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混合型单髁与全膝关节置换治疗膝内侧间室骨关节炎的疗效比较

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【摘要】 目的: 探讨 Oxford 第 3 代混合型单髁置换(unicompartmental knee arthroplasty, UKA)与全膝关节置换(total knee arthroplasty, TKA)治疗膝内侧间室骨关节炎的疗效。方法: 回顾性分析 2017 年 10 月至 2019 年 10 月行膝关节置换术的 156 例患者, 男 44 例, 女 112 例, 年龄 50~75(58.76±4.97)岁。根据不同治疗方式分为单侧 TKA 组和单侧 Oxford 第 3 代混合型 UKA 组。单侧 TKA 81 例(81 膝), 男 23 例, 女 58 例, 年龄 51~75(58.60±5.01)岁; 单侧 Oxford 第 3 代混合型 UKA 75 例(75 膝), 男 21 例, 女 54 例, 年龄 50~72(58.92±4.95)岁。比较两组临床评估指标, 包括手术一般情况、相关并发症、美国膝关节协会评分(American Knee Society score, AKSS)临床评分和功能评分; 影像评估指标包括髌膝踝角(hip-knee-ankle angle, HKA)、股骨假体内外翻角(femoral component valgus/varus angle, FCVA)、股骨假体后倾角(femoral component posterior slope angle, FCPSA)、胫骨假体内外翻角(tibial component valgus/varus angle, TCVA)、胫骨假体后倾角(tibial component posterior slope angle, TCPSA), 是否发生膝外侧间室进展、衬垫脱位、假体下沉、松动。结果: UKA 组术中出血量、手术时间、住院天数均显著优于 TKA 组($P<0.05$), 两组术后均未出现并发症。两组患者均获随访, 时间 24~54(38.01±8.90)个月。末次随访两组 AKSS 临床评分、功能评分、HKA 均优于术前($P<0.05$)。末次随访 UKA 组 AKSS 临床评分、功能评分均优于 TKA 组($P<0.05$), TKA 组 HKA 优于 UKA 组($P<0.05$)。末次随访两组 TCVA、FCVA 差异无统计学意义($P>0.05$), UKA 组 TCPSA、FCPSA 大于 TKA 组($P<0.05$), UKA 组未出现外侧室进展。结论: Oxford 第 3 代混合型 UKA 治疗膝内侧间室骨关节炎, 较 TKA 具有手术创伤小、失血量少、手术时间短、住院时间短、术后快速康复、膝关节功能恢复更好等优势, 疗效满意。

【关键词】 Oxford 第 3 代混合型单髁置换; 全膝关节置换; 骨关节炎

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Comparison of outcomes of mixed unicompartmental knee arthroplasty and total knee arthroplasty in the treatment of medial osteoarthritis of the knee

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ABSTRACT Objective To evaluate outcomes of mixed unicompartmental knee arthroplasty (UKA) and total knee arthroplasty (TKA) in the treatment of medial osteoarthritis (OA) of the knee. **Methods** Retrospective analysis of 156 patients, 44 males and 112 females, aged from 50 to 75 years old with an average of (58.76±4.97) years old, who underwent knee arthroplasty from October 2017 to October 2019. The patients were divided into two groups: 81 cases (81 knees) underwent TKA, including 23 males and 58 females, aged from 51 to 75 years old with an average of (58.60±5.01) years old, and 75 case (75 knees) underwent UKA with mixed phase 3 Oxford, including 21 males and 54 females, aged from 50 to 72 years old with an average of (58.92±4.95) years old. The two groups were compared regarding to the clinical outcomes, assessed using surgical information and complications, American Knee Society score (AKSS) clinical score and functional score. Radiographs were assessed using hip-knee-ankle angle (HKA), tibial component valgus/varus angle (TCVA), tibial component posterior slope angle (TCPSA), femoral component valgus/varus angle (FCVA), femoral component posterior slope angle (FCPSA), looking for bearing dislocation, prosthesis loosening, progression of OA in lateral compartment. **Results** Intraoperative bleeding, operative time and hospital days were significantly better in the UKA group than in the TKA group ($P<0.05$), and there were no postoperative complications in either group. Patients in both groups were enrolled with an average follow-up time of (38.01±8.90) months, ranged from 24 to 54 months. AKSS functional, AKSS clinical, HKA in both groups significantly improved at the final follow-up compared with those before operation. At the final follow-up, the UKA group was significantly better than the TKA group in AKSS functional and AKSS clinical, whereas HKA in the TKA group was better. At the final follow-up. TCVA and FCVA between the two groups were not significantly different, while TCPSA and FCPSA in the UKA group were significantly greater than the TKA group. No signs of progression of OA to the lateral compartment were observed. **Conclusion** Mixed phase 3 Oxford UKA in medial unicompartmental knee osteoarthritis was considerably better than TKA for less blood loss, shorter operation time, shorter hospital stay, rapid postoperative recovery, helping achieve satisfactory function, provided satisfactory outcome.

KEYWORDS Mixed phase 3 Oxford unicompartmental knee arthroplasty; Total knee arthroplasty; Osteoarthritis

膝关节置换手术可以有效缓解疼痛和改善功能,恢复患者生活质量,被认为是治疗保守效果不佳的终末期膝骨关节炎的最有效手段。单纯的膝关节内侧间室重度骨关节炎既往常应用全膝关节置换术(total knee arthroplasty, TKA)治疗。随着手术技术的提升及假体设计的不断改进,单髁置换术(unicompartmental knee arthroplasty, UKA)在临床上得到越来越多的应用^[1-3]。本研究回顾分析了 2017 年 10 月至 2019 年 10 月因膝关节内侧间室重度骨关节炎行单侧 TKA 81 例(81 膝)和单侧 Oxford 第 3 代混合型(股骨侧生物固定型假体、胫骨侧骨水泥固定型假体及活动型高分子聚乙烯衬垫)UKA 75 例(75 膝)患者临床资料,比较两组临床疗效,报道如下。

1 资料与方法

1.1 病例选择

纳入标准:(1)术前 X 线及查体符合膝关节内侧间室骨关节炎,无合并严重髌股关节炎或者膝关节外侧间室骨关节炎。(2)膝关节屈曲挛缩 $<15^{\circ}$,内翻 $<15^{\circ}$,关节活动度 $>100^{\circ}$ 。(3)术中明确膝关节各韧带功能好。(4)随访时间 >2 年。排除标准:膝关节骨坏死、炎症性关节炎,合并严重精神类疾病。

1.2 临床资料

2017 年 10 月至 2019 年 10 月行膝关节置换术

156 例,男 44 例,女 112 例,年龄 50~75 (58.76±4.97) 岁。单侧 TKA 患者 81 例(81 膝)和行单侧 Oxford 第 3 代混合型 UKA 患者 75 例(75 膝)。TKA 组患者年龄 51~75 岁,UKA 组患者年龄 50~72 岁。两组患者性别、侧别、年龄、身体质量指数比较,差异无统计学意义($P>0.05$),具有可比性。见表 1。

表 1 两组行膝关节置换手术患者一般资料比较

Tab.1 Comparison of general data between two groups of patients with undergoing knee arthroplasty

组别	例数	性别/例		侧别/例		年龄($\bar{x}\pm s$)/岁	身体质量指数($\bar{x}\pm s$)/ $\text{kg}\cdot\text{m}^{-2}$
		男	女	左	右		
TKA 组	81	23	58	43	38	58.60±5.01	24.82±2.41
UKA 组	75	21	54	36	39	58.92±4.95	25.10±2.11
检验值		$\chi^2=-0.055$		$\chi^2=-0.633$		$t=-0.395$	$t=-0.568$
P 值		0.956		0.527		0.694	0.571

1.3 治疗方法

1.3.1 术前评估 膝关节负重位正侧位、双下肢负重位全长、内外翻应力位、屈膝 45°髌骨轴位 X 线片评估,体格检查评估。

1.3.2 手术方法 两组均接受全麻,由同一组医师完成手术。

TKA 组采用髌旁内侧入路, 胫骨髓外定位完成胫骨近端截骨、股骨髓内定位完成股骨远端及四合一截骨。试模调试屈伸间隙平衡并行髌骨成形及髌周去神经化后安装胫骨、股骨假体及聚乙烯垫片, 彻底冲洗后关闭伤口。本组患者均采用固定平台后稳定型全膝假体。

UKA 组采用微创髌旁内侧入路, 胫骨侧参考髌腱内缘与髌间棘内侧结节的连线^[4]做垂直截骨后再行水平截骨, 再完成股骨后髁截骨及远端研磨, 制备胫骨龙骨槽。试模调试屈伸间隙平衡, 极度屈膝外旋内翻垫片无脱位后安装骨水泥型胫骨假体、生物型股骨假体, 活动型聚乙烯衬垫, 彻底冲洗后关闭伤口。本组患者均采用 Oxford 第 3 代混合型假体。

两组术中均于关节腔内注射氨甲环酸注射液 1 g (广州白云山天心制药股份有限公司, 国药准字 H20059686, 5 ml:0.5 g), 均未放置引流管。

1.3.3 术后处理 两组均常规进行消肿、止痛、预防感染、抗凝等处理, 术后当天开始踝泵训练, 术后第 1 天开始助行器下地负重行走及渐进性功能训练。术后每隔 6 个月行临床评估并复查膝关节负重位正侧位、双下肢负重位全长及屈膝 45° 髌骨轴位 X 线片。

1.4 观察项目与方法

1.4.1 临床评估指标 手术一般情况包括术中出血量、手术时间、住院时间。观察围手术期是否发生切口愈合不良、感染、肺栓塞及下肢深静脉血栓形成。采用美国膝关节协会评分 (American Knee Society score, AKSS)^[5], 分别于术前、末次随访进行评估, 包括 AKSS 临床评分和 AKSS 功能评分。

1.4.2 影像学评估指标 髌膝踝角 (hip-knee-ankle angle, HKA): 股骨头中心-膝关节中心-踝关节中心, 三点所形成的角度。胫骨假体内翻角 (tibial component valgus/varus angle, TCVA) 和胫骨假体后倾角 (tibial component posterior slope angle, TCPSA): TCVA 为膝关节正位 X 线片胫骨解剖轴的垂线与胫骨假体底板的夹角, 内翻为正值, 外翻为负值 (图 1a); TCPSA 为膝关节侧位 X 线片胫骨解剖轴的垂线与胫骨假体底板的夹角 (图 1b)。股骨假体内翻角 (femoral component valgus/varus angle, FCVA) 和股骨假体后倾角 (femoral component posterior slope angle, FCPSA): FCVA 为双下肢全长 X 线片股骨机械轴与股骨假体力线的夹角 (图 1a); FCPSA 为膝关节侧位 X 线片股骨解剖轴与股骨假体力线的夹角 (图 1b)。应用 Kellgren-Lawrence 分级^[6]评估是否发生膝关节外侧间室进展, 观察是否发生衬垫脱位、假体下沉、松动。



图 1 UKA 术后假体相关角度测量 1a. 胫骨假体内翻角、股骨假体内翻角 1b. 胫骨假体后倾角、股骨假体后倾角

Fig.1 Measurement of relative angles of prosthesis after UKA 1a. Tibial component valgus/varus angle, femoral component valgus/varus angle 1b. Tibial component posterior slope angle, femoral component posterior slope angle

1.5 统计学处理

采用 SPSS 20.0 软件进行统计分析, 检验水准取 $\alpha=0.05$, 符合正态分布的定量资料采用均数 \pm 标准差 ($\bar{x}\pm s$) 表示, 包括两组的年龄、身体质量指数、术中出血量、手术时间、住院时间、AKSS 临床和功能评分、HKA、TCVA、TCPSA、FCVA、FCPSA, 采用成组设计定量资料的 t 检验行组间比较。定性资料包括性别、侧别, 采用 χ^2 检验。以 $P<0.05$ 为差异有统计学意义。

2 结果

2.1 临床评估

UKA 组术中出血量、手术时间、住院时间均优于 TKA 组 ($P<0.05$), 见表 2。两组围手术期均未发生切口愈合不良、感染、肺栓塞及下肢深静脉血栓形成。两组患者均获得随访, 时间 24~54 (38.01 \pm 8.90) 个月。两组术前 AKSS 临床评分、功能评分比较, 差异无统计学意义 ($P>0.05$); UKA 组末次随访 AKSS 临床评分、功能评分优于 TKA 组 ($P<0.05$), 两组患者末次随访评分均优于术前 ($P<0.05$), 见表 3。

2.2 影像评估

两组术前 HKA 比较差异无统计学意义 ($P>0.05$); 末次随访 TKA 组优于 UKA 组 ($P<0.05$), 两组均优于术前 ($P<0.05$)。末次随访两组 TCVA、FCVA 比较差异无统计学意义 ($P>0.05$), UKA 组 TCPSA、FCPSA 均大于 TKA 组 ($P<0.05$), 见表 4。UKA 组无发生膝关节外侧室进展, 两组均未发生衬垫脱位、假

表 2 两组行膝关节置换手术患者手术一般情况比较 ($\bar{x}\pm s$)

Tab.2 Comparison of surgical information between two groups of patients undergoing knee arthroplasty ($\bar{x}\pm s$)

组别	例数	术中出血量/ml	手术时间/min	住院时间/d
TKA 组	81	62.86±10.31	65.72±9.15	7.25±1.44
UKA 组	75	33.56±9.91	40.51±8.01	5.39±1.26
<i>t</i> 值		-18.245	-18.069	-8.566
<i>P</i> 值		0.000	0.000	0.000

体下沉、松动。典型病例影像学图片见图 2、图 3。

3 讨论

3.1 Oxford 第 3 代混合型 UKA 治疗膝关节内侧间室重度骨关节炎的优点

UKA 和 TKA 都是治疗膝关节内侧间室重度骨关节炎的常用术式,但最佳手术治疗一直存在争议^[7-8]。TKA 通过膝关节双间室或者三间室置换彻底修复病变关节,疗效明确^[9]。但对于仅仅累及内侧间室重度骨关节炎,会破坏额外间室及交叉韧带而造成过度治疗。而 UKA 是破坏较小的术式,直接置换

表 3 两组行膝关节置换手术患者临床指标比较 ($\bar{x}\pm s$)

Tab.3 Comparison of clinical indexes between two groups of patients undergoing knee arthroplasty ($\bar{x}\pm s$)

组别	例数	AKSS 临床评分		AKSS 功能评分	
		术前	末次随访	术前	末次随访
UKA 组	81	52.60±6.15	90.83±5.44*	51.24±6.05	88.13±4.44*
TKA 组	75	52.46±5.47	86.91±5.68*	50.91±6.19	83.07±4.33*
<i>t</i> 值		-0.154	-4.396	0.851	-7.189
<i>P</i> 值		0.878	0.000	0.740	0.000

单位:分

注: *与术前比较, $P < 0.05$

病变的内侧间室,保留了外侧间室、前后交叉韧带及髌股关节^[10],更符合自然的膝关节生物力学^[11-12]。

目前,随着手术技术的提升及假体设计的不断改进,UKA 在临床上应用越来越多。Oxford 单髁是典型的平台型单髁^[13],具有独特的自由活动型半月板衬垫,临床疗效明确。但 Oxford 第 3 代骨水泥型 UKA 术后影像存在较高的透亮线发生率^[14],甚至误解导致翻修^[15];而 Oxford 第 3 代生物型 UKA 存



图 2 患者,女,61 岁,膝内侧间室骨关节炎行 UKA 2a,2b. 术前负重位正侧位 X 线片示内侧室骨关节炎 2c. 术前双下肢负重位全长 X 线片示下肢力线内翻 2d,2e. 术后 30 个月负重位正侧位 X 线片示假体位置良好,未见脱位,未见透亮线 2f. 术后 30 个月双下肢负重位全长 X 线片示下肢力线良好

Fig.2 A 61-year-old female patient, medial osteoarthritis of the knee underwent UKA 2a,2b. Preoperative weight-bearing AP and lateral X-ray films showed medial unicompartmental knee osteoarthritis 2c. Preoperative weight-bearing long X-ray of bilateral lower limbs showed lower limbs alignment in varus position 2d,2e. At 30 months postoperative weight-bearing AP and lateral X-ray films showed components in good position, no dislocation and no bright line 2f. At 30 months postoperative weight-bearing long X-ray film of bilateral lower limbs showed lower limbs alignment

表 4 两组行膝关节置换手术患者影像指标比较($\bar{x}\pm s$)

Tab.4 Comparison of imaging indexes between two groups of patients undergoing knee arthroplasty($\bar{x}\pm s$)

组别	例数	HKA		末次随访	末次随访	末次随访	末次随访
		术前	末次随访	TCVA	TCPSA	FCVA	FCPSA
UKA 组	81	170.79±2.65	176.07±2.20*	1.15±1.84	7.23±2.29	2.09±1.60	5.09±2.34
TKA 组	75	170.07±2.75	177.19±1.91*	1.59±1.37	3.74±1.13	2.05±1.15	2.57±1.52
t 值		-1.644	3.377	0.009	-10.766	-0.198	-8.050
P 值		0.102	0.001	0.086	0.000	0.843	0.000

单位:°

注: *与术前比较, $P < 0.05$



图 3 患者,女,63 岁,膝内侧间室骨关节炎行 TKA 3a,3b. 术前负重位正侧位 X 线片示内侧室骨关节炎 3c. 术前双下肢负重位全长 X 线片示下肢力线内翻 3d,3e. 术后 30 个月负重位正侧位 X 线片示假体位置良好,未见透亮线 3f. 术后双下肢负重位全长 X 线片示下肢力线良好
Fig.3 A 63-year-old female patient with medial osteoarthritis of the knee underwent TKA 3a,3b. Preoperative weight-bearing AP and lateral X-ray films showed medial unicompartmental knee osteoarthritis 3c. Preoperative weight-bearing long X-ray of bilateral lower limbs showed lower limbs alignment in varus position 3d,3e. At 30 months postoperative weight-bearing AP and lateral X-ray films showed components in good position, no dislocation and no bright line 3f. At 30 months postoperative weight-bearing long X-ray film of bilateral lower limbs showed lower limbs alignment

在一定的胫骨假体周围骨折发生率特别是亚洲人群^[16-17]。2017 年 Oxford 第 3 代混合型 UKA 开始应用于国内临床,组件包括活动型高分子聚乙烯衬垫、骨水泥固定型胫骨假体及生物固定型股骨假体,报道相关临床疗效的文章仍较少。本研究对 2017 年 10 月至 2019 年 10 月因膝关节内侧间室重度骨关节炎行单侧 TKA 81 例和单侧 Oxford 第 3 代混合型 UKA 75 例患者临床资料回顾分析。

许多研究表明,UKA 治疗较 TKA 具有手术创伤小、失血量少、手术时间短、住院时间短、术后快速康

复等优点^[1-2]。本研究 Oxford 第 3 代混合型 UKA 组术中出血量、手术时间、住院天数均优于 TKA 组,符合以上结论。末次随访 Oxford 第 3 代混合型 UKA 组 AKSS 临床和功能评分均优于 TKA 组,分析相关原因如下:(1)UKA 术后患者具备相对更高的遗忘特性^[18],UKA 手术切口小,只置换内侧间室,保留前后交叉韧带,最大程度地保留本体感受器,更大限度地保留膝关节的运动特性,与正常生理活动更匹配,关节稳定性及活动度更为满意^[19-20]。有学者研究指出韧带,特别是交叉韧带,可能对动态本体感觉非常

重要,UKA 交叉韧带正常而 TKA 交叉韧带不正常,因此 UKA 术后的动态本体感觉比 TKA 后好得多,从某种程度上解释了 UKA 患者术后功能优于 TKA 患者^[21]。也有学者通过 C 反应蛋白反映机体对手术的反应角度,进一步论证了 UKA 具有创伤小、炎症反应低的优点^[22]。(2)末次随访 UKA 组 TCPSA、FCPSA 均大于 TKA 组,可能也是相关影响因素。

3.2 Oxford 第 3 代混合型 UKA 治疗膝关节内侧间室重度骨关节炎的要点

首先,术前把控适应证,而年龄、髌股关节炎、肥胖、活动量并不列为绝对禁忌证^[23-26]。对于骨质疏松是否影响生物固定型单髁假体的临床疗效目前并没有文献明确报道,基于担心生物固定型假体下沉及松动等相关问题,本研究对于合并骨质疏松者不采用。此外 UKA 治疗膝内侧髌骨坏死的疗效及预后受骨坏死病因、坏死分期、坏死范围大小影响^[27],同时应用股骨侧生物固定型假体需彻底处理坏死区域保证坏死区有充分的血供避免术后无菌性松动,故本研究内侧髌骨坏死也不采用。

其次,术中注重操作要点:(1)胫骨截骨控制 TCVA 在±5°,TCPSA 在(7±5)°范围^[28],股骨截骨控制 FCVA 在±10°,FCPSA 在 0°~15°范围^[6]。(2)避免损伤内侧副韧带,测试间隙平衡,极度屈膝外旋内翻垫片无脱位。(3)彻底清理骨水泥,本研究 Oxford 第 3 代混合型 UKA 较骨水泥型清理时间更充足从而减少残留。(4)选择合适厚度的衬垫,使韧带张力恢复。本研究 UKA 组保留轻微内翻,避免“矫枉过正”导致膝外侧间室进展或过度内翻导致聚乙烯磨损引起早期翻修^[29]。

最后,Oxford 第 3 代混合型 UKA 术后可进行加速康复锻炼,同骨水泥型 UKA 可术后即刻下地。

综上,Oxford 第 3 代混合型 UKA 治疗膝关节内侧间室骨关节炎,术前需严格把控适应证,注重术中操作要点,术后可进行加速康复锻炼,较 TKA 具有手术创伤小、失血量少、手术时间短、住院时间短、术后快速康复、更好的膝关节功能等优势,疗效满意。但本研究仍需要进一步远期随访。

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