

引文格式:袁媛,彭华琮,陈雅琼.飞秒激光辅助白内障手术与传统白内障手术联合 Toric 人工晶状体植入术治疗长眼轴白内障患者的临床疗效比较[J].眼科新进展,2020,40(2):144-147. doi:10.13389/j.cnki.rao.2020.0034

【应用研究】

飞秒激光辅助白内障手术与传统白内障手术联合 Toric 人工晶状体植入术治疗长眼轴白内障患者的临床疗效比较[△]

袁媛 彭华琮 陈雅琼

作者简介:袁媛,女,1978年7月出生,湖北黄石人,硕士,副主任医师。研究方向:白内障和青光眼。联系电话:18694052760; E-mail: yuan82622617@163.com; ORCID: 0000-0002-2193-1387

收稿日期:2019-03-21
修回日期:2019-06-20
本文编辑:董建军

△基金项目:武汉市卫计委科研计划资助青年项目(编号:WX18Q29)
作者单位:430019 湖北省武汉市,武汉艾格眼科医院

【摘要】 目的 比较飞秒激光辅助白内障手术与传统白内障手术联合 Toric 人工晶状体植入术治疗长眼轴白内障患者的临床疗效。**方法** 选取在我院行白内障手术眼轴长度大于24 mm的白内障患者49例49眼,按患者主观意愿选择术式;飞秒组患者20例20眼,均行飞秒激光辅助白内障手术;传统组患者29例29眼,均行传统白内障手术。两组患者术中眼内均植入 Toric 人工晶状体。每例患眼均行 IOL-Master、OPD-SCAN III 视觉质量分析仪检测,获得患者散光度、最佳矫正视力(best corrected visual acuity, BCVA)、角膜规则指数、表面不对称指数、不规则散光指数、角膜球差及像差与斯特列尔比值。角膜规则指数、表面不对称指数、不规则散光指数、角膜球差及眼高阶像差与斯特列尔比值相关情况采用 Spearman 相关分析。**结果** 术后3个月,两组患者 BCVA 均较术前显著提高,差异均有统计学意义(均为 $P < 0.05$);飞秒组患者 BCVA 为 0.09 ± 0.09 ,传统组为 0.13 ± 0.10 ,两组相比差异无统计学意义($P > 0.05$)。术前飞秒组患者散光度为 $(1.84 \pm 0.57) D$,传统组为 $(2.17 \pm 0.83) D$,两组比较差异无统计学意义($P > 0.05$)。术后3个月,飞秒组患者总残余散光度为 $(0.50 \pm 0.50) D$,传统组为 $(0.55 \pm 0.37) D$,两组间比较差异无统计学意义($P > 0.05$)。术后3个月,飞秒组患者斯特列尔比值为 0.18 ± 0.15 ,传统组为 0.15 ± 0.12 ,两组比较差异无统计学意义($P > 0.05$)。术后3个月,飞秒组患者斯特列尔比值与角膜规则指数、表面不对称指数、不规则散光指数、角膜球差之间均无相关性(均为 $P > 0.05$);传统组亦均无相关性(均为 $P > 0.05$)。飞秒组患者斯特列尔比值与全眼人工晶状体倾斜棱镜、3-8阶所有项高阶像差总和、高阶球面像差呈负相关(均为 $P < 0.05$)。传统组患者斯特列尔比值与角膜0-8阶所有项高阶像差总和、人工晶状体倾斜棱镜,眼内人工晶状体倾斜棱镜、3-8阶所有项高阶像差总和、高阶彗差、高阶球面像差,全眼人工晶状体倾斜棱镜、3-8阶所有项高阶像差总和、高阶彗差、高阶球面像差均呈负相关(均为 $P < 0.05$)。**结论** 飞秒激光辅助白内障手术与传统白内障手术联合 Toric 人工晶状体植入术均能显著提高长眼轴白内障患者术后视力。

【关键词】 飞秒激光;白内障;Toric 人工晶状体;视觉质量

【中图分类号】 R779

白内障手术已经跨入屈光手术时代。在大多数国家中,23.0%~47.0%的白内障患者术前散光度大于1.0 D;在中国,25.4%的白内障患者术前散光度大于1.5 D^[1]。散光度超过0.75 D即可引起患者视物模糊、重影、光晕、眩光等症状^[2-3]。目前人们已发现,Toric 人工晶状体用于矫正白内障合并角膜散光的效果确切^[4-6],但由于这种晶状体存在散光轴向设计,所以在眼内植入后其居中性、旋转稳定性以及在眼内最终轴位等对术后患者的视觉质量均有重要影响。眼轴长度大于24 mm的白内障患者由于眼轴过长,大多伴有晶状体囊袋过大,故普通人工晶状体植入容易发生晶状体偏斜、旋转等。这类长眼轴且伴有角膜高散光度患者如果植入这种 Toric 人工晶状体效果如何,目前临床报道不多。飞秒激光技术应用与白内障手术以来备受临床眼科医师的关注^[7-8]。本研究比较飞秒激光辅助白内障手术与传统白内障手术联合 Toric 人工晶状体植入术治疗长眼轴白内障患者的临床效果,现报告如下。

1 资料与方法

1.1 一般资料 本研究为前瞻性研究。选取2017年1月至2018年3月在我院行白内障手术眼轴长度大于24 mm的白内障患者49例49眼,按患者主观意愿选择术式。飞秒组患者20例20眼,其中男9例9眼,女11例11眼,年龄(65.00 ± 3.25)岁,均行飞秒激光辅助白内障手术;传统组患者29例29眼,其中男11例11眼,女18例18眼,年龄(68.00 ± 3.68)岁,均行传统白内障手术。两组患者术中均联合植入 Toric 人工晶状体。

1.1.2 患者纳入与排除标准 (1)确诊为白内障;(2)IV级以下核(按 Emery 核硬度分级标准);(3)眼轴长度24~30(26.0 ± 2.2)mm;(4)患瞳孔药物性散大至少直径达6 mm以上;(5)规则性角膜散光度达到0.75 D及以上。排除标准:角膜病变、核硬度超过IV级、青光眼、睑球粘连、小睑裂、眼球震颤、晶状体脱位、曾行角膜或内眼手术者以及不能配合

的患者。

1.1.3 仪器与设备 OPD-SCAN III 视觉质量分析仪(日本 NIDEK 公司); LenSx 飞秒激光系统(美国 ALCON 公司); CENTURION 白内障智能超声乳化仪(美国爱尔康公司)。

1.2 方法

1.2.1 手术前准备 在裂隙灯下将角膜参数定位于 0°、180°。术中植入 Toric 人工晶状体的轴向由角膜定位器标记且利用 Toric 计算程序(www.acrysoft-oriccalculator.com)决定轴向位置。

1.2.2 手术方法 飞秒组患者先行飞秒激光步骤(美国 ALCON 公司 LenSx 飞秒激光系统),包括撕囊、劈核及切口制作,设定前囊口大小 5.2 mm,主切口位置设定均与术前 Toric 计算程序中设定切口位置相符,宽度为 2.4 mm;再行超声乳化术(美国爱尔康 CENTURION 白内障智能超声乳化仪),植入 Toric 人工晶状体,彻底清除晶状体后表面黏弹剂,将人工晶状体轴向调至标记的预定角度,轻压人工晶状体中央使其与囊袋贴附,水密切口。传统组患者直接行白内障手术联合 Toric 人工晶状体植入术。所有手术均由同一位经验丰富的白内障手术医师完成。

1.2.3 观察指标 术前检查患眼最佳矫正视力(best corrected visual acuity, BCVA)换算为 logMAR,每例患眼均行 IOL-Master、OPD-SCAN III 视觉质量分析仪检测。其中,OPD-SCAN III 检测包括角膜规则指数、表面不对称指数、不规则散光指数、角膜球差、斯特列尔比值及眼高阶像差。眼高阶像差包括角膜、眼内及全眼(散瞳后检测瞳孔直径 5.5 mm 以内范围)三部分区域,三个区域内均检测 5 项指标,分别为:0-8 阶所有项高阶像差总和(Total)、人工晶状体倾斜棱镜(Tilt)、3-8 阶所有项高阶像差总和(High)、高阶彗差及高阶球面像差。Toric 人工晶状体的棱镜度数以及定位轴向通过在线计算程序(www.acrysoftoriccalculator.com)获得。输入计算机程序的术源性散光根据术前收集术者的术后数据输入 0.3 D 计算。术后 3 个月随访患者复查 BCVA、斯特列尔比值及 OPD-SCAN III 视觉质量分析仪检测结果。患眼充分散瞳后应用 OPD-SCAN III 视觉质量分析仪检测人工晶状体旋转稳定性。

1.3 统计学处理 采用 SPSS 16.0 软件对数据进行统计学处理,计量资料以均数 ± 标准差表示。术前散光度和手术前后 BCVA 比较等均采用两独立样本秩和检验。各角膜指数及眼高阶像差与斯特列尔比值相关情况采用 Spearman 相关分析。检验水准:α=0.05。

2 结果

2.1 术后两组患者 BCVA 术后 3 个月,两组患者 BCVA 均较术前显著提高,差异均有统计学意义(均为 $P < 0.05$);飞秒组患者 BCVA 为 0.09 ± 0.09 ,传

统组为 0.13 ± 0.10 ,两组相比差异无统计学意义($P > 0.05$)。

2.2 术前两组患者散光度及术后总残余散光度、斯特列尔比值 术前飞秒组患者散光度为 (1.84 ± 0.57) D,传统组为 (2.17 ± 0.83) D,两组比较差异无统计学意义($P > 0.05$)。术后 3 个月,飞秒组患者总残余散光度为 (0.50 ± 0.50) D,传统组为 (0.55 ± 0.37) D,两组间比较差异无统计学意义($P > 0.05$)。术后 3 个月,飞秒组患者斯特列尔比值为 0.18 ± 0.15 ,传统组为 0.15 ± 0.12 ,两组比较差异无统计学意义($P > 0.05$)。

2.3 术后两组患者斯特列尔比值与各角膜指数及角膜球差的相关分析结果 Spearman 相关分析结果显示,术后 3 个月,飞秒组患者斯特列尔比值与角膜规则指数、表面不对称指数、不规则散光指数、角膜球差之间均无相关性(均为 $P > 0.05$);传统组亦均无相关性(均为 $P > 0.05$)。

2.4 术后两组患者斯特列尔比值与眼高阶像差相关分析结果 Spearman 相关分析结果显示,术后 3 个月,飞秒组患者斯特列尔比值与全眼 Tilt、High、高阶球面像差均呈负相关(均为 $P < 0.05$)。传统组患者斯特列尔比值与角膜 Total、Tilt,眼内 Tilt、High、高阶彗差、高阶球面像差,全眼 Tilt、High、高阶彗差、高阶球面像差均呈负相关(均为 $P < 0.05$)。见表 1。

表 1 术后两组患者斯特列尔比值与眼高阶像差相关分析结果

参数	飞秒组		传统组	
	r 值	P 值	r 值	P 值
角膜				
Total	-0.26	0.45	-0.49	0.02
Tilt	-0.06	0.87	-0.44	0.04
High	-0.26	0.45	-0.20	0.38
高阶彗差	-0.26	0.45	-0.13	0.56
高阶球面像差	-0.29	0.39	-0.22	0.33
眼内				
Total	-0.46	0.16	-0.02	0.94
Tilt	-0.48	0.13	-0.49	0.02
High	-0.30	0.37	-0.49	0.02
高阶彗差	-0.36	0.29	-0.52	0.01
高阶球面像差	-0.04	0.92	-0.47	0.03
全眼				
Total	-0.49	0.13	-0.28	0.21
Tilt	-0.81	0.00	-0.98	0.01
High	-0.66	0.03	-0.48	0.03
高阶彗差	-0.56	0.07	-0.43	0.04
高阶球面像差	-0.76	0.01	-0.56	0.01

3 讨论

Toric 人工晶状体具有旋转稳定性好,预测性佳等优点,是目前眼科领域矫正白内障合并规则角膜散光的首选人工晶状体^[9-11]。ALCON 公司于 2006

年推出 AcrySof IQ Toric 人工晶状体,它是一片式疏水性丙烯酸酯人工晶状体,采用了改良的 L 祥,其柱面设计在光学面的后表面,这些晶状体细节的设计使之在眼内更具稳定性,能有效矫正患眼散光。但是,在长眼轴甚至高度近视超长眼轴患者中,这类人工晶状体能否在眼内保持它的旋转稳定性,临床报道不多。Toric 人工晶状体矫正规则角膜散光的效果与术后晶状体囊袋内位置密切相关。研究表明,Toric 人工晶状体轴位每移动 1° ,就会造成 3.3% 的柱镜度数失效,移动超过 30° ,柱镜的作用就会完全消失,甚至会增加眼内散光^[7-9]。本研究数据显示两组间人工晶状体的轴位旋转度数差异无统计学意义。两组患眼植入 Toric 人工晶状体后 BCVA 均较术前有明显提高,术后患眼总残余散光度在 0.50 D 左右,组间差异不明显。

本研究采用 OPD-SCAN III 视觉质量分析仪,它能精确快速检测角膜、眼内甚至全眼各类高阶像差。本次我们对白内障术后眼高阶像差与视觉质量进行了相关分析。术后 3 个月,飞秒组患眼斯特列尔比值与全眼 Tilt、High、高阶球面像差均呈负相关;传统组患眼斯特列尔比值与角膜 Total、Tilt,眼内 Tilt、High、高阶彗差、高阶球面像差,全眼 Tilt、High、高阶彗差、高阶球面像差均呈负相关。研究表明,白内障手术后人工晶状体内高阶像差大小除受患眼视网膜影响外多由眼内的人工晶状体产生,晶状体的移位偏斜等都会造成像差的变化^[12-13]。人工晶状体的稳定性是靠前后囊的融合实现的,影响因素包括选用材料、光学部及襻的设计和连续环形撕囊大小、囊袋大小等^[13]。人工晶状体在眼内位置不居中、倾斜等会直接增加 Tilt 导致术后视觉质量下降。高质量的人工晶状体能从源头上减少晶状体源性高阶像差产生,保证患者术后获得较高视觉质量。

综上所述,在眼轴长度大于 24 mm 的白内障人群中植入 Toric 人工晶状体能有效矫正患眼角膜规则散光,无论是应用传统技术还是现代飞秒激光辅助白内障手术均能长期保持人工晶状体内旋转稳定性,显著提高患者术后视力及脱镜率,是治疗角膜散光安全、有效和可预测的方法。

参考文献

[1] DAVID F A, MUKESH D, CHRISTINE B, MICHAEL S K. Global prevalence and economic and humanistic burden of astigmatism in cataract patients; a systematic literature review [J]. *Clin Ophthalmol*, 2018, 6(12): 439-452.
[2] 肖迟, 何海燕, 刘园珍, 钟伟友, 杨玉芳. 两种散光矫正型人工晶

状体术后效果及中长期旋转稳定性观察及比较[J]. *中国医药科学*, 2018, 8(6): 225-227.
XIAO C, HE H Y, LIU Y Z, ZHONG W Y, YANG Y F. Observation and comparison of postoperative effects and mid- and long-term rotational stability of two kinds of astigmatism-corrected intraocular lenses[J]. *Chin Med Pharm*, 2018, 8(6): 225-227.
[3] 冯宇宁. Toric 人工晶状体矫正老年性白内障合并角膜散光的临床疗效分析[J]. *中国实用医药*, 2018, 13(7): 66-67.
FENG Y N. Toric intraocular lens correction of senile cataract with corneal astigmatism[J]. *Chin Pract Med*, 2018, 13(7): 66-67.
[4] 王晓明, 汤欣, 郑秀华. VERION 数字导航系统行散光矫正型人工晶状体(Toric IOL)轴位标记与传统裂隙灯标记方法的对比研究[J]. *眼科新进展*, 2018, 38(2): 153-155.
WANG X M, TANG X, ZHENG X H. Comparative study of VERION digital navigation system astigmatism correction intraocular lens(Toric IOL) axial position marking and traditional slit lamp marking method[J]. *Rec Adv Ophthalmol*, 2018, 38(2): 153-155.
[5] 王旭. 结合散光矫正型人工晶状体治疗合并角膜散光白内障的临床疗效[J]. *世界最新医学信息文摘*, 2018, 18(10): 63-64.
WANG X. Clinical efficacy of astigmatic correction of intraocular lens in the treatment of corneal astigmatism with astigmatism[J]. *World Latest Med Inform*, 2018, 18(10): 63-64.
[6] 段练. 现代白内障手术方式与人工晶状体选择对术后视觉质量的影响[D]. 济南: 山东大学, 2017: 63-64.
DUAN L. The effect of modern cataract surgery and intraocular lens selection on postoperative visual quality[D]. Jinan: Shandong University, 2017: 63-64.
[7] NINOMIYA Y, MINAMI K, MIYATA K, EGUCHI S, SATO R, OKAMOTO F, et al. Toric intraocular lenses in eyes with with-the-rule, against-the-rule, and oblique astigmatism: One-year results[J]. *J Cataract Refract Surg*, 2016, 42(10): 1431-1440.
[8] EMESZ M, DEXL A K, KRALL E M, BACHERNEGG A, MOUSSA S, JELL G, et al. Randomized controlled clinical trial to evaluate different intraocular lenses for the surgical compensation of low to moderate-to-high regular corneal astigmatism during cataract surgery[J]. *J Cataract Refract Surg*, 2015, 41(12): 2683-2694.
[9] VESELÁ M, BARÁKOVÁ D, BUJALKOVÁ D, GARAJOVÁ D. The effect of multifocal toric lens rotation on visual quality[J]. *Cesk Slov Oftalmol*, 2016, 72(2): 3-11.
[10] CHEN X, ZHAO M, SHI Y, YANG L, LU Y, HUANG Z. Visual outcomes and optical quality after implantation of a diffractive multifocal toric intraocular lens[J]. *Indian J Ophthalmol*, 2016, 64: 285-291.
[11] BALESTRAZZI A, BAIOCCHI S, BALESTRAZZI A, CARTOCCHI G, TOSI G M, MARTONE G, et al. Mini-incision cataract surgery and toric lens implantation for the reduction of high myopic astigmatism in patients with pellucid marginal degeneration[J]. *Eye (Lond)*, 2015, 29(5): 637-642.
[12] 孟克青. 散光矫正型人工晶状体治疗合并角膜散光白内障的临床疗效评价[J]. *中国卫生标准管理*, 2017, 8(4): 40-42.
MENG K Q. Evaluation of clinical efficacy of astigmatism corrected intraocular lens in the treatment of corneal astigmatism with astigmatism[J]. *Chin Heal Stand Manag*, 2017, 8(4): 40-42.
[13] 周沐瑶, 窦晓燕, 杨浩江, 李林, 郭疆. 非球面散光型人工晶状体治疗白内障合并规则角膜散光的临床分析[J]. *深圳中西医结合杂志*, 2016, 26(18): 17-20.
ZHOU M Y, DOU X Y, YANG H J, LI L, GUO J. Clinical analysis of aspheric astigmatic intraocular lens for the treatment of cataract with regular corneal astigmatism[J]. *Shenzhen J Int Tradit Chin West Med*, 2016, 26(18): 17-20.

Comparative analysis of clinical efficacy between femtosecond laser-assisted cataract surgery and traditional cataract surgery combined with Toric IOL implantation in treatment of long-axis cataract

YUAN Yuan, PENG Huacong, CHEN Yaqiong

Department of Ophthalmology, Wuhan Eyegood Ophthalmic Hospital, Wuhan 430019, Hubei Province, China

[Abstract] Objective To compare the clinical effects between femtosecond laser-assisted cataract surgery and traditional cataract surgery combined with Toric intraocular lens (IOL) implantation in treatment of patients with long-axis cataract. **Methods** Totally 49 eyes of 49 cataract patients with axial length longer than 24 mm received cataract surgery in our hospital were selected, and divided into two groups according to the surgical methods on patient's subjective willingness. Femtosecond group (20 eyes in 20 patients) received femtosecond laser-assisted cataract surgery; traditional group (29 eyes in 29 patients) received traditional cataract surgery. All patients received Toric IOL implantation during surgery. IOL-Master and OPD-SCAN III visual quality analyzer were used for examination of affected eyes, to collect astigmatism, best corrected visual acuity (BCVA; converted to logMAR), corneal regularity index, surface asymmetry index, irregular astigmatism index, corneal spherical aberration and higher-order aberration and Strehl ratio. Spearman correlation analysis was used to analyze the relation of corneal regularity index, surface asymmetry index, irregular astigmatism index, corneal spherical aberration and higher-order aberration with Strehl ratio. **Results** Three months after surgery, BCVA was higher than that before surgery in both two groups (both $P < 0.05$). BCVA were 0.09 ± 0.09 in femtosecond group and 0.13 ± 0.10 in traditional group, and no significant difference was observed between the two groups ($P > 0.05$). Before surgery, the astigmatism were (1.84 ± 0.57) D in femtosecond group and (2.17 ± 0.83) D in traditional group, and there was no significant difference between the two groups ($P > 0.05$). Three months after surgery, the total residual astigmatism were (0.50 ± 0.50) D in femtosecond group and (0.55 ± 0.37) D in traditional group, and there was no significant difference between the two groups ($P > 0.05$). Three months after surgery, the Strehl ratios were 0.18 ± 0.15 in femtosecond group and 0.15 ± 0.12 in traditional group, and there was no significant difference between the two groups ($P > 0.05$). Three months after surgery, there was no correlation of Strehl ratio with corneal regularity index, surface asymmetry index, irregular astigmatism index or corneal spherical aberration in the femtosecond group (all $P > 0.05$) or in the traditional group (all $P > 0.05$). Strehl ratio had negative correlation with the full ocular artificial lens oblique prism, total high-order aberrations at 3–8 orders and high-order spherical aberration in femtosecond group (all $P < 0.05$). For patients in traditional group, Strehl ratio had negative correlation with total high-order aberrations at 3–8 orders, artificial lens oblique prism, IOL oblique prism, high-order coma, high-order spherical aberration (all $P < 0.05$). **Conclusion** Femtosecond laser-assisted cataract surgery and traditional cataract surgery combined with Toric IOL implantation can significantly improve postoperative visual acuity in patients with long-axis cataract.

[Key words] femtosecond laser; cataract; Toric IOL; visual quality

(上接第 143 页)

Comparative analysis of vitrectomy with preservation or removal of IOL in the treatment of infectious endophthalmitis after cataract surgery

ZHOU Enliang, KE Genjie, GU Yonghao, DONG Kai

First Affiliated Hospital of University of Science and Technology of China (Anhui Provincial Hospital), Hefei 230001, Anhui Province, China

[Abstract] Objective To compare and analyze the clinical characteristics of infective endophthalmitis after cataract surgery treated by vitrectomy with intraocular lens (IOL) preservation or removal, and to explore the influencing factors of different surgical methods and their effectiveness and safety. **Methods** From July 2015 to July 2018, 43 consecutive patients (43 eyes) with infective endophthalmitis after cataract surgery treated by 23G vitrectomy in the First Affiliated Hospital of University of Science and Technology of China were enrolled and retrospectively analyzed in this study. They were divided into IOL preservation group (21 eyes) and IOL extraction group (22 eyes) according to whether the IOL was removed during vitrectomy. All patients were followed up for 3–6 months. The surgical results were recorded. The clinical features such as age, gender, side of affected eye, best corrected visual acuity (BCVA) before and after surgery were collected and compared between the two groups. **Results** Infection was improved in all patients after surgery. For patients in IOL preservation group, BCVA were (2.57 ± 1.20) logMAR before surgery and (1.60 ± 1.22) logMAR after surgery; for patients in IOL extraction group, BCVA were (3.12 ± 0.71) logMAR before surgery and (1.95 ± 1.08) logMAR after surgery. There were significant differences in visual improvement after surgery for both two groups (all $P < 0.05$). There was no difference in age, gender, side of affected eye, incidence of complication disease, positive rate of bacterial culture, level of surgeons and ratio of silicone oil filling during surgery between the two groups (all $P > 0.05$). However, significant difference was found in BCVA between the two groups before and after surgery (both $P < 0.05$). **Conclusion** Vitrectomy is an important and effective surgery for the treatment of infectious endophthalmitis after cataract surgery. BCVA before surgery may be a key factor in determining whether the surgery retains IOL or not.

[Key words] vitrectomy; postoperative endophthalmitis; cataract; intraocular lens