittal and horizontal MRI showed L<sub>1,2</sub> disc degeneration with prominent, spinal stenosis 1e, 1f. Post-operative lumbar AP and lateral radiographs on the first month showed L<sub>1,2</sub> pedicle fixation, intervertebral height restoration, fusion location

括后路、前路、侧入路,其中后入路又包括传统开放、微创通道下椎间融合内固定等。传统后路减压椎间融合手术疗效确切,被认为是腰椎后路融合金标准;主要的不足是软组织损伤严重,神经损伤风险高,手

术时间较长、出血多,术后恢复时间长。为了减少传统手术损伤,近年来脊柱微创治疗发展迅速,微创通道下经椎间孔减压、椎间融合、经皮椎弓钉固定等技术逐渐成熟,有文献报道<sup>[9-10]</sup>将椎间孔镜技术应用在



表 5 两组腰椎间盘突出症患者术后融合率比较 [% (例/例)]

Tab.5 Comparison of fusion rate of patients with lumbar disc herniation between two groups after operation [% (case/case)]

组别	例数	术后 6 个月融合率			术后 12 个月融合率		
		1 级	2 级	3 级	1 级	2 级	3 级
XLIF 组	30	57.0(17/30)	40.0(12/30)	3.3(1/30)	96.7(29/30)	-	3.3(1/30)
传统后路组	30	53.0(16/30)	40.0(12/30)	6.6(2/30)	96.7(29/30)	-	3.3(1/30)
$\chi^2$ 值	-	0.364			0.0		
P 值	-	0.834			1.0		



图 2 患者,男,57 岁,腰椎间盘突出症、腰椎退行性变 2a,2b. CT 矢状位和水平位示 L<sub>3,4</sub> 椎间盘退变伴突出 2c,2d. MRI 矢状位和水平位显示 L<sub>3,4</sub> 椎间盘、右侧隐窝狭窄和中央椎管狭窄 2e,2f. 术后 1 个月腰椎正侧位 X 线片示椎弓根固定, L<sub>3,4</sub> 椎间高度恢复,融合器位置好  
 Fig.2 Male, 57-year-old, lumbar disc herniation, lumbar degeneration 2a, 2b. Sagittal and horizontal CT showed intervertebral disc degeneration and herniation in L<sub>3,4</sub> 2c, 2d. Sagittal and horizontal MRI showed L<sub>3,4</sub> intervertebral disc, right recess stenosis and central spinal stenosis 2e, 2f. Postoperative lumbar AP and lateral radiographs on the first month showed L<sub>3,4</sub> pedicle fixation, intervertebral height restoration, fusion location

高位腰椎间盘突出症的治疗中取得了满意的疗效。

### 3.2 XLIF 技术

XLIF 是一种在微创通道辅助下实施的腰椎侧入路融合手术,间接减压减少了常规前路及后路手术的风险,具有创伤小、术后恢复快等优点<sup>[11-14]</sup>。主要用于治疗腰椎间盘突出、腰椎轻度滑脱、腰椎骨折、腰椎退行性疾病、结核及肿瘤等。文献报道<sup>[13-14]</sup>,行 XLIF 手术前后腰椎 VAS、Oswestry 功能障碍指数 (ODI) 比较差异有统计学意义,手术效果理想。XLIF

并发症少<sup>[15-17]</sup>,主要包括:腰骶丛神经损伤,如术后屈髋和腰大肌无力;腹腔血管脏器损伤,如腹膜穿孔等。

### 3.3 结果分析

XLIF 采用侧方入路,经腹膜后、腰大肌进入椎间隙行椎体钉固定,内固定置入远离神经根及硬膜,术中软组织基本保留,脊柱结构完整,故手术损伤小、出血少、术后恢复快。从两组病例的手术切口、手术时间、术中出血量、术后切口引流液量的对比来看,验证了 XLIF 手术具有微创的特点,两组结果差

异有统计学意义,特别是手术时间、出血量和术后引流量差异较大;与文献报道<sup>[3-4,11]</sup>应用 XLIF 治疗腰椎间盘突出结果一致。在术后功能恢复方面,XLIF 组和传统后路组术后 1 个月随访时的腰痛 VAS 评分分别为  $3.3 \pm 1.7$  和  $4.8 \pm 1.8$ , 腰椎 JOA 评分分别为  $21.5 \pm 4.3$  和  $18.1 \pm 4.0$ , 两者相比差异有统计学意义,即前者优于后者。另外,XLIF 组病例采用的椎间融合器长度与椎体横径相同,接触面积大,保留了关节突及椎板,不破坏脊柱骨性结构,保证了脊柱的稳定性,术后 1 d 即可下床活动,早期开始功能锻炼,避免长期卧床的并发症。通过对两组数据分析,术后 6、12 个月融合率两组差异无统计学意义,XLIF 手术能取得与传统后路手术相似的融合率。Malham 等<sup>[18]</sup>也报道 XLIF 与传统的手术方法在不影响临床结果和融合率情况下,具有并发症发生率低的优点。

因此,从以上分析可以看出,XLIF 较传统后路手术治疗高位腰椎间盘突出具有更好的临床优势。需要注意的是:XLIF 是经侧入路腰大肌间接减压内固定,不适应椎间盘纤维环破裂髓核脱出游离的患者。

综上所述,通过回顾,综合分析多项指标,证实 XLIF 手术治疗腰椎间盘突出患者手术时间短、术中出血量少,术前后 JOA、VAS 评分得到明显改善,具有理想的临床疗效。行 XLIF 治疗腰椎间盘突出早期疗效是满意的,术后并发症发生率低,是理想的微创治疗腰椎间盘突出的方法之一。本研究受随访时间、病例数量的限制,缺乏大样本的数据支持,接下来将进一步收集病例,长期随访、收集观察。

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