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Secondary positioning of rotationally asymmetric refractive multifocal intraocular lens in a patient with glaucoma: a case report

Positioning of IOL in glaucoma patient

Abstract**BACKGROUND**

Asymmetric multifocal intraocular lenses (IOLs) are now widely used in the modern cataract surgery, providing a good level of visual performance over a range of distances and high postoperative patient satisfaction. We report a case of improved visual quality after shifting the near segment of an asymmetrical multifocal intraocular lens (IOL) to the superotemporal placement in the dominant eye of a glaucoma patient.

CASE SUMMARY

A 72-year-old woman with bilateral glaucoma underwent phacoemulsification in dominant eye (left eye) with implantation of an asymmetrical multifocal IOL. Postoperative uncorrected distance visual acuity (UDVA) was 0.0 LogMAR (20/20 Snellen) and uncorrected near visual acuity (UNVA) was 0.1 LogMAR (20/25 Snellen). Two weeks later, the patient presented to our clinic with decreased vision due to migration of lens epithelial cells to IOL anterior surface and edema of corneal endothelium cells. Anterior capsule polishing and superotemporal placement of near segment (+3.00 diopter [D] addition [add]) of IOL were performed, as a result, UDVA at the first week and first year after reposition was 0.0 LogMAR (20/20 Snellen), and compared with 0.3 LogMAR (20/40 Snellen) in the first week, the UNVA was improved to 0.0 LogMAR (20/20 Snellen) one year after surgery.

CONCLUSION

The postoperative inflammatory reaction and lens epithelial cells proliferation were obvious in this glaucoma patient. Capsule polishing and rotation of the lens were beneficial to the patient, which not only enhanced the patient's vision, but also improved the patient's satisfaction. There, glaucoma patients need to be cautious of implanting multifocal IOLs. Placement of a near segment of an asymmetrical multifocal IOL in the dominant eye should be performed on an individual basis.

Key Words: Cataract surgery; Glaucoma; Rotationally asymmetric refractive multifocal intraocular lens; Visual quality; Patient satisfaction

fan C, zhou Y, jiang J. Secondary positioning of rotationally asymmetric refractive multifocal intraocular lens in a patient with glaucoma: a case report . *World J Clin Cases* 2022; In press

Core Tip: Based on the design concept of asymmetric region refraction, the placement of asymmetric multifocal IOLs are particularly important. Here, we report a case of a glaucoma patient undergoing cataract surgery with an asymmetric multifocal IOL implanted in the dominant eye. After 2 wk, the lens epithelial cells proliferated rapidly and visual acuity decreased significantly, which was recovered after capsular polishing combined with IOL rotation. We hope to provide new insights into the implantation of asymmetric multifocal IOLs in patients with glaucoma.

INTRODUCTION

Cataract is the leading cause of blindness in the world, ⁶ The development of the intraocular lens and phacoemulsification as a technique for cataract removal could be considered as the two

most significant strides that have been made in this surgical field^[1]. With the development of science and technology, the choice of intraocular lens is becoming more and more diversified and personalized. Asymmetric multifocal intraocular lenses (IOLs) are now widely used in the modern cataract surgery, which provide excellent levels of visual performance at a range of distances as well as high postoperative patient satisfaction^[2-4]. Asymmetrical multifocal IOLs such as the SBL-3 (Lenstec, Inc.) as we mentioned in this case, which provide its multifocality through a refractive design by incorporating a near vision section in the IOL^[5]. Therefore, the SBL-3 is an asymmetric multifocal IOL with a +3.0 D near portion and a seamless transition zone between distance section and near section, the asymmetric nature means the position of the near segment must be considered.

⁴ **CASE PRESENTATION**

Chief complaints

A 72-year-old woman was referred to our clinic with a complaint of 2 wk after cataract surgery in left eye and visual acuity decreased for 1 wk.

History of present illness

The patient underwent an uneventful phacoemulsification cataract surgery for left eye in our department two weeks ago, a rotationally asymmetric refractive multifocal IOL (SBL-3, Lenstec, Inc.) was chosen and implanted with the near segments placed inferonasally. The first day post-surgery, UDVA was 0.0 LogMAR (20/20 Snellen) and UNVA was 0.1 LogMAR (20/25 Snellen), Preoperative biometric data are given in Table A.

History of past illness

The patient has bilateral primary angle closure glaucoma treated by laser peripheral iridectomy before in local hospital, bilateral intraocular pressure was normal with no

glaucoma medication before cataract surgery, and she has no allergies, trauma, surgery, or systemic disease.

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Personal and family history

The patient was married and had two sons. There was no family history of ocular disease.

Physical examination

The patient presented to our clinic for reexamination with deterioration in the UDVA to 1.0 LogMAR (20/200 Snellen) and in the corrected distant visual acuity (CDVA) of 1.0 LogMAR (20/200 Snellen). Using a slit lamp, the swelling of corneal endothelium and proliferation of lens epithelial cells crawling over the surface of the IOL could be clearly seen. Meanwhile, the IOL was in positive position, without any tilt or decentration, and the near segment was located in inferonasal orientation (Figure 1).

Laboratory examinations

Not available

Imaging examinations

Not available

MULTIDISCIPLINARY EXPERT CONSULTATION

Not available

FINAL DIAGNOSIS

Intraocular lens (left), complicated cataract (right), primary angle closure glaucoma (both) and Status after laser peripheral iridectomy (both).

TREATMENT

We performed surgery for polishing capsule and repositioning the IOL. During surgery, the anterior capsule was polished with a polisher to reduce the incidence of capsular contraction syndrome and posterior capsular opacification (PCO). Meanwhile, near segment of IOL was shifted to the superotemporal placement, and coinciding transition zone of IOL with angle Kappa was avoided. At the end of the operation, the central position of the IOL was checked by whether light projection of microscope was on the central point of IOL (Figure 2). Postoperatively, the patient was treated with a schedule of levofloxacin 0.5%, prednisolone, and pranoprofen eyedrops for 4 wk.

OUTCOME AND FOLLOW-UP

The first day after rotation, UDVA and UNVA was 0.2¹² LogMAR (20/32 Snellen) and 0.3 LogMAR (20/40 Snellen), respectively. UDVA improved to 0.0 LogMAR (20/20 Snellen) one week later (Table B), and the intraocular pressure was 16mmHg, which have remained stable during follow-up. One year after rotation, when she checked again, we found that she had a cataract surgery on her right eye at another hospital half a year ago, and the type of the intraocular lens was the same as on the left. In addition, the near segment of the lens on the right was positioned inferiorly with slight nasal deviation. For the right eye, UDVA and UNVA⁸ was 0.0 LogMAR (20/20 Snellen) and 0.10 LogMAR (20/25 Snellen), respectively. While for the left eye, UDVA and UNVA⁸ was 0.0 LogMAR (20/20 Snellen) and 0.0 LogMAR (20/20 Snellen), respectively. After a series of examinations, the lens position of the left eye was still positive, which almost was unchanged from the previous. visual quality was assessed using OPD Scan III (Nidek Inc., Tokyo, Japan), the tilt was acceptable in both horizontal and vertical directions without adversely affecting visual quality. At the same time, the lens position was also positive with no obvious tilt when viewed using ultrasound biomicroscopy (UBM) (Supplementary materials). The patient was very satisfied with the distant and near visual acuity, and obtain excellent visual performance.

DISCUSSION

We speculated the reasons for deterioration of postoperative visual quality such as postoperative inflammation which could lead to proliferation of lens epithelial cells and migration to the anterior surface of IOL, even lead to corneal endothelium edema and opacity of refractive media. For the unique functional and structural characteristics of glaucoma patients, which lead to an increased risk of PCO, inflammation, and anterior capsular opacification (ACO)^[6-8]. Above all, although the patient's eyesight reflected well numerically, when we repeatedly confirm her subjective experience on the first day postoperatively, there was no inflammatory reaction and no proliferation of lens epithelial cells, the patient emphasized that she felt clearly in near vision while obscurely in distant vision. Consequently, we conjectured lens position plays a key role. Given that the lens was a plate-haptic design for excellent stability, it will be more difficult to rotate it later, Meanwhile, anterior capsule polishing is a kind of method to prevent the occurrence of PCO and enhance visual function^[9]. Here, we decided to perform surgery for polishing capsule and repositioning the IOL in the same operation, trying to enhance the patient's visual quality and reduce the patient's complaints and pain.

Why do we choose to rotate the near segment to the superotemporal position rather than somewhere else? SBL-3, as mentioned in this case, is designed based on the concept of asymmetric regional refraction, the choice of its placement position appears to be particularly important. A study by Deric W *et al*^[10] found that the difference between inferonasal near add positioning and superotemporal near add positioning has no statistical significance. What's more, whether the near segment is positioned inferiorly, superiorly, or temporally, there was no significant effect on visual performance^[11]. While a study by McNeely *et al*^[5] found that bilateral implantation of asymmetric multifocal IOLs with a combination of superotemporal placement of the near segment in the dominant eye and inferonasal placement of the near segment in the fellow eye enhanced quality of vision (QoV) and reduced symptoms such as glare and halo compared with bilateral inferonasal placement. In our case, we choose to shift the near segment to the superotemporal in the dominant eye (Figure 3), coincidentally, the

near segment of the lens of the fellow eye was positioned inferonasally. The patient's satisfactory postoperative results confirmed the feasibility of the mix and match placement scheme.

Because of its asymmetrical design, tilt and decentration had a prominent effect on optical quality with the rotational asymmetric multifocal IOL in vitro. Liu *et al*^[12] found that the decentration induced increased or decreased optical quality, but tilt yielded decreased optical quality at different orientations. Moore *et al*^[13] has also demonstrated that rotation of the asymmetric IOL can be used to both recenter the IOL and increase the required surface area of either distance or near component within the physiological pupil thereby optimizing visual outcomes. These are all important considerations when using this asymmetric multifocal IOL.

There has been considerable debate over whether multifocal IOL implantation is a suitable choice for glaucoma patients. Studies have shown that glaucoma patients can benefit from multifocal IOL technology and achieve spectacle independence with no significant adverse effects^[14]. Use of these IOLs in the presence of concurrent eye diseases has not been extensively studied. Thus, decisions regarding the choice of a multifocal IOL in patients with glaucoma must be made on an individual basis, with patient motivation and expectation being a prime mover. The rate of progression of glaucoma in an individual patient is also an important consideration^[15].

CONCLUSION

The postoperative inflammatory reaction and lens epithelial cells proliferation were obvious in this glaucoma patient. Capsule polishing and rotation of the lens were beneficial to the patient, which not only enhanced the patient's vision, but also improved the patient's satisfaction. Glaucoma patients need to be cautious of implanting multifocal IOLs. Placement of a near segment of an asymmetrical multifocal IOL in the dominant eye should be performed on an individual basis. Although cataract surgery for glaucoma patients may be challenging, it affords an opportunity to dramatically improve the quality of life of patients.

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