Supplement to

Cataract & Refractive Surgery TODAY

August 2008

OVD Strategies *for* Complex Cases

OVDs with advanced protection make cataract surgery safer and faster.

Supported by an educational grant from Alcon Laboratories, Inc.

The Extra Edge

Good cataract surgeons are like professional golfers. Although we know what to do when the ball is lying in the fairway or on the green, the real test of skill comes when we suddenly need to scramble to avoid unexpected trouble. Like a difficult shot from the deep rough, complicated cases test our skills, experience, creativity, and mental toughness as surgeons. Because of how quickly problems can arise, we must be prepared to handle complications by having the best equipment, OVDs, and devices at our disposal and then mentally preparing ourselves by rehearsing contingency strategies in advance.

In this supplement to *Cataract & Refractive Surgery Today*, six noted cataract experts describe how they approached some of their most challenging cases. Through the combination of video and written explanation, they will share valuable tips, techniques, and ideas with you. Although you may not face an identical situation, contemplate how you would have handled these eyes, and try to incorporate these techniques into your surgical armamentarium. Brunescent nuclei and weak zonules never fail to confront us, our staff, and our equipment with the ultimate surgical test. This is why we are always trying to find that extra edge.

David F. Chang, MD
Chief Medical Editor, *Cataract & Refractive Surgery Today*

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This supplement includes a CD of narrated surgical videos that correspond with the articles. Watch and listen as each surgeon demonstrates and describes how ophthalmic viscosurgical devices improve the management, safety, and efficacy of his or her challenging case. You may also view the videos online at www.Eyetube.net.

Brunescent Cataract With Capsular Rent and Silicone Oil

Successful management depended on the choice of OVD, such as Viscoat.

BY JASON JONES, MD

This case involved a fairly active 70-year-old white male who had experienced retinal detachment and had undergone four vitrectomies and a scleral buckle in his right eye. His last vitrectomy had involved the placement of silicone oil in the vitreous cavity. Although the patient's retinal pathology was severe, the retinal surgeon thought it was possible that his retina could stabilize enough in the future to remove the oil, but this determination was precluded by the presence of a fairly dense, brunescent cataract. My goal was to remove this cataract from the eye to enable better visualization of the posterior segment and perhaps improve the patient's visual acuity.

SURGICAL COURSE

Astigmatic Treatment

An eye that has undergone vitrectomies is always at risk for capsular injury that can be occult, and so the surgeon must prepare for the possibility that the capsule may be open unexpectedly. Initially, I approached this patient's cataract surgery like any other, beginning with IV sedation and topical anesthesia with intracameral nonpreserved lidocaine. Then, I made central corneal relaxing incisions to treat 6.00 D of naturally occurring corneal astigmatism.

Marking

Proceeding with my usual surgical routine, I marked the corneal surface for capsulorhexis sizing and centration, which later proved to be a fortunate step. I use a 5.75-mm–diameter corneal marker made by Mastel Precision, Inc. (Rapid City, SD), for all my cases, because I usually plan to implant a 6-mm–optic IOL. Next, I inflated the anterior chamber with Viscoat ophthalmic viscosurgical device (OVD) (Alcon Laboratories, Inc., Fort Worth, TX). Using Utrata forceps, I initiated a tear in the capsule and then made a capsulorhexis following the inscribed mark from the corneal marker. I always aim to keep the tear exactly

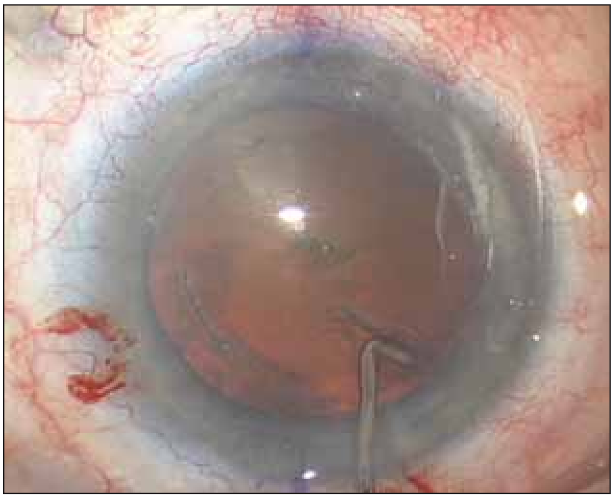

Figure 1. The appearance of the fluid wave changed toward the conclusion of the irrigation step.

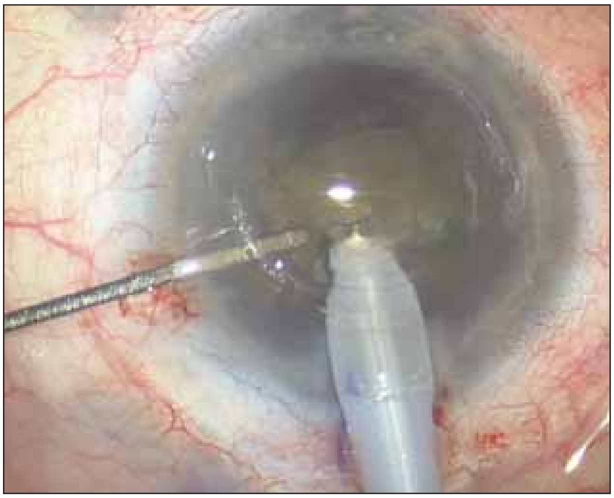

Figure 2. The author uses a spatula to guide nuclear fragments toward the phaco tip.

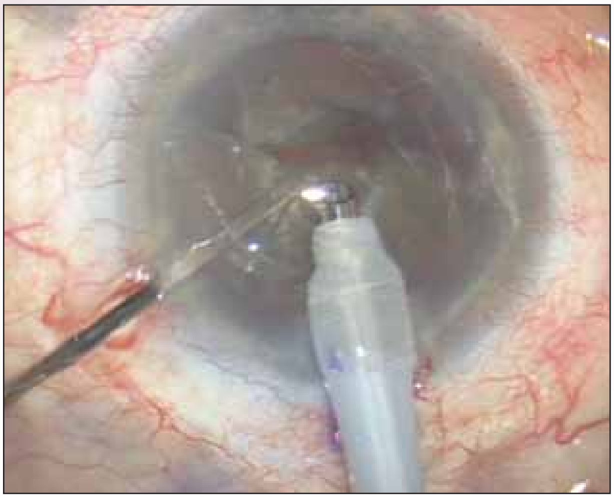

Figure 3. The author notices the appearance of a silicone oil bubble where posterior capsule and cortex should be.

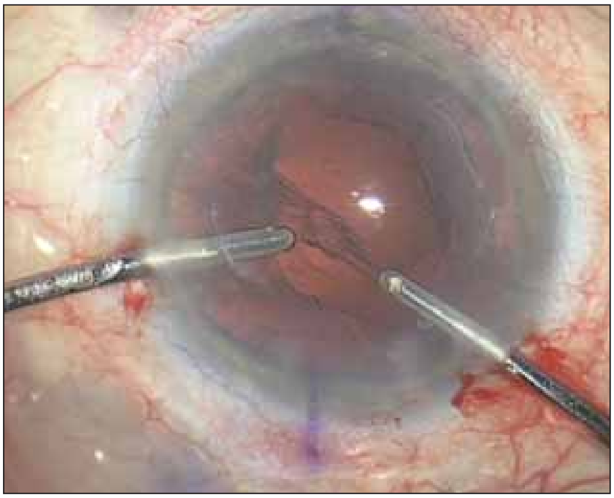

Figure 4. The author switches to a bimanual technique with a low bottle height to remove the cortical material.

on or just inside that mark so that the anterior capsulorhexis overlaps the optic by 360º.

Hydrodissection and Nuclear Fragmentation

I typically perform hydrodissection with a Chang cannula (Mastel Precision, Inc., or Katena Products, Inc., Denville, NJ). I place the tip of the cannula to the right of the anterior capsule, almost to the subincisional space underneath it, and I elevate the capsule's edge to allow the fluid wave to cross the entire posterior capsule. This step helps to loosen the subincisional cortex. I then rotate the tip of the Chang cannula around and elevate the capsule without irrigation. I mechanically dissect the capsule off of the cortex, starting to the left of the incision and proceeding clockwise until I am across from the main incision. Then, I can easily turn the tip of the Chang cannula down into the cortex and nuclear material, purchase the material, and rotate the nucleus, usually in a counterclockwise direction. I simultaneously use a slight downward pressure to help complete the fluid wave.

The fluid wave appeared normal initially, but its appearance suddenly changed at the very end of my irrigation (Figure 1). I was not sure of the significance of the change, so I continued as I normally would with mechanical dissection and rotation of the nucleus. All ocular components seemed stable, and the tissue was responding normally, so I proceeded to phacoemulsification.

Phacoemulsification

I employed a quick-chop procedure, impaling the nucleus deeply and centrally. I held the nucleus with vacuum as I created a cleavage plane with a Nichamin Quick Chopper II (Rhein Medical, Inc., Tampa, FL); this technique usually produces an effective crack through the nuclear material and nuclear plate. Next, I rotated the nucleus and started to subdivide the hemisections. This is where I altered my technique somewhat to anticipate the silicone oil's tendency to push forward. With such cases, I subdivide the nucleus into smaller fragments. Then, I remove the sharp-ended vertical chopper, which could inadvertently damage the posterior capsule, and I use a spatula to manipulate the pieces toward the phaco tip (Figure 2). This way, should the silicone oil push the posterior capsule forward (in the saline environment, silicone oil often floats upward), I have an element of protection in the posterior capsule.

Also, I subdivide dense cataracts more thoroughly (into seven or eight pieces) than I do softer ones (five or six pieces), depending on how the cracks progress.

Posterior Capsular Rent

After I removed two pieces of nuclear material, I noticed a bubble of silicone oil in the area that should have been occupied by the posterior capsule and posterior cortex (Figure 3). I knew the posterior capsule was open. A lot of nuclear material was still inside the eye, and it would be difficult to remove if it descended posteriorly, due to its density and the presence of the silicone oil. I proceeded carefully, sequentially removing the nuclear fragments piece by piece until one hemisection was entirely excised. The second hemisection, unfortunately, still had some adherent central fibers. Knowing that there was a large exposure of a posterior capsular rent with silicone oil behind it, I elected to keep this hemisection as one piece and remove it as best I could. I flipped it vertically toward the phaco tip, which may have disrupted any remaining posterior capsule (it was unclear to me whether any posterior capsule was left at that point). I was able to remove all the remaining nuclear fragments by this anterior segment approach.

Toward the end of the procedure, a fairly sizeable nuclear fragment repelled from my phaco tip, and I had to reach across the anterior chamber to retrieve it. In doing so, I could see the interface of the silicone oil and saline. Although silicone oil often floats anteriorly or up on top of saline, it also maintains surface tension with sufficient IOP, which allows the surgeon to continue working in the anterior chamber as long as the IOP remains stable. When I noticed the rent, I had alerted my technician that I would need extra Viscoat. As I extracted the phaco tip, I instilled more Viscoat to replace the volume in the anterior chamber. Initially, I did not lower the irrigation bottle enough, so much of the OVD came out through the paracentesis. I lowered the bottle, administered a second syringe of Viscoat, and was able to maintain the surface tension on the silicone bubble, thus keeping it out of the front of the eye.

Aspiration and IOL Implantation

There was a significant amount of cortical material adherent to the intact anterior capsular rim, so I commenced with a dry aspiration technique using a 27-gauge cannula on a 5-mL saline-filled syringe. I was unable to liberate much of the cortical material in this manner, so I switched to a bimanual I/A technique with a very low bottle height (Figure 4). It was almost a dry technique using very little infusion pressure. I added supplemental Viscoat to the anterior chamber as needed, which kept the silicone oil in the posterior segment and allowed me to evacuate almost all of the cortical material. Then, I expanded the sulcus space with Viscoat and injected a three-piece hydrophobic acrylic IOL (the Sensar AR40 IOL; Advanced Medical Optics, Inc., Santa Ana, CA). I left the trailing haptic outside of the wound while I rotated the lens into position, and then I rotated the trailing haptic into the sulcus as well. Because I had a properly sized and centered capsulorhexis, I was able to achieve anterior optic capture (Figure 5). The optic capture was instrumental in keeping the silicone oil in the posterior segment for the long term.

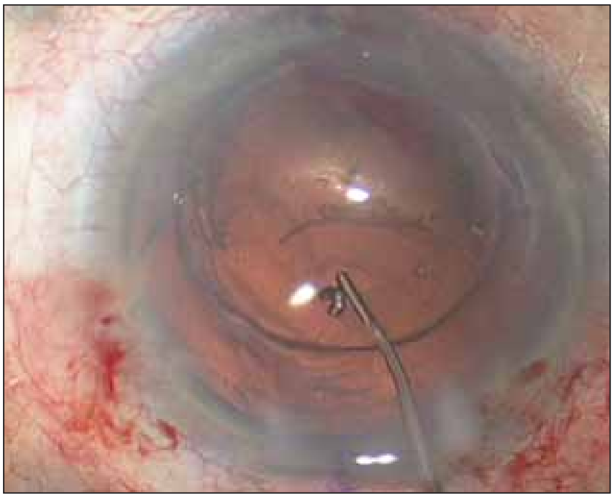

Figure 5. The author captures the optic anteriorly, trapping the silicone oil in the posterior segment.

COMPLETION

I completed the case by instilling some Miochol-E (Novartis International AG, Basel, Switzerland) and removing a small amount of Viscoat with bimanual I/A. Postoperatively, I managed the patient's IOP medically with oral acetazolamide and a topical beta-blocker.

Although the patient did well anatomically, unfortunately, his vision remains reduced due to his retinal pathology and the silicone oil. He is now out more than 2 years, and the oil has not migrated into his anterior segment.

DISCUSSION

Silicone Oil

The reason for leaving silicone oil in the eye is to have it remain in the posterior segment. Because I had a nicely centered and sized capsulorhexis for the IOL I selected, I was able to prolapse the optic posteriorly through the capsulorhexis, achieving an optic capture that formed an anatomic barrier to oil migration into the anterior segment following cataract extraction.

OVD

I chose to use Viscoat in this case for two reasons. First, I wanted an agent that would sufficiently coat and protect the anterior structures, which I feel Viscoat does the best of any such product on the market. Second, I needed an OVD that would resist evacuation. Any viscoelastic evacuated from the eye during this procedure would have been replaced with saline, which would have allowed the silicone oil to float anteriorly. Thus, Viscoat's resistance was an important factor in this case. Given these properties, I think Viscoat would work equally well in an eye that has just vitreous in the posterior cavity and a broken posterior capsule. Additionally, Viscoat has a relatively low molecular weight, which permits the medical management of any postoperative IOP issues, and in my opinion, generally allows an easier resolution. OVDs of high molecular weight will interfere with IOP issues and must be removed. Thus, I feel that Viscoat allows me the greatest flexibility with the best properties of any available viscoelastic product. ■

Jason Jones, MD, is Assistant Medical Director of Jones Eye Clinic, Sioux City, Iowa. He acknowledged no financial interest in any of the products or companies mentioned herein and stated that he is not a paid consultant for any company. Dr. Jones may be reached at (712) 239-3937; jasonjonesmd@mac.com.

The "IOL Bandage" Technique, Using DisCoVisc

A departure from standard cataract surgical technique turns a challenging scenario into a safe and reproducible procedure.

BY MICHAEL E. SNYDER, MD

In the event of a posterior capsular tear during cataract surgery, changing the sequence of steps can effectively keep vitreous and nuclear fragments in their respective ocular chambers. Although this technique deviates from classical teaching, it is exceedingly reproducible and safe.

STEP No. 1: MAINTAIN PRESSURE

If a posterior capsule tears, particularly during phacoemulsification, traditional technique guides the surgeon to remove any remaining nuclear fragments before proceeding. In my proposed sequence, however, I immediately cease aspiration, but I keep the I/A instrument in the eye and continue irrigation. Through the sideport incision, I fill the anterior chamber completely with DisCoVisc ophthalmic viscosurgical device (OVD) (Alcon Laboratories, Inc., Fort Worth, TX). I ensure that the OVD has pressurized the anterior chamber to a greater degree than the vitreous pressure by watching to see that whatever remains of the posterior capsule bows posteriorly to the point of slight concavity as the anterior chamber fills. If the pressure in the anterior chamber is higher than that of the vitreous, the gel will not move forward, as vitreous gel will only follow pressure gradients from higher to lower. Once I have pressurized the anterior chamber adequately, I take the I/A instrument out of the eye and continue with the next step.

STEP No. 2: STABILIZE NUCLEAR FRAGMENTS

If nuclear fragments remain inside the eye, I use DisCoVisc to gently push them from the pupil's center to the peripheral iris so they will not fall through any opening created.

STEP No. 3: REMOVE CORTEX

The next step is to remove any thick cortical material, for which I use the dry aspiration technique developed by my colleague, Robert Osher, MD. I place a 27-gauge cannula against the cortical material and then use a 3-mL syringe to serially aspirate it. I may add DisCoVisc to ensure that the anterior chamber stays pressurized during this process. The DisCoVisc also coats and protects the exposed hyaloid face and keeps the anterior chamber adequately pressurized, thus allowing me to remove cortex safely without vitreous coming forward.

STEP No. 4: INSERT THE IOL

While the nuclear material remains sequestered on the iris leaflet, I implant the IOL. Using a three-piece implant, I first insert the haptics into the ciliary sulcus and then capture the optic through the anterior capsulorhexis (Figure 1). This maneuver re-establishes a barrier between the anterior segment and the vitreous cavity. With the implant captured in this position, there is no way for the nuclear fragments to travel to the back of the eye. Then, I can phacoemulsify the remaining nuclear fragments using my normal

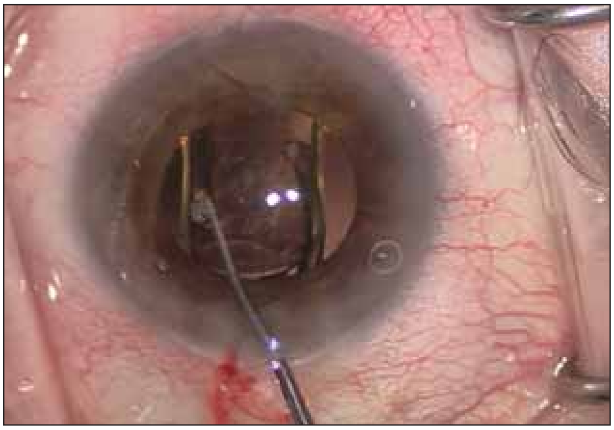

Figure 1. The author injects the IOL into the capsular bag to protect the posterior capsule.

settings with a tremendous degree of safety (Figure 2). I usually recommend instilling Miostat (carbachol; Alcon Laboratories, Inc.) intraocularly at the end of the case to control the IOP for the first few postoperative days, just in case some viscoelastic material remains.

This technique of using DisCoVisc and an IOL as barriers to both vitreous prolapse and subluxation of nuclear material converts what would ordinarily be a very challenging case—unaspirated nuclear fragments in the presence of a posterior capsular rent—into a safe, straightforward procedure.

WHY DISCOVISC?

DisCoVisc is my preferred OVD for this technique because it has cohesive properties that help it maintain a pressurized anterior chamber, and it creates a dispersive coating that acts as a barrier between any surgical manipulations and the exposed anterior hyaloid face. Furthermore, DisCoVisc has balanced retentive and dispersive qualities that keep it in the eye while I aspirate the cortical material. An overly cohesive OVD would try to enter the cannula ahead of the cortex, whereas DisCoVisc will generally shear off from the cannula's orifice. A small amount may enter the cannula, but not much. If any OVD remains in the eye at the end of the case, which is highly likely with capsular tears, regardless of technique, DisCoVisc will not raise the IOP as much as the more highly cohesive OVDs.

A comparably minor benefit of DisCoVisc, but one that I appreciate nonetheless, is the generous volume of material included in each syringe. If I suddenly start to lose pressure in the anterior chamber (say, due to a posterior capsular tear), I will have no difficulty instilling more DisCoVisc at a moment's notice. Smaller syringes sometimes do not contain enough OVD left to refill the chamber after the initial instillation, and I do not want to have to wait for my nurse to run down the hall to get a second vial of the OVD.

OTHER APPLICATIONS

This sequence of maneuvers I describe herein is equally effective in the prophylaxis of a tear when the posterior capsule bows convexly, especially cases in with a very shallow and/or volatile anterior chamber or significant posterior pressure. Early placement of the IOL protects the posterior capsule and eliminates any chance of tear during emulsification of the last few nuclear pieces. I presented such a case at the 2008 ASCRS meeting[1] of a highly hyperopic eye with a short anterior chamber. I used this technique to finish the phacoemulsification, because I was concerned about touching the capsule with the phaco tip in the narrow space, and the capsule was coming forward every time I applied aspiration. Here again, I inserted the implant before completing the phacoemulsification, and I pressurized the chamber with DisCoVisc.

Figure 2. The remaining nuclear material is emulsified safely. The IOL prohibits the capsule from coming forward and prevents inadvertent breakage of the capsule by the phaco tip.

This technique can also be useful in eyes with a very small anterior segment experiencing vitreous pressure, since the greatest chance of breaking the capsule during phacoemulsification is during the removal of the final fragments, when the greatest area of posterior capsule has been exposed.

CAVEAT

Certainly, if the capsule has already opened and vitreous is present in the anterior chamber, then the primary goal is to avoid mechanically manipulating vitreous with any surgical technique. If the nuclear fragments are already entangled in vitreous gel, then the gel must be addressed first, because pulling on the vitreous once it is in the anterior segment can impose traction on the retina and increase the risk for a retinal tear and subsequent detachment.

CONCLUSION

To review, my IOL bandage technique is useful for completing phacoemulsification in the presence of significant posterior pressure, a convex posterior capsule with a small anterior segment, or when there is an opening in the posterior capsule without penetration of the vitreous in the anterior segment. Placement of the IOL earlier in the procedure than usual protects the intact but vulnerable posterior capsule and re-establishes the anterior-posterior barrier when the capsule has been violated. ■

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1. Snyder ME. The use of DisCoVisc in complex cases. Booth presentation for Alcon Laboratories, Inc. Presented at: The ASCRS Symposium on Cataract, IOL and Refractive Surgery; April 6, 2008; Chicago, IL.

A "Cornea Conscious" Approach to Dense Nuclei

Strategies that protect the eye, such as DuoVisc, ensure pristine corneas.

BY GARRY P. CONDON, MD

When faced with a brunescent cataract, we ophthalmologists often brace ourselves, knowing we are not going to be able to cruise through the case with the same ease and speed we enjoy with garden-variety cataracts. Brunescent lenses require greater total amounts of emulsification energy that, if not managed carefully, may cause corneal edema that can take days or sometimes weeks to clear.

I employ several surgical strategies that can turn challenging cases with dense nuclei into relatively relaxed procedures. Although my approach is somewhat more time consuming than the average case, it promotes crystal-clear corneas postoperatively, eases my anxiety about complications, and reduces the procedure's adverse effects on the eye, thus optimizing the outcome.

STRATEGY 1: PATIENCE

Above all, I prefer to approach brunescent nuclei with patience and allow them more time in my surgical plan. I feel that trying to hasten extraction in these cases compromises their safety.

STRATEGY 2: A DISPERSIVE OPHTHALMIC VISCOSURGICAL DEVICE

I rely on a dispersive ophthalmic viscosurgical device (OVD) to protect the corneal endothelium from the phaco energy required for brunescent cataracts. I use Viscoat OVD (Alcon Laboratories, Inc., Fort Worth, TX), because the formulation combines chondroitin sulfate and sodium hyaluronate to produce a triple negative charge, which greatly enhances its adherence to the corneal endothelium. I fill the entire anterior chamber with Viscoat before making the capsulorhexis, and then I proceed carefully, because the capsule of a very dense lens must withstand greater stress than the average case.

STRATEGY 3: LOCATION

With brunescent lenses, I phacoemulsify as much of the nucleus as possible in the capsular bag (Figure 1), rather than trying to first chop the cataract and then bring the fragments more anteriorly to phacoemulsify them. My goal is to remove as much of the nucleus as possible while staying away from the corneal endothelium. Like any waveform, phaco energy decays by the square root of the distance, so the farther it is from the endothelium, the less trauma it causes exponentially.

I use the INFINITI Vision System with Torsional Ultrasound and a standard-size OZil phaco tip (both manufactured by Alcon Laboratories, Inc.) for phacoemulsification. For the sculpting phase, I combine both torsional and longitudinal ultrasound in a linear mode preset at 100% power, with a flow rate of about 17 to 20 mm Hg and a vacuum of around 50 mL/minute. Rather than creating a trough just adequate enough to crack the lens, I make wide, deep grooves to create four small nuclear quadrants (Figure 2). This emulsifies the bulk of the lens material without my having to remove it from the capsular bag. Next, I crack the remaining nucleus into the four small quadrants and bring each one up to the iris plane for phacoemulsification. Before emulsifying the quadrants, I replenish any Viscoat that was aspirated from the anterior chamber during the sculpting phase. I instill the

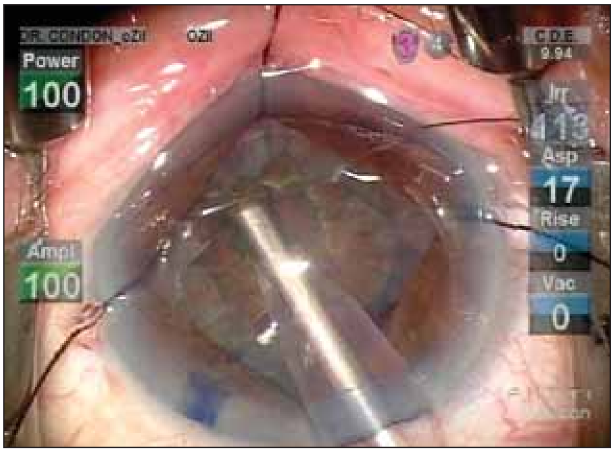

Figure 1. The author phacoemulsifies the cataract inside the capsular bag using a combination of torsional and longitudinal ultrasound.

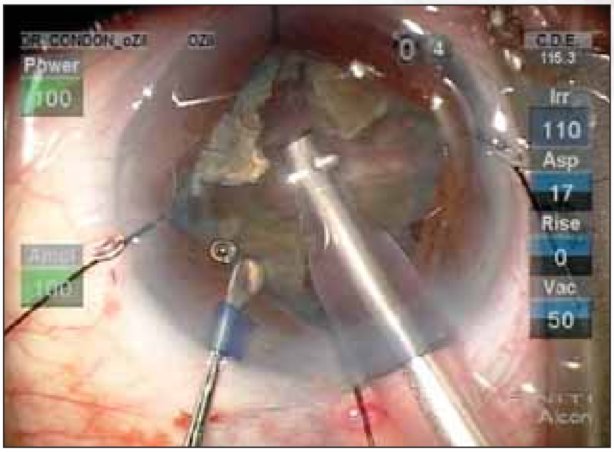

Figure 2. The author makes wide, deep grooves to reduce the nucleus into four small quadrants.

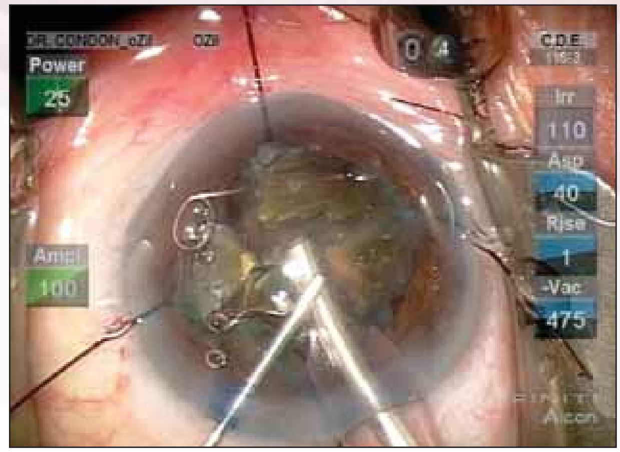

Figure 3. The author instills additional Viscoat over the top of the phaco tip to coat the underside of the cornea.

OVD through the sideport incision over the top of the phaco tip while the tip is in the eye (Figure 3), until the underside of the cornea is coated with a complete layer. This critical step maintains endothelial protection.

STRATEGY 4: TORSIONAL AMPLITUDE

To remove the small remaining quadrants, I usually switch to 100% torsional amplitude. I have created a quadrant removal preset on the INFINITI system that uses vacuum of about 450 mm Hg and a flow rate of about 45 mL/min. Pure torsional ultrasound keeps the lenticular material at the phaco tip, making it easy for me to park the tip in a central safe zone and thus reduce chatter during this phase of the procedure.

STRATEGY 5: COMPLETE REMOVAL OF OVD

After extracting all the nuclear material, I proceed in the standard fashion with cortical cleanup, with the added step of also removing all the Viscoat from the eye. Because the viscoagent extends beyond the iris and angle, it often contains microscopic lens particles that can contribute to postoperative IOP spikes if allowed to remain. I use Provisc OVD (Alcon Laboratories, Inc.) to inflate the bag and implant the IOL, because this OVD is so easy to remove with minimal manipulation.

ENERGY MANAGEMENT

In my opinion, many cataract surgeons are overly anxious to reach the stage of breaking the nucleus into pieces. I do not think this is the ideal approach for dense lenses. Simply put, it takes more time and energy to break up brunescent nuclei than it does to fragment standard cataracts. No matter how fast a surgeon divides a nucleus or how many pieces he creates, he must bring them anterior to the rest of the lens in order to emulsify them. He is therefore forced to work closer to the corneal endothelium than is preferable and to use more energy to emulsify the large, dense fragments than he would for softer nuclei.

At first glance, the amount of cumulative dispersed energy I expend in my surgical technique appears high (Figure 1). However, ultrasonic energy that is generated in the space behind the iris—an area of the eye that Jim Davison, MD, refers to as a *free zone* for phacoemulsification—creates the least amount of stress to the corneal endothelium. Then, the remaining small residual fragments require much less energy to extract from the anterior chamber. I find that if I perform the bulk of the work away from the endothelium, my cumulative dispersed energy rates do not affect the surgical outcome.

SURGICAL SUCCESS

Brunescent nuclei always require longer surgeries than normal cataract cases, and surgeons who believe otherwise risk complications at worst and cloudy corneas at best. For me, the best surgical course for extracting dense nuclei is to use Viscoat (OVDs that do not stick well to the corneal endothelium truly compromise safety), to employ a combination of longitudinal and torsional phacoemulsification, and to perform as much of the extraction as possible behind the anterior capsule and iris. In my experience, these techniques produce crystal clear corneas on postoperative day 1, and my patients have been extremely satisfied with their results. ■

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Viscodissection During Phacoemulsification

How DisCoVisc's unique properties create a safe working zone in structurally weak eyes.

BY VAISHALI A. VASAVADA, MD

Cortical cleaving hydrodissection has increased the safety and efficacy of cataract surgery by creating a plane of cleavage between the cortex and the capsule. However, in the presence of a weakened posterior capsule or deficient zonules, this technique is unsafe and may cause the blowout of the posterior capsule. As an adjunct to phacoemulsification, viscodissection has proven useful in eyes with a weak capsular bag and zonules, such as those with posterior polar, subluxated, or traumatic cataracts.[1-4] Recently, lower rates of posterior capsular rupture has been reported in conjunction with viscodissection as compared to cortical cleaving hydrodissection alone, even in uncomplicated cases.[5] Viscodissection may enhance safety during phacoemulsification by providing a cushion of ophthalmic viscosurgical device (OVD) to protect the posterior capsule and maintain working space in the bag.

My colleagues (Viraj A. Vasavada, MS; Liliana Werner, MD, PhD; Nick Mamalis, MD; Abhay R. Vasavada, MS, FRCS; and Alan Crandall, MD) and I decided to test this clinical experience in a laboratory setting. We designed a cadaver eye study with the objective of evaluating and comparing the mechanical cushioning effect provided by viscodissection as opposed to hydrodissection during phacoemulsification.

A recently launched OVD, DisCoVisc (Alcon Laboratories, Inc., Fort Worth, TX), is unique among similar agents in that it is viscous dispersive. My colleagues and I have found that this OVD maintains space in the eye, protects ocular tissue, and is easily removed.

STUDY

Parameters

We prepared seven pairs of eyes according to the standard Miyake-Apple technique for posterior viewing and imaging.[6] The Miyake-Apple eye preparation provides a unique posterior view of the anterior segment during intraocular manipulations and is particularly useful in evaluating the dynamics of the capsular bag and zonular stress. One limitation of the Miyake-Apple technique, however, is that it is an open-sky setting. Hence, to more closely mimic the clinical scenario, we prepared one pair of eyes to simulate a closed-chamber setting. We randomly selected one eye of each pair to undergo either cortical cleaving hydrodissection with

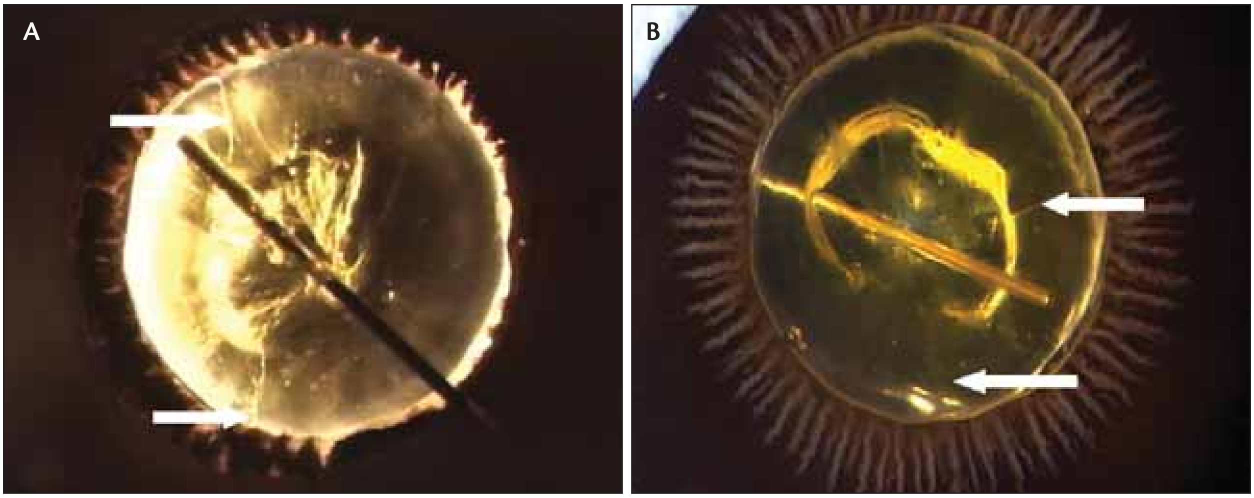

Figure 1. The arrows indicate clearly the visible passage of the OVD beyond the equator. On the left is the anterior (surgeon's) view (A), and on the right is the posterior (Miyake-Apple) view (B).

BSS (Alcon Laboratories, Inc.) (group 1, n = 7) or hydrodissection followed by viscodissection with DisCoVisc (group 2, n = 7). I performed the surgeries on the eyes prepared for the Miyake-Apple viewing technique, and another surgeon performed the procedures on the closed-chamber eyes.

Surgical Course

First, we conducted cortical cleaving hydrodissection by using BSS to tent the anterior capsule. We confirmed the creation of a cleavage plane between the capsule and cortex when we saw a fluid wave pass across the posterior capsule. We commenced viscodissection by slowly injecting small quantities of DisCoVisc into multiple quadrants by directing the cannula along the newly created cleavage plane. When we witnessed the OVD's passage beyond the equator in all of the quadrants, we knew we had created a distinct space between the capsule and cortex that was greatest at the capsular fornices.

DISCUSSION

It is important to keep in mind that the technique of injecting an OVD differs from that of injecting BSS. Hydrodissection produces a fluid wave via a forceful single-site or multiquadrant injection of BSS. In viscodissection, the surgeon slowly and gently injects small amounts of an OVD while moving the cannula in a 360º sweeping motion (Figure 1). Viscodissection is complete when the surgeon can see that the OVD is present beyond the equator in all quadrants. The surgeon injects 0.1 to 0.2 mL of the OVD during viscodissection.

We observed that during subsequent stages of phacoemulsification, the cleavage plane created between the capsule and the cortex was maintained to a significant extent in the eyes that received viscodissection. Our subjective impressions further endorsed these observations.

CORROBORATIVE FINDINGS

Although this technique has been previously described using different OVDs—including Healon and Healon5 (both manufactured by Advanced Medical Optics, Inc., Santa Ana, CA) and Viscoat (Alcon Laboratories, Inc.)[5,7,8]—we chose to use DisCoVisc in our study due to its unique dispersive and retentive properties. Confocal microscopy and Scheimpflug photography showed that DisCoVisc was more retentive than Viscoat and Healon5,[9,10] yet it had a significantly shorter removal time than either of the Healon OVDs. DisCoVisc also offered excellent intraoperative visibility compared with Viscoat. In addition, following the IOL's implantation, the removal of DisCoVisc from behind the lens did not require special techniques.

In a prospective case series, my colleagues and I found that DisCoVisc, although viscous like a cohesive OVD, has all of the protective properties of a dispersive device. It maintains space in the eye well and allows superior visualization, and it can be easily removed at the end of surgery.[11] To further substantiate this finding, my colleagues and I conducted a histopathological analysis. We sectioned the capsular bag with the lens in situ after performing the two procedures. Histopathological examination revealed significantly greater separation of the posterior capsule and cortex in the eyes in which DisCoVisc was injected compared with the eyes that received only BSS.

CONCLUSIONS

Viscodissection with DisCoVisc OVD maintains a much larger space in the eye than hydrodissection. In eyes with weakened internal structures, viscodissection creates and preserves a safety zone by partitioning the posterior capsule from the activity inside the capsular bag. The technique is simple to perform and may be incorporated as an adjunct to hydrodissection. It is easy to understand why viscodissection has widespread applications in cases involving posterior polar cataracts and zonular weakness and why it is used as a tool to reduce the incidence of posterior capsular rupture. My colleagues and I envision that the intraocular space this technique creates will have several as yet unexplored benefits in the sphere of cataract surgery. ■

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ECP in Cataract Surgery

An underutilized technique for managing IOP and discontinuing medications.

MARK PACKER, MD

I have been using endoscopic cyclophotocoagulation (ECP) to treat glaucoma both at the time of cataract surgery and in pseudophakic eyes for over 6 years, and I have found it to be a very useful addition to my armamentarium. The procedure is particularly attractive as an adjunct to small-incision cataract surgery. It takes only about 5 to 10 extra minutes to add ECP to phacoemulsification, and the technique offers a significantly better safety profile with a less stressful postoperative course compared to trabeculectomy.

DisCoVisc ophthalmic viscosurgical device (OVD) (Alcon Laboratories, Inc., Fort Worth, TX) has the ideal properties for use during ECP. It stays in the eye during the procedure. I have not had to refill the eye during ECP since I started using DisCoVisc. At the end of the procedure, when I irrigate and aspirate, the OVD comes out quickly and easily. Additionally, I have not had any pressure spikes with DisCoVisc.

HISTORY

The reputation that cyclodestructive procedures represent a last-ditch effort in essentially blind, hypertensive eyes stems from transscleral procedures like cyclocryotherapy and cyclophotocoagulation. ECP is often grouped with transscleral cyclophotocoagulation, which is a much less controlled treatment that causes collateral damage and inflammation. It is my impression that experience with transscleral cyclodestructive procedures is the reason why few surgeons are adopting the newer endoscopic treatment.

I have found ECP to be a safe and effective procedure that is completely different from transscleral cyclophotocoagulation. ECP is an extremely gentle procedure that is effective in lowering IOP and also reducing or eliminating the need for medications.

Richard J. Mackool, MD, of Astoria, New York, was the first to present the results of combining ECP with phacoemulsification to reduce glaucoma medication requirements.[1] He reasoned that performing ECP at the same time as phacoemulsification through the same incision adds little if anything to the risk of infection. Through his study, he concluded that adding ECP to phacoemulsification does not increase the risk of serious complications, but it does decrease the number of medications needed to maintain IOP control. The final IOP was the same in the phaco-alone and phaco+ECP groups, but the phaco+ECP group was on significantly fewer medications.

More recently, a study by Stanley Berke, MD, of East Meadow, New York, involved the largest follow-up of patients to date.[2] A total of 707 patients were followed in this study to test the safety and effectiveness of ECP when used in combination with phacoemulsification. The results from Berke's study showed that ECP+phaco does not cause additional complications and is effective in reducing or eliminating the use of medications. This study included a large volume of patients, and the rate of complications was better than in other incisional glaucoma procedures (Figure 1). The safety record of ECP is better than that of trabeculectomy or shunt surgery. The only known cases of hypotony and phthisis after ECP have occurred in neovascular glaucoma and refractory pediatric glaucoma. There have been no reported devastating complications in phaco+ECP for primary open-angle glaucoma (POAG).

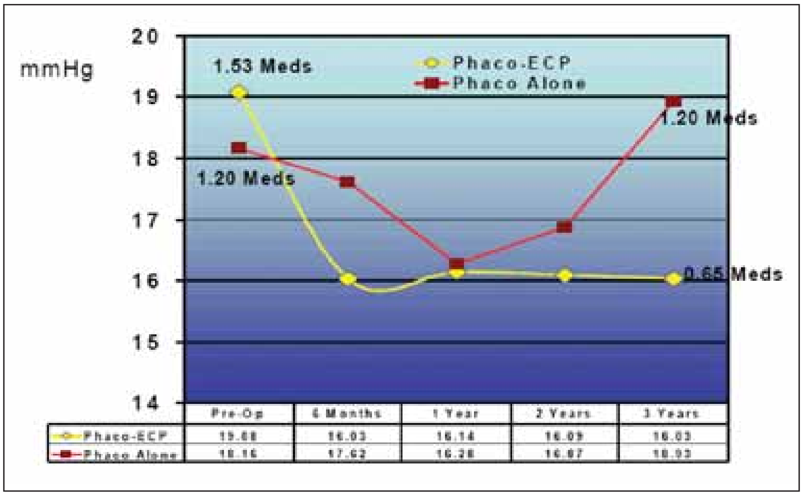

Figure 1. This graph shows the mean IOP over time for phaco+ECP versus phacoemulsification alone.

TABLE 1. MEDICATIONS		
	Phaco+ECP	Phaco Alone
No Change	27% (168/626)	77% (62/81)
Increase	5% (33/626)	12% (10/81)
Decrease	68% (425/626)	11% (9/81)

ADDITIONAL CONSIDERATIONS

The endoscopic approach provides a new view of the eye that anterior segment surgeons have not had before. When first performing ECP, the entire OR staff will be astounded when they see the internal picture of the eye. It was the first time I had ever looked at the ciliary body this way. In the past, I have found a piece of nucleus still left in the eye from phacoemulsification. I would not have seen this if I did not perform ECP afterward. Small pieces of lenticular material hiding in the ciliary sulcus may in fact be the cause of postoperative iritis that emerges after the completion of a typical steroid taper. The high clarity of the viscoelastic agent used (such as DisCoVisc) enhances the image of the intraocular tissue.

Evidence supports the use of ECP for POAG in combination with cataract surgery. I have seen, on average, a 30% reduction in pressure and a 30% reduction in medications after ECP, which agrees generally with Berke's experience[2] (Table 1). This procedure also benefits pseudophakic patients with POAG.

The most common problem with ECP is the failure to adequately control IOP without medications. If the goal is a pressure below 15 mm Hg on zero medications, then trabeculectomy or a shunting procedure is more likely to reach it. However, these procedures have a significantly greater complication rate, including early hypotony, choroidal detachment and late infection, bleb leaks, and failure due to scarring. In advanced glaucoma, a trabeculectomy or shunt may nevertheless be the best choice, and I continue to use these procedures, as well as nonpenetrating sclerectomy, in selected patients.

For controlled glaucoma in a patient coming to cataract surgery, however, ECP adds virtually no risk and no increased follow-up. The postoperative regimen is the same as for phacoemulsification alone, and the IOP stabilizes after about 6 weeks. At that time, medications can be titrated to achieve the target IOP. The patient may still require some medications, which can be disappointing if his goal is to eliminate them. But, if the patient accepts a reduction in medications as a valuable goal, then it can usually be achieved with ECP. Setting reasonable expectations for the procedure is important.

EXPERIENCE

A small (< 5%) hyphema is a complication that appears to occur from trauma to the iris or ciliary body. It may be from inadvertent trauma caused by excessive laser energy, and it occurs about 4% of time. There may also be mechanical damage from the probe itself if it is not handled properly. This complication rate is less than that with trabeculectomy or tube implant procedures, in my experience.

The most dramatic result I have had with ECP was in a patient whose trabeculectomy failed several weeks after his cataract extraction. I actually saw this patient in the office in the afternoon on the day his filter later failed. His IOP had been 12 mm Hg consistently on no medications, but, that afternoon, it was 17 mm Hg. His bleb had always been shallow and did not appear to have changed. However, that night, he called me with pain and decreased vision. I was surprised to hear from him (fortunately, I was on call for our group). His wife drove him 60 miles back to the office in the middle of the night. His IOP was more than 50 mm Hg. I treated him with oral Diamox (Duramed Pharmaceuticals, Inc., Cincinnati, OH) and multiple topical agents. Two days later, I took this patient to the OR and performed ECP. Postoperatively, he again was able to cease all medications, and his IOP has consistently been 14 mm Hg for 3 years.

Another patient in his mid-70s was on five medications in both eyes and had an IOP of 11 mm Hg OU. His vision was decreasing, and he was developing diffuse visual field changes in one eye. The examination suggested this condition was due to worsening nuclear sclerosis. Following phacoemulsification plus ECP, the IOP in that eye remained 11 mm Hg without any medications. He has an incipient cataract in the fellow eye and is waiting for it to worsen so he can undergo the same procedure in that eye. He hopes to get off his medications completely.

A younger patient of mine had Array multifocal IOLs (Advanced Medical Optics, Inc., Santa Ana, CA) OU. He was a refractive lens exchange patient who achieved 20/20 and J1 acuity OU. He has a long family history of glaucoma as well as longevity (relatives alive past 100 years). He has significant cupping and visual field loss in one eye. He underwent ECP in that eye, which resulted in reducing the number of medications from three to one. He now has an IOP of 14 mm Hg on a prostaglandin analog.

CONCLUSION

From my experience of more than 6 years, I have found that ECP does not increase complications when added to phacoemulsification. My attitude now is that controlled POAG in the setting of cataract should be considered an indication for ECP unless proven otherwise. In fact, I now use ECP in conjunction with phacoemulsification unless convinced to proceed otherwise. I have not seen any serious complications with this approach, and I have witnessed a moderate reduction in IOP and medications in almost all my patients. This strategy is particularly effective in combination with phacoemulsification, but ECP has also been effective as a solo procedure. In extreme cases such as the patient with the failing trabeculectomy, I believe ECP can be an effective method of lowering pressures and preserving vision. Additionally, I have found that DisCoVisc has the right balance of space maintenance and ease of irrigation to facilitate a clear view of the ciliary epithelium during treatment and avoid pressure spikes in the immediate postoperative period. ■

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DisCoVisc in the Case of Homocystinuria

The OVD maintained space and protected the eye during this challenging surgery.

BY ALAN S. CRANDALL, MD

This article describes my use of DisCoVisc ophthalmic viscosurgical device (OVD) (Alcon Laboratories, Inc., Fort Worth, TX) to extract a soft cataract from the eye of a 3-year-old male with homocystinuria. I selected DisCoVisc for this case to help maintain space in the anterior chamber, prevent vitreous from coming forward, and facilitate implantation of the IOL.

SURGICAL COURSE

This eye completely lacked zonular support. Because I was unable to penetrate the capsular bag with the sharp cystotome (Figure 1A), I had to use counterpressure with the help of a second instrument to begin the capsulorhexis. During this phase, the DisCoVisc acted as a cohesive viscoelastic and kept the anterior chamber inflated and stable while I pulled the tear around. Midway through, I inserted a Grieshaber iris retractor (Grieshaber & Company AG, Schaffhausen, Switzerland) to enhance the counterpressure so I could complete the capsulorhexis. Next, I placed two additional Grieshaber retractors to help maintain the bag's position and allow me to remove the nucleus. Here again, DisCoVisc kept the chamber open while I used I/A to viscodissect the extremely soft lens. Although I usually prefer a bimanual approach in challenging cataract surgery, because of the position and mobility of the lens, I used traditional I/A through a single microincision of 2.2 mm (Figure 1B).

After extracting a nucleus, it is important not to remove the instrument from the anterior chamber. I instilled more DisCoVisc to maintain the structure, keep the vitreous face back, and to increase the diameter of the capsular bag for the IOL's implantation (Figure 1C). I had positioned two Cionni capsular tension rings (Morcher GmbH, Stuttgart, Germany) on either side of the capsular bag, 180º apart. After placing an 8–0 Gore-Tex suture (W.L. Gore & Associates, Newark, DE), I used an ab externo technique to dock the two needles through the capsular tension rings at 1 mm posterior to the limbus. With the capsular bag stabilized, I implanted and positioned a single-piece AcrySof IQ IOL (Alcon Laboratories, Inc.). The DisCoVisc, which had remained undisturbed by the low aspiration settings (less than 25 mm Hg) I used during the procedure, was easy to extract by increasing the aspiration to approximately 35 mm Hg. Finally, I removed the iris hooks, which deepened the chamber and opened the bag for the lens. I closed the wounds using Gore-Tex sutures, which also served to center the capsular bag easily.

OUTCOME

The patient experienced no postoperative complications. He is 1.5 years out from the surgery and sees very well. ■

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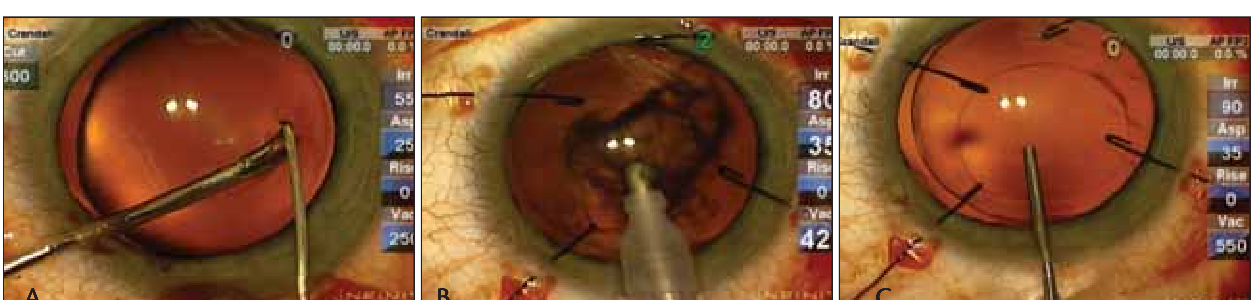

Figure 1. In this young eye, DisCoVisc stabilized the capsule during the capsulorhexis (A), offered protection during microincisional I/A (B), and maintained space in the capsular bag for the IOL's implantation (C).