DOI:10.14744/bej.2020.18199
Beyoglu Eye J 2020; 5(3): 223-227

Original Article

Combined Intracapsular Lens Removal and Scleral Fixation of Intraocular Lenses Through the Same Scleral Tunnel in Cases with Severely Dislocated Lenses

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Abstract

Objectives: The management of severely dislocated lenses floating in the anterior vitreous is challenging. This study describes the clinical outcome of a surgical approach with intracapsular lens extraction (ICCE) and implantation of a scleral-fixated posterior chamber intraocular lens (SF-IOL) at the same surgical session.

Methods: Records of patients who had severely dislocated lenses were retrospectively reviewed. All included patients had undergone ICCE, followed by implantation of an SF-IOL during the same surgical session through the same scleral tunnel placed 1.5 mm posterior to the limbus. Clinical characteristics of the patients were collected, and surgical videos were watched again to review intraoperative complications.

Results: Thirty eyes of 30 patients (mean age, 68±11.1 years, 23 male, 7 female) were included in the study. Twenty-five patients had a history of blunt trauma, and five patients had pseudoexfoliation syndrome. The best-corrected visual acuity of the patient improved significantly after the procedure (p=0.001). The intraocular pressure of the patients remained unchanged (p=0.38). Three patients developed mild IOL dislocation that did not require any intervention. A patient developed transient hypotony, and another developed mild vitreous hemorrhage. These complications improved spontaneously without the need for further intervention.

Conclusion: Simultaneous removal of dislocated lens and SF-IOL implantation through the same scleral tunnel was a safe and effective procedure for patients with severely dislocated IOLs.

Keywords: Dislocated lens, scleral fixation, scleral tunnel.

Introduction

Insertion of an intraocular lens (IOLs) into the capsular bag is not always possible when the integrity of the capsular bag or zonules is compromised. Such conditions include ocular trauma, complicated cataract surgeries, elastic tissue diseases, metabolic diseases, or pseudoexfoliation syndrome. In these cases, surgical options include implantation of an anterior-chamber IOL (AC-IOL), an iris-fixated IOL (IF-IOL), or a sclera-fixated IOL (SF-IOL). SF-IOL avoids the common complications observed with AC-IOLs and IF-IOLs including corneal endothelial damage, peripheral anterior synechia, and glaucoma (1). SF-IOLs provide a more natural visual rehabilitation because they are placed at the physiological position of the crystalline lens and stayed near the nodal point of the eye (2). These points make SF-IOL implantation

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Submitted Date: October 17, 2020 **Accepted Date:** November 10, 2020 **Available Online Date:** December 28, 2020

the preferred method in most of these cases. However, it is also a complex procedure that has a relatively steep learning curve and may cause some other complications such as retinal detachment, IOL tilt, corneal astigmatism, and suture-related complications (mainly due to the knots). In this study, we described a modified SF-IOL insertion procedure that evades corneal astigmatism and knot-related complications.

Methods

This retrospective, interventional case series included 30 eyes of 30 individuals who had an SF-IOL implantation with the above-mentioned technique. Ocular history and pathology, preoperative and postoperative best-corrected visual acuity (BCVA), corneal astigmatism, and complications were recorded and analyzed. Complete ophthalmological evaluation, including slit lamp examination, intraocular pressure (IOP) measurement, and dilated fundus examination, was performed at all preoperative and postoperative visits.

The study protocol was approved by the institutional review board of Beyoglu Eye Education and Research Hospital (Document No: 42/A-1, dated 26.08.2020) and adhered to the tenets of the Declaration of Helsinki. Informed consent was obtained from the patients after they were provided with detailed explanation of the procedure and its possible complications.

Patients underwent intracapsular cataract extraction (ICCE), followed by scleral fixation through the same scleral tunnel with the Z-suture technique. After induction of retrobulbar anesthesia, a 7 mm long curvilinear line was marked 1.5 mm behind and parallel to the limbus at the 12 o'clock position. The conjunctiva was opened to reach the marked area and the sides at the 2 o'clock and 8 o'clock positions. The sclera was incised with one half thickness incision using a 45° blade under the guidance of the markings, and the dissection was advanced using a crescent blade from the vertex of the curvilinear opening into the clear cornea. The scleral tunnel was completed by extending the dissection on both sides. The tunnel was further extended to the anterior-chamber (AC) using a 3.2 mm blade. If vitreous bands were observed in the pupillary area, anterior vitrectomy was performed before lens removal. The inner opening of the tunnel was extended on both sides to reach a size of approximately 10 mm. The dislocated lens was removed through the scleral tunnel using an irrigating vectis. Anterior vitrectomy was performed to clean the AC from vitreous bands. The haptics of the posterior chamber IOLs were tied using a PC-9 suture outside the eye. The needle of the PC-9 suture was passed through the sclera at 8 o'clock position 2 mm behind the limbus for the first haptic and at 2 o'clock position for the second haptic. The IOL position was adjusted by pulling the sutures from both sides. The sutures were stabilized inside the scleral tissue with the Z-suture technique. Conjunctival incisions were closed with 8/0 degradable vicryl sutures. The surgical steps are shown in Figure 1.

The clinical characteristics of the patients were recorded in an Excel file, and data were transferred to and analyzed in SPSS 21.0 for Mac. Data distribution was determined by Kolmogorov–Smirnov test. Continuous variables were given as mean ± standard deviation, and descriptive data were presented as numbers and percentages. Preoperative and postoperative findings were compared with Wilcoxon test. Only one eye of every patient was included in the statistical analysis to avoid double-organ bias (3). P values below 0.05 were considered as statistically significant.

Results

The study included 30 eyes of 30 patients who underwent surgery with the above-mentioned technique. Seven patients were female and 23 patients were male. Seventeen were right eyes and 13 were left eyes. The mean patient age was 68±11.1 years. The mean preparative K1 and K2 were 41.8±3.1 diopters (D) and 42.8±3.0D, respectively, and the mean axial length was 23.7±1.8 mm. In all cases, the indication for surgery was the presence of a luxated lens with insufficient capsular support. The underlying etiology was blunt trauma (n=25) and pseudoexfoliation syndrome (n=5). All lenses were severely dislocated and floating over the anterior vitreous, preventing a safe capsulorhexis or placement of capsular tension rings. Baseline clinical characteristics of the patients are summarized in Table 1.

The BCVA improved significantly after the procedure. The median BCVA was 1.8 LogMAR preoperatively and improved to 1.0 LogMAR at postoperative week 1 (p=0.001). No significant change was found in the IOP after surgery. The median IOP was 16 mmHg preoperatively, 14.5 mmHg at postoperative day 1, and 17 mmHg at postoperative week 1 (p=0.45 and p=0.38, respectively). The surgical outcomes of the patients are summarized in Table 2.

No intraoperative complications were noted during the surgery. Mild IOL decentration was observed in three cases, but no intervention was required as the IOL stayed within the pupillary axis and it did not bring significant changes to visual function. A patient had transient hypotony after the surgery, which resolved spontaneously at postoperative day 10. Another patient developed mild vitreous hemorrhage during the placement of the scleral suture, and it also resolved spontaneously without the need for further intervention. None of the patients developed intraoperative expulsive suprachoroidal hemorrhage.

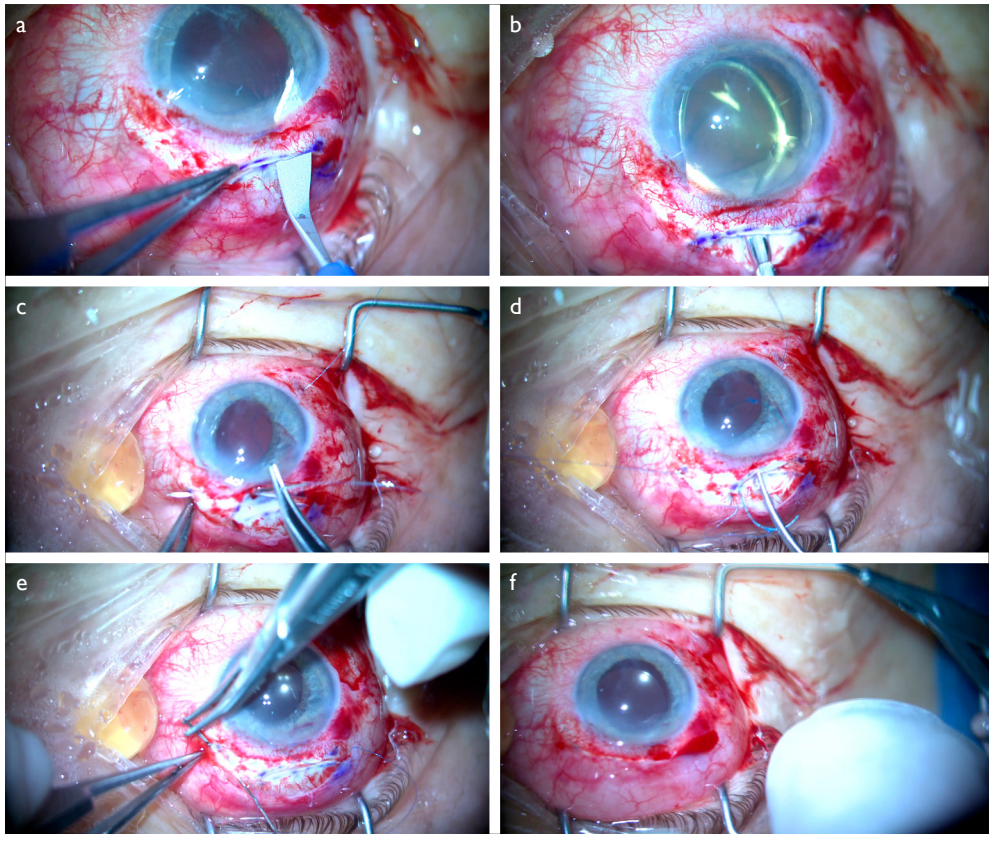

Figure 1. Surgical steps during intracapsular removal of the dislocated lens and scleral fixation of a posterior chamber intraocular lens (IOLs).
(a) The sclera was incised half thickness using a 45° blade, and the dissection was advanced using a crescent blade from the vertex of the curvilinear opening to the clear cornea. The scleral tunnel was completed by extending the dissection on both sides. The tunnel was further extended to the AC using a 3.2 mm blade. The inner opening of the tunnel was extended on both sides (approximately 10 mm). **(b)** The dislocated lens was removed through the scleral tunnel using an irrigating vectis. **(c)** The haptics of the IOL were tied using a PC-9 suture outside the eye. The needle of the PC-9 suture was passed through the sclera at 8 o'clock position 2 mm behind the limbus for the first haptic and at 2 o'clock position for the second haptic. **(d)** The IOL was inserted in to the AC through the same scleral tunnel. The IOL position was adjusted by pulling the sutures from both sides. **(e)** The sutures were stabilized inside the scleral tissue with the Z-suture technique. **(f)** Conjunctival incisions were closed with 8/0 degradable vicryl sutures.

Table 1. Demographic characteristics of the patients

Male, n (%)	23 (76.7)
Female, n (%)	7 (23.3)
Age, Mean±SD	68.1±11.1
Underlying etiology	
Blunt trauma, n (%)	25 (83.3)
Pseudoexfoliation syndrome, n (%)	5 (16.7)

SD: Standard deviation.

Discussion

Capsular support or zonular integrity may be compromised due to various conditions including ocular trauma, hereditary zonular weakness, or complicated cataract surgery. The current surgical options for placing an IOL in an eye without adequate capsular support include AC-IOLs, IF-IOLs, and SF-IOLs. SF-IOL is a safe and effective method for cases with insufficient capsular support (4–6). Recent comparative studies have not found significant difference in the postoperative BCVA or complication rates between these approaches (7–10). Patients with an intact iris can always be candidates for AC-IOL or IF-IOL implantation. AC-IOLs are no longer preferred, as they can cause significant endothelial loss and bullous keratopathy, but IF-IOLs still remain as a viable option. The main disadvantage of IF-IOLs is their higher price, and they cannot be placed to eyes with iris damage or uveitis. SF-IOL implantation is a safer approach in these patients and in patients with a shallow AC or reduced endothelial cell count (11,12). Moreover, SF-IOL maintains the normal anatomical position of the lens and is closer to the nodal point of the eye.

ICCE was preferred in this study, as the dislocated lenses

Table 2. Clinical outcome of the patients

		p*
Preoperative BCVA, LogMAR, median (IQR)	1.8 (1.3-3.0)	0.001
Postoperative BCVA, LogMAR, median (IQR)	1.0 (0.4-1.8)	
Preoperative IOP, median (IQR)	16.0 (15.7-18.9)	0.38
Postoperative IOP, median (IQR)	17.0 (14.0-18.0)	
Complications		
Mild IOL dislocation, n (%)	3 (10.0)	
Vitreous hemorrhage, n (%)	1 (0)	
Transient hypotony, n (%)	1 (0)	
Endophthalmitis, n (%)	0 (0)	

BCVA; best corrected visual acuity; LogMAR; logarithm of minimal angle of deviation; IQR: interquartile range; IOL: intraocular lens; *Wilcoxon test.

were luxated to the anterior vitreous and there was no possibility to perform a safe phacoemulsification cataract surgery with capsular tension rings without dropping the lens to the vitreous cavity. After lens extraction, the same scleral tunnel could be used for SF-IOL implantation. This approach provides a closed system during the surgery to maintain the stability of the AC during surgery compared with clear corneal and limbal incisions and thereby reduced the risk of expulsive suprachoroidal haemmhorrhage (13). This approach also offered the opportunity to perform surgery in cases with corneal problems, as it did not change the biomechanical properties of the cornea (14). Clear corneal incisions >2 mm cause significant corneal shape changes and induce corneal astigmatism (15). This approach also prevented induction of corneal astigmatism. As the only disadvantage of this approach, it is not always easy for inexperienced surgeons to perform the scleral fixation procedure through a scleral tunnel, which requires relatively longer tunnel then clear corneal or limbal incisions. However, relatively longer scleral tunnels reduce the rate of endophthalmitis compared with clear corneal incisions, and this is a significant advantage (16).

Scleral fixation of IOLs by suture can cause several complications such as corneal edema, ocular hypertension, intraocular hemorrhage, and suture-related complications. Suture-related complications include IOL tilt, IOL dislocation, suture erosion, suture breakage, and endophthalmitis. Various surgical approaches and techniques were developed and tested to avoid these complications. IOL tilt and decentration of an IOL >5° is associated with significant refractive error (17). Several techniques can be used to achieve better IOL centration, but their main disadvantage is increased risk of hemorrhage due to more scleral passes (18). We used ab interno scleral fixation technique and observed mild IOL decentralization only in 10% of our cases that did not require any surgical intervention. To avoid the development of scleral and conjunctival erosions due to the trauma of the suture knot, we preferred the Z-suture technique in all cases. This technique was introduced by Szurman et al.,(19) and it does not require knotting of the suture to the scleral tissue by performing parallel crossings through the sclera. They did not report scleral atrophy or chronic inflammation in the long-term follow-up of the Z-suture technique. However, other complications of this surgery remained at similar rates such as cystoid macular edema, glaucoma, hemorrhage, and late suture breakage (20). Sutureless SF-IOL is also available, yet no significant difference in visual gain and complication rates was demonstrated (21).

The lack of a control group was a limitation in this study, and we were unable to compare the clinical outcome of this surgical approach with other surgical options. These severely luxated cataracts are complex cases that are relatively rare in the general ophthalmology practice. Therefore, the sample size could not be higher than 30 cases in this study. These patients underwent surgery in a referral center, and long-term follow-up of these patients could not be obtained, as these patients went to their hometowns and visited their local clinics for long-term follow-up.

In conclusion, this surgical approach allowed for a safe management of severely dislocated lenses without vitreous drop, provided management of aphakia at the same surgical session, and was a closed system surgery that successfully prevented development of intraoperative expulsive suprachoroidal hemorrhage. This approach has a favorable outcome with a minimal complication rate and does not induce corneal astigmatism. We believe that combined intracapsular lens removal and scleral fixation of IOLs through the same scleral tunnel at the same surgical session is a good surgical approach for severely dislocated lenses.

Disclosures

Ethics Committee Approval: The study protocol was approved by the institutional review board of Beyoglu Eye Education and Research Hospital (Document No: 42/A-1, dated 26.08.2020) and adhered to the tenets of the Declaration of Helsinki.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Involved in design and conduct of the study (SG, ASK, OY, ST, FE); preparation and review of the study (SG, ASK, OY, ST, FE); data collection (SG, ASK, OY, ST); and statistical analysis (FE).

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