Goniosynechialysis and Repositioning of Intraocular Lens in a Case of Secondary Angle Closure Glaucoma

Masaru FUJITA[*1], Masafumi OGATA[*2], Yasuyuki SUZUKI[*2], Tsunetomo ICHIHASHI[*1], Miyuki NAGAHARA[*1] and Kenji KAWAI[*2]

[*1]*Department of Ophthalmology, Tokai University Hachioji Hospital*
[*2]*Department of Ophthalmology, Tokai University School of Medicine*

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Purpose: Implanting intraocular lens (IOL) in proper direction is important in cataract surgery to reduce the possibility of undesirable complications. We experienced a case who underwent vitrectomy combined with cataract surgery and developed secondary angle closure glaucoma caused by IOL misdirection. Goniosynechialysis (GSL) and repositioning of IOL successfully ameliorated the high intraocular pressure (IOP).

Case report: A 64-year-old male with massive vitreous hemorrhage underwent vitrectomy combined with cataract surgery. In implanting IOL, posterior capsule was accidentally raptured, and we were obliged to implant IOL reversely in the ciliary sulcus. A month postoperatively, the capture of IOL by iris and the shallow anterior chamber with iris bombe formation led to the elevated IOP up to 60 mmHg. Laser iridotomy and maximum anti-glaucoma medications including oral carbon anhydrase inhibitor could not control IOP. Subsequently, we performed GSL and IOL repositioning to correct the lens direction and the IOP was successfully reduced to normal level.

Conclusion: Reversely sulcus-implanted IOL should be repositioned to prevent secondary angle closure glaucoma.

Key words: secondary angle closure glaucoma, high intraocular pressure, reversely sulcus-implanted IOL, goniosynechialysis

INTRODUCTION

Intraocular lens (IOL) for cataract surgery have front and rear surfaces, with each surface being designed to optimize IOL performance when inserted properly. When the IOL is inserted inversely, its optical features are compromised and postoperative posterior capsule opacity and other IOL-related complications are more likely to develop. In some IOLs, the haptics of the lens are angled to ensure sufficient distance between the lens and iris [1]. In such cases, when IOL is inserted inversely, correct refraction will not be obtained and the approximate distance between the IOL and the iris may cause pigment dispersion of the iris due to the surface of the IOL chafing the iris or the peripheral anterior synechia of the iris being pushed by the haptics, which can lead to secondary angle closure glaucoma [2–7]. There are situations, however, when surgeons have no choice but to leave reversely inserted IOL in during surgery, such as an inappropriate injection of a pre-set IOL, posterior capsule rupture, patient restlessness, or other unanticipated complications.

In the present case, the patient underwent vitrectomy combined with cataract surgery for a vitreous hemorrhage. During surgery, the posterior capsule of the lens ruptured and the inserted IOL was almost dropped into the vitreous cavity. As a result, the IOL was inversely inserted in the ciliary sulcus in spite of an attempt to correct its direction. Secondary angle closure developed one month following the operation, but was successfully treated with goniosynechialysis and repositioning of the IOL.

CASE REPORT

A 64-year old man was referred to the Department of Ophthalmology at the Tokai University Hospital from a nearby clinic with a diagnosis of vitreous hemorrhage in the right eye in February 2015. Best corrected Visual Acuity (BCVA) was counting fingers (non corrigunt) in the right eye and 1.2 in the left eye. The intraocular pressure (IOP) was 14 mmHg in the right eye and 16 mmHg in the left eye. Slit lamp examination revealed slight cataracts in both eyes. The anterior chamber was wide open and no inflammation was detected. A massive vitreous hemorrhage was observed in the right eye, making examination of the fundus impossible. There were no particular findings in the left eye vitreous cavity or during fundus examination. Ultrasound examination of the right eye showed no apparent retinal detachment or proliferative changes in the retina. The patient had no systemic disease or systemic abnormality that could cause vitreous hemorrhage. We suspected that he suffered from a vitreous hemorrhage caused by posterior vitreous detachment and decided to observe the patient without

Masaru FUJITA, Department of Ophthalmology, Tokai University Hachioji Hospital, 1838 Ishikawa-machi, Hachioji, Tokyo 192-0032, Japan
Tel: +81-42-639-1111 Fax: +81-42-639-1144 E-mail: fu6ji2ta1@yahoo.co.jp

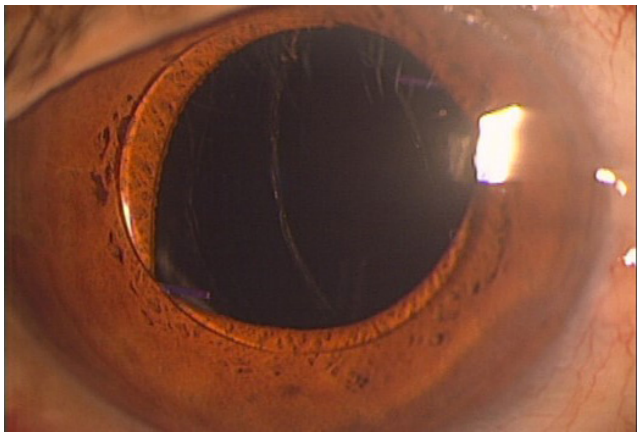

Fig. 1 Photo of the anterior segment one month after the first operation showing iris capture with the intraocular lenses (IOL) and iris bombe formation.

any treatment for several weeks. An eye examination performed one month later, however, did not show any improvement, and then vitrectomy combined with cataract surgery was planned.

The operation was performed under local anesthesia with 3 ml of 2% lidocaine (Xylocaine, AstraZeneca, Japan) injected into the retrobulbar space. First, cataract surgery was performed with the usual sequence: conjunctival incision, sclerocorneal three-step incision, side port corneal incisions, injection of viscoelastic material (Opegan-high, Santen, Japan) through a side port incision, continuous curvicular capsulotomy with forceps through the side port incision, phacoemulfiscation of the lens nucleus with the divide and conquer method, and aspiration of the residual cortex. After the temporal suture of the sclerocorneal incision, 23-gauge (G) vitrectomy was performed. Three port incisions were made with trocars and vitreous with massive hemorrhage was cut and aspirated. Residual vitreous was further aspirated with the aid of triamcinolone. There were no abnormalities that could have caused vitreous hemorrhage; therefore, the diagnosis of vitreous hemorrhage caused by posterior vitreous detachment was confirmed. After finishing the vitrectomy, viscoelastic material was injected into the anterior chamber and the lens, capsular bag, and temporal suture of sclerocorneal incision was removed. From the sclerocorneal incision, a 3-piece type IOL with proline haptics (PN6, Kowa, Japan) was inserted using the manufacturer provided injector. During IOL insertion, the anterior haptic pushed the posterior capsule of the lens and ruptured it. The IOL nearly dropped into the vitreous cavity, so the surgeon grasped the lens with forceps inserted through the sclerocorneal incision. With the forceps and IOL manipulation hooks, the IOL was placed in the ciliary sulcus, but the direction of the lens was reversed. After several attempts to correct the lens direction, the patient became restless and it became difficult to continue the operation. The decision was made to leave the IOL positioned in the inverse direction in the ciliary sulcus and finish the operation.

Immediately following the surgery, there was no severe inflammation and no remarkable complications. BCVA of the right eye was 0.6 and the IOP was 24 mmHg with no IOP lowering medications for a week following surgery. One month after the surgery, however, the patient presented with reduced visual acuity and a dull pain in the operated eye. Visual acuity was 0.02 (non corrigunt) and the IOP rose to 60 mmHg. Slit-lamp examination showed iris capture of the IOL and the shallow anterior chamber with iris bombe formation (Fig. 1). Laser iridotomy with a Nd: YAG laser was performed and IOP-lowering medications were prescribed, including dorzolamide/timolol, brimonidine eye drops, and oral carbonic anhydrase inhibitor. IOP reduced temporarily to 21 mmHg after laser iridotomy and IOL-lowering medications, but rose to 38 mmHg after two weeks. The angle examination showed 360-degree peripheral anterior synechia formation of the iris and strong pigmentation of the inferior part of the angle (Fig. 2a). The diagnosis of secondary angle closure glaucoma caused by the misdirection of the IOL was made and surgery to reposition the lens was planned.

The second operation was performed under local anesthesia with 3 ml of 2% lidocaine injected into the retrobulbar space. A 25-gauge trocar was inserted into the temporal inferior portion of sclera and artificial aqueous humor (BSS-plus, Alcon, USA) was continuously irrigated though the port. Three side-port corneal incisions were made and a viscoelastic material was injected into the anterior chamber space. With a goniolens and goniosynechialysis cannulas, the iris root of the anterior chamber angle was pressed down until the trabecular meshwork was observed and the peripheral anterior synechia of the iris was released at 210-degrees (2−9 clocks). Forceps were inserted through a side port incision and a haptic of the lens was pulled out from the side port. While the haptic was grasped with the forceps, the other haptic was dropped into the vitreous cavity with another forceps inserted through another side port and the IOL was flipped to the correct direction, then the haptic was again placed in the ciliary sulcus. The removed haptic was then inserted into the anterior chamber and placed in the ciliary sulcus. The viscoelastic material and the trocar were removed. The IOP was elevated by injecting artificial aqueous humor into the anterior chamber to seal the corneal and scleral incisions.

The IOP of the eye reduced to 11 mmHg without

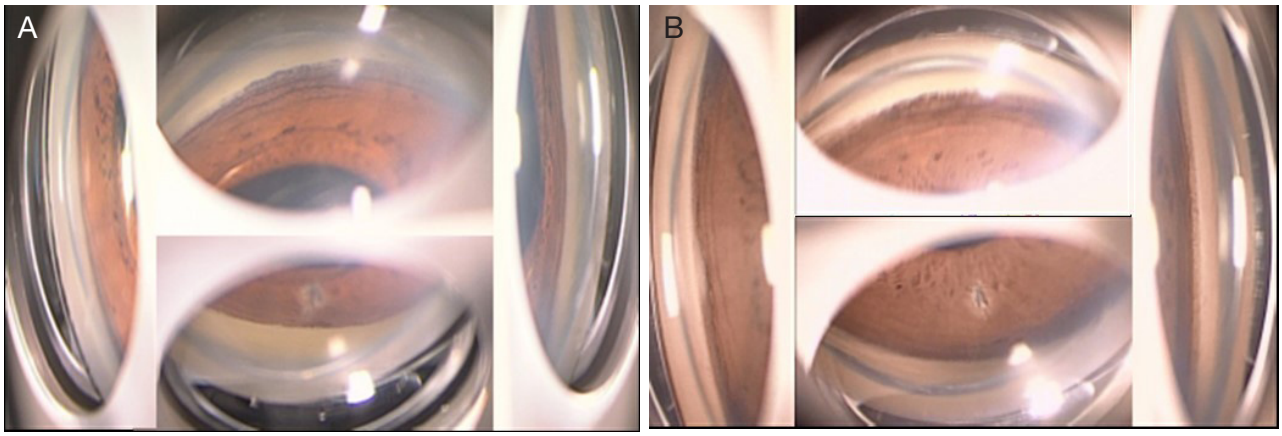

Fig. 2 a: 360-degree peripheral anterior synechia formation of the iris and strong pigmentation of the inferior part of the angle.
b: The opening of the inferior portion of the angle was confirmed.

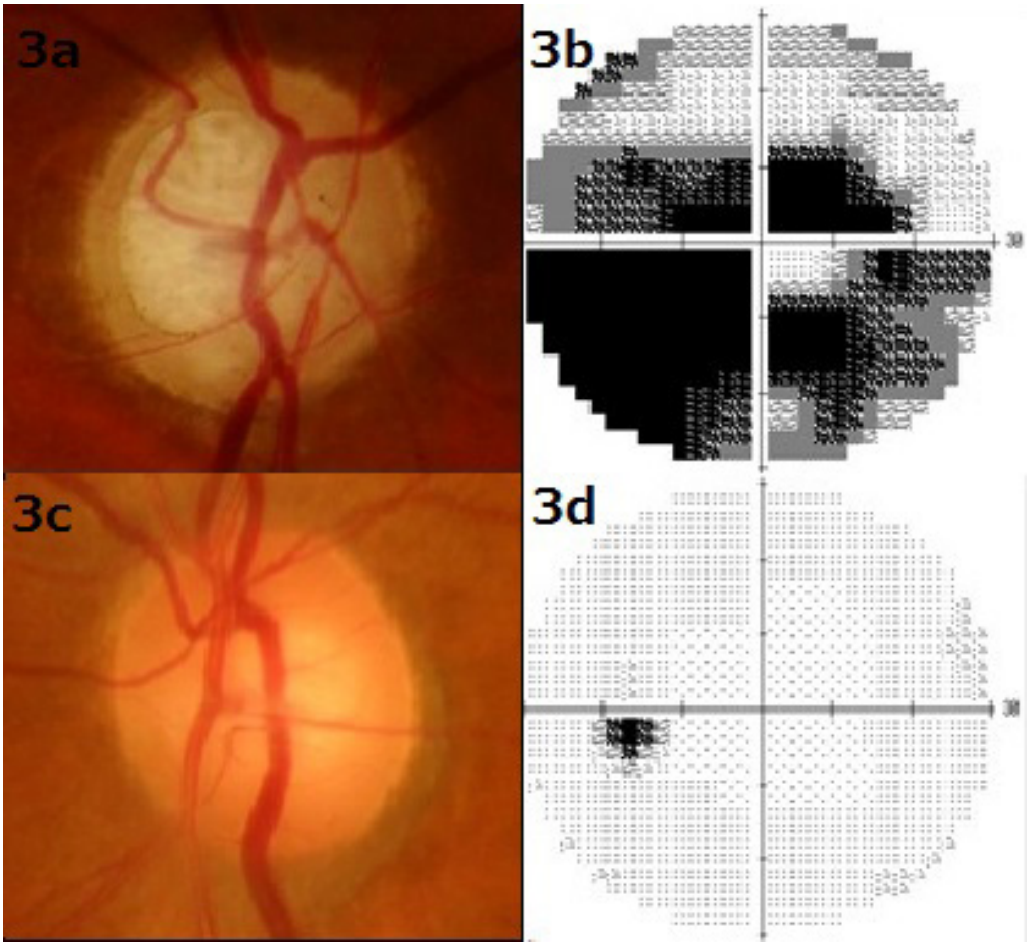

Fig. 3 a: A fundus photograph of the right eye one year after the second surgery that shows severe optic disc atrophy.
b: Results of the visual field test of the right eye one year after the second surgery, which show a severe visual field defect had developed.
c: A fundus photograph of the left eye showing the normal appearance of the optic disc.
d: The results of the visual field test of the left eye show no visual field defect.

any glaucoma medications by the following day and the inferior portion of the angle was confirmed open (Fig. 2b). The IOP was well controlled following the second operation. One year after the surgery, the visual acuity of the eye was 0.7 (1.2) and the IOP was 20 mmHg without any glaucoma medications. The fundus photographs and visual field results showed severe optic disc atrophy (Fig. 3a) and a visual field defect (Fig. 3b) in the right eye (Fig. 3c, 3d), which was caused by the damage from the secondary angle closure glaucoma.

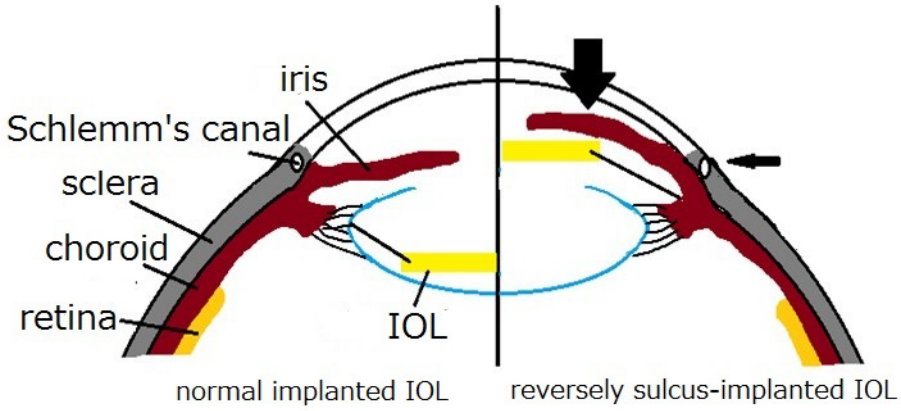

Fig. 4 A schematic of the mechanism of secondary angle closure glaucoma development in the present case. An inversely sulcus-implanted intraocular lens caused chafing of the iris and the intraocular lens (IOL) pushed the iris (big arrow) and the shallow anterior chamber (small arrow).

DISCUSSION

Recent IOLs have several design features to prevent complications after implantation. For example, the edge of the rear surface is usually specially designed to prevent development of posterior capsule opacity, which is the most frequent complication of IOL implantation. In some IOLs, the haptics of the lens are angled to maintain good positioning of the lens and ensure enough distance between the lens and iris to prevent undesirable iris chafing by the lens, which can cause pigment dispersion of the iris and inflammation of anterior chamber. When this kind of the lens is inserted inversely, the position of the IOL moves anteriorly and pushes the iris. In extreme cases, such as the present one, the IOL is captured within the pupil and causes extensive peripheral anterior synechia of the iris, and eventually leads to secondary angle closure glaucoma (Fig. 4). Additionally, the inversely implanted IOL changes the optical alignment of the lens relative to the eye; the distance between the lens and the cornea is shortened and the retina is elongated. This means that an eye with an inversely implanted IOL becomes more myopic than before implantation [1].

In the present case, the IOL was implanted after most of the vitreous was removed. If vitreous remained when the IOL was inserted, the vitreous might have sustained the IOL in the anterior chamber to some extent even after the posterior capsule rupture, but because there was almost no vitreous left, the inserted IOL readily dropped into the vitreous cavity. Although the surgeon tried to correct the lens direction with forceps and IOL manipulation hooks several times, the patient's restlessness made him abandon the operation and leave the inversely implanted IOL placed in the ciliary sulcus. The lens implanted had angled haptics with 5 degrees. Therefore, the lens position was placed more anteriorly than planned. Moreover, the placement of the lens in the ciliary sulcus rather than in the capsular bag caused the extensive posterior capsule rupture that occurred during the operation, which made the iris chafing by the lens more severe and the position of the lens more anterior than when inserted in the capsular bag. Hence, severe iris capture of the IOL and the shallow anterior chamber with iris bombe formation developed in a relatively short time following the surgery. The strong pigmentation of the inferior angle indicated that some kind of pigment dispersion caused by iris chafing also occurred.

The usual treatments for iris bombe formation within the shallow anterior chamber are laser iridotomy or cataract extraction combined with IOP-lowering medications. In most cases, IOP can be readily lowered with such treatments when there is no extensive peripheral anterior synechia of the iris. The prolonged iris bombe formation with shallow anterior chamber, however, closed the anterior chamber angle and caused extensive peripheral anterior synechia of the iris. In such cases, IOP cannot be controlled by laser iridotomy or cataract extraction and further surgical intervention, such as goniosynechialysis and trabeculectomy, are necessary. Goniosynechialysis is a surgical procedure that mechanically opens the closed angle and restores the physiological aqueous drainage through the trabecular meshwork. In this procedure, the anterior chamber angle is visualized using a goniolens by tilting the operating microscope and the face of the patient. After viscoelastic material is injected into anterior chamber to maintain the surgical space, the iris root of the anterior chamber angle was pressed down until the trabecular meshwork was observed using goniosynechialysis cannulas or spatulas. Then, the viscoelastic material was removed. There are several studies reporting the effectiveness of goniosynechialysis for the treatment of chronic angle closure glaucoma [8–10]. In the present case, goniosynechialysis combined with IOL repositioning successfully opened anterior chamber angle and lowered IOP.

Although the secondary angle closure glaucoma in the present case was successfully treated with IOL repositioning and goniosynechialysis, severe optic disc atrophy and a visual field defect remained after IOP normalization. Damage to the optic nerve is irreversible in most glaucoma cases and early intervention is

necessary to prevent permanent visual impairment. In the present case, we could have performed the IOL repositioning operation before secondary glaucoma developed. Early correction of the IOL direction might have stopped the progression of peripheral anterior synechia of the iris, and hence, prevented the optic nerve damage by secondary glaucoma.

In conclusion, inversely sulcus-implanted IOL can cause secondary angle closure glaucoma, especially when the haptics of the IOL are angled. Misdirection of the implanted IOL should be avoided whenever possible and when this condition happens, it is advocated that surgical IOL repositioning should be performed as soon as possible.

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