·Opinion·

Intraocular lens exchange- removing the optic intact

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Abstract

• Current practice for intraocular lens (IOL) exchange is to cut the optic of the posterior chamber intraocular lens (PCIOL) prior to removing it. Great care must be taken during this maneuver to avoid a posterior capsular tear. Removing the haptics from the fibrosed capsule can also be hazardous, as it may result in zonular stress and dehiscence. A technique is described for performing foldable (one-piece acrylic) IOL removal without cutting the optic. Careful visco-dissection of the haptics with a low viscosity ophthalmic viscosurgical device (OVD) in the fibrosed peripheral capsular tunnel avoids zonular or capsular stress. Internal wound enlargement permits foldable IOL removal in one piece, whilst preserving a self-sealing sutureless corneal wound. This technique may enhance the safety and efficacy of foldable IOL exchange.

• **KEYWORDS:** intraocular lens exchange; viscodissection; posterior capsular tear
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INTRODUCTION

Intraocular lens (IOL) implantation, an essential part of modern phacoemulsification surgery, is a commonly performed and extremely successful procedure. However, complications relating to the IOL occasionally arise and necessitate the need for an IOL exchange.

Incorrect IOL power is the most common indication for IOL exchange [1-2] and is a common cause of malpractice claims[3]. This is partly related to increasing patient expectations and a demand for refractive results near emmetropia and independence from spectacles [1,4-5]. Another rising indication is intolerance of multifocal IOLs especially due to dysphotopsia or photic phenomena[4-6]. Similarly, the "glistenings" of the commonly used Acrysof® IOLs results in patient dissatisfaction [7]. Other well-known indications also include lens decentration/dislocation[2,8-10] and optic opacification [2,9,11-12].

Many effective techniques for IOL exchange exist [13-17], but the majority involve cutting the optic to remove the IOL which risks damaging the posterior capsule with the intraocular scissors. Lee *et al* [18], Theoulakis *et al*[19], Kubaloglu *et al* [20] and Dagres *et al* [21] reported a posterior capsule rupture rate of 8.6%, 3.6%, 12% and 9% respectively. Zonular dehiscence is also a common complication due to the fact that separating the haptics from the fibrosed capsule is technically challenging [21-22]. When it occurs, additional procedures are required such as removal of the prolapsed vitreous, trans-scleral fixation of the IOL or unplanned anterior chamber IOL implantation[18].

We describe a technique that can lower the risk of both zonular dehiscence and posterior capsule rupture. We employ careful viscodissection of the haptics in the fibrosed peripheral capsular tunnel which effectively frees it up and can subsequently be rotated out. We also avoid the potentially dangerous maneuver of cutting the optic based on the principle that "if the IOL can fold in, it will fold out", facilitated by internal wound enlargement which enables IOL removal in one piece. This simultaneously preserves the benefits of a self-sealing sutureless corneal wound. This technique also preserves the integrity of the capsular bag so that a foldable IOL can be replaced into the capsule bag.

SURGICAL TECHNIQUE

A temporal clear corneal two step sealing incision is made at the limbus with a 2.75 mm keratome. A cohesive low-viscosity ophthalmic viscosurgical device (OVD) such as Provisc® is injected into the anterior chamber. A 1.2 mm corneal side port is made 45 degrees from the main incision. A sinskey hook is used to create a passage between the anterior capsular flap and IOL (Figure 1A). The low-viscosity OVD is inserted on a Rycroft cannula through the passage and the optic of the IOL is visco-dissected from the anterior capsule. The OVD is used to viscodissect the haptics free in their fibrosed peripheral capsular tunnel. The IOL is rotated carefully out of the capsular bag and into the anterior chamber (Figure 1B, 1C). The 2.75 mm incision is internally enlarged 0.5 mm approximately each side so that the internal diameter is approximately 3.75 mm and the external diameter remains at 2.75 mm to maintain self-sealing wound integrity (Figure 1D). The haptics are checked to make sure they are

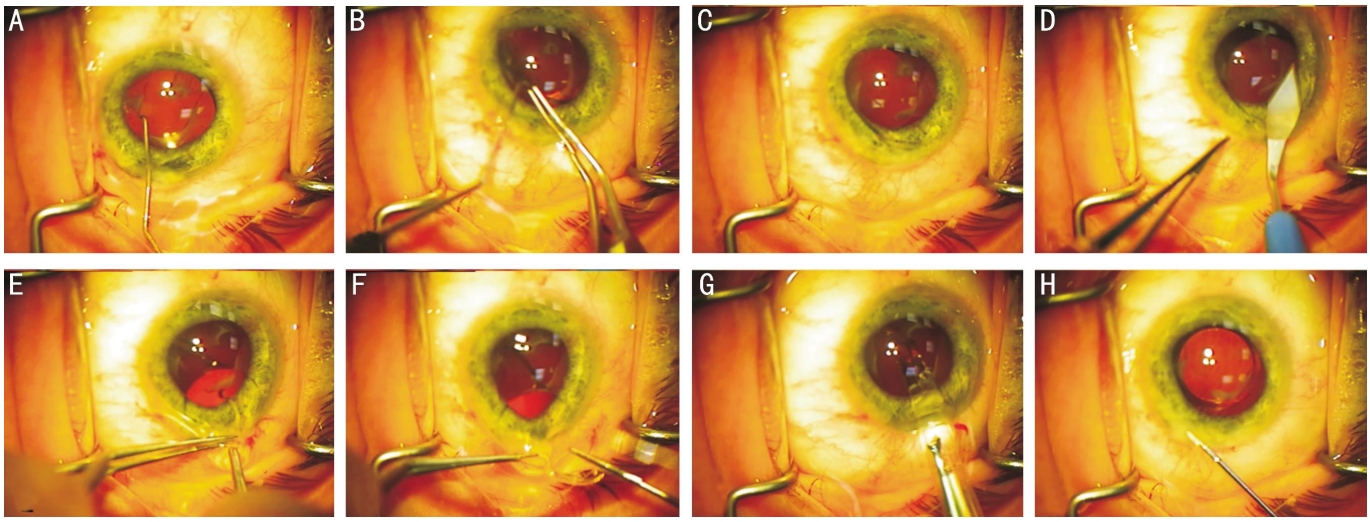

Figure 1 Steps involved in the foldable (one-piece acrylic) IOL exchange technique without cutting the optic A: Sinskey hook creates a passage between anterior capsular flap and the IOL; B: Circumferential rotation of IOL under cohesive OVD; C: Circumferential rotation of IOL with resultant freeing of haptics; D: Internal enlargement of corneal wound to approximately 3.75 mm but keeping the external diameter of 2.75 mm so it is likely to self seal without sutures; E: Foldable IOL removed from the eye under soft-shell technique; F: Hand over hand technique with Kelman forceps so one hand is always holding the optic (as opposed to the haptic) with forceps; G: Injection of alternative foldable IOL into capsular bag; H: Hydration of self-sealing wound with BSS.

not trapped under the corneal shelves of the main incision. Two Kelman McPhearson forceps are needed to remove the IOL in one piece under OVD protection of the corneal endothelium using Arshninof's soft-shell technique (Figure 1E). The optic is grasped with the Kelman forcep in the right hand. The IOL is then gently and firmly brought to the corneal wound. The centre of the optic is regrasped with the left hand Kelman forcep; the right hand Kelman then regrasps the optic and the IOL is gently removed from the eye (Figure 1F). It is important not to grasp the haptic alone as it may then break off. Following IOL removal, the capsular bag is refilled with OVD. The replacement IOL is injected through the main incision and into the intact capsular bag (Figure 1G). The replacement IOL is centred and the OVD is subsequently removed. The corneal wounds are sealed with balanced salt solution (BSS) for stromal hydration (Figure 1H). A corneal suture is placed if there is demonstrated wound leak if there has been any stretching of the corneal wound by the manouvers. Cefazolin 1 mg in 0.1 mL is then injected through the side port into the anterior chamber for endophthalmitis prophylaxis.

DISCUSSION

Cataract surgery and IOL implantation has seen a rapid evolution over the past few years. While surgical improvement of cataract surgery has greatly reduced the incidence of IOL exchange in the past decade [1-2,9], complications such as IOL dislocation [23-25], incorrect IOL power [4-6] and IOL opacification [12,26-29] remain common indications for the exchange procedure. As more patients with higher visual expectations receive refractive lenses such as multifocal or toric lenses, the request for IOL exchange due to patient dissatisfaction is on the rise; the reasons are predominantly due to intrinsic weaknesses associated with these lenses such as unsatisfactory visual acuity at specific working distances, increased dysphotopsia compared to monofocal IOLs, decreased contrast sensitivity, and increased intraocular straylight [8,30-33]. In uncommon situations where a reason for refractive surprise cannot be identified, a mislabeled IOL ought to be considered as a potential cause[34]. There are numerous IOL exchange techniques which involve cutting the optic or optic/haptic junction. These include optic bisection and partial optic bisection[13], trisection[15], crisscross lensotomy [16], optic-only removal [18], piggybacking technique [35], and the IOL scaffold technique [17,36-37]. Whilst effective, the risk of posterior capsular rupture is still present-Lee *et al* [18] optic-only removal technique was reported to have an 8.7% posterior capsule rupture rate when the optic was being divided with Vannas scissors. He also acknowledged that attention is required when cutting the haptic-optic junction to avoid damaging intraocular structures. Kubaloglu *et al* [20] technique, also involving division of the optic, had a 12% posterior capsule rupture rate. Another reason disfavoring the cutting of the optic is that one must either purchase special and often expensive micro-instruments or enlarge the incision to permit entry of the scissors[38]. For these reasons, we prefer avoiding the need to cut the optic altogether and feel that folding the IOL is a safer option.

Based on the principle "if the IOL folds in, it will fold out", the foldable IOL will fold out with minimal trauma to the corneal endothelium if it is protected by the OVD and if the internal opening of the wound is enlarged to 3.75 mm.

Henderson and Yang [38], who used a similar technique of "sandwiching" the IOL between the dispersive OVD, found that there was no additional loss of endothelial cells or corneal edema after two months in their first patient and after one year in their second patient. Our use of internal wound enlargement further improves on Henderson's technique; he states that if the original cataract surgery incision is <2.75 mm, the wound needs to be widened. However, we found that internal wound enlargement to approximately 3.75 mm (but keeping the external diameter of 2.75 mm) permits extraction of the IOL yet negates the need for external wound enlargement, hence preserving the benefits of a small self-sealing sutureless wound. These include a lower risk of surgically induced astigmatism, postoperative inflammation and endophthalmitis [39]. There was no significant surgically induced astigmatism in our cases and corneas remained clear attesting to a healthy endothelial cell count with no significant losses due to the technique.

Another prominent feature of our technique is careful hydrodissection of the haptics out of its fibrosed tunnel with a cohesive OVD (Provisc®) rather than a dispersive OVD (Viscoat®). If this is gently injected within the fibrosed tunnel, the haptics are easily freed up and can be rotated out. This step greatly decreases the risk of zonular dehiscence. Many surgeons have found separating the haptics from the fibrosed capsule technically challenging [21-22]; Izak *et al*[40] described a case in which a second attempt at explantation of an SA20AL IOL (Alcon) in the presence of a fibrosed and contracted capsular bag resulted in explantation of the IOL together with the capsular bag. Lee *et al* [18] proposed a workaround by suggesting an optic-only removal to avoid zonular dehiscence. However, complications that can occur as a result of remnant haptics include dislocation of the haptic to the optic zone or into the vitreous cavity, interference with the positioning of the newly implanted IOL, and iritis due to chafing of the iris when the haptics of the new IOL are located in the ciliary sulcus.

In conclusion, this technique provides a safe and efficient technique for foldable (one-piece acrylic) IOL removal without cutting the optic. By removing the IOL intact and enlarging the wound internally, we eliminate the need for using intraocular scissors yet permit safe explantation of the IOL with minimal trauma to the corneal endothelium by employing the soft-shell technique. The use of cohesive OVD to hydrodissect the haptics out of the fibrosed capsule also greatly reduces the risk of zonular dehiscence. The description of this procedure provides the surgeon with an alternative technique for foldable IOL removal and exchange.

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