

doi: 10.3978/j.issn.1000-4432.2019.11.02

View this article at: <http://dx.doi.org/10.3978/j.issn.1000-4432.2019.11.02>

多焦点人工晶状体2.2 mm微切口植入治疗老年性白内障的临床观察

梁婉玲, 罗秀枝, 周怀胜, 晏世刚

(佛山市第二人民医院眼科中心, 广东 佛山 528000)

[摘要] 目的: 评估2.2 mm微切口白内障超声乳化摘除(phacoemulsification, Phaco)联合多焦点人工晶状体(multifocal intraocular lens, MIOLs)植入术治疗老年性白内障的临床安全性及疗效。方法: 选取于2018年1月1日至2018年6月31日于佛山市第二人民医院行白内障Phaco联合人工晶状体植入的老年白内障患者。将其分为2组: A组31例35眼行2.2 mm微切口Phaco联合MIOLs植入术, B组31例38眼行3.0 mm标准切口Phaco联合单焦点IOLs植入术。2组患者均完善术前、术后的裸眼视力、角膜曲率、眼压、角膜内皮细胞数、离焦曲线等检查, 同时记录其手术过程中的参数, 进行比较。结果: A组与B组在手术过程中, 总超乳时间、总超乳能量、超声乳化累积能量复合参数、有效超乳时间、平均超乳能量、总手术时间对比, 差异均无统计学意义(均 $P>0.05$)。2组患者术后较术前比较, 角膜内皮细胞数均有所下降, 差异有统计学意义($P<0.05$); 2组患者间在各时间点的比较, 差异均无统计学意义(均 $P>0.05$)。2组患者手术中均未出现后囊膜破裂等并发症。2.2 mm切口与3.0 mm切口术后均增加了角膜散光, 与术前比较差异均有统计学意义(均 $P<0.01$); 2组间比较, 差异无统计学意义(均 $P>0.05$)。术后3个月, 2组间裸眼远视力(uncorrected distance visual acuity, UCDVA)对比差异无统计学意义($t=-1.794$, $P=0.07$); 裸眼近视力(uncorrected near visual acuity, UCNVA)对比差异有统计学意义($t=-25.147$, $P<0.01$)。A组的离焦曲线有2个峰值, 分别位于0 D和-3.5 D附近, 两峰值间形成一个下降平缓的平台; B组的离焦曲线只有1个峰值, 位于0~0.5 D之间, 峰值两端下降趋势明显。A组的脱镜率为77.42%(24/31), B组的脱镜率为12.90%(4/31), 差异有统计学意义($\chi^2=26.050$, $P<0.01$); 2组的总体满意度差异无统计学意义($\chi^2=1.615$, $P=0.204$)。结论: 2.2 mm同轴微切口白内障手术在临床上安全性良好, 联合植入MIOLs有较好的疗效, 可于临床上广泛推广。

[关键词] 微切口; 多焦点人工晶状体; 白内障超声乳化摘除联合人工晶状体植入术; 离焦曲线

Clinical observation of multifocal intraocular lens with 2.2 mm microincision implantation for senile cataract

LIANG Wanling, LUO Xiuzhi, ZHOU Huaisheng, YAN Shigang

(Department of Ophthalmology, Second People's Hospital of Foshan, Foshan Guangdong 528000, China)

Abstract **Objective:** To evaluate the clinical safety and curative effect of phacoemulsification (Phaco) combined with

收稿日期 (Date of reception): 2019-07-23

通信作者 (Corresponding author): 晏世刚, Email: fsyansg@126.com

基金项目 (Foundation item): 佛山市卫生与计划生育局医学科研课题 (20170108)。This work was supported by the Medical Research Project of Foshan Health and Family Planning Bureau, China (20170108).

multifocal intraocular lens (MIOLs) implantation in the treatment of senile cataract with 2.2 mm microincision cataract. **Methods:** The cataract patients who underwent phacoemulsification and intraocular lens implantation in our hospital were selected from January 1, 2018 to June 31, 2018. They were divided into two groups: group A with 31 patients (35 eyes) undergoing 2.2 mm micro-incision Phaco combined with MIOLs, while group B with 31 patients (38 eyes) undergoing 3.0 mm standard incision Phaco combined with single focus IOLs. The preoperative and postoperative uncorrected visual acuity, corneal curvature, intraocular pressure, corneal endothelium number, and defocus curve were recorded in both groups. The parameters during the operation were also recorded and compared. **Results:** There was no statistically significant difference in the parameters including total phacoemulsification time, total phacoemulsification energy, phacoemulsification cumulative energy compound parameters, effective phacoemulsification time, average phacoemulsification energy, total surgery time between group A and group B during the operation (all $P>0.05$). Compared with preoperative, the number of corneal endothelial cells decreased both in the two groups after surgery. The difference was statistically significant ($P<0.05$). There was no significant difference between the two groups at any time (all $P>0.05$). There were no complications such as posterior capsule rupture during operation in both groups. The corneal astigmatism was increased after operation both in the 2.2 mm incision and 3.0 mm incision, and the difference was statistically significant compared with pre-operation (both $P<0.01$). There was no significant difference between the two groups (all $P>0.05$). At 3 months postoperatively, there was no significant difference in uncorrected distance visual acuity (UCDVA) between the two groups ($t=-1.794$, $P=0.07$), and the difference was statistically significant in the uncorrected near visual acuity (UCNVA) ($t=-25.147$, $P<0.01$). Defocus curve: The defocus curve of group A had two peaks, which are located near 0 D and -3.5 D, forming a flat platform with a descent between the two peaks. The defocus curve of group B had only one peak, located at 0-0.5 D, and the downward trend at both ends of the peak was obvious. The rate of off-glasses and satisfaction: the rate of off-glasses in group A was 77.42% (24/31), and the rate of dislocation in group B was 12.90% (4/31). The difference was statistically significant ($\chi^2=26.050$, $P<0.01$). There was no significant difference in overall satisfaction between the two groups ($\chi^2=1.615$, $P=0.204$). **Conclusion:** The 2.2 mm coaxial microincision cataract surgery yields high clinical safety, and the combined implantation of multi-focal intraocular lens has good curative effect and can be widely promoted in clinical practice.

Keywords microincision; multifocal intraocular lens; phacoemulsification and intraocular lens implantation; defocus curve

白内障是全球最常见的可逆性致盲眼病^[1]。手术是根治白内障的唯一方法。白内障手术经历了3个阶段:囊内摘除、囊外摘除和超声乳化摘除(phacoemulsification, Phaco)。目前,白内障Phaco联合人工晶状体植入术,是治疗白内障的主流。白内障从过往的防盲手术逐渐演变为现代的屈光矫正手术:目的从单纯的提高视力转变为改善视功能;手术切口从原来的大切口(12 mm)、小切口(8 mm)转变为现在的标准切口(2.8~3.0 mm)、微切口(1.8~2.2 mm);人工晶状体从既往的硬晶体、可折叠的单焦点软晶体转变为新型的多功能高端人

工晶状体。本文通过观察同轴2.2 mm微切口白内障Phaco联合AT LISA 809M人工晶状体植入的手术方式,评估其临床疗效及安全性。

1 对象与方法

1.1 对象

选取于2018年1至6月就诊于广东省佛山市第二人民医院眼科中心的年龄相关性白内障患者,共62例73眼,分为2组:A组(采用2.2 mm微切口,植入AT LISA 809M)31例35眼, B组(采用3.0 mm

标准切口, 植入AKREOS ADAPT-AO)31例38眼。入选标准: 1)患者年龄>50岁; 2)Lenstar LS900测量得出的角膜散光<1.0 D; 3)按照Emery核硬度分级标准, 患者为II~IV级核。排除标准: 1)既往有葡萄膜炎、青光眼角膜病变、圆锥角膜、翼状胬肉、斜视、眼底疾病等病史的患者; 2)既往有外伤病史、晶状体脱位及角膜屈光手术史的患者; 3)角膜内皮数<2 000个/mm²的患者。观察指标: 1)安全性。2组患者手术过程中各参数的比较; 2)组患者术前、术后角膜内皮细胞数和角膜散光变化的比较。2)疗效。术前、术后3个月裸眼远视力(uncorrected distance visual acuity, UCDVA)、裸眼近视力(uncorrected near visual acuity, UCNVA)、离焦曲线、脱镜率、手术并发症的比较等。其中术前术后的裸眼视力以最小分辨角对数(logMAR)表示。

1.2 手术方法

2组患者均采用白内障Phaco联合人工晶状体植入的手术方式。A组为透明角膜主切口2.2 mm, B组为透明角膜主切口3.0 mm。所有手术均有同一医生完成。术前所有患者均予复方托吡卡胺滴眼液充分散大瞳孔(直径>6 mm及对光反射消失), 常规消毒铺巾, 采用50 g/L聚维酮碘溶液及生理盐水分别冲洗结膜囊2 min, 爱尔卡因滴眼液行表面麻醉。2.2 mm或3.0 mm一次性手术刀于11:00位作透明角膜缘主切口, 30°刀于3:00位作侧切口, 前房内注入玻璃酸钠粘弹剂, 行连续环形撕囊, 囊口直径为5.5 mm, 要求位置居中。水分离、水分层后, 采用美国爱尔康公司的Infinity超声乳化机行Phaco晶状体核, 抽吸皮质, 并作前囊口及后囊抛光, 再次向前房及囊袋内注入粘弹剂, 向囊袋内植入人工晶状体(A组植入AT LISA 809M, B组植入AKREOS ADAPT-AO), 清除残留粘弹剂, 水密封切口, 见前房深度可, 人工晶状体位置居中。术毕, 结膜囊内涂妥布霉素地塞米松眼膏。参数设定: 超声能量上限为20%, 负压450 mmHg(1 mmHg=0.133 kPa), 流量35 mL/min, 灌注液瓶高度105 cmH₂O。

1.3 统计学处理

采用SPSS 20.0统计软件对数据进行分析处

理。计量资料用均数±标准差($\bar{x} \pm s$)描述, 采用 t 检验; 计数资料用个数(n)或率(%)描述, 采用 χ^2 检验。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 一般资料

2组患者的性别、年龄、手术眼别、术前裸眼视力、角膜曲率、角膜散光、眼压、核硬度等情况比较, 差异均无统计学意义(均 $P > 0.05$), 具有可比性(表1, 表2)。

2.2 手术参数的比较

手术中的2组患者的参数比较, 包括总超乳时间(s)、总超乳能量(%)、超声乳化累积能量复合参数(cumulative dissipated energy, CDE)、有效超乳时间(s)、平均超乳能量(%)、总手术时间(min), 差异均无统计学意义(均 $P > 0.05$, 表3)。

2.3 角膜内皮细胞数的比较

2组患者术后较术前比较, 角膜内皮细胞数均有所下降, 差异有统计学意义($P < 0.05$)。2组患者间在各时间点的比较, 差异均无统计学意义(均 $P > 0.05$, 表4)。

2.4 角膜散光的比较

A组、B组2组内术后各时间点与术前的比较, 差异均有统计学意义(均 $P < 0.05$)。术后1周、1个月、3个月, 2组间散光的对比差异无统计学意义(均 $P > 0.05$, 表5)。

2.5 手术前后视力的比较

2组患者术后3个月的UCDVA相比, 差异无统计学意义($t = -1.794$, $P = 0.07$); 术后3个月的UCNVA相比, 差异有统计学意义($t = -25.147$, $P < 0.01$; 表6)。

2.6 离焦曲线的比较

术后3个月, A组的离焦曲线有2个峰值, 分别位于0 D和-3.5 D附近, 两峰值间形成1个下降平缓的平台; B组的离焦曲线只有1个峰值, 位于0~0.5 D之间, 峰值两端下降趋势明显(图1)。

表1 2组患者基本资料的比较

Table 1 Comparison of baseline data between two groups

组别	性别 (男/女)/例	年龄/岁	手术眼别 (右眼/左眼)	术前裸眼视力	角膜曲率/%	角膜散光	眼压/mmHg
A组	16/19	67.40 ± 7.92	22/13	0.81 ± 0.42	44.03 ± 1.20	0.52 ± 0.25	14.37 ± 4.33
B组	11/27	69.21 ± 7.81	16/22	0.94 ± 0.52	44.69 ± 1.78	0.56 ± 0.31	14.40 ± 3.63
t/χ^2	2.198 [#]	-0.983 [*]	3.144 [#]	-1.127 [*]	-1.850 [*]	-0.661 [*]	-0.028 [*]
P	0.138	0.329	0.076	0.264	0.069	0.511	0.978

*采用独立样本 t 检验, [#]采用 χ^2 检验。*Using independent sample t -test, [#]Using χ^2 test.

表2 2组患者间核硬度的比较

Table 2 Comparison of nuclear hardness between two groups

组别	眼数	硬度		
		II	III	IV
A组	35	9	19	7
B组	38	4	26	8
χ^2			2.960	
P			0.228	

表3 2组间手术参数的比较

Table 3 Comparison of surgical parameters between two groups

组别	眼数	总超声时间/s	总超乳能量/%	CDE	有效超乳时间/s	超乳能量/%	总手术时间/min
A组	35	105.68 ± 54.77	12.15 ± 4.56	17.23 ± 12.64	15.45 ± 7.45	9.09 ± 2.71	12.54 ± 5.24
B组	38	87.05 ± 38.36	13.96 ± 5.54	19.95 ± 13.12	18.06 ± 7.94	10.02 ± 2.94	10.82 ± 4.54
t		1.670	-1.531	-0.902	-1.443	-1.401	1.509
P		0.100	0.130	0.370	0.154	0.165	0.136

表4 2组患者术前及术后角膜内皮细胞数的比较($\bar{x} \pm s$)Table 4 Comparison of preoperative and postoperative corneal endothelial cells between two groups ($\bar{x} \pm s$)

组别	眼数	角膜内皮细胞数				F	P
		术前/(个·mm ⁻²)	术后1周/(个·mm ⁻²)	术后1个月/(个·mm ⁻²)	术后3个月/(个·mm ⁻²)		
A组	35	2 462.13 ± 190.59	2 327.57 ± 177.31 [*]	2 314.10 ± 173.51 ^{*#}	2 306.43 ± 172.78 ^{*^&}	183.412	<0.001
B组	38	2 584.35 ± 341.71	2 406.93 ± 330.69 [*]	2 393.31 ± 333.65 ^{*#}	2 387.24 ± 326.74 ^{*#&}	160.481	<0.001
t		-1.906	-1.291	-1.287	-1.335		
P		0.06	0.202	0.203	0.187		

与术前比较, ^{*} $P < 0.05$; 与术后1周比较, [#] $P > 0.05$; 与术后1个月比较, [^] $P < 0.05$; 与术后3个月比较, [&] $P > 0.05$ 。Compared with preoperative, ^{*} $P < 0.05$; compared with 1 week after operation, [#] $P > 0.05$; compared with 1 month after operation, [^] $P < 0.05$; compared with 3 months after operation, [&] $P > 0.05$.

表5 2组患者术前及术后散光的对比($\bar{x} \pm s$)

Table 5 Comparison of preoperative and postoperative astigmatism between two groups ($\bar{x} \pm s$)

组别	眼数	散光				F	P
		术前	术后1周	术后1个月	术后3个月		
A组	35	0.52 ± 0.25	1.06 ± 0.2*	0.90 ± 0.27**	0.78 ± 0.26**&	151.047	<0.001
B组	38	0.56 ± 0.31	1.15 ± 0.33*	0.86 ± 0.33**	0.75 ± 0.27**&	131.745	<0.001
t		-0.661	-1.476	0.122	0.379		
P		0.511	0.145	0.494	0.706		

与术前比较, *P<0.05; 与术后1周比较, *P<0.05; 与术后1个月比较, &P<0.05。

Compared with preoperative, *P<0.05; compared with 1 week after surgery, *P<0.05; compared with 1 month after surgery, &P<0.05.

表6 2组患者术后裸眼视力的比较($\bar{x} \pm s$, logMAR)

Table 6 Comparison of postoperative naked eye vision between two groups ($\bar{x} \pm s$, logMAR)

组别	术前	UCDVA	UCNVA
A组	0.81 ± 0.42	0.055 ± 0.009	0.118 ± 0.067
B组	0.94 ± 0.52	0.060 ± 0.010	0.594 ± 0.093
t	-1.127	-1.794	-25.147
P	0.264	0.077	<0.01

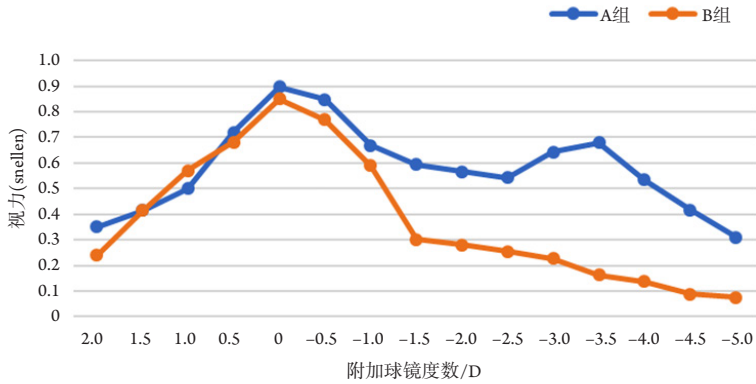


图1 2组患者离焦曲线的比较

Figure 1 Comparison of the defocus curves between two groups

2.7 脱镜率情况

术后3个月, 患者视近时(33~40 cm)不需要佩戴老视镜的人数比率定义为该人群的脱镜率。A组的脱镜率为77.42%(24/31), B组的脱镜率为12.90%(4/31), 差异有统计学意义($\chi^2=26.050$, $P<0.01$)。

2.8 随访调查

患者满意度分为: 非常满意、一般满意、一般不满意、非常不满意, 其中非常满意和一般满意视为满意。术后3个月, A组总体满意度为85.71%(30/35), B组总体满意度为73.68%(28/38), 差异没有统计学意义($\chi^2=1.615$, $P=0.204$; 表7)。

表7 2组患者满意度的比较

Table 7 Comparison of satisfaction between two groups

项目	眼数	总体满意度/[眼(%)]	远视力/[眼(%)]	近视力/[眼(%)]	眩光等视觉干扰/[眼(%)]
A组	35	30 (85.71)	31 (88.57)	28 (80.00)	9 (25.71)
B组	38	28 (73.68)	32 (84.21)	6 (15.79)	3 (7.89)
χ^2		1.615	0.293	30.189	4.212
P		0.204	0.588	<0.01	0.04

2.9 手术并发症的比较

2组患者手术过程中均未出现后囊膜破裂、晶状体下沉、视网膜脱离、爆发性脉络膜上腔出血等的并发症。

3 讨论

白内障 Phaco 联合人工晶状体植入术 (Phaco+IOLs 植入术) 是目前治疗白内障的最常用手术方式^[2]。本研究主要探讨同轴 2.2 mm 微小切口联合多焦点 IOLs 植入在临床上的使用情况。

既往大量的文献[3-4]报道微切口 (2.2 mm 及 1.8 mm, 临床上指同轴 2.4 mm 以下, 双轴 1.5 mm) 在白内障超声乳化手术中的安全性与优势。2.2 mm 微切口 Phaco 术, 手术切口小、术中前房稳定性良好、术后切口不需缝合、术后切口的术源性散光小等优点^[5]。2.2 mm 的切口较标准切口小, 加大了手术的难度, 从而有可能影响手术的安全性。本研究从多方面评估其安全性。首先, 本研究中 2.2 mm 微切口 Phaco 手术较 3.0 mm 切口的手术时间稍长 (12.54 min > 10.82 min), 但差异无统计学意义。同时, 手术过程中超声乳化的各参数的比较, 没有明显的差异, 这表明了 2.2 mm 微切口白内障手术过程的安全性。第二, 手术中使用的器械管径需与其切口大小相符合, 减少术中对眼内组织的扰乱及损伤, 保证微切口手术的安全性。第三, 角膜内皮细胞数的丢失率是评估手术安全性的重要指征。角膜内皮细胞丢失可导致角膜水肿, 严重者可致角膜失代偿。角膜内皮细胞数丢失的原因包括年龄、白内障核硬度、手术过程中超声乳化的能量、时间、灌注/抽吸时灌注液的流速与时间对角膜内皮的冲刷作用等^[6-10]。本

研究中角膜内皮数的变化, 2组患者术后较术前均有所下降, 但2组患者之间的比较, 差异无统计学意义, 这与以往的研究^[11]一致。在并发症观察方面, 2组患者均未出现后囊膜破裂、晶状体下沉、视网膜脱落、爆发性脉络膜上腔出血等情况。Song等^[12]的研究表明微切口手术与标准切口的安全性是一致的。本文研究与其结果相符。

2组患者间角膜散光的比较, 差异无统计学意义, 2.2 mm 切口对角膜的影响与 3.0 mm 基本一致。这与既往的部分学者的研究^[13-15]不一致, 可能与本研究选取的患者术前角膜散光要求 < 1.0 D 相关。本研究中 Phaco 手术采用 2.2 mm 切口, 同时植入多焦点 IOLs, 在视觉质量方面, 多焦点 IOLs 在远视力上除有与单焦点 IOL 同样的效果外, 在近视力上较单焦点 IOLs 有更大的优势, 从而提高了患者的脱镜率与近距离操作的便利^[16-17]。在本研究中, 2组患者的 UCDVA 对比, 差异无统计学意义; A组近视力明显优于B组。这与既往研究^[18]一致。另外, 本研究分析了离焦曲线客观地呈现出此优势, A组离焦曲线上存在2个峰值, 峰值间的过渡相对较平缓, B组的峰值两端呈现出急剧下降的趋势; 主观上, A组患者的脱镜率明显低于B组。现代老年白内障患者, 术前部分人群由于白内障的原因存在一定程度的近视状态, 这利于其日常生活(如穿针、读报等)。然而, 手术植入单焦点 IOLs 后此状态减弱甚至消失, 从而导致患者对手术的满意度下降。2组患者近视力满意度的差异正说明了此现象。本研究中2组患者的总体满意度差异无统计学意义, 原因在于手术前已对植入单焦点 IOLs 的患者详细清晰地交代术后视近需佩戴老视镜的预示, 其满意度高主要体现在远视力方面。多焦点 IOLs 除完成了患者远视力的恢复

外,同时也满足了手术前的近视屈光状态,降低了其对患者术前术后生活习惯的影响。本研究采用的是AT LISA 809M多焦点IOL,其水溶性材质柔软性强,利于术中2.2 mm切口的植入;+3.5D的附加度数,更利于老年人的近距离工作。对于多焦点IOLs产生的眩光问题,由于本研究选取的对象为50岁以上的老年患者,其对夜间工作的需求不大,故由于瞳孔变大光线进入不同衍射环时产生的眩光情况并不多见(25.71%),即使与单焦点的存在差异性,但患者的满意度仍较高。

本研究的优点在于同时探讨了2.2 mm微切口结合多焦点IOLs植入在老年白内障患者中的临床使用情况;从安全性及疗效性观察上来说,本研究表明了其在临床上的可行性。白内障逐渐进入一个微创的屈光时代。本研究的不足点在于病例数偏少,观察时间较短。在未来的研究中,除加大样本量外,我们已开展了1.8 mm切口白内障手术的临床观察、三焦点及区域折射型人工晶状体的视觉质量观察等。

参考文献

1. Song P, Wang H, Theodoratou E, et al. The national and subnational prevalence of cataract and cataract blindness in China: a systematic review and meta-analysis[J]. *J Glob Health*, 2018, 8(1): 010804.
2. 何守志, 李晓陵. 原位超声乳化白内障吸除及椭圆形人工晶体植入术[J]. *中华眼科杂志*, 1996, 32(5): 326-332.
HE Shouzhi, LI Xiaoling. Cataract extraction by phacoemulsification in situ and elliptical intraocular lens implantation[J]. *Chinese Journal of Ophthalmology*, 1996, 32(5): 326-332.
3. Wang L, Xiao X, Zhao L, et al. Comparison of efficacy between coaxial microincision and standard-incision phacoemulsification in patients with age-related cataracts: a meta-analysis[J]. *BMC Ophthalmol*, 2017, 17(1): 267.
4. 李盈龙, 彭小宁, 杨国科. 两种不同切口同轴白内障超声乳化术的临床分析[J]. *国际眼科杂志*, 2018, 18(4): 674-677.
LI Yinglong, PENG Xiaoning, YANG Guoke. Clinical analysis of two different incision coaxial phacoemulsification[J]. *International Journal of Ophthalmology*, 2018, 18(4): 674-677.
5. 李丹, 刘志英, 崔巍, 等. 同轴1.8mm微切口超声乳化术治疗短眼轴白内障的疗效[J]. *国际眼科杂志*, 2016, 16(3): 439-442.
LI Dan, LIU Zhiying, CUI Wei, et al. The efficacy of coaxial 1.8 mm micro-incision phacoemulsification in the treatment of short-axis cataract[J]. *International Journal of Ophthalmology*, 2016, 16(3): 439-442.
6. 曹端荣, 龚静青, 金玲, 等. 白内障患者术后角膜内皮细胞计数减少的多因素分析[J]. *国际眼科杂志*, 2018, 18(4): 716-719.
CAO Duanrong, GONG Jingqing, JIN Ling, et al. Multivariate analysis of postoperative corneal endothelial cell count reduction in cataract patients[J]. *International Journal of Ophthalmology*, 2018, 18(4): 716-719.
7. Storr-Paulsen A, Norregaard JC, Ahmed S, et al. Endothelial cell damage after cataract surgery: divide-and-conquer versus phaco-chop technique[J]. *J Cataract Refract Surg*, 2008, 34(6): 996-1000.
8. O' Brien PD, Fitzpatrick P, Kilmartin DJ, et al. Risk factors for endothelial cell loss after phacoemulsification surgery by a junior resident[J]. *J Cataract Refract Surg*, 2004, 30(4): 839-843.
9. Walkow T, Anders N, Klebe S. Endothelial cell loss after phacoemulsification: relation to preoperative and intraoperative parameters[J]. *J Cataract Refract Surg*, 2000, 26(5): 727-732.
10. Hayashi K, Hayashi H, Nakao F, et al. Risk factors for corneal endothelial injury during phacoemulsification[J]. *J Cataract Refract Surg*, 1996, 22(8): 1079-1084.
11. 谢洪涛, 刘钊臣. 2.2 mm微切口对白内障角膜内皮细胞丢失率及散射光变化分析[J]. *国际眼科杂志*, 2017, 17(1): 43-46.
XIE Hongtao, LIU Yichen. Analysis of the loss rate and scattered light of cataract corneal endothelial cells in 2.2 mm micro-incision[J]. *International Journal of Ophthalmology*, 2017, 17(1): 43-46.
12. Song E, Li X, Bi MC, et al. A comparison of surgical efficacy between a 1.8-mm microincision and 3.2-mm and 5.5-mm incisions for phacoemulsification[J]. *Int J Ophthalmol*, 2018, 11(3): 516-519.
13. Luo L, Lin H, He M, et al. Clinical evaluation of three incision size-dependent phacoemulsification systems[J]. *Am J Ophthalmol*, 2012, 153(5): 831-839.
14. Yao K, Tang X, Ye P. Corneal astigmatism, high order aberrations, and optical quality after cataract surgery: microincision versus small incision[J]. *J Refract Surg*, 2006, 22(9 Suppl): S1079-S1082.
15. Kurz S, Krummenauer F, Gabriel P, et al. Biaxial microincision versus coaxial small-incision clear cornea cataract surgery[J]. *Ophthalmology*, 2006, 113(10): 1818-1826.
16. Maurino V, Allan BD, Rubin GS, et al. Quality of vision after bilateral multifocal intraocular lens implantation: a randomized trial--AT LISA 809M versus AcrySof ReSTOR SN6AD1[J]. *Ophthalmology*, 2015,

- 122(4): 700-710.
17. Toygar B, Yabas Kiziloglu O, Toygar O, et al. Clinical outcomes of a new diffractive multifocal intraocular lens[J]. Int J Ophthalmol, 2017, 10(12): 1844-1850.
18. 杨卫华. 老年性白内障多焦点IOL同轴微切口植入的视觉质量

观察[J]. 国际眼科杂志, 2016, 16(4): 748-751.

YANG Weihua. Visual quality observation of multifocal IOL coaxial micro-incision implantation for senile cataract[J]. International Journal of Ophthalmology, 2016, 16(4): 748-751.

本文引用: 梁婉玲, 罗秀枝, 周怀胜, 晏世刚. 多焦点人工晶状体 2.2 mm微切口植入治疗老年性白内障的临床观察[J]. 眼科学报, 2019, 34(4): 229-236. doi: 10.3978/j.issn.1000-4432.2019.11.02

Cite this article as: LIANG Wanling, LUO Xiuzhi, ZHOU Huaisheng, YAN Shigang. Clinical observation of multifocal intraocular lens with 2.2 mm microincision implantation for senile cataract[J]. Yan Ke Xue Bao, 2019, 34(4): 229-236. doi: 10.3978/j.issn.1000-4432.2019.11.02