

Spontaneous Dislocation of In-the-Bag Intraocular Lens Primarily

Occurred in Cases with Prior Vitrectomy

Short title: Spontaneous dislocation of in-the-bag intraocular lens

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Structured abstract

- **Purpose:** To report cases of late onset spontaneous in-the-bag dislocation of

the intraocular lens (IOL) and to compare these results with past reports.

- **Methods:** We retrospectively studied 21 eyes of 18 patients with dislocation of

the entire capsular bag containing the IOL. Gender, age, interval between

original surgery and IOL dislocation, and the predisposing factors were

examined. Cases occurring after trauma were excluded.

- **Results:** The mean age for the 12 males (57.1%) and 9 females included in

the study was 67.8 ± 8.6 (\pm standard deviation) years at the time of the IOL removal procedure. The interval between the original surgery and the IOL dislocation was 7.9 ± 8.6 (mean \pm standard deviation). Associated clinical conditions included vitrectomy in 8 eyes (40.0%) of 7 patients, high myopia in 3 eyes (14%) of 2 patients, uveitis in 2 eyes (9.5%) of 2 patients, retinitis pigmentosa in 2 eyes (9.5%) of 1 patient, and pseudoexfoliation in 1 eye (4.8%) of 1 patient. There was no identifiable associated condition in 2 eyes (9.5%) of 2 patients, who were comparatively younger than the other cases. This result differs from previously published reports that have found a higher frequency of pseudoexfoliation and lower frequency of prior vitrectomy.

• **Conclusions:** In-the-bag IOL dislocation was frequently associated with prior

vitrectomy and sometimes occurred without specific conditions. (217/250 words)

• **keywords** : in-the-bag, intraocular lens, dislocation, prior vitrectomy

INTRODUCTION

Although intraocular lens (IOL) dislocation is uncommon, it is a serious complication of cataract surgery. Dislocation during the early postoperative period may occur due to insufficient support of the intraocular lens by the capsular bag or ciliary sulcus (1). In addition, damage to the zonules during cataract surgery can occur due to pressure on the lens during a “can-opener style” capsulotomy, or during nucleus phacoemulsification and aspiration (PEA), or even during insertion of the IOL (2). When late IOL dislocation within the capsular bag occurs more than 3 months after the initial surgery, it is generally believed to be due to zonular weakness that is caused by various conditions.

However, this dislocation does not occur because of inadequate fixation of the

IOLs (3, 4).

Previous studies have reported that pseudoexfoliation is the most commonly

associated condition with cases of IOL dislocation (3, 5-8). In the current study,

we obtained different results from those that have been previously reported.

Therefore, in addition to reporting our original results, we also discuss our

findings on the factors associated with the in-the-bag IOL dislocation.

MATERIALS AND METHODS

Prior to study participation, all subjects provided written informed consent. We

studied consecutive cases that underwent removal of dislocated in-the-bag

posterior chamber intraocular lens (PC-IOL) with the whole capsule at Nagasaki

University Hospital during the period between January 2001 and October 2010.

All cases were retrospectively reviewed based on operative reports, operative

videos and medical records. Gender, age, the interval between the original

surgery and the subsequent IOL dislocation, and the predisposing factor were all

examined.

In order to be included in the study, subjects had to have a history of

uncomplicated cataract extraction along with implantation of a posterior chamber

IOL, in addition to a late onset of dislocation of the entire capsular bag containing

the intraocular lens. Patients with a history of trauma that could potentially

contribute to zonular instability or IOL dislocation were excluded from the study.

RESULTS

We reviewed a total of 21 eyes of 18 patients, with all of the data collected from

the medical records of the subjects (Table I). A total of 12 eyes of 11 male

patients (57.1%) and 9 eyes of 7 female patients (42.9%) were enrolled in the

study. Bilateral in-the-bag IOL dislocations occurred in 3 patients who had

diabetic retinopathy, high myopia, or retinitis pigmentosa, respectively. The

mean age at the time of the cataract surgery was 59.6 ± 8.4 years (range, 42-72).

The mean age at the time of IOL removal surgery was 67.8 ± 8.6 years (range,

48-84). The interval from the initial cataract surgery to the dislocated in-the-bag

IOL ranged from 1.5 to 17 years (mean 7.9 ± 3.8 years). Of these patients, 8 eyes

(40%) of 7 patients had prior vitrectomies (case 1, branch retinal artery occlusion

with vitreous hemorrhage; cases 2, 8, 15 and 17, retinal detachment; and case 3

(both eyes) and case 4, diabetic retinopathy), while 1 patient had prior

penetrating keratoplasty (case 5, corneal leucoma) and 1 had scleral buckling

(case 10, retinal detachment). Associated clinical conditions included high

myopia in 3 eyes (14%, case 6 (both eyes) and case 11), uveitis in 2 eyes (9.5%,

cases 13 and 14), retinitis pigmentosa in 2 eyes (9.5%, case 9 (both eyes)), pseudoexfoliation and high myopia in 1 eye (4.8%, case 7) and atopic dermatitis in 1 eye (4.8%, case 12). However, case 16 (52-year-old male) and case 18 (50-year-old male) exhibited no identifiable cause.

During the IOL removal surgery, all cases underwent vitrectomy, with 18 eyes of 16 patients also undergoing transscleral ciliary sulcus suturing of a different PC-IOL. There were 3 eyes of 2 patients with long axial lengths that remained aphakic, with a myopic refractive error present postoperatively.

DISCUSSION

Similar to what we observed in the current study, recently, there have been

reports on a new type of IOL dislocation in which the IOL dislocates within an intact capsular bag due to zonular dehiscence (3, 5-10). The factors that contribute to this in-the-bag dislocation include zonular weakness and contraction of the capsular bag. It has been previously suggested that there are predisposing factors for IOL dislocations (6, 7), which include pseudoexfoliation (8, 9, 11, 12), uveitis (13, 14), trauma (15), high myopia (14, 16), diabetes mellitus (17), increased age, retinitis pigmentosa (10), atopic dermatitis (18), previous acute angle-closure glaucoma attack (19), the status after vitrectomy (20), and other diseases that are associated with progressive zonular weakening and capsular contraction (21, 22).

Gimbel et al. (6) reported on 89 eyes in 73 patients that were taking part in the Dislocated In-the-Bag Intraocular Lens Study Group. In their study, pseudoexfoliation was found to be the most common condition, accounting for more than 50% of the cases. Other commonly found conditions included uveitis, trauma, vitrectomy, and increased axial lengths. A total of 8 eyes (9.0%) in 6 patients were found to have had a prior vitrectomy. In another study, Davis et al. (5) examined 86 consecutive cases and reported that the main conditions associated with the IOL dislocation were pseudoexfoliation (50%), prior vitreoretinal surgery (19%), history of trauma (6%), and uveitis (2%). In 23% of the cases, the patients exhibited no identifiable conditions. However, the results

of these previous studies were different from our findings, as we found prior

vitrectomy to be the most common condition (8 eyes, 40%) while only 1 eye

(4.8%) had pseudoexfoliation. Forsius have reported that pseudoexfoliation is a

worldwide disease that transcends races and nations. Moreover it has been

reported in Japan that the frequency of pseudoexfoliation in those aged 60 and

over is 5%, and this is equivalent to frequency in other countries (23). In this

study we could not obtain sufficient data accounting for the reason why there

was a low rate of pseudoexfoliation in our cases. In order to reach a conclusion ,

a further prospective study with a greater number of cases will be required.

In the study by Gimbel et al. (6), bilateral in-the-bag IOL dislocation occurred in

16 patients. Of these, 4 had pseudoexfoliation, 2 had pseudoexfoliative glaucoma and repaired retinal detachment, 4 had retinitis pigmentosa, 2 had sarcoidosis uveitis, 2 had prior vitrectomy and 2 patients had other causes. In the current study, bilateral in-the-bag IOL dislocation occurred in 3 patients. One patient had been treated with PEA, insertion of PC-IOL, and pars plana vitrectomy for proliferative diabetic retinopathy, while one had high myopia and one had retinitis pigmentosa.

The period from the initial cataract surgery to the dislocated in-the-bag IOL ranged from 4.5 to 16 years in Gimbel's (6) study, and from 3 months to 17 years (mean 8.5 years) in the Davis (5) study. In our study, we found the range to be

from 1.5 to 17 years (mean 7.9 ± 3.8 years), which was similar to these two previous studies.

In the current study, the in-the-bag IOL dislocation was frequently associated with the status after vitrectomy. This result differs from the previously published reports that found a lower frequency of prior vitrectomy. Because of damage to the anterior hyaloids membrane and the posterior zonules resulting from a vitrectomy with scleral depression, there may be nothing left to support the IOL in the capsular bag, with the exception of the remained zonules. Damage to the anterior hyaloids membrane and the posterior zonules could have occurred because we performed vitrectomy primarily in the periphery in those patients

with diabetes retinopathy and retinal detachment. Thus, after a vitrectomy, the

IOL in-the-bag capsular bag would no longer have any support from the posterior

part, which could lead to it being easily dislocated to the vitreous cavity.

Gimbel et al. (6) also reported in their study that no associated condition could

be determined in 6 eyes of 6 patients (8.3%) (mean age of 61 years). In our

study, we found two patients (9.5%) who exhibited no associated condition. It

should be noted that these two patients were comparatively younger, being only

50 and 52 years old. Previous studies have reported that in-the-bag IOL

dislocations occurred in the absence of any associated conditions in

comparatively young subjects (5-7). When cataracts are present at a younger

age, this may indicate that these subjects originally had weaker zonular forces.

These underlying changes may last longer period for younger patients, and thus

could pose a higher risk of IOL dislocation in the future as compared to older

patients. Therefore, careful attention needs to be paid to younger patients after

cataract surgery. In addition, the younger patients in these previous studies were

all male and also the cases of our study were all male. Further studies that

include both more cases and greater detailed analyses will be necessary in

order to clarify the exact number of cases of IOL dislocation that occur without

any associated conditions.

There were more male patients (57.1%) of in the bag IOL dislocation than

female in our study. Our results are similar to the studies by Gross et al. (7), Hayashi et al. (3), and Davis et al. (5), who found these tendencies in 68.0%, 71.1% and 53.8% of the males, respectively. Since males are often physically more active than females, this could result in a higher frequency of traumatic events that ultimately lead to zonular weakness.

In conclusion, our findings suggest that a higher risk for spontaneous IOL dislocation may exist in eyes that have undergone a previous vitrectomy. Thus, to lower this potential risk, vitrectomies need to be performed using an approach that minimizes the damage to the zonular forces.

REFERENCES

1. Schneiderman TE, Johnson MW, Smiddy WE, et al. Surgical management of posteriorly dislocated silicone plate haptic intraocular lenses. *Am J Ophthalmol* 1997;123:629-635.
2. Wilson DJ, Jaeger MJ, Green WR. Effects of extracapsular cataract extraction on the lens zonules. *Ophthalmology* 1987;94:467-470.
3. Hayashi K, Hirata A, Hayashi H. Possible predisposing factors for in-the-bag and out-of-the-bag intraocular lens dislocation and outcomes of intraocular lens exchange surgery. *Ophthalmology* 2007;114:969-975.
4. Boke WR, Kruger HC. Causes and management of posterior chamber lens displacement. *J Am Intraocul Implant Soc* 1985;11:179-184.
5. Davis D, Brubaker J, Espandar L, et al. Late in-the-bag spontaneous intraocular lens dislocation: evaluation of 86 consecutive cases. *Ophthalmology* 2009;116:664-670.
6. Gimbel HV, Condon GP, Kohnen T, et al. Late in-the-bag intraocular lens dislocation: incidence, prevention, and management. *J Cataract Refract Surg* 2005;31:2193-2204.
7. Gross JG, Kokame GT, Weinberg DV. In-the-bag intraocular lens dislocation. *Am J Ophthalmol* 2004;137:630-635.
8. Lorente R, de Rojas V, Vazquez de Parga P, et al. Management of late spontaneous in-the-bag intraocular lens dislocation: Retrospective analysis of 45 cases. *J Cataract Refract Surg*;36:1270-1282.
9. Jehan FS, Mamalis N, Crandall AS. Spontaneous late dislocation of intraocular lens within

the capsular bag in pseudoexfoliation patients. *Ophthalmology* 2001;108:1727-1231.

10. Hayashi K, Hayashi H, Matsuo K, et al. Anterior capsule contraction and intraocular lens dislocation after implant surgery in eyes with retinitis pigmentosa. *Ophthalmology* 1998;105:1239-1243.

11. Masket S, Osher RH. Late complications with intraocular lens dislocation after capsulorhexis in pseudoexfoliation syndrome. *J Cataract Refract Surg* 2002;28:1481-1484.

12. Lim MC, Doe EA, Vroman DT, et al. Late onset lens particle glaucoma as a consequence of spontaneous dislocation of an intraocular lens in pseudoexfoliation syndrome. *Am J Ophthalmol* 2001;132:261-263.

13. Brilakis HS, Lustbader JM. Bilateral dislocation of in-the-bag posterior chamber intraocular lenses in a patient with intermediate uveitis. *J Cataract Refract Surg* 2003;29:2013-2014.

14. Shigeeda T, Nagahara M, Kato S, et al. Spontaneous posterior dislocation of intraocular lenses fixated in the capsular bag. *J Cataract Refract Surg* 2002;28:1689-1693.

15. Zech JC, Tanniere P, Denis P, Trepsat C. Posterior chamber intraocular lens dislocation with the bag. *J Cataract Refract Surg* 1999;25:1168-1169.

16. Mastropasqua L, Toto L, Nubile M, et al. Long-term complications of bilateral posterior chamber phakic intraocular lens implantation. *J Cataract Refract Surg* 2004;30:901-904.

17. Hayashi H, Hayashi K, Nakao F, Hayashi F. Area reduction in the anterior capsule opening in eyes of diabetes mellitus patients. *J Cataract Refract Surg* 1998;24:1105-1110.

18. Yamazaki S, Nakamura K, Kurosaka D. Intraocular lens subluxation in a patient with facial atopic dermatitis. *J Cataract Refract Surg* 2001;27:337-338.
19. Su WW, Chang SH. Spontaneous, late, in-the-bag intraocular lens subluxation in a patient with a previous acute angle-closure glaucoma attack. *J Cataract Refract Surg* 2004;30:1805-1807.
20. Yasuda A, Ohkoshi K, Orihara Y, et al. Spontaneous luxation of encapsulated intraocular lens onto the retina after a triple procedure of vitrectomy, phacoemulsification, and intraocular lens implantation. *Am J Ophthalmol* 2000;130:836-837.
21. Choudhary A, Sahni J, Kaye SB. Late spontaneous anterior dislocation of an intraocular lens (IOL) with the capsular bag. *Eye* 2005;19:101-102.
22. Pavlin CJ, Buys YM, Pathmanathan T. Imaging zonular abnormalities using ultrasound biomicroscopy. *Arch Ophthalmol* 1998;116:854-857.
23. Forsius H. Exfoliation syndrome in various ethnic populations. *Acta Ophthalmol Suppl* 1988;184:71-85.

Table I. Details for the 21 eyes with In-the-bag IOL dislocation

Case No.	Gender	Age (cataract surgery)	Eye	Age (IOL removed)	Time to dislocate (years)	Diagnosis	Previous procedures
1	M	65	L	71	6	BRVO, Vit hemo	PEA+IOL+Vit
2	M	61	L	67	6	RD	Scleral buckling, Vit, SF6gas tamponade twice, pECCE+IOL
3	M	65	R	68	3	DR	PEA+IOL+Vit
		65	L	69	4	DR	PEA+IOL+Vit
4	M	61	L	62	1.5	DR	PEA+IOL+Vit
5	F	70	R	84	7	Corneal leucoma	PKP+pECCE+IOL
6	F	72	R	77	5	High myopia	PEA+IOL
		72	L	79	7	High myopia	PEA+IOL
7	F	67	L	79	12	PE, High myopia	PEA+IOL
8	M	62	R	73	11	RD	PEA+IOL+Vit
9	F	58	R	68	10	Pigmentosa	PEA+IOL
		58	L	68	10	Pigmentosa	PEA+IOL
10	M	43	R	48	5	RD	Scleral buckling, PEA+IOL
11	F	62	L	76	14	High myopia	PEA+IOL
12	M	42	R	54	12	Atopic dermatitis	PEA+IOL
13	F	54	L	63	9	Uveitis	PEA+IOL
14	F	52	R	60	8	Uveitis	PEA+IOL
15	M	59	R	65	6	RD	PEA+IOL+Vit
16	M	52	R	59	7	No associated	PEA+IOL
17	M	61	R	66	5	RD	PEA+IOL+Vit
18	M	50	R	67	17	No associated	PEA+IOL

L, left; R, right; M, male; F, female; BRVO, branch retinal vein occlusion; Vit hemo, vitreous hemorrhage; RD, retinal detachment; DR, diabetic retinopathy; PE, pseudoexfoliation; PEA, phacoemulsification and aspiration; IOL, intraocular lens; Vit, pars plana vitrectomy; pECCE, planned extracapsular cataract extraction; PKP, penetrating keratoplasty.