ORIGINAL ARTICLE

Refixation of dislocated intraocular lens using the double needle flanged technique

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Abstract

Purpose: To review cases of refixation of the dislocated three-piece intraocular lens (IOL) using the Yamane flanged technique.
Methods: Medical charts of six patients who underwent refixation of subluxed or posteriorly dislocated three-piece IOLs using the Yamane flanged technique between January and December 2018 were retrospectively reviewed. The time from initial IOL implantation to IOL refixation, logMAR best-corrected visual acuity at baseline and months 1, 3, and 6, spherical equivalent at month 6, IOL horizontal and vertical tilt at month 6, and complications were documented.
Results: The mean time from IOL implantation to IOL refixation was 12.6±9.7 years. Of the six cases, four had successful refixation of IOL and two had unsuccessful refixation of IOL and necessitated removal of the IOL and implantation of a new one. The mean logMAR best-corrected visual acuity improved from 1.48 preoperatively to 0.680 at month 1, 0.400 at month 3, and 0.320 at month 6. The mean spherical equivalent at month 6 was -0.520. In the four cases with the original IOL, at month 6 the IOL horizontal tilt was 2.5°±4.5° and the vertical tilt was -4.00°±2.754°.
Conclusion: Using the Yamane flanged technique to refixate the dislocated IOL achieves good stability and spherical equivalent of the IOL. Intra-operative assessment of the IOL and correct angulation and manipulation of the haptics are crucial for the success of surgery.

Key words: Lens implantation, intraocular; Lens subluxation

Introduction

Intraocular lens (IOL) dislocation is a serious complication after cataract surgery, with an incidence ranging from 0.2% to 3%.[1] Dislocations occurring early after surgery are common owing to inadequate capsular bag or ciliary sulcus support. Other risk factors of IOL dislocation include high myopia, trauma, pseudoexfoliation syndrome, uveitis, post-vitreoretinal surgery, and neodymium-doped yttrium aluminum garnet laser–induced capsulotomy.[1-3] The use of the three-piece IOL is often associated with intra-operative complications such as an unstable capsular bag, zonulysis, posterior capsular rupture, and capsulorhexis radial extension. The IOL is often placed into the sulcus or directly into the capsular bag, and this may result in postoperative IOL instability or dislocation.

Symptoms of dislocated IOL range from drop in visual acuity to diplopia. In cases of posteriorly dislocated IOL into the vitreous cavity, there are additional risks of retinal breaks, retinal detachment, vitreous hemorrhage, and chronic cystoid macula edema. Surgical approaches for IOL implantation in eyes with inadequate posterior capsule support include anterior chamber IOL, iris-fixated IOL, and

intrascleral-fixated IOL. Intrascleral-fixated IOL is preferred owing to its physiological location with less risk of corneal decompensation, iris chafing, or uveitis-glaucoma-hyphema syndrome.[4]

Intrascleral IOL fixation involves the use of sutures for anchorage and hence carries risks of suture breakage and conjunctival erosion. In 2017, Yamane et al proposed a sutureless double-needle flanged technique,[5,6] which has been widely used with promising results.[7-10] We reviewed a case series of refixation of dislocated three-piece IOL using the double needle flanged technique. This technique uses a small corneal incisional wound and thus achieves better intra-operative anterior chamber stability and less risk of endothelial damage, postoperative astigmatism, and intraocular bleeding.

Methods

Medical charts of six patients who underwent refixation of subluxed or posteriorly dislocated three-piece IOLs with inadequate sulcus support between January and December 2018 were retrospectively reviewed. All surgeries were performed using the Yamane flanged technique by a single surgeon at Grantham Hospital Eye Center in Hong Kong. Rescuing of the dislocated IOL was attempted in all cases. The time from initial IOL implantation to IOL refixation, logMAR best-corrected visual acuity at baseline and months 1, 3, and 6, spherical equivalent at month 6, IOL horizontal and vertical tilt at month 6, and complications were documented. IOL tilt was calculated from horizontal and vertical images. A straight line passing through the iris-corneal angles on each side was used as the reference line. The angle between the reference line and the horizontal/vertical axis of the IOL was measured as the IOL horizontal/vertical tilt. The mean IOL tilt was defined as the mean measurement of horizontal and vertical tilts.[5] Statistic analysis was performed using the Graphpad (Prism8 v8.2.1). One-way ANOVA was used to compare repeated measurements at follow-ups.

Under general anesthesia, a 25-gauge vitrectomy was performed. The dislocated lens was retrieved into the anterior chamber using the Alcon 25-gauge intraocular serrated forceps (**Figure a**) Two small corneal paracentesis were created at 2 and 10 o'clock positions. While the dislocated lens was in the anterior chamber, capsular remnants were removed to free residual adhesions using 25-gauge curved scissors. Externalization of IOL haptics through the paracentesis wound may be necessary in cases with strongly adhered capsular remnants to facilitate its removal (**Figure b**). A 27-gauge bent needle was inserted through the conjunctiva at 1.5 mm from the limbus, with the scleral entry of needle head kept at 20° and an intrascleral tunnel of 1.5 mm (**Figure c**). The leading haptic of the IOL was introduced, and one third of the haptic was advanced into the lumen of needle with the aid of intraocular forceps (**Figure d**). Another 27-gauge needle was inserted 180° from and in the opposite direction of the first needle. The trailing haptic was docked into the needle lumen in the same fashion as the leading haptic (Figure e). Both needles were withdrawn at the same time to externalize the haptics. Low temperature cautery was used to create terminal bulbs on the haptics and these flanged ends helped to fixate the intraocular lens (**Figure f**).

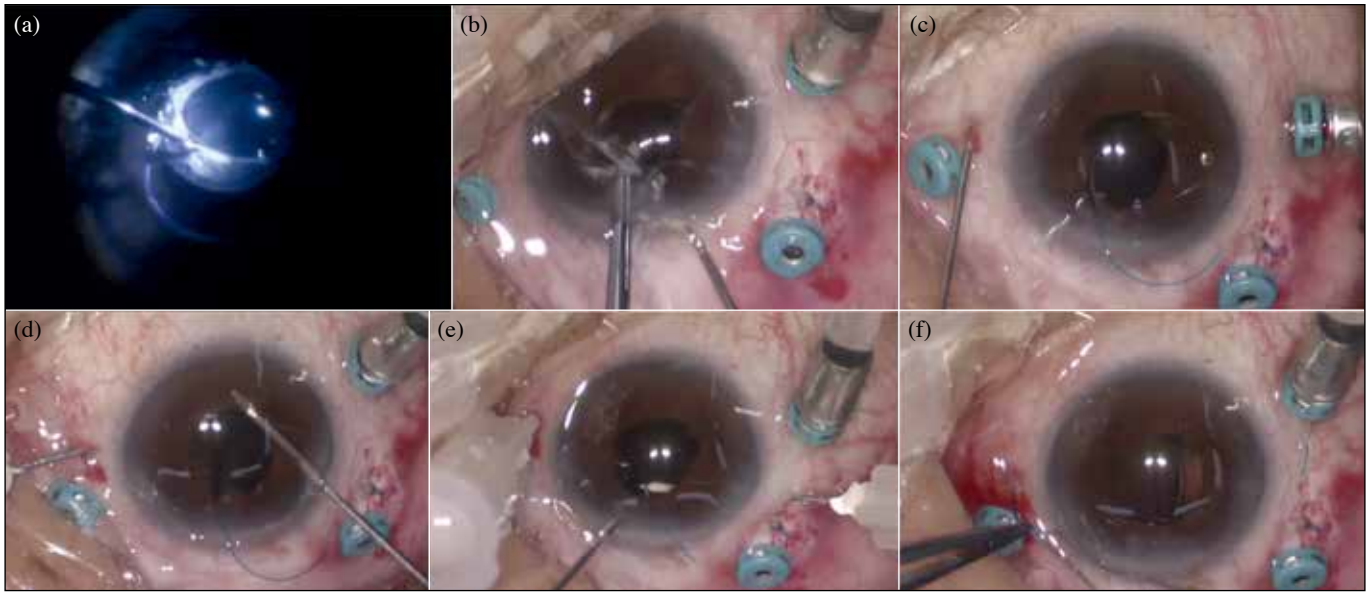

Figure. The double needle flanged technique: (a) The dislocated intraocular lens (IOL) is retrieved using an intraocular serrated forceps. (b) The IOL haptic is externalized via a paracentesis wound to facilitate removal of residual capsular remnants. (c) A 27-gauge bent needle was inserted. (d) The leading haptic of the IOL was introduced into the lumen of needle. (e) The trailing haptic is docked into the needle lumen in the same fashion as the leading haptic. (f) Both needles are withdrawn at the same time to externalize the haptics. Flanged ends are created with low temperature cautery.

Results

We reviewed six eyes in two men and four women (mean age, 71.17±5.565 years) who underwent refixation of subluxed (n=2) or dislocated (n=4) IOL caused by trauma (n=1), zonulysis following posterior capsular rupture (n=1), or unknown causes (n=4). The mean time from IOL implantation to IOL refixation was 12.6±9.7 years. Of the six cases, four had successful refixation of IOL including Sensar AR40e (n=1), Alcon MA60MA (n=1), and undocumented lenses (n=2). The two remaining cases had unsuccessful refixation of IOL and necessitated removal of the IOL and implantation of a new one. In one case with the Sensar AR40e, the haptic was broken at the optic haptic junction intra-operatively. In another case with the Hoya PY60R), the haptic was broken during docking manipulations. The two IOLs were placed into the anterior chamber and were cut into halves and removed via a 2.75-mm wound created by a corneal knife. A new three-piece (Sensar AR40e) IOL was then injected into the anterior chamber and implanted using the double needle flange technique.

The mean logMAR best-corrected visual acuity improved from 1.48 preoperatively to 0.680 at month 1, 0.400 at month 3, and 0.320 at month 6 (**Table 1**). The visual acuity of one patient was disregarded owing to the absence of visual potential secondary to a macula off retinal detachment before original IOL implantation. The mean spherical equivalent at month 6 was -0.520. In the four cases with the original IOL, at month 6 the IOL horizontal tilt was 2.5°±4.5° and the vertical tilt was -4.00°±2.754°. Comparing the four cases with the original IOL and the two cases with new IOL, there was no significant difference at month 6 in terms of visual acuity and IOL horizontal and vertical tilt. However, those with the original IOL had better spherical equivalence (-0.3438 vs -0.8759, p=0.018, **Table 2**).

One case developed Irvine Gass syndrome, which was resolved after topical non-steroidal anti-inflammatory drugs use. There were no major complications such as retinal detachment, choroidal detachment, suprachoroidal hemorrhage, endophthalmitis, and corneal decompensation.

Discussion

Scleral-fixating IOL is a popular procedure for secondary IOL implantation when there is instability in the capsular bag or anterior capsule. Conventionally, reimplantation of IOL requires a trans-scleral suturing technique. In 2017, Yamane et al introduced a sutureless double needle flanged IOL technique.[5,6] The IOL is fixed at exact centration and results in good axial stability and proper centration.[11] Such technique is relatively simple and minimally invasive, compared with the conventional procedure.

In cases of subluxed or dislocated IOL, the old IOL is often retrieved and a new IOL implanted. Retrieval of the subluxed or dislocated IOL requires a big corneal wound, resulting in delayed wound healing and postoperative astigmatism. The Yamane flanged technique enables saving of the IOL, faster

Table 1. Clinical characteristics of the six patients

Patient no.	Age, y	Time from initial intraocular lens implantation to refixation, y	LogMAR visual acuity				Replacement of intraocular lens	Spherical equivalence at month 6
			Baseline	Month 1	Month 3	Month 6		
1	63	13.5	HM	HM	HM	HM	No	-0.50
2	70	18	2.3	0.7	0.4	0.4	Yes	-1.00
3	79	8	1.0	0.5	0.5	0.5	No	-0.25
4	75	0.08	1.9	0.5	0.3	0.2	No	-0.375
5	72	28	1.9	1	0.5	0.3	No	-0.25
6	68	8	0.3	0.7	0.3	0.2	Yes	-0.75
Mean±SD	71.17±5.565	12.6±9.7	1.48±0.814	0.680±0.205	0.400±0.100	0.320±0.130	-	-0.520±0.300

Table 2. Comparison of cases with original versus new intraocular lens in terms of outcome at month 6

Outcome at month 6	Cases with original IOL (n=4)	Cases with new IOL (n=2)	P value
LogMAR visual acuity	0.3333	0.3000	0.8223
Spherical equivalence	-0.3438	-0.8750	0.018
Intraocular lens tilt (horizontal)	92.50°	88.50°	0.4879
Intraocular lens tilt (vertical)	86.00°	90.50°	0.0565

recovery, and a more stable anterior chamber. A similar flanged technique for dislocated IOL was reported to achieve good visual outcome of 20/25 without surgical complications in a 78-year-old patient.[9] The IOL was dislocated a few days after cataract surgery and was retrieved soon after. In our series, the IOLs remained in the eye for >12 years on average.

In our series, the dislocated IOL was successfully refixated in four of six eyes. Marked improvement of best-corrected visual acuity was observed, especially at postoperative month 6. The mean spherical equivalent at month 6 was satisfactory (-0.52 D), which is within the acceptable range of -1.0 D to -1.5 D to achieve best uncorrected distance and near vision.[12] IOL tilt is an important factor in the success of the surgery. >7° of IOL tilt significantly decreases visual acuity.[13] In our series, the mean IOL tilt of 2.5°±4.5° horizontally and -4.00°±2.754° vertically is within the limits to avoid visual disturbances. The two patients with replacement of IOL had a poorer spherical equivalence, probably because of the use of a new IOL, the presence of larger (2.75 mm) corneal incision, and the manipulation of IOL explantation. Nonetheless, studies with a larger sample size are needed to reveal group differences more accurately.

The existing three-piece IOLs had more angulated haptics owing to prolonged implantation within the capsular bag, compared with the brand new three-piece IOLs. In the two cases with replacement of IOL, the haptics were broken while being angulated to fit into the 27-gauge needle. Careful intra-operative assessment is crucial for haptic-optic junction stability (to minimize dislocation at the junction), haptic symmetry or bend (to minimize IOL tilt after implant), and haptic damage or kink (to minimize breakage during docking). When the angulation is too great, it is advisable to explant the old IOL and to replace it with a new one, as the chance of a broken haptic during or after fixation is high. When the old IOL is kept, capsular remnants should be completely cleared, especially the fibrotic capsules that wrap around the haptics. This ensures smooth docking into smaller gauge needles such as a 30G thin wall or 27G needle. The Alcon 25G serrated forceps is useful in the capsular removal process and IOL retrieval as well as haptics guidance into the 27G needle for externalization. A pair of 25G curved scissors is used to dissect the fibrotic capsule or tissue. Capsular removal is performed within the vitreous cavity and in the anterior chamber; manipulation in the anterior chamber is easier owing to a superior view through the cornea. The double needle technique facilitates the second haptic docking. With the first needle/haptic rotated deep into the eye, the second haptic is more ergonomically aligned for docking with the needle. Nonetheless, with the old three-piece IOL, the angulation requires more rotation, which can be achieved with slightly less threading of the first haptic into the needle, leaving two-thirds exposed rather than one third. This enables the IOL to rotate further for easier docking with a bent haptic.

The decision to keep the existing IOL was made intra-operatively. It was not known whether the haptics of unknown IOLs could be threaded into the needles. The integrity of the optic-haptic junction was difficult to assess after manipulation. There was a risk of breakage during haptic externalization or after surgery. Each IOL was brought into the anterior chamber for inspection, and the haptics were externalized via the paracentesis wounds for removal of capsular remnants. This is a good opportunity to inspect and manipulate the haptics for instability. In the two cases with IOL replacement, the old IOL design and long duration of implantation may have played a role. The Hoya lens had very small round bulbs at the haptics that made docking difficult, but the optic-haptic junction seemed to be very strong. The Sensar lens had been implanted for >18 years, and the junction may have weakened. In addition, the patient had had bilateral recurrent uveitis since 2012, and the IOL material may have weakened. The IOL design, duration of implantation, and occurrence of uveitis are important for patient selection. Long-term studies with a larger sample size are warranted to confirm our results.

Conclusion

Using the Yamane flanged technique to refixate the dislocated IOL achieves good stability and spherical equivalent of the IOL. Intra-operative assessment of the IOL and correct angulation and manipulation of the haptics are crucial for the success of surgery.

Contributors

All authors designed the study, acquired the data, analyzed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflict of interest

All authors have disclosed no conflicts of interest.

Funding/support

This study received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

All data generated or analyzed during the present study are available from the corresponding author on reasonable request.

Ethics approval

The study was approved by the Institutional Review Board of The University of Hong Kong / Hospital Authority Hong Kong West Cluster (reference: UW-20-078).

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