Rescue of an extending capsulorrhexis by creating a midway tangential anterior capsular flap: a novel technique in 22 eyes

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ABSTRACT • RÉSUMÉ

Objective: To show how an extending capsulorrhexis can be rescued by a midway tangential capsular flap in order to achieve an uneventful phacoemulsification.

Design: Consecutive case series.

Participants: Twenty-two eyes of 22 patients with extending capsulorrhexis treated at the Farabi Eye Hospital, Tehran.

Methods: First, a tangential capsular opening was created on the border of the presumed continuous curvilinear capsulorrhexis just midway between the beginning of the capsulorrhexis and the edge of the extending capsulorrhexis, to make a tangential flap of the anterior capsule. Second, the centre of this new flap was grasped and pulled centripetally until the edges of the new flap joined the edges of the extending flap to complete the capsulorrhexis.

Results: The technique was successfully performed in all cases, leading to an uneventful phacoemulsification.

Conclusions: Midway tangential capsular flap is a safe and effective technique to rescue an extending capsulorrhexis and leads to an uneventful phacoemulsification.

Objet : Démontrer comment on peut sauver l'extension du capsulorrhexis par un lambeau capsulaire tangentiel à mi-chemin pour obtenir une phacoémulsification sans incident.

Nature : Série de cas consécutifs.

Participants : Vingt-deux patients (22 yeux) ayant une extension du capsulorrhexis traités au Farabi Eye Hospital, à Téhéran.

Méthodes : Premièrement, une ouverture capsulaire tangentielle a été pratiquée en bordure du présumé capsulorrhexis curvilinéaire continue juste à mi-chemin entre le début et le bord de l'extension du capsulorrhexis pour créer un lambeau tangentiel de la capsule antérieure. Deuxièmement, le centre de ce nouveau lambeau est capté et tiré dans le sens centripète jusqu'à ce que la bordure du nouveau lambeau joigne le bord du lambeau de l'extension pour compléter le capsulorrhexis.

Résultats : La technique a réussi dans tous les cas, menant à une phacoémulsification sans incident.

Conclusions : Le lambeau capsulaire tangentiel à mi-chemin est sécuritaire et efficace pour sauver l'extension du capsulorrhexis et obtenir une phacoémulsification sans problème.

Radial tears on the anterior capsule during capsulorrhexis are one of the most untoward and catastrophic events that a surgeon may experience during cataract surgery. They may lead to a vicious cycle and a subsequent series of complications such as zonular rupture, posterior capsular tear, vitreous presentation, insufficient capsular support for posterior chamber intraocular lens (IOL) implantation, and even nucleus drop during phacoemulsification. These complications are a particular risk when intumescent white cataracts or brunescent hard ''catarocks'' are encountered.

There are many factors that may play a role in inducing radial tears during capsulorrhexis, such as shallow anterior chamber, weak zonules seen in pseudoexfoliation syndrome, high positive vitreous pressure, intumescent and hypermature cataracts, pediatric cataracts, and a surgeon with little experience performing capsulorrhexis. Although tears are more common when the surgeon shifts from the traditional extracapsular cataract extraction (ECCE) to phacoemulsification,[1–9] even experienced surgeons may induce radial tears.

This paper describes a novel technique of creating a midway tangential anterior capsular flap, grasping its centre with capsular forceps, and pulling it centripetally; in this way its leading edges can be joined to the edges of the extending capsulorrhexis. Aspirating the anterior epinuclear lens materials prior to phacoemulsification may produce some free space between the nucleus and lens capsule, especially important in the case of white intumescent cataracts, and then phacoemulsification can safely proceed.

METHODS

This novel technique was applied for 22 eyes of 22 patients in whom radial tears developed during capsulorrhexis, after it had been performed approximately 180° of its

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full circle, were managed using this technique. The applied ophthalmic viscosurgical device was hydroxypropyl methyl cellulose, a viscodispersive agent (Coatel, Chauvin Opsia, France). The intended diameter of the capsulorrhexis was 5.5 mm, and it was started from the centre of the anterior capsule and progressed in a counterclockwise direction. However, a radial tear, extending to the lens equator, developed when an attempt was made to guide the edge of the capsulorrhexis in an inferior direction (Fig. 1A). The edge of the anterior capsule could not be redirected to the centre of the capsulorrhexis by any effort. Subsequently a midway tangential anterior capsular flap was created (Fig. 1B), its centre grasped with capsular forceps (Fig. 1C), and then pulled centripetally to join its leading edges to the edges of the extending capsulorrhexis (Fig. 1D, E).

Hydrodissection and hydrodelineation were performed by injecting 1–2 mL of balanced salt solution under the anterior lens capsule and within the nucleus, 180° away from the radial tear. The anterior epinuclear lens material was then aspirated using the aspiration mode of a 30° phacoemulsification probe from the main incision (before starting the phacoemulsification) to decrease the forces that might extend the capsulorrhexis.

After performance of this surgical technique, despite an oval and sometimes irregular capsulorrhexis, the overall phacoemulsification procedure was completed uneventfully.

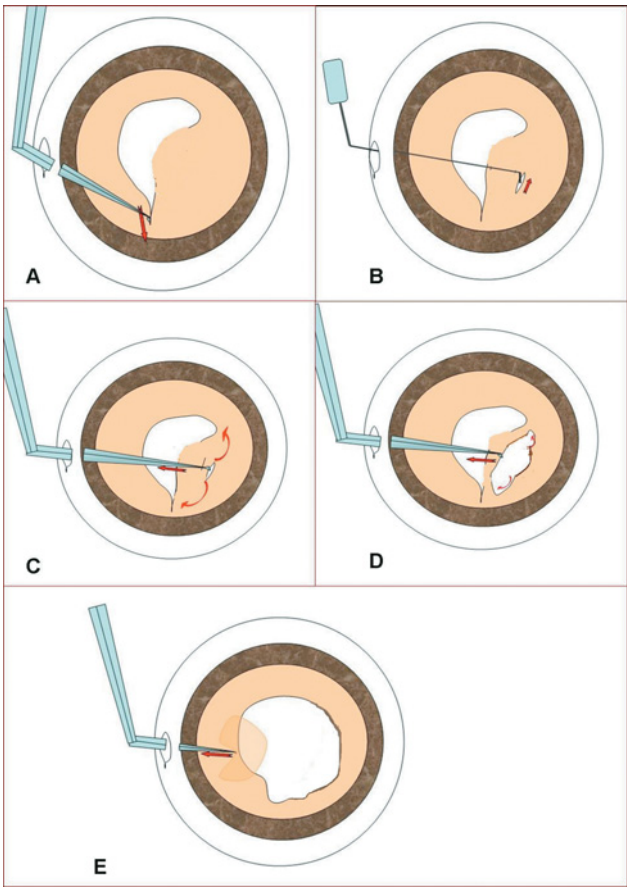

Fig. 1—Schematic presentation of consecutive steps for rescue of an extending capsulorrhexis by creation of a midway tangential anterior capsular flap: developing a radial tear, not extending to the lens equator (A); making a midway tangential anterior capsular flap (B); grasping its centre with capsular forceps (C); and pulling the anterior capsular flap centripetally to join its leading edges to the edges of the extending capsulorrhexis (D, E).

Results

Twenty-two consecutive cases with extended capsulorrhexis were managed with the above mentioned technique. The capsulorrhexis was completed as shown in Figure 1. The entire phacoemulsification was performed uneventfully, and the PCIOL was implanted in the bag. There were no intra- or post-operative complications in these cases.

Conclusions

Nowadays, techniques for cataract surgery undergo significant and sometimes unbelievable improvements that make this kind of surgery one of the most effective and safe procedures that is performed for patients. However, the risk of posterior capsular rupture, a dangerous and irreversible complication, has not still been eliminated. An important predisposing factor for posterior capsular tears is radial extension during capsulorrhexis.[1] Although lack of surgical experience is one of the greatest concerns in this complication,[2–7] even experienced surgeons may encounter this problem.[1]

Different measures exist for managing a radial tear or extended capsulorrhexis, such as changing the procedure to a conventional can-opener capsulotomy and subsequent ECCE, or restarting from the opposite direction, each with its own drawbacks and complications. Changing the procedure to an ECCE, especially when the temporal approach is applied, may cause significant postoperative against-the-rule astigmatism and exposure of the wound and sutures in the palpebral fissure. Restarting the capsulorrhexis in the opposite direction is a difficult procedure, and the capsulorrhexis may be decentred, irregular, and notched out, which may cause further extension of the capsulorrhexis to the posterior capsule during hydrodissection or phacoemulsification.[8–9]

If the surgeon believes that phacoemulsification will be uneventful when the rhexis is at risk of posterior extension, his or her performance and self-confidence may increase and the probability of radial tear during capsulorrhexis may decrease. On the other hand, if the surgeon thinks that any probable problem in the entire course of the capsulorrhexis may lead to irreversible complications, the stress-induced catecholamine release could ruin his or her confidence, especially during the learning curve period.

Various measures have been suggested for preventing radial tear formation in special cases, such as restarting the rhexis from the opposite direction;[10] vitrectorhexis and 4-incision capsulorrhexis[11] for pediatric cataract surgery,

especially in the first 2 years of life; capsulorrhexis tear-out rescue technique by backward traction on the capsule flap;[12] use of indocyanine green dye staining for phacoemulsification in white cataracts;[13] and plasma blade and diathermy capsulotomy[14] for beginners with inadequate surgical experience. However, there are few feasible and practical guidelines for management of radial tears and completion of safe phacoemulsification and posterior chamber IOL implantation.

Another important issue for decentred or irregular capsulorrhexis with a radial tear is the preferred IOL type and site of implantation (capsular bag vs ciliary sulcus) and the long-term effects of various anterior capsulotomies and radial tears on IOL centration. Oner et al.[15] compared the outcomes of different anterior capsulotomies for guaranteeing IOL centration. They found that the lowest rate of early decentration and tilt occurred in patients with intact capsulorrhexis and capsulorrhexis with 1 radial tear, and the highest rate of tilt and decentration occurred in envelope capsulotomy. They concluded that an additional symmetric relaxing incision at quadrant 6 had no effect on the prevention of decentration and tilt compared with 1 relaxing incision. Some authors suggest a 6.5 mm optic poly (methyl methacrylate) IOL in the case of radial tears in capsulorrhexis to prevent later decentraton.[16] I suggest not performing an additional opposing radial tear but, rather, rescuing the extending capsulorrhexis by creating a midway tangential anterior capsular flap, joining it to the beginning of the rhexis and the extending edge by pulling this flap centripetally (as shown in Figs. 1A–E), and finally implanting a 1-piece foldable IOL with a 6 mm optic and overall diameter of 13 mm (e.g., Acrysof SA60, Alcon Laboratories).

In conclusion, rescuing the extending capsulorrhexis by the technique described, followed by decortification of anterior lens material prior to phacoemulsification, enables the surgeon to continue the entire procedure uneventfully.

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