

Pars plana vitreous tap for phacoemulsification in the crowded eye

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ABSTRACT

This technique facilitates phacoemulsification and foldable intraocular lens (IOL) implantation in eyes with extremely crowded anterior segments. An automated pars plana vitreous tap is used to expand the anterior segment when extremely shallow anterior chambers do not deepen sufficiently with viscoelastic injection alone. This technique permits successful completion of pupilloplasty, capsulorhexis, phacoemulsification, and foldable IOL implantation in these high-risk eyes. *J Cataract Refract Surg* 2001; 27:1911–1914 © 2001 ASCRS and ESCRS

The crowded anterior segment presents one of the most challenging situations for the phacoemulsification surgeon. Whether because of a short axial length, a larger lens, or a combination, these eyes present with narrow angles and shallow anterior chambers. As a result, they carry an increased risk of peripheral capsulorhexis tears, corneal decompensation, and intraoperative suprachoroidal hemorrhage.¹ Although injection of a viscoelastic substance usually provides enough room to perform phacoemulsification, we occasionally encounter eyes with anterior chambers so shallow that they do not deepen sufficiently with viscoelastic material. I de-

scribe the use of an automated pars plana vitreous tap to facilitate small incision cataract surgery.

Surgical Technique

If a vitreous tap is anticipated, a retrobulbar local anesthetic agent is administered. An attempt is made to deepen the anterior chamber by injecting a retentive, dispersive viscoelastic substance through a clear corneal stab incision. This is stopped once the globe starts to become firm to prevent iris prolapse. In cases in which the anterior chamber remains virtually flat, a pars plana vitreous tap is performed in the following manner: A small conjunctival incision is created at the intended site. After light cautery, a sclerotomy 3.5 mm posterior to the limbus is made with a disposable #19 MVR blade (Alcon). A small amount of vitreous (approximately 0.2 cc) is aspirated using an automated vitrectomy hand-piece without infusion. A high vitrectomy cutting rate with a low vacuum setting is used. Additional viscoelastic material is immediately added through the paracentesis to deepen the anterior chamber. If the eye becomes excessively firm or the chamber remains too shallow, the

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vitreal tap is repeated. Either sodium hyaluronate 2.3% (Healon®5) or a soft-shell technique using sodium hyaluronate 3.0%–chondroitin sulfate 4.0% (Viscoat®) followed by sodium hyaluronate 1.0% (Provisc®) is used.

After the anterior chamber is deepened, 2 Lester hooks are used to lyse any posterior synechias and perform bimanual pupil stretching. Partial-thickness sphincterotomies with a long Vannas scissors are created if necessary. Phacoemulsification is performed using a phaco-chop technique, and a 3-piece foldable silicone IOL is implanted. Surgery is performed through a temporal clear corneal incision. The sclerotomy site is closed with a 10-0 nylon interrupted suture at the conclusion of the cataract surgery.

Results

This technique was used in 4 eyes with extremely shallow anterior chambers that did not deepen sufficiently with viscoelastic injection before phacoemulsification.

Case 1

A 72-year-old white man was referred by his ophthalmologist for cataract surgery in the right eye. His left eye had no light perception following acute angle-closure glaucoma for which he had refused treatment. A neodymium:YAG (Nd:YAG) laser iridotomy had been performed in the right eye. Because of his 1-eyed status, the patient had postponed cataract surgery in the right eye. Although he had been placed on pilocarpine and timolol drops for mixed mechanism glaucoma, he exhibited significant confusion over this and his compliance was deemed to be very poor. He had chronic congestive heart failure.

On examination, the best corrected visual acuity (BCVA) in the right eye was counting fingers at 6 inches and the intraocular pressure (IOP) with medications was 26 mm Hg. The patient had Fuchs' corneal dystrophy with 4+ guttata and 1+ to 2+ epithelial bedewing, but there was no stromal edema. The right pupil was fixed at 1.5 mm with 360 degrees of posterior synechias. He had a patent peripheral iridotomy. The anterior chamber appeared flat peripherally and extremely shallow centrally. A mature 4+ ultrabrunescent lens prevented view of the fundus. The axial length was 23.1 mm.

The patient lived alone. Because of his poor compliance with eye medication and the inability to examine the disc or visual field, a single-site phacotrabeculectomy with mitomycin-C was performed on July 18, 1996. After a limbal-based conjunctival flap was fashioned superiorly, a pars plana vitre-

ous tap was performed to increase the distance between the nucleus and the cornea. The case was completed through the phacotrabeculectomy incision.

Postoperatively, the BCVA improved to 20/70. The cornea did not worsen from the preoperative state but was responsible for the limited vision. At 3 months, the patient had a functioning bleb and an IOP of 7 mm Hg with no medication. The patient was lost to follow-up.

Case 2

A 76-year-old Chinese man with chronic angle-closure glaucoma required cataract surgery in the left eye. He had a trabeculectomy in this eye 18 years earlier and an Nd:YAG laser iridotomy more recently in the right eye. On examination, the BCVA was 20/100 in the left eye and 20/50 in the right eye. He had a functioning bleb with an IOP of 15 mm Hg. The anterior chamber was extremely shallow and nearly flat centrally. The pupil was fixed at 3.0 mm as a result of 360 degrees of posterior synechias. He had a 3+ nuclear sclerotic cataract with a normal disc and fundus and an axial length of 21.7 mm. Surgery was performed on January 7, 1999. Postoperatively, the BCVA improved to 20/25 and the IOP was unchanged.

Case 3

An 81-year-old Chinese man required cataract surgery in the right eye. Many years earlier, he had a surgical peripheral iridectomy in this eye. On examination, the BCVA in the right eye was 20/80; it was 20/400 in the left eye as a result of geographic age-related macular degeneration (ARMD). The anterior chamber was extremely shallow and nearly flat centrally. The IOP in the right eye was 23 mm Hg. The pupil was fixed at 1.0 mm as a result of 360 degrees of posterior synechias. A 4+ mature ultrabrunescent/black cataract obscured the fundus. The axial length was 20.4 mm. Surgery was performed on July 15, 1999. Postoperatively, the BCVA improved to 20/50, compatible with the degree of dry ARMD, and IOP decreased to 19 mm Hg.

Case 4

A 92-year-old white man was referred by his ophthalmologist for cataract surgery in the right eye. Bilateral Nd:YAG iridotomies had been performed for narrow angles. A standard extracapsular cataract extraction with a superior sector iridectomy had been performed 11 years earlier in the left eye, which now had a BCVA of 20/200 as a result of wet ARMD. On examination, the BCVA in the right eye was 20/80. The anterior chamber was extremely shallow and nearly flat centrally. The IOP was 17 mm Hg. The pupil was fixed at 1.0 mm as a result of 360 degrees of posterior synechias. A mature 4+ brunescent cataract obscured the fundus. The axial length was 21.5 mm. Surgery was performed on July 18, 2000. Postoperatively, the BCVA improved to 20/40, compatible with the dry ARMD in the eye.

All Cases

In all 4 cases, the anterior chamber could be expanded to a normal depth with injection of a viscoelastic agent after a pars plana vitreous tap(s). After the pupil was enlarged, a capsulorhexis was successfully achieved in all eyes. Phacoemulsification of these brunescient nuclei was followed by foldable IOL implantation in the capsular bag in all cases.

There were no intraoperative complications of the vitreous tap or cataract surgery. Specifically, there were no instances of intraoperative incision problems, vitreous hemorrhage, suprachoroidal hemorrhage, iris prolapse, torn capsulorhexis, or posterior capsule rupture. No retinal complications were noted, although follow-up was not long term. Postoperatively, all 4 eyes achieved the expected level of BCVA consistent with preexisting corneal or macular pathology. All retained functional, round pupils 3.0 mm diameter or less. Although there was no worsening of the corneal edema in the eye with Fuchs' dystrophy 3 months postoperatively, the patient was lost to further follow-up. No other remaining eye had corneal decompensation.

Discussion

A crowded anterior chamber complicates multiple surgical steps.¹ A properly constructed clear corneal incision may be more difficult to achieve because of peripheral iridocorneal apposition or proximity. The anterior iris location increases the chance of iris/instrument contact and iris prolapse, both of which cause intraoperative pupil constriction.

The use of a capsule forceps and instrumentation for intraoperative pupil enlargement may be constrained by the very shallow chamber.²⁻⁵ In addition, the capsulorhexis is more difficult to control because the increased convexity of the anterior capsule tends to steer the tear peripherally.⁶ The risk of endothelial cell loss is greater because of the closer proximity of the phaco tip during nucleus emulsification.^{7,8} Finally, hyperopic eyes with short axial lengths may be more predisposed to suprachoroidal hemorrhage.⁹

The 4 cases discussed here illustrate that these eyes usually present with multiple complicating risk factors.¹⁰ All 4 patients had prior laser or surgical iridotomies for narrow angles. The pupils were small and fixed with circumferential posterior synechias in all cases. Most of the patients had been treated with topical miotics. Three had glaucoma or ocular hypertension. One required and another had had filtration surgery. Three patients were legally blind in the opposite eye. These 3 patients had a brunescient mature nuclear cataract ob-

scuring the fundus and had delayed cataract surgery because of their 1-eyed status. Three patients had short axial lengths, increasing the risk of intraoperative suprachoroidal hemorrhage. Two were Chinese. This series did not include nanophthalmic patients. Such eyes might have a greater risk of hypotony-induced suprachoroidal hemorrhage or effusion without simultaneous or immediate anterior chamber expansion. It is also unclear whether a pars plana tap would obviate the need for a prophylactic sclerotomy in a nanophthalmic eye.

In most eyes with a shallow anterior chamber, the combination of preoperative ocular compression and injection of a viscoelastic agent deepens the chamber enough for phacoemulsification to be safely performed.¹¹ A high-molecular-weight cohesive viscoelastic substance can maximally flatten the central anterior lens surface. Dispersive viscoelastic agents exhibit superior retention in the face of wound manipulation. The soft-shell technique combines the advantages of both.¹² Healon5, which recently became available in the United States, has both maximally cohesive and highly retentive properties. However, overinflation with any viscoelastic material leads to excessive IOP elevation with iris prolapse and should be avoided. These 4 patients represent the extreme end of a continuum of chamber depth in which the anterior chamber was nearly flat and remained extremely shallow despite the maximum permissible viscoelastic injection.

A standard extracapsular technique is an option in such cases; however, there are at least 2 significant disadvantages to the larger wound. First, a small self-sealing incision is desirable in eyes at greater risk of suprachoroidal hemorrhage or effusion.¹³ Second, these eyes often have coexisting glaucoma and like those in our series, may have had or require a trabeculectomy.¹⁴⁻¹⁷ Administration of a hyperosmotic agent such as mannitol might dehydrate and reduce the vitreous volume. However, it was contraindicated in at least 1 patient, who had congestive heart failure.

A pars plana vitreous tap using a vitrectomy probe without irrigation sufficiently expanded the anterior chamber with viscoelastic injection in all 4 cases. This allowed bimanual pupil stretching, a capsulorhexis, and uneventful phacoemulsification and foldable IOL implantation. There were no complications of the vitreous tap or cataract surgery and no instances of corneal decompensation. The use of a vitrectomy cutter to remove

vitreous presumably decreases the potential for vitreous traction compared with a needle aspiration technique.¹⁸

In conclusion, extremely shallow anterior chambers that cannot be deepened with viscoelastic material are occasionally encountered, particularly in the Asian population.¹⁹ An automated pars plana vitreous tap to expand the anterior chamber can allow pupilloplasty, capsulorhexis, phacoemulsification, and foldable IOL implantation in these high-risk eyes while maintaining the advantages and safety of a small incision.

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