

Potential Risk in Combined Use of Capsule Retractors and Capsular Tension Rings

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Abstract

The aim of this study, present a complication associated with capsular tension ring (CTR) implantation after placement of capsule retractors.

A 66-year-old man presented with progressive bilateral vision loss. He had no history of ocular trauma, and previous eye surgery. In ophthalmological examination bilateral large zonular deficiency had been noted in both eyes. The remaining ocular and medical history was unremarkable. Cataract extraction with IOL placement was performed in the right eye by the help of capsule retractors and CTR.

On attempted removal one of the capsule retractor, it was discovered that the CTR had passed through the retractor's distal loop. Additional gently manipulation and rotation of the CTR through the retractor's distal loop was ended with atraumatic removal of the capsule retractor.

Though capsule retractors improve challenge of weak zonules during cataract surgery, the instrument itself may cause complications and unwanted problems when combined use with CTRs.

Keywords: Capsular tension ring; Capsule retractor; Cataract surgery

Introduction

Despite modern techniques and technologies for cataract, surgery in the presence of zonular weakness or subluxated lens was a great surgical challenge for anterior segment surgeons [1]. Even though age is the main risk factor for cataract progression, pseudoexfoliation syndrome (PXF) represents an independent threat for the development of nuclear sclerosis [1,2]. Because of PXF, intraoperative and postoperative complications may arise from weakened capsule and zonulopathy [2,3]. Capsular tension rings are used to stabilize the capsular bag of the crystalline lens both during and after cataract surgery [4]. Varying designs of capsular tension rings are used widely throughout the world [5]. The capsular tension ring reinforces the zonule in eyes with zonular dehiscence and to prevent capsular phimosis [5,6]. The decision of using capsular tension ring is made before surgery during the preoperative visit and perioperative situation [4-6]. The most common causes of zonular weakness are pseudoexfoliation, traumatic lens displacement, and other inherited causes including Marfan's syndrome, homocystinuria, Weill-Marchesani syndrome, microspherophakia, retinitis pigmentosa and lens coloboma [1,4,6].

In cases of severe zonular instability, capsule retractors are used to provide support to the unsteady capsule during phacoemulsification [7]. Capsule retractors help support the zonular lens complex in the antero-posterior direction, facilitating hydrodissection and cataract fragmentation [7].

In this study, we aimed to present a complication seen as a result of capsular tension ring and capsule retractor use in a case with zonule weakness.

Case Report

A 66-year-old man presented with decreased visual acuity in bilateral eyes to our clinic. His past medical history was unremarkable. He had no history of ocular trauma and previous eye surgery. His best corrected visual acuity (BCVA) in the right and left eye was 1/10 and hand motion, respectively. Intraocular pressure was measured 13 mmHg in the right eye with prostaglandin analogues and dorzolamide-timolol medical combination. Intraocular pressure was 29 mmHg with full topical medical treatment in the left eye. Slit-lamp examination revealed nuclear sclerotic cataract in both eyes and bilateral large zonular deficiency. Notable finding was white flaky material seen on the pupil border in right eye. After pupil dilatation, the whitish-flaky material was observed on the anterior capsular surface in both eyes. Gonioscopy was performed and grade IV open angle with 2+ pigmentation of trabecular band was seen in both eyes. This finding was considered as pseudoexfoliation syndrome. After the diagnosis, phacodonesis was noticed during the biomicroscopic examination. Fundus examination showed that cup-to-disc ratio was 0.5 in the right eye and 1.0 in the left eye.

When these conditions were evaluated preoperatively, phacoemulsification surgery was planned with the capsular tension ring and capsule retractors to the patient's right eye. Phacoemulsification with insertion of a capsular tension ring (12 mm in diameter) and in the bag implantation of an acrylic single-piece

posterior chamber intraocular lens was performed by aid of capsule retractors on the right eye. Towards the end of surgery, an unexpected complication was observed. On attempted removal one of the capsule retractor, we had seen that the capsular tension ring had passed through the retractor's distal loop inadvertent (Figure 1). Additional gently manipulation and rotation of the capsular tension ring through the retractor's distal loop was ended with atraumatic removal of the capsule retractor (Figure 2). The operation was successfully completed without additional complication.

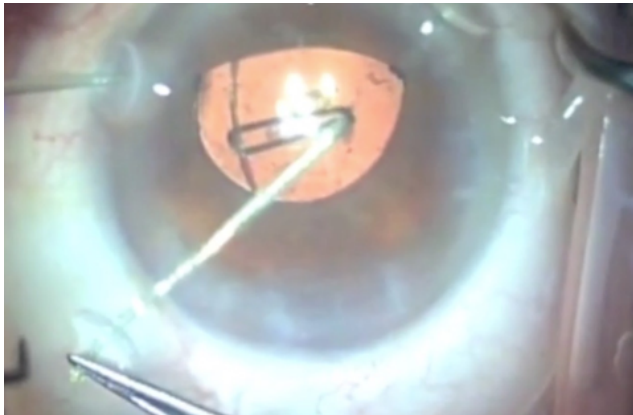


Figure 1: It was seen that the capsular tension ring had passed through the retractor's distal loop inadvertent.

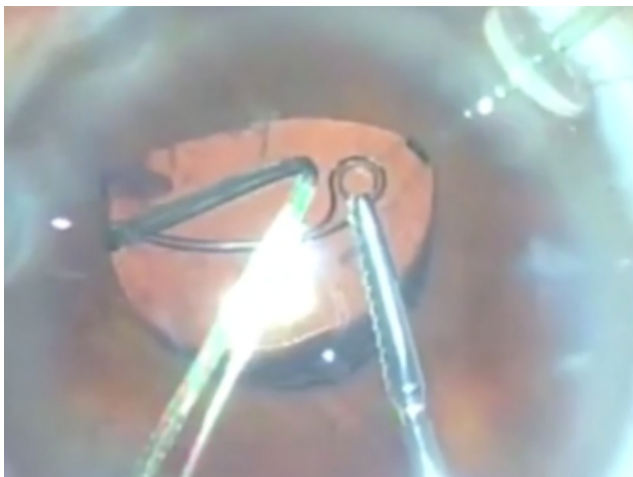


Figure 2: Gently manipulation of the capsular tension ring through the retractor's distal loop was ended with atraumatic removal of the capsule retractor.

The patient's visual acuity improved to 6/10 on the first day after surgery. His intraocular pressure was 18 mmHg. Slit lamp examination revealed minimal corneal edema, mild conjunctival congestion, regular pupil and deeper anterior chamber. After dilatation pupil it was observed that the intraocular lens was located in the center of capsular bag and capsular tension ring was stable in the capsular bag. Fundus examination was unremarkable. One month after surgery, his visual acuity was 8/10 and the intraocular pressure was 16 mmHg. Slit lamp

examination revealed a clear cornea, regular pupil, centralized intraocular lens and normal depth anterior chamber. Fundus examination showed that the retinal anatomy was stable.

Discussion

Common causes of zonular weakness include surgical trauma, mature cataract, pathological myopia, pseudoexfoliation syndrome, Marfan's syndrome, homocystinuria, Weill- Marchesani syndrome, microspherophakia, retinitis pigmentosa, lens coloboma and blunt trauma [4,6,8]. Pseudoexfoliative material involving most ocular tissues determines progressive weakening of the zonular ligament with consequent loss of lens stability [2,3]. Pseudoexfoliation syndrome is a multiorgan disease which genetically determined, age-related and environmentally influenced disorder of the elastic fiber structure [2,3]. Pseudoexfoliation is diagnosed by deposition of abnormal white, dandruff-like, flaky material on ocular structures that line the surfaces of anterior segment [2,3]. The material is composed of amyloid, laminin, elastic fibers, collagen and basement membrane [2,3]. Genetic and environmental factors may have influence on the manifestation of the disease. A documented association with mutations in lysyl oxidase-like 1 (LOXL-1) gene, which codes for elastic fiber components of extracellular matrix [2,3]. Pseudoexfoliation syndrome is an age related condition [2,3]. In all populations, its prevalence increases markedly with age [2,3]. Most patients are older than 50 years [2,3]. In our case, the patient with pseudoexfoliation syndrome was 66 y old.

Raised intraocular pressure and prevalence of glaucoma is frequently expected in patients with PXF [3]. PXF is the most frequent cause of secondary glaucoma as the results of an increased outflow resistance because of the chronic deposition of pigmented material freed from iris and in addition of exfoliative material throughout the trabecular meshwork [2,3]. Due to the high level of the intraocular pressure exhibited, the risk of glaucoma development and progression is elevated in these patients with PXF [2,3]. In our patient, secondary glaucoma due to PXF has seen both eyes.

The main accepted indications for capsular tension ring are zonular dialysis and zonular weakness [1,5,6,8]. Typical signs of zonular weakness are phacodonesis with eye movements and a reduction of anterior chamber depth because of forward shift of the lens [4,5,7]. A capsular tension ring is designed to stretch the lens capsule and thereby maintain the circular contour of the capsular bag [5,6]. Capsular tension rings are most commonly used in eyes with suspected or actual zonular weakness, including eyes with pseudoexfoliation syndrome, high myopia, mature cataracts and lens subluxation [1,5,6,8]. In our case, zonular weakness is caused by pseudoexfoliation syndrome is the main factor of using capsular tension ring. Before phacoemulsification insertion of capsular tension ring of subluxated lens with zonular defect can readjust the manipulating forces during cataract removal [5-8]. Capsular tension ring insertion has the advantage of preserving the zonular and capsular complex for endocapsular phacoemulsification and implantation of the intraocular lens implantation within the capsular bag [1,4-8]. Capsular tension rings also minimize the risk of vitreous prolapse, capsular rupture and IOL dislocation which were not seen in our case [4-8]. In our surgery, a single-piece posterior chamber IOL was successfully implanted into the capsular bag. Moreover, long term stability of the bag and intraocular lens is uncertain in eyes with progressive loss of zonular support, in these cases capsular retractors are more effective [1,5,6,8]. However, the perioperative and postoperative complications of these devices are controversial [1,5-8]. Delayed insertion of the capsular

tension ring (prior to implanting the IOL) is less traumatic and is not associated with the perioperative problems [4-8]. However, this does not afford support of the capsule during phacoemulsification, and there is potential risk of the bag collapsing and/or complete luxation of the lens, a good reason why hooks or capsular retractors are useful [4-8]. In our case, capsular tension ring and capsule retractors provided safe completion of phacoemulsification and implantation of foldable intraocular lens in the capsular bag. Capsular tension ring strengthened the zonular and capsular complex and this allowed good centration of the intraocular lens postoperatively [4-6,8]. But in our case, we observed an unexpected complication that the capsular tension ring had passed through the retractor's distal loop. This complication is very rare and there are few cases in the literature [7].

Capsular tension rings reduce the risk intraoperative and postoperative complications [1,2,4-6]. When encountered zonular weakness, capsular tension devices such as capsular tension ring and capsule retractors should be used in order to ensure safe removal of the crystalline lens and stable placement of the intraocular lens for long term stability [5-8]. Capsular support devices is relatively easy to implant and may be used to restore the round contour of the capsular bag [1,4,6-8]. When the capsule retractors used with capsule tension rings, it can cause undesired troubles and complications [7]. Anterior segment surgeons should be alert and cautious for these complications.

Conclusion

Modern techniques and instruments for surgery have improved the reliance toward the surgical approach and operative management of zonular weakness; yet, the higher risk of complications with surgery still suggests the need for greater expertise and surgical skill.

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