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Management of vitreous loss during cataract surgery under topical anesthesia with transconjunctival vitrectomy system

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PURPOSE. *A new technique to manage posterior capsular rupture with vitreous prolapse into the anterior chamber during phacoemulsification under topical anesthesia using the sutureless self-sealing 25-gauge transconjuctival vitrectomy system.*

METHOD. *In the event of vitreous prolapse into the anterior chamber, the corneal wound is sutured and cleared of vitreous. A trans conjunctival 25-gauge sclerotomy through the pars plana is made. The high speed 25-guage trans-conjunctival vitrectomy system (TVS-25) under topical anesthesia is introduced and vitrectomy is performed to clear the anterior chamber of vitreous. An anterior vitrectomy is also done. A foldable intraocular lens is subsequently inserted.*

RESULTS. *The vitrectomy is performed in a closed chamber maintaining normal intraocular pressure. The high-speed cutter exerts minimal traction on the vitreous. The accessibility to vitreous improves through the pars plana route ensuring more complete removal of the vitreous and restoration of normal anatomy. Topical anesthesia avoids the risks of globe perforation, retrobulbar hemorrhage, and prolonged postoperative akinesia of the eye.*

CONCLUSIONS. *The 25-gauge pars plana incision is small and self-sealing. This makes the procedure fast, effective, painless and safe. (Eur J Ophthalmol 2003; 13: 693-6)*

KEY WORDS. *Phacoemulsification, Posterior capsule rupture, Small gauge pars plana vitrectomy, Sutureless vitrectomy, Vitrectomy, Vitreous prolapse*

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INTRODUCTION

Posterior capsular rupture with vitreous prolapse into the anterior chamber during cataract surgery is fraught with immediate and long-term complications. Despite recent surgical advances, visual acuity obtained after vitreous loss is lower than with uneventful cataract surgery (1).

Phacoemulsification under topical anesthesia has become the preferred method of cataract extraction in the recent past. It reduces complications related to peribulbar anesthesia and provides immediate visual rehabilitation. With advances in phacoemulsification techniques, instrumentation, and intraocular lenses (IOL), the number of complications in cataract surgery with IOL implantation has continued to decline. The reported incidence of vitreous loss varies from 1.8% to 10% and depends upon the level of surgical training (2).

Vicary et al (3) described their successful technique of phacoemulsification and IOL implantation combined with trabeculectomy (phacotrabeculectomy) using topical plus conjunctival anesthesia. Phacoemulsification with conventional pars plana vitrectomy has been described (4). Here we report our technique for the intra operative management of vitreous loss dur-

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ing phacoemulsification under topical anesthesia via a pars plana approach using 25 gauge vitrectomy instrumentation. To the best of our knowledge, this has not been previously reported.

Surgical Technique

Instrumentation for 25 gauge pars plana vitrectomy used in this procedure are shown in Figure 1 a) and b).

Step 1: We refrain from further cortical clean up as soon as we detect vitreous prolapse. The corneal wound is sutured with a single 10-0 suture to create a watertight anterior chamber. The proposed site for introduction of the 25-gauge trocar is anesthetized with topical 4% lidocaine gel for 5 minutes.

Step 2: An additional self-sealing limbal side port is made, opposite to the existing port made during phacoemulsification. An infusion cannula is introduced (the infusion is not opened) through one side port and an iris spatula is inserted through the other. The corneal wound (tunnel) is cleared of vitreous strands by the iris spatula (Fig. 2). Complete removal of vitreous from the wound is confirmed with scleral illumination (25-gauge light pipe using scleral scatter illumination).

Step 3: The infusion cannula through the side port is subsequently opened. The irrigating fluid increases the intraocular pressure (IOP) making the eye firm and pushes vitreous back towards the posterior segment, away from the corneal wound.

Step 4: We use a 25-gauge vitrectomy system (Transconjunctival Vitrectomy System (TVS-25), Bausch and Lomb®). The 25-gauge trocar and cannula is introduced transconjunctively 3 mm posterior to the limbus through the pars plana after verifying the effect of anesthesia. If satisfactory anesthesia is not achieved a subtenon injection of 2% lignocaine is given at the site. The globe is stabilized to allow smooth insertion of the trocar. The trocar is removed and 25-gauge high-speed cutter is introduced through the cannula. Anterior and partial core vitrectomy (1500 cuts/minute (cpm), vacuum at 200 mm of Hg and bottle height at 40 cms)) is performed to debulk the vitreous under direct visualization (Fig. 3). Occasionally a second instrument is used through the anterior chamber paracentesis to stabilize the globe.

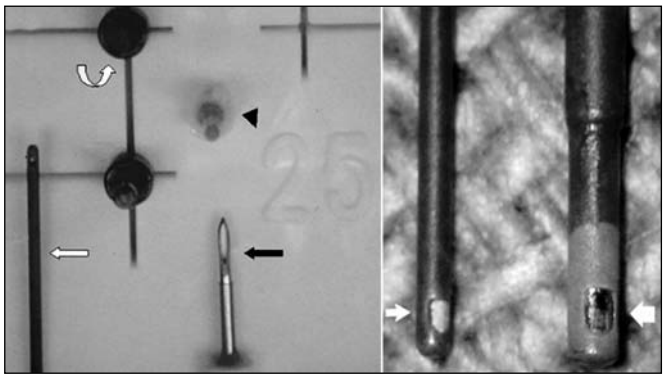

Fig. 1 - a) *The newly designed 25-gauge high speed system- vitrectomy cutter (white straight arrow), trocar (black arrow), infusions cannula (black arrow head) and plug (white curved arrow).* **b)** *Photograph comparing the diameter of the 25-gauge (narrow arrow) and 20-gauge (thick arrow) vitrectomy cutters under the microscope.*

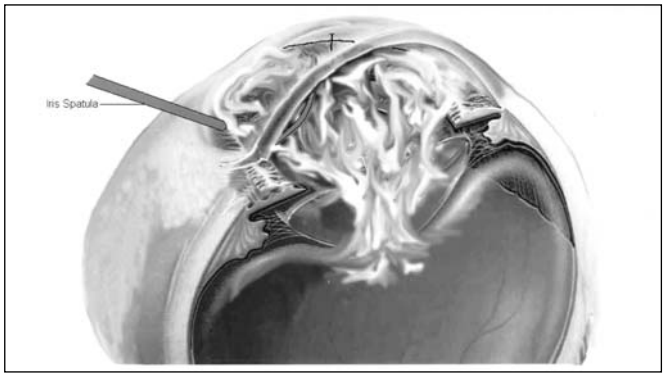

Fig. 2 - *Step 2: Schematic representation of clearing the corneal wound with the spatula. The 25-gauge cannula has been introduced through the side port.*

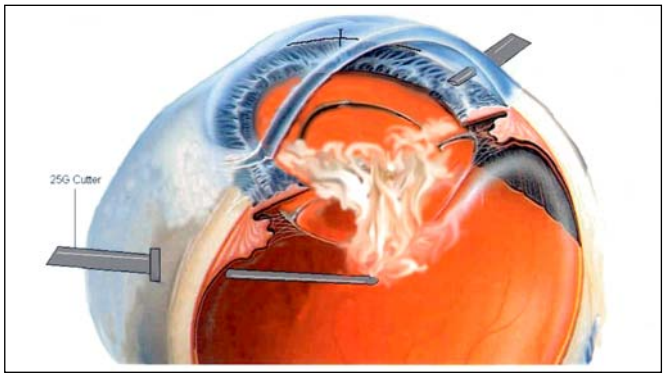

Fig. 3 - *Step 4: Schematic representation of the vitrectomy with 25-gauge vitrectomy cutter through the pars plana.*

Step 5: Vitreous present in the anterior chamber is addressed through the posterior capsular rent if it is sufficiently large. 25-gauge light pipe (scleral scatter illumination) is used to illuminate anterior chamber and assist identification of the vitreous. Residual cortical matter and epinucleus (if present) are removed simultaneously. Care is taken to avoid extension of the capsular rent and to protect the anterior capsular rhexis margin from coming into the cutter. In cases where the posterior capsule rent is small or there is danger of its extension through the posterior approach, the 25-gauge cutter can be introduced through one of the limbal side ports to address the vitreous in the anterior chamber. Upon completion of the vitrectomy, the cutter is removed and the cannula is closed with a plug.

Step 6: Irrigation is closed and corneal suture removed. A viscoelastic agent is placed in the anterior chamber. The foldable intraocular lens is placed in the bag or in the sulcus depending on the extent of posterior capsule rupture.

Step 7: Residual viscoelastic is aspirated from the anterior chamber. Prior to removal of the 25-gauge cannula, routine indirect ophthalmoscopy is performed to rule out any peripheral retinal pathology. The 25-gauge cannula is removed from the pars plana, and pressure is applied to the area with a wexel sponge. No suture is required. The infusion cannula is removed from the side port subsequently. Side port incisions are hydrated with balanced saline solution to make them self-sealing (Fig. 4).

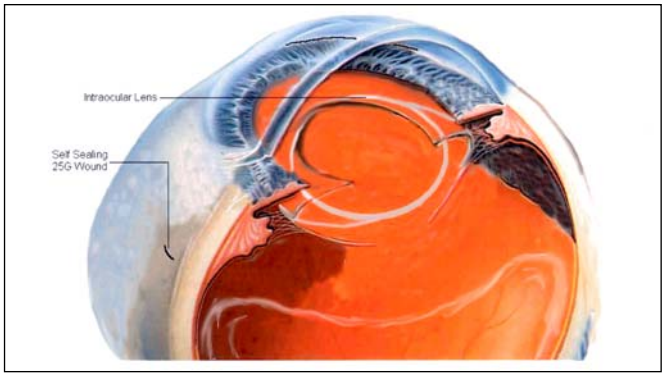

Fig. 4 - *Step 7: Schematic representation of the eye at the end of the procedure.*

DISCUSSION

Posterior capsule rupture with vitreous loss during cataract surgery is managed by numerous methods (5-9). We report our previously unreported method to manage vitreous loss during phacoemulsification under topical anesthesia with the use of a new sutureless 25-gauge vitrectomy system. This is a modification of our previously reported technique (10).

Complete removal of subincisional vitreous from the anterior chamber tunnel is often difficult due to poor access and visualization through the corneal tunnel. The cutter used is usually a slow cutter with large aspiration port. This tends to exert traction on the peripheral vitreous, increasing the potential for creating tractional retinal holes and postoperative retinal detachment. Inadequate removal of the vitreous from the anterior chamber and the wound increases the likelihood of immediate and long-term complications (1, 11).

Our technique is performed in a closed chamber eye, avoiding IOP fluctuations and thus reducing the chances of suprachoroidal hemorrhage. The high-speed cutter (1500 cpm) exerts minimal vitreous traction during the vitrectomy, making it safer (12). The pars plana approach improves accessibility and allows complete vitreous clean up compared to the anterior approach. The pars plana approach should be limited in cases were the posterior capsule rent is large (> 3 mm) or if there is a radial tear involving equatorial area of the capsule to prevent extension of the rent. In other circumstances the 25 gauge cutter should be used through the limbal side port or phacoemulsification incision. In eyes with increased posterior pressure pars plana approach is better than an anterior approach as it reduces the amount of vitreous prolapse into the anterior chamber.

Vitreous incarceration, dragging of the retina; entry site retinal dialysis and tears, injury to the ciliary body, fibrovascular downgrowth; suture protrusion; wound dehiscence, difficulty in maintaining stable IOP during closure and post operative hypotony (wound leak) are some of the complications related to a large sclerotomy. To avoid these problems, several investigators have used self-sealing sclerotomies (13, 14). We have used the 25-gauge (0.5mm) vitrectomy cutter (Fig. 2), which uses a small entry wound into the pars plana and does not require suturing. Histological studies did not show abnormal vitreous adhesions at the

wound in small gauge sclerotomies with normal intraocular pressure (15). This minimizes sclerotomy related complications. The natural elasticity of the sclera adequately approximates the 25-gauge (0.5 mm) sclerotomy and does not require sutures (15). The sutureless technique is fast, less painful, safer, incites less ocular inflammation and offers immediate rehabilitation compared to 20-gauge (1 mm) wound with the conventional vitrectomy system. The 20-gauge sclerotomy is more prone to the above-mentioned sclerotomy related and suture related complications as compared to the sutureless 25-gauge sclerotomy.

The limitation of the 25-gauge vitrectomy system in this setting is the management of posteriorly dislocated nuclear fragments, as the cutter cannot efficiently remove them. Posterior phakofragmentation through traditional sclerotomy is required in such cases.

Topical anesthesia eliminates the risk of globe perforation, retrobulbar hemorrhage, optic nerve damage, significant conjunctival chemosis and periorbital hematoma (16). It appears to provide acceptable analgesia during surgery, wears off rapidly postoperatively, and does not interfere with the patient's ability to blink, see, or move the eye. Patients are able to follow commands, and movement of the eyeball is controlled using intraocular instruments. Communication with the patient is vital for the topical technique to be successful. The patient must be informed that he/she will be able to move their eye and will have some sensation in their eye during surgery. Only patients willing to co-operate should be chosen for topical surgery. Anxious or uncooperative patients are poor candidates. Even though 25-gauge simultaneous vitrectomy is not a planned event, in our experience, it is well tolerated under topical anesthesia. Topical anesthesia has been shown to be a safe and effective alternative to peribulbar or retrobulbar anesthesia in phacoemulsification and IOL implantation combined with 20-gauge 3-port pars plana vitrectomy (3).

We believe, this technique is safe, effective, fast and a valuable adjunct to the armamentarium of the modern day cataract surgeon.

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