Surgical Technique

Kissing microvitreoretinal blade technique: A novel approach for safe and effective endocapsular lens aspiration in microspherophakia

Jayanand Urkude, Rashmi Singh, Jeewan S Titiyal, Namrata Sharma

We herein describe the kissing MVR technique in cases of microspherophakia for safe and effective endocapsular lens aspiration. Microspherophakia is associated with abnormally lax and broken zonules, which pose a great challenge to the operating surgeon, especially while creating the openings in the capsular bag. In this novel technique, simultaneous use of two 23 G MVR blades reduces the above problem associated with the severely mobile lens. Here, one MVR blade stabilizes the capsular bag and, at the same time, provides counter-traction for the opposite MVR blade while puncturing the capsular bag. Furthermore, the creation of openings in the lens at the equator or just posterior to it is beneficial as the capsule is relatively thicker and stronger at this location. This also minimizes the risk of premature extension to the anterior or posterior capsule, thereby avoiding complications like dropped lens matter, vitreous prolapse, and vitreous traction.

Key words: Dislocated lens, ectopia lentis, endocapsular lens aspiration, microspherophakia, MVR blade

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Microspherophakia is an uncommon bilateral developmental anomaly of the crystalline lens in which there is an increase in antero-posterior diameter along with decreased equatorial dimension, resulting in a small spherical globular lens.[1,2] As the lens is small and spherical, owing to generalized zonulopathy associated with abnormally lax and broken zonules, it remains freely mobile.[3,4]

There are various techniques that have been described in the literature for surgical correction of ectopia lentis. Intralenticular lens aspiration with bimanual irrigation/aspiration (I/A) has been described in such scenarios with extreme subluxation.[5,6] Khokhar *et al*.[7] described a similar surgical approach in microspherophakia with modification wherein the vitrectomy probe was used along with irrigation cannula instead of the bimanual I/A. The capsule in microspherophakia is very elastic and the small globular lens can mold in different shapes whenever force is applied on it, posing great challenge to the operating surgeon when creating openings in the capsular bag.

Herein, we describe a new approach, that is, the kissing MVR technique in the management of microspherophakia for safe and effective endocapsular lens aspiration. In our technique, the simultaneous use of two microvitreoretinal (MVR) blades for stabilization and puncturing of extremely soft, mobile crystalline lens, allows reproducible results with better surgical and visual outcomes.

Surgical Technique

The surgery is performed under general anesthesia taking all aseptic precautions. Two clear corneal stab incisions are made ~180° apart at 3 o'clock and 9 o'clock positions [Fig. 1a]. The anterior chamber is formed with cohesive (sodium hyaluronate 1%) ophthalmic viscosurgical device (OVD). Two 23 G MVR blades (Alcon Laboratories, Inc., Fort Worth, TX, USA) are introduced simultaneously through the corneal stab incisions at 3'o clock and 9'o clock positions [Fig. 1b]. The MVR blades are then engaged at the equator of the capsular bag or just posterior to it, leading to the formation of the dumbbell sign [Fig. 1c]. The lens is then brought in the pupillary axis and two MVR blades moved towards each other until the operating surgeon senses a giveaway feeling [Fig. 1d]. After making sure that the blades have punctured the capsular bag, the blades are withdrawn. In retro-illumination, the operating surgeon can see the exact location of the entries in the capsular bag, which appear as

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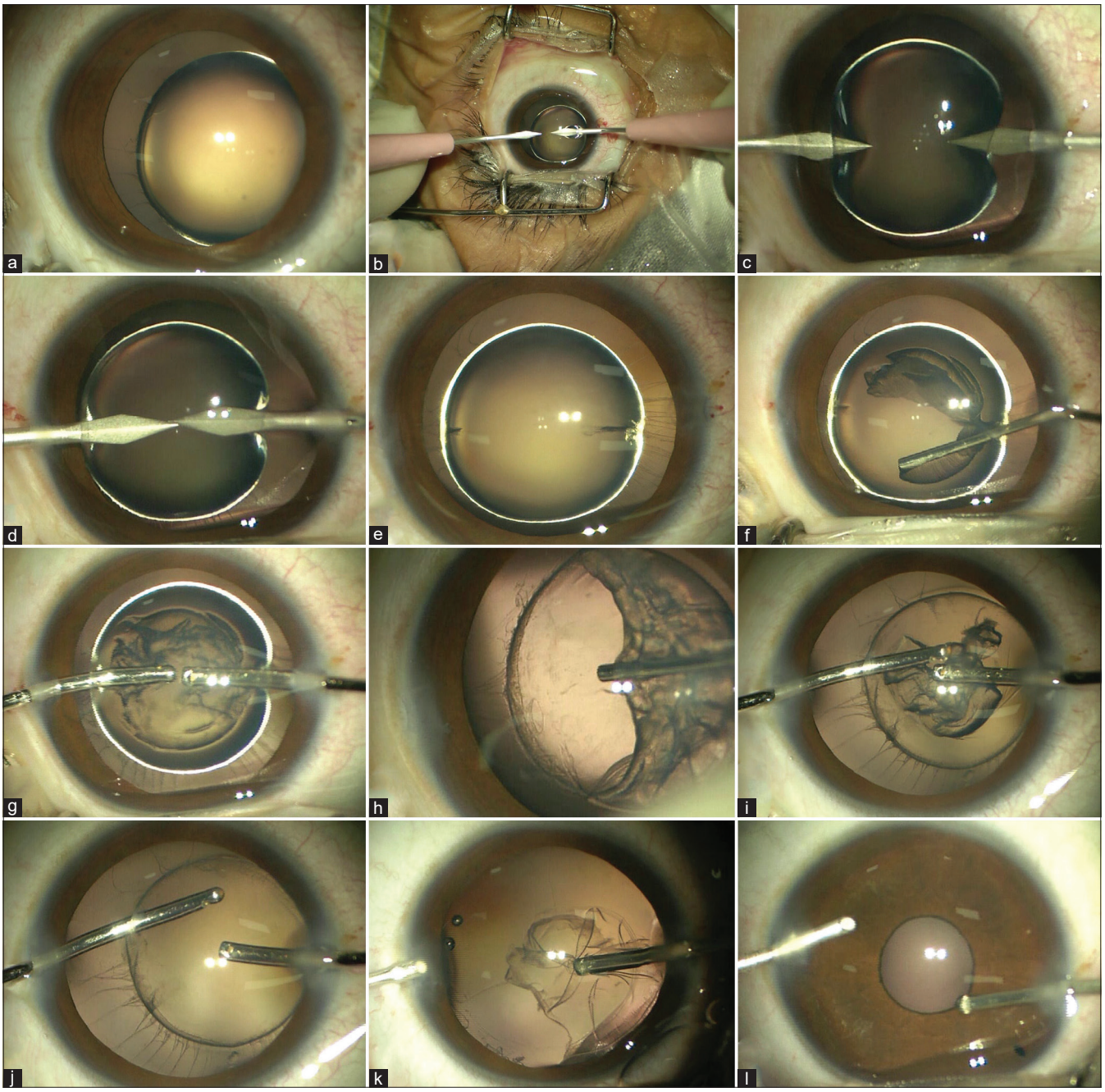

Figure 1: (a) Two corneal stab incisions created at 3 and 9 o'clock positions. (b) Two 23 G MVR blade held facing each other. (c) MVR blades introduced and engaged at equator (dumbbell sign). (d) MVR blades moved toward each other. (e) Entry points are visualized in retro-illumination. (f) 25 G cannula is used for hydro-delineation. (g) 25 G bimanual I/A probes are introduced. (h) Central core of lens is aspirated. (i) Peripheral cortex is aspirated. (j) Cortical matter around the capsular openings is removed. (k) Capsular bag is removed using vitrectomy cutter. (l) Limited anterior vitrectomy and peripheral iridectomy is done

dark, radiating spokes at the equator of the lens [Fig. 1e]. A 25 G cannula is then introduced through the capsular opening to achieve good hydro-delineation without disturbing the peripheral cortex [Fig. 1f]. 25 G bimanual I/A probes are introduced in the capsular bag [Fig. 1g]. Capsular openings are visible throughout the procedure under retro-illumination, minimizing the manipulation while reintroducing I/A probes in the capsular bag [Fig. 1h]. Central endonucleus is aspirated followed by the peripheral cortical cushion [Fig. 1i]. The cortical matter near the capsular openings is aspirated toward the end of the lens aspiration to keep the capsular openings undisturbed and unextended [Fig. 1j]. The aspiration probe is then removed and the vitrectomy cutter is introduced to remove the empty capsular bag [Fig. 1k]. The pupil is constricted using intracameral pilocarpine 0.2% followed by triamcinolone acetonide 40 mg/ml (diluted with a balanced salt solution at about 1:4) assisted limited anterior vitrectomy. A peripheral iridectomy is performed with the help of vitrectomy cutter in I/A mode setting [Fig. 1l]. Corneal incisions are then closed with the help of 10-0 nylon monofilament suture and anterior chamber is

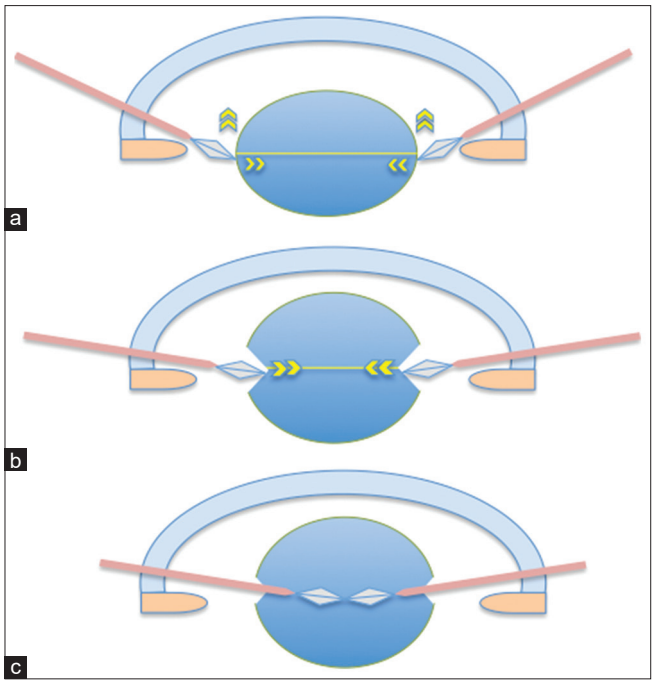

Figure 2: Animated illustration of kissing MVR technique in the management of microspherophakia. (a) Two 23 G MVR blades are introduced through clear corneal stab incisions placed at 180° and engaged with the capsular bag at the equator or just posterior to it. (b) MVR blades are then moved toward each other. A good engagement leads to the formation of dimpling of the lens at its equator simulating as dumbbell sign. (c) Two MVR blades are further moved toward each other till the surgeon senses the giveaway feeling, which indicates the formation of capsular openings in the capsular bag

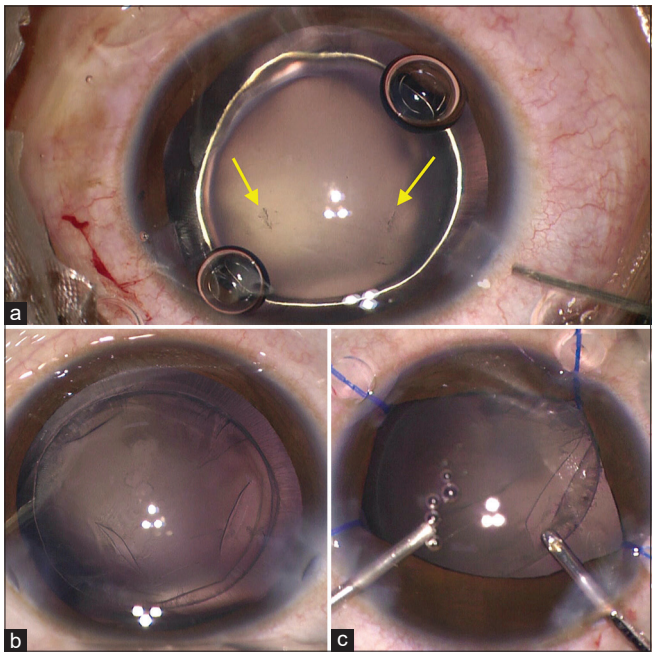

Figure 3: Pictures demonstrate the conventional approach of creating anterior capsular openings. (a) Anterior capsular openings are visualized in retro-illumination. (b) Extension of anterior capsular openings. (c) Extension of anterior capsular openings into posterior capsule

formed. At the end of the surgery, a subconjunctival injection of gentamycin 20 mg and dexamethasone 4 mg is given. The allied supplemental digital content [Video] shows the surgical steps of the kissing MVR technique in microspherophakia.

Animated illustration of our technique is shown in Fig. 2.

Results

The kissing MVR technique was performed in 8 eyes of 4 patients with microspherophakia. The mean age was 7.25 ± 2.2 years with preoperative uncorrected and best-corrected distance visual acuity (logMAR) being 1.44 ± 0.41 and 0.93 ± 0.71, respectively. Preoperative intraocular pressure (IOP) was 18.37 ± 7.83 mmHg. Three eyes had anterior dislocation; 2 eyes had a lens in the pupillary plane and 3 eyes had posterior chamber subluxation. Using our technique, endocapsular lens aspiration was successfully performed in all patients without any intraoperative difficulties and complications. Six eyes were left aphakic and spectacle correction was prescribed postoperatively. Two eyes underwent simultaneous scleral fixation of the intraocular lens (IOL). Postoperatively at three months follow-up, the IOP was well controlled (15 ± 3.023 mmHg) with best-corrected distance visual acuity of 0.12 ± 0.11.

Discussion

Major surgical indications in case of microspherophakia are recurrent attacks of phakic pupillary block glaucoma, severely subluxated or dislocated lens and corneo-lenticular touch.[4,8] Microspherophakia is associated with severe phacodonesis as compared to the ectopia lentis cases with a similar amount of zonular abnormality; this is because of abnormally lax and broken zonules in microspherophakia. Severe phacodonesis with extremely elastic capsule makes it very difficult for capsulorrhexis or even making small openings with an MVR blade.

In the conventional approach, either a capsulorrhexis is created or an MVR blade is used to create openings in the capsular bag. The main problem associated with both the techniques is the absence of any counter traction force and excessive mobility of the lens during manipulation because of the globular shape and abnormally lax zonules. All this may lead to increased intraoperative manipulation and complications. Our technique involves the simultaneous introduction of two 23 G MVR blades into the capsular bag, approximately 180° apart at the equator or just posterior to the equator. This simple maneuver helps as one MVR gives stabilization and counter-traction for the opposite MVR while puncturing into the bag. The two MVR blades help maintain the lens in the central visual axis, avoiding excessive movement of the lens. The simultaneous engagement of MVR blades to the lens leads to a dumbbell-like shape (dumbbell sign), indicating a good grip and entry at the proper intended site.

The rationale behind the ideal site of entry being the equator or just posterior to it as compared to routinely done openings in the anterior capsule is that the capsule is relatively thicker and hence stronger in this area, and has more resistance to tear, thereby minimizing the risk of extension anteriorly or posteriorly.[9] Another advantage of equatorial or juxta-equatorial openings is the good visibility of both

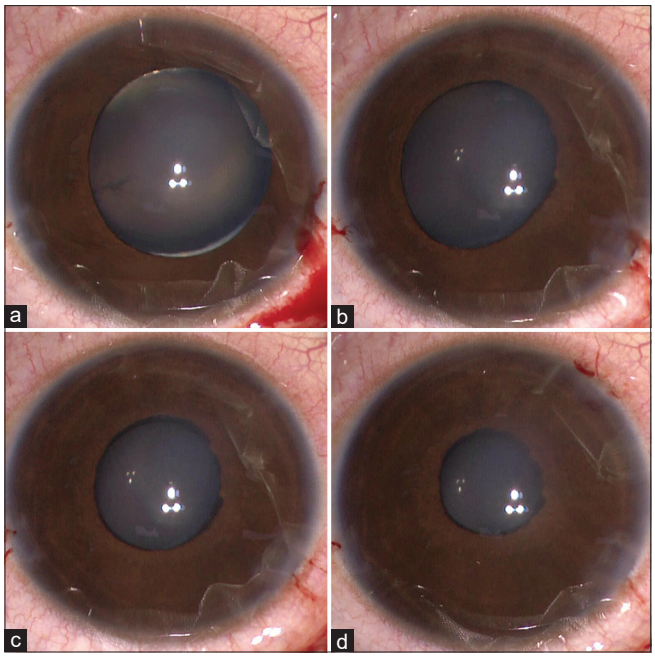

Figure 4: Pictures show the complications that can arise after injecting intracameral pilocarpine in cases with anteriorly dislocated lens. (a) Lens in anterior chamber with one edge at the pupillary plane. (b) After injecting pilocarpine, the pupil starts constricting and lens iris diaphragm moves anteriorly. (c) The lens moves posterior to the iris and creates a difficult situation with the (d) lens being stuck behind pinpoint pupil.

instruments through the undisturbed anterior capsule as well as easier surgical maneuvering owing to the good distance between them [Fig.3a-c].

In scenarios where the lens is anteriorly dislocated, the usual response of the surgeon is to use intracameral pilocarpine at the very start of the surgery to decrease the risk of posterior displacement of the lens. However, pilocarpine not only makes the pupil smaller but it also pushes the iris diaphragm anteriorly.[10] As the lens in microspherophakia is small and globular with poor zonular support, it gets displaced posteriorly due to pilocarpine-induced anterior chamber crowding. Ultimately, the situation becomes tougher with the lens stuck behind a pinpoint pupil posing a great challenge for the remaining steps of the surgery [Fig.4a-d].

In our technique, the radial extensions of the MVR track can be visualized under retro-illumination mode as dark radiating spokes, which indicates the site of capsular bag openings. Our technique helps in easier re-entry of I/A probes, as the corneal and bag incisions lie in the same plane.

Another crucial point is the initial aspiration of the endonucleus followed by removal of peripheral cortex while keeping the cortical plates around the capsular openings intact till the end. This helps in maintaining the capsular bag and prevents the capsular openings from getting torn or extending into the posterior capsule.

Conclusion

To conclude, the kissing MVR technique is a safe and effective procedure for endocapsular lens aspiration in cases of microspherophakia, even with a severely mobile lens. Our technique overcomes the problems which are encountered when operating on the unstable lens, such as posterior dislocation of the lens, premature extension of the capsular openings, dropped lens matter, vitreous prolapse, and vitreous traction. Thus, our technique is simple, precise and easily reproducible with optimum surgical outcomes.

Abbreviations and Acronyms

MVR: Microvitreoretinal blade; OVD: Ophthalmic viscosurgical device; I/A: Irrigation/Aspiration; PI: Peripheral iridectomy; IOP: Intraocular pressure.

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Conflicts of interest

There are no conflicts of interest.

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