American Journal of Ophthalmology Case Reports 21 (2021) 101000

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Four-flanged prolene fixation for a toric trifocal intraocular lens of the double C-Loop design in an eye with severe capsular phimosis

Abdulhameed Hashim Mahmood [a,b,*], Mohammed Khalid Aljodaie [a], Anoud Faisal Alsaati [a]

[a] Prince Sultan Military Medical City, PO Box 7897, Riyadh, 11159, Saudi Arabia
[b] Salmaniya Medical Complex, PO Box 12, Manama, Bahrain

ARTICLE INFO

Keywords:
Anterior capsular phimosis
Cataract
Toric trifocal IOL
Flanged prolene
Novel technique
IOL repositioning

ABSTRACT

Purpose: To report a rare case of severe capsular phimosis after toric trifocal intraocular lens implantation, in a patient who was already on systemic immunosuppression and to present a modified fixation technique, based on the four-flanged prolene technique, which could be adapted for fixation of intraocular lenses of the double-C-loop design.

Observations: A 33 year old gentleman, who underwent uneventful, sequential, bilateral phacoemulsification with implantation of toric trifocal intraocular lenses, presented 6 weeks post-operatively, with severe capsular phimosis, causing decentration of the IOL and deformation of the haptics in both eyes. The left eye was successfully managed by Nd-YAG laser anterior capsulotomy, while the right eye required surgical intervention.

Conclusion and importance: In the present case report, we describe a novel technique to successfully reposition and realign a decentered toric trifocal intraocular lens of the double C-loop haptic design, after severe capsule phimosis.

1. Introduction

Anterior capsule phimosis, commonly referred to as anterior capsule contraction syndrome (ACCS), is an exaggerated fibrotic response reducing the size of the anterior capsulotomy and capsular bag diameter. Even though fibrosis is more frequent in the posterior capsule, it may still involve the anterior capsule. This condition remains asymptomatic unless the constriction encroach into the visual axis potentially resulting in deteriorated visual acuity, pseudophacodonesis and occasionally significant intraocular lens decentration.[1–3]

Anterior capsule phimosis has been associated with smaller size capsulorhexis, eyes with weak zonules in pseudoexfoliation syndrome and in eyes with inflammation, including uveitis, retinitis pigmentosa, and diabetes.[4–7] Several studies have demonstrated that the composition and design of the IOL plays a significant role in the development and progression of ACCS. Silicone, acrylic, plate haptic, and polyHEMA IOLs have all been associated with higher percentage of ACCS and more pronounced phimosis when compared with PMMA IOLs.[8–10] Studies also showed that, with or without risk factors, there is a higher chance of developing ACCS after implantation of hydrophilic acrylic IOLs compared to their hydrophobic counterparts.[11–14]

Management of ACCS consists of creating multiple radial anterior capsulotomies utilizing Nd:YAG laser or surgical excision depending on the severity of the contraction and its effect on visual acuity.[15–19] Recently, a new technique was described in which femtosecond laser anterior capsulotomy was performed using a non-applanating fluid--filled interface, with the help of a spectral-domain optical coherence tomography imaging system to achieve precise centration and location of the capsulotomy.[20,21]

Scleral fixated IOL techniques for aphakia and/or dislocated IOLs, have evolved significantly over the last 2 decades. Different surgical techniques have been described including sutured scleral fixation, intrascleral haptic fixation, Glued IOL, Yamane technique, and many others. Sutureless techniques in particular, have recently attracted more interest among anterior segment surgeons.[22] Most recently, Sergio Canabrava and his colleagues from Brazil, introduced the four-flanged intrascleral IOL fixation technique, using 5′0 prolene and a four-eyelet design monofocal intraocular lens.[23]

In our case, the toric trifocal IOL was of the double C-loop design, and IOL exchange with a monofocal lens was not an ideal option, given the patient's preference and the fact that he has a trifocal IOL implanted in the other eye. Therefore, we decided to attempt the same technique

* Corresponding author. Prince Sultan Military Medical City, PO Box 7897, Riyadh, 11159, Saudi Arabia.
E-mail addresses: hameedhn@gmail.com (A.H. Mahmood), 99mohammad99@live.com (M.K. Aljodaie), anoudsaati@gmail.com (A.F. Alsaati).

https://doi.org/10.1016/j.ajoc.2020.101000
Received 26 June 2020; Received in revised form 27 October 2020; Accepted 7 December 2020
Available online 8 January 2021

described by Canabrava et al., on the double C-loop IOL.

2. Case report

A 33 year old gentleman, with history of primary renal failure due to Focal Segmental Glomerulosclerosis since early adulthood, underwent a renal transplant at the age of 24, after which he was placed on lifetime steroids and Tacrolimus. He presented to us with steroid induced cataract and underwent bilateral, sequential, 4-days-apart, uneventful phacoemulsification with implantation of toric trifocal intraocular lenses [FineVision (POD FT) by PhysIOL, Liège, Belgium].

The patient had uneventful recovery and was placed on topical antibiotic drops for 1 week (moxifloxacin 0.5%, four times daily), and topical steroid drops (Prednisolone acetate 1%) every 2 hours for the first 2 days and every 4 hours for the third and fourth days, followed by slow tapering to four times daily, three times daily, two times daily and once daily, 2 weeks each. His regular post-transplant immunosuppression therapy was not altered and included oral prednisone and tacrolimus.

On his 2 weeks post-op visit, his examination showed quiet anterior chambers bilaterally, well-centered IOLs with accurate axis alignment. His uncorrected distance visual acuity at that point was 6/6 in both eyes.

The patient presented 6 weeks post operatively, complaining of bilateral gradual deterioration of vision that became intolerable over the last one week duration, and was worse in the right eye. His visual acuity was 6/60 in the right eye and 6/24 in the left eye. His slit lamp examination revealed severe capsular phimosis which was more aggressive in the right eye, displacing the IOL superiorly and folding the haptics on top of the optic (Fig. 1, Video 1 and Video 2).

Supplementary video related to this article can be found at https://doi.org/10.1016/j.ajoc.2020.101000

While Nd:YAG laser anterior capsulotomy was sufficient to re-center the IOL in the left eye, it was not successful in the right eye, and the decision was made to reposition and fix the IOL surgically (Fig. 2).

2.1. Surgical technique

Taking advantage of the IOL design (Double-C Loop), we decided to fix it by creating a loop of 5′0 prolene thread, around the neck of the optic-haptic junction on both sides, with four points of fixation, then cauterizing the ends of these threads creating four flanges in a similar fashion to the technique described by Canabrava et al.[23]

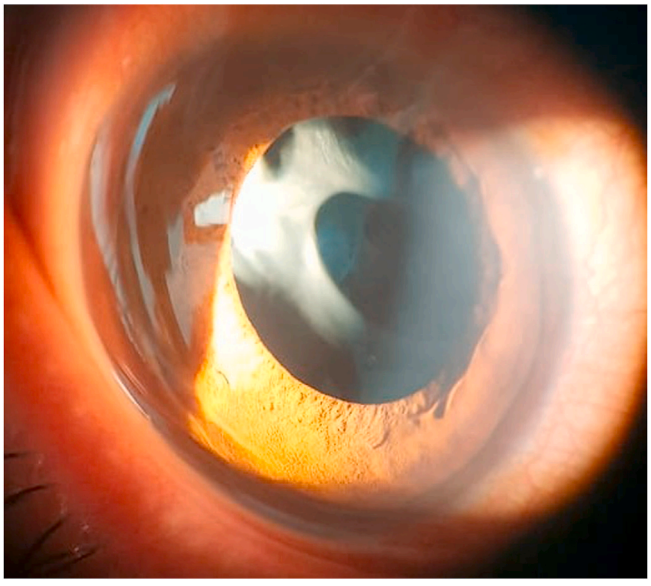

Fig. 1. Slit lamp examination photo of the right eye, showing the severity of the anterior capsule phimosis.

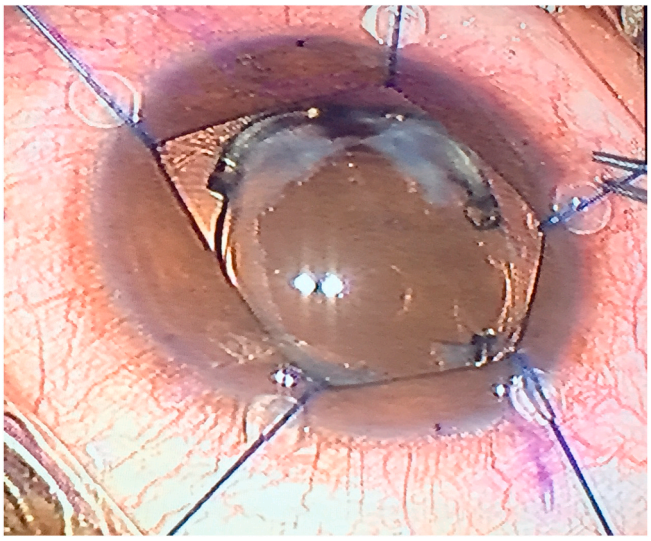

Fig. 2. Intra-opeartive photo of the right eye after placing iris retractors, clearly demonstrating the amount of decentration of the IOL and deformation of the haptics.

While sitting superiorly, we started with conjunctival peritomy on both sides of the IOL axis. Hemostasis was maintained with wet-field bipolar cauterization. Two surgical marks were then placed 3mm apart, 1.5mm posterior to the limbus on each side of the IOL axis, marking the 4 sclerotomies that will be used as fixation points of the IOL. After that, two opposite corneal paracentesis wounds were created at the IOL axis.

A ½ inch-27-gauge needle was then bent 90° bevel up at 2/3 of its length. The bent needle then pierced the sclera keeping its bevel upwards at one of the two fixation points that were pre-marked. It then pierced the posterior capsule at one side of the optic-haptic junction aiming to pass under the haptics but above the optic (Fig. 3). With the second hand, a 5′0 prolene suture (cut at an angle to facilitate threading) was introduced through the opposite paracentesis and fed into the lumen of the 27 gauge needle (Fig. 4), which was then pulled outside to externalize the prolene thread (Fig. 5). The 27 gauge needle was then introduced through the second sclerotomy mark and the other end of the same suture was fed into it in the same fashion, and externalized to create a hammock-like loop of 5′0 prolene thread pulling the optic-haptic junction (Fig. 6).

The same process was repeated on the other side's haptics. The four prolene threads were then trimmed as necessary, pulled until proper IOL centration was restored, and finally cauterized by low-heat hand-held cautery to create 4 flanges (Fig. 7), which were tucked back into the

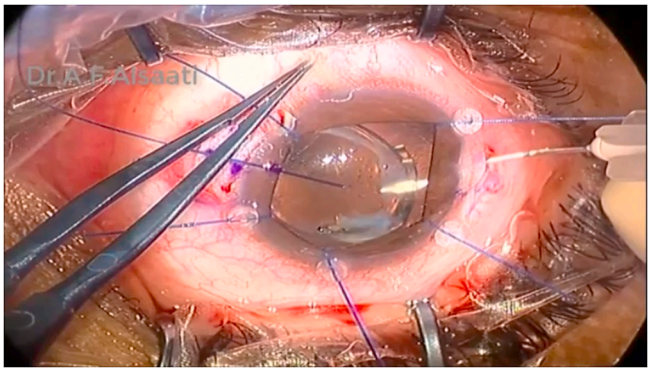

Fig. 3. A bent 27-gauge needle is introduced through one of the sclerotomy marks, piercing the posterior capsule and passing underneath the haptic.

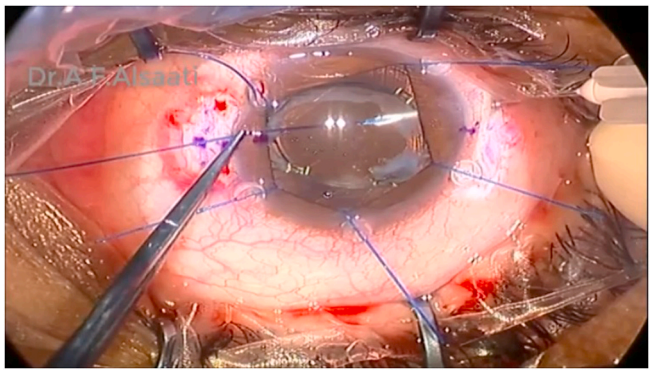

Fig. 4. 5′0 Prolene suture is being fed into the lumen of 27-gauge needle.

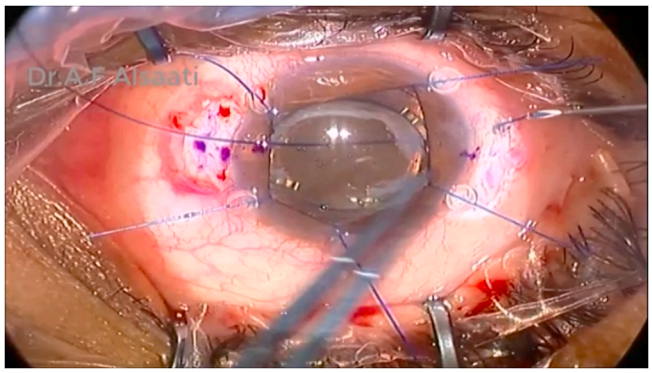

Fig. 5. The 5′0 Prolene suture is externalized.

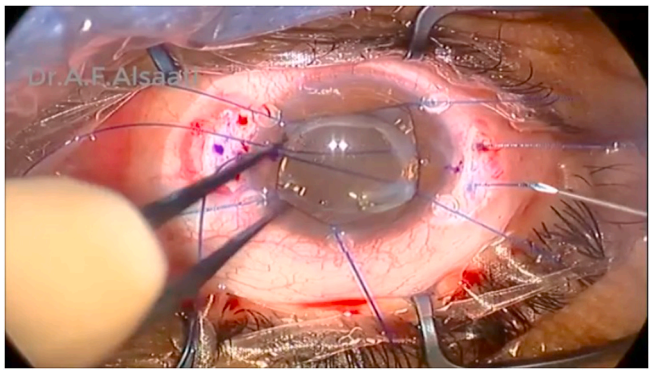

Fig. 6. The other end of the same 5′0 Prolene suture is externalized to wrap around the optic-haptic junction.

sclerotomies. All fibrotic capsular contractions were then cut using intraocular scissors to release the four haptics and relax the IOL back into normal position. The conjunctiva was then closed with fibrin glue. The supplemental video (Video 3) shows all steps of the surgical procedure in more details.

Supplementary video related to this article can be found at https://doi.org/10.1016/j.ajoc.2020.101000

2.2. Post-operative findings

The patient was kept on topical antibiotic drops for 1 week (moxifloxacin 0.5%, four times daily), and topical steroid drops (Prednisolone acetate 1%) every 2 hours for the first week. Despite his compliance with topical steroid drops, moderate fibrinous anterior chamber reaction was noted 1 week after the surgery, for which the patient received an

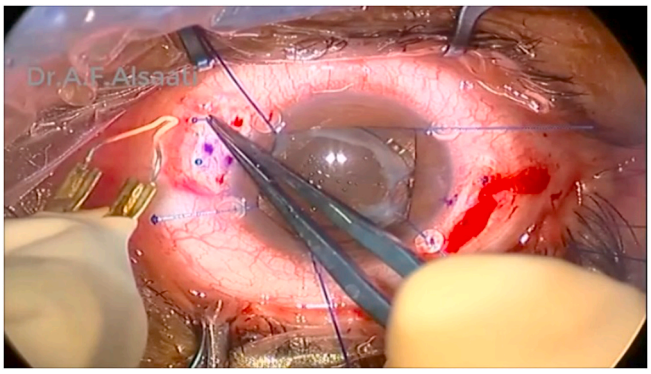

Fig. 7. Low-heat hand-held cautery is used to create the four flanges.

intracameral injection of tissue plasminogen activator (tPA) (25μg/0.1ml).

After this injection, the patient's condition improved and we managed to taper his steroid drops slowly over the next month. At 1 month post-op, he presented with visual acuity of (6/36p) in the right eye. Slit lamp examination showed a well centered multifocal IOL, with the flanged prolene suture well-tucked and barely visible under the conjunctiva (Fig. 8), and posterior capsular opacity (Fig. 9) for which Nd:YAG posterior capsulotomy was done.

3 months after the posterior capsulotomy, UCDVA has improved to $6/10^{-2}$ in the right eye with well positioned multifocal IOL by slit lamp examination (Fig. 10) and a spherical equivalent of −0.375D by auto-refraction. The patient was spectacle-free at all distances.

3. Discussion

Although rare, progressive constriction of the capsulorhexis, also known as Anterior Capsular Contraction Syndrome, remains an important late complication of cataract surgery.[1–3] IOL composition has been implicated in the development of ACCS, in addition to a small sized capsulorhexis.[4,8] While patient-related risk factors include pseudoexfoliation syndrome, uveitis, retinitis pigmentosa and diabetes.

Our case is unique in the fact that the patient developed this significant capsular phimosis, and significant fibrinous anterior chamber reaction post-operatively, despite being on systemic immunosuppression.

Shah et al.[24] reported higher rate of Nd-YAG Capsulotomy performed for posterior capsular opacification (PCO) in multifocal IOL compared to monofocal IOL of the same design. However, the authors also noticed

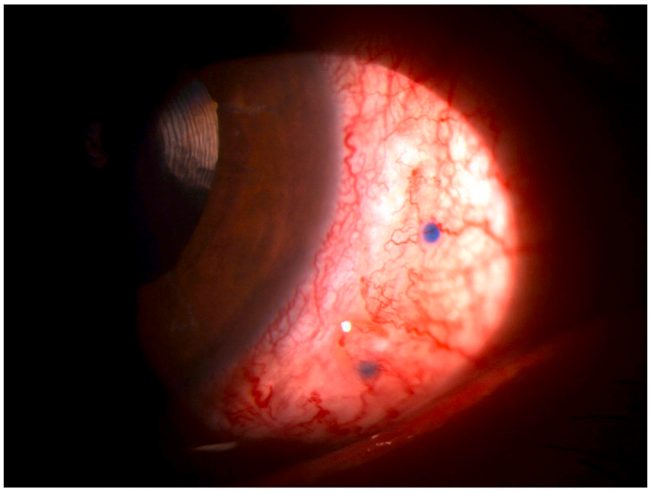

Fig. 8. The flanged prolene suture well-tucked and barely visible under the conjunctiva.

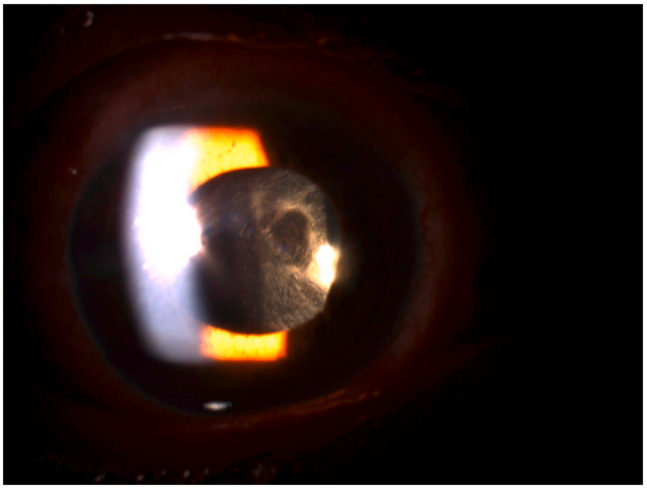

Fig. 9. Slit lamp photo of the right eye, showing posterior capsular opacity.

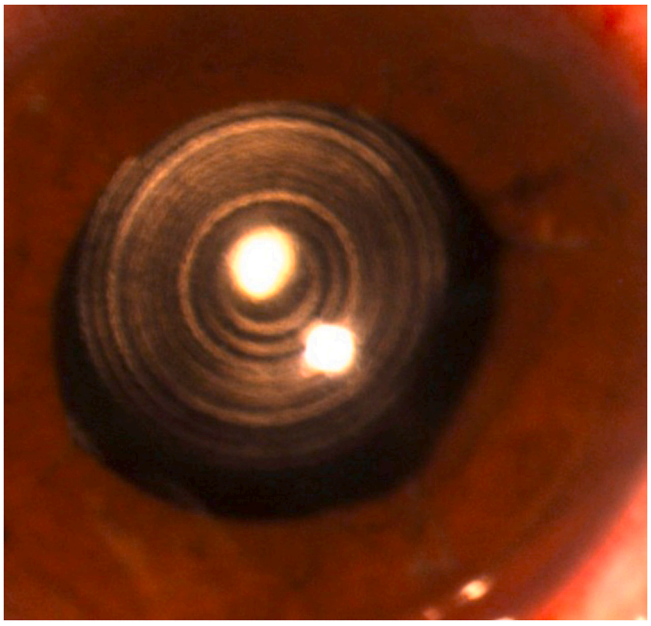

Fig. 10. Slit lamp photo of the right eye, showing well centered tri-focal IOL, 3 months after the procedure.

that the amount of opacification was not more aggressive clinically in the multifocal IOLs than that in the monofocal IOLs and concluded that the higher rate of Nd-YAG capsulotomy performed was attributed to the more troublesome disturbance in vision caused by PCO in multifocal IOLs. Elgohary et al.[25] also demonstrated that patients with multifocal IOLs were less tolerant to PCO-induced functional loss than those with a monofocal IOLs.

Both PCO and ACCS are caused by proliferation of residual lens epithelial cells, which, in case of ACCS, undergo myofibroblastic transformation into actin containing cells, which are capable of contraction leading to fibrous membrane formation.[26,27] Several studies have shown that anterior capsule phimosis can result in posterior migration of the IOL, causing a hyperobic shift, that is visually significant even in monofocal IOLs.[28–30] In our case, the decentration and posterior migration of the IOL caused by the capsular phimosis, combined with the fact that it is a multifocal IOL, have all contributed to the significant visual deterioration the patient was suffering from on presentation.

Sutureless, intrascleral IOL fixation techniques are now preferred by many anterior surgeons for cases of aphakia and dislocated IOLs,[22] but only few cases were reported, where these techniques were used to fix a multifocal IOL,[31–33] or a toric IOL.[34] To the best of our knowledge, this is the first case report describing a knotless, glue-less intrascleral fixation technique of a toric, multifocal IOL, with successful centration and alignment as established by slit-lamp examination and auto-refraction.

Patient consent

The patient consented orally to the publication of this case, including slit lamp photographs and surgical video.

Funding

No funding or grant support.

Authorship

All authors attest to satisfying the ICMJE criteria for Authorship.

Declaration of competing interest

All authors have no financial disclosure and no conflict of interest to declare.

Acknowledgements

None.

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