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A case report of Intraocular Lens Luxation with the Capsular Bag after Vitrectomy

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We experienced a case of intraocular lens (IOL) luxation with the capsular bag after vitrectomy. The case was a 66 - year-old female in whom an IOL was implanted one year after surgery for giant tear retinal detachment using silicone oil. Four years after the implantation surgery, the patient suffered subluxation of the IOL with the capsular bag. Examinations of the luxated IOL with the capsular bag using a stereoscopic microscope confirmed the presence of silicone oil droplets between the capsule and the IOL. Adhesion of vitreous body residues was observed in the capsule. Luxation of the IOL was thought to be connected with chronic inflammation resulting from the use of silicone oil and repeated vitrectomy. In addition to examining pathological findings of luxated IOL, it would also be important in the future to identify the pathology of the capsular bag.

Key words : post vitrectomy complications, stereoscopic microscope, intraocular lens luxation, silicone oil

INTRODUCTION

In recent years, there have been many reported cases of intraocular lens (IOL) luxation with the capsular bag accompanied by brittleness of Zinn's zonule as a late post-cataract surgery complication [1-3]. In the present study, we investigated a case of IOL luxation with the capsular bag after vitrectomy and, in order to determine the cause of luxation, conducted pathological examinations.

CASE PRESENTATION

The subject was a 66 - year-old female with luxation of IOL with the capsular bag who had previously been treated by one of the authors at Ogaki municipal hospital. After obtaining the subject's consent, we conducted pathological examinations at the Department of Ophthalmology of Tokai University School of Medicine.

The patient underwent vitrectomy using perfluorodecalin on September 20, 1993, after suffering left eye far-side 180° giant tear retinal detachment, with silicone oil replacement being conducted after repositioning of the retina.

On September 2, 1994, the patient developed increasing lens opacity in the left eye, making the fundus examination impossible. Therefore, she underwent phacoemulsification/aspiration (PEA) and implantation of IOL made of polymethyl methacrylate (PMMA) in the silicone oil-filled eye.

On January 20, 1995, two years post-vitrectomy, because no new retinal detachment was observed, the patient underwent silicone oil/water replacement surgery concurrently with posterior capsulectomy using a vitreous cutter to treat posterior subcapsular opacity. The patient's subsequent course was stable. However, on December 21, 1998, she was admitted to the hospital due to a sudden decrease in visual acuity.

The patient suffered a subluxated IOL on the posterior interior surface of the iris. On

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December 21, 1998, the patient underwent emergency extraction of the luxated IOL and secondary implantation of a new lens.

After obtaining the patient's consent, the extracted IOL was fixed with formalin together with the capsular bag for pathological examinations.

The extracted IOL specimens were fixed with a mixture of 5 % formaldehyde and 2.5 % glutaraldehyde in a 0.1 M phosphate buffer (pH 7.4) at room temperature for two weeks. The specimens were then washed with distilled water, and the surfaces were examined using a stereoscopic microscope.

RESULTS

IOL luxation with accompanying weakness of Zinn's zonule after vitrectomy:

1. Extensive tissue proliferation was observed inside the lens capsule. The IOL inside the capsular bag was composed of a single piece of PMMA. The tissue proliferation, thought to be composed of vitreous body tissue, showed a slight yellow coloration. Brown matters, thought to be iridial pigmentation, were found adhered to a portion of the capsule (Fig. 1A, Fig. 2A).
2. When the IOL inside the capsular bag was examined from the anterior angle, a few fine silicone oil droplets were seen on the upper optic and haptic edges (Fig. 1B, C).
3. When the IOL inside the capsular bag was examined from the posterior angle, numerous fine droplets, thought to be silicone oil, were observed between the IOL optic and the capsule. Judging from the site of the IOL fixation site prior to luxation, numerous droplets were seen in the upper region (Fig. 2A, B, C).

DISCUSSION

Whilst in-the-bag IOL implantation has been a common procedure for a majority of surgeons in recent years [4, 5], there are some reported cases describing that in spite of having maintained long-term visual function with this procedure, the patients suffered dislocation or luxation of IOL with the bag and eventually had to undergo IOL extraction due to a remarkable decrease in visual acuity [1-3]. Potential causes of such IOL luxation include trauma, exfoliation syndrome, glaucoma, and vitrectomy, resulting in weakness of Zinn's zonule.

The present case underwent PEA surgery after vitrectomy and, 4 years later, luxation with the bag developed.

The cause of IOL luxation:

Vitrectomy and retinal detachment surgery are thought to be one of the causes for subluxation. In the case of retinal detachment, the procedure of draining subretinal fluid can place a considerable burden on Zinn's zonule, weakening it. In the case of vitrectomy as well, the sclera may be strongly compressed during excision of the peripheral portion. When pathological changes in the vitreous body extend to the peripheral area of the retina, burden is placed on Zinn's zonule in the lens in achieving sufficient treatment of the peripheral area of the vitreous body. It is highly likely that this procedure weakens the zonule.

When the retina is repositioned using gas during vitrectomy, one should not overlook the fact that an air pressure of 80-100 mmHg is applied to the lens during the surgery. Moreover, degeneration of Zinn's zonule due to the use of perfluorocarbon liquid [6] or the long-term effects of silicone oil [7, 8] and repeated surgery may also cause weakness of the zonule.

Silicone oil and IOLs:

Numerous intraocular pathological changes are known to result from silicone oil including cataracts, corneal damage, elevated intraocular pressure, and damage to the retina or optic nerve [9, 10]. In 1994, Yamazaki *et al.* reported the following findings concerning the changes in lens epithelial cells in rabbits that occurred after silicone oil injections were given into the vitreous body [11].

The authors performed vitrectomies on rabbit eyes, injected silicone oil into one eye, and examined opacity of the lens over time for periods of two weeks to three months using a slit-lamp microscope and a transmission electron microscope. Their results showed that beginning approximately one month after surgery, the rabbits developed posterior subcapsular opacity. No silicone oil droplets were seen within the lens capsule and, beginning two weeks after surgery, a vacuolar structure in the cytoplasm adjacent to intercellular gaps (interdigitation) was observed in the lens epithelial cells. It was suggested that the changes in the lens epithelial

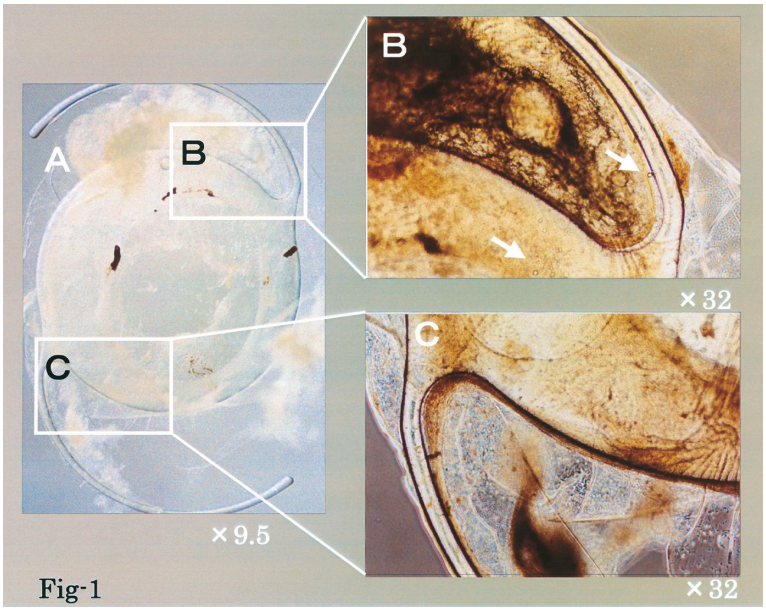

Fig. 1 A: Examination of the IOL in capsular bag from the anterior surface revealed iridial pigmentation in a portion of the bag. Residues of the vitreous body were observed in the bag (stereoscopic microscope×9.5).
B: Droplets thought to be silicone oil are observed between the haptic and optic within the upper portion of the capsule (arrows)(phase-contrast microscope×32).
C: No silicone oil droplets were observed in the lower portion of the capsule (phase-contrast microscope×32).

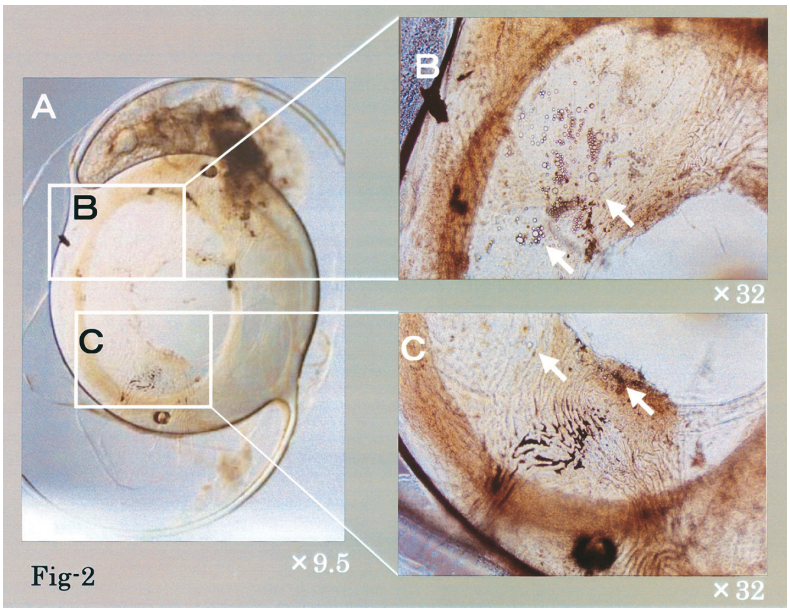

Fig. 2 A: When IOL in capsule is observed posteriorly, the capsulotomy site can be confirmed (stereoscopic microscope×9.5).
B: Numerous silicone oil droplets (arrows) are observed in the upper portion of the capsule, possibly having migrated from capsulotomy site (phase-contrast microscope×32).
C: Small amounts of silicone oil granules (arrows) are observed in the lower portion of the capsule (phase-contrast microscope×32).

cells exerted an effect on opacity.

In our study as well, posterior subcapsular opacity was observed during injection of silicone oil following cataract surgery, and posterior capsulectomy was performed when the silicone oil was removed.

When we examined the surface of the capsular bag using an inverted phase-contrast microscope, we clearly found that the oil had entered the capsular bag (as shown on Fig. 2). However, this oil was thought to have migrated between the IOL and the capsule, rather than being phagocytosed by epithelial cells. The reason for this is that numerous silicone oil droplets were found to have migrated from the area of the posterior capsular incision into the capsule, particularly in the upper area. The number of droplets migrating into the capsule from the area of the anterior capsular incision was negligible. Rather than penetration into the tissue, this is considered attributable to the fact that upon removal (replacement) of the silicone oil, the silicone oil droplets physically entered the capsule from the incised posterior capsular surface because a posterior capsular incision was made. Since it is unclear how small these silicone oil droplets can become, tissue sections should be observed under a scanning electron microscope. In such cases, it will be necessary in the future to examine tissue sections of the capsule, as advocated by Yamazaki *et al*. [11]. The reason for this is that the silicone oil droplets are considered to be an important factor in determining the etiology of cataracts and after cataracts resulting from silicone oil. Our case showed pronounced anterior capsule opacity and contraction and fibrotic opacity. It is thought that the observed more pronounced opacity was caused by chronic inflammation resulting from vitrectomy using silicone oil.

In the future, implantations of intraocular lenses will be performed frequently. The complication of IOL luxation with the bag following implantation will occur. The present study was reported because we believe that pathological findings including the capsule will be of vital importance to ophthalmologists in understanding the pathology of IOL luxation.

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