Improving Phacoemulsification

Cataract & Refractive Surgery Today invited seven expert surgeons to share tips drawn from their own cataract surgical technique. As an accompaniment, each has provided a video demonstration that is available at Eyetube.net.

Surgical Pearls for Weak Zonules

By David F. Chang, MD

My video demonstrates several strategies for performing phacoemulsification in an eye with weak zonules and a brunescent cataract. The capsulorhexis step represents the surgeon's first opportunity to evaluate zonular integrity. I have used the term *pseudo-elasticity* to describe movement of the peripheral capsule while traction is being applied to the flap; pseudo-elasticity is poor zonular footing instead of a truly elastic anterior capsule (such as in children).

SUPPORT OF THE CAPSULAR BAG

Capsular tension rings (CTRs) redistribute and transmit surgical forces to the entire circumferential zonular complex. A CTR would do little, however, to augment surgical support of the capsule in this eye with diffuse zonular pathology, and it might even tear zonules as it was inserted. Furthermore, the tendency of CTRs to trap cortex is particularly problematic in the setting of widespread zonular deficiency. The newly available Henderson Capsular Tension Ring (Morcher GmbH, Stuttgart, Germany; distributed in the United States by FCI Ophthalmics, Marshfield Hills, MA) is less likely to trap cortex, but it still impedes cortical cleanup in eyes with advanced circumferential zonular weakness, as in this case.

I find using capsule retractors to be the best way of providing surgical support to the capsular bag and postponing the CTR's insertion until after the cortex has been removed (Figure 1). If specialized capsule retractors (available from companies such as FCI Ophthalmics, Impex, Inc. [Staten Island, NY], and DORC International BV [Zuidland, The Netherlands]) are not available, one can use four iris retractors to hook the capsulotomy's edge, as demonstrated in my video. Unlike CTRs, capsule retractors anchor the bag to the wall of the eye; they provide rotational fixation and support the bag in the anteroposterior dimension.

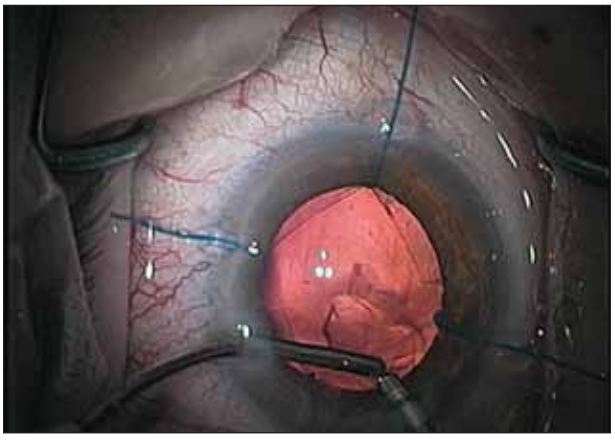

Figure 1. Cortical cleanup with bimanual I/A in an eye with diffuse zonular weakness. Four iris retractors support the capsular bag, and Viscoat keeps the bag inflated to avoid aspiration of a "trampolining" posterior capsule. Because a CTR would entrap cortex, the surgeon has postponed inserting the device until after all cortex has been removed.

NUCLEAR DISASSEMBLY AND REMOVAL

My preference for disassembly of a dense nucleus is to use a combination of vertical chop to section the nucleus and horizontal chop to subdivide mobilized fragments. Along with advanced power modulations such as Ozil Torsional ultrasound (Alcon Laboratories, Inc., Fort Worth, TX) and Ellips Transversal Ultrasound (Abbott Medical Optics Inc., Santa Ana, CA), the latter step reduces the tendency for turbulence and chatter of pieces as they are emulsified. Using a smaller 20-gauge phaco tip reduces the risk of aspirating a trampolining posterior capsule.

As more of the lax posterior capsule becomes exposed, the risk of aspirating it along with the final nuclear or epinuclear fragments increases. Although they support the bag, capsule retractors do not provide the normal centrifugal zonular tension that keeps the posterior capsule somewhat stretched and taut in normal eyes. The risk of tearing the capsule remains high during cortical cleanup, even in

the absence of a CTR. Adherent cortex does not easily separate from a lax posterior capsule that wants to follow the cortex into the aspirating port. Expanding the capsular bag with a dispersive ophthalmic viscosurgical device (OVD) such as Viscoat (Alcon Laboratories, Inc.) stretches the pliant posterior capsule and restrains it from trampolining toward the tip of the aspirating instrument. An important benefit of Viscoat is it resists being aspirated as quickly as "nondispersive" agents.

CORTICAL CLEANUP

There are several advantages to using bimanual I/A instrumentation to remove cortex in the setting of weak zonules. The first is improved access to the subincisional cortex, and the ability to swap limbal entry ports minimizes the frequency with which the aspirating port must be turned toward the posterior or equatorial capsule. Finally, the absence of the constraining infusion sleeve facilitates maneuvering the aspirating port as peripherally as possible, where the tip can be buried in equatorial cortex. Immediately blocking the aspirating tip with cortex lessens the possibility of snagging a loose fold of posterior capsule.

PLACEMENT OF A CTR

During phacoemulsification, the combination of placing capsule retractors and repeatedly filling the capsular bag with a dispersive OVD improves surgical safety without requiring a CTR. After removing the cortex but prior to removing the capsule retractors, I inject a CTR into a capsular bag that is maximally expanded by an OVD. The leading tip of the CTR might catch a capsular fold and cause a tear if the bag is not fully inflated. Capsule retractors also reduce the likelihood of a zonular dialysis caused by the ring as it is inserted. The primary purpose of the CTR is to prevent postoperative contraction of the capsular bag and capsulorhexis in the setting of weak zonules.

CHOICE AND PLACEMENT OF AN IOL

When there is significant circumferential zonular weakness, such as in the case depicted in my video, surgeons must consider the risk of late dislocation of the bag-IOL complex. A CTR lessens but does not eliminate the possibility. I believe that placing a three-piece posterior chamber IOL in the sulcus is less likely to result in bag-IOL dislocation in these eyes at risk. If the IOL is entirely contained within the capsular bag, the zonules must absorb all of the torque and kinetic energy that is produced by saccadic eye movements. If the C-loop haptics are in contact with the ciliary sulcus, however, this torque is transmitted to the inner wall of the eye instead. Capsulorhexis capture of the optic should prevent any contraction of the capsulotomy, while the CTR should prevent shrinkage of the equatorial bag.

A video demonstration of these technical pearls is available at http://eyetube.net/v.asp?gogozo.

David F. Chang, MD, is a clinical professor at the University of California, San Francisco. Dr. Chang donates his consulting fees from Abbott Medical Optics Inc. and Alcon Laboratories, Inc., to Project Vision and the Himalayan Cataract Project. He acknowledged no financial interest in the products or other companies mentioned herein. Dr. Chang may be reached at (650) 948-9123; dceye@earthlink.net.

Prechopping, Torsional Ultrasound, and Centration of the IOL

By Robert J. Cionni, MD

It is hard to believe that cataract-removal technologies can continue to improve, but they do. I have made significant changes during the past year. Here are some of the techniques and technologies that have made me more efficient and improved my outcomes.

PRECHOP

If someone had told me a year ago that I would be prechopping the majority of my cataracts, I would have replied, "Not possible." After observing Alan Crandall, MD, prechop a cataract and the low level of phaco energy needed, I thought I would give the technique a try. I now prechop all cataracts up to grade 3. After capsulorhexis and hydrodissection, I rotate the cataract with the Chang hydrodissection cannula (Katena Products, Inc., Denville, NJ). After embedding the Akahoshi Prechopper (ASICO LLC, Westmont, IL) into the far third of the lens and waiting 1 second to allow it to settle into place, I open the instrument's blades to bisect the lens. I then use the chopper to rotate the lens 90° and apply the same maneuver. I perform this rotation-and-divide maneuver a total of four times until all four quadrants are separated. Next, I begin phacoemulsification in quadrant-removal mode. The quadrant's "shoulder" is freed first or, alternatively, the apex. After the first quadrant's removal, the rest free up easily for emulsification.

TORSIONAL ULTRASOUND

Ozil Intelligent Phaco (IP) software (Alcon Laboratories, Inc., Fort Worth, TX) has markedly improved my ability to safely and efficiently remove cataracts. The Infiniti Vision System (Alcon Laboratories, Inc.) had a remarkable ability to decrease chatter and improve followability and efficiency, but the platform has become even better with its Ozil IP. My first experience with the software demonstrated as impressive an improvement as did my first experience with torsional ultrasound—less chatter and unsurpassed followability. Since the introduction of torsional ultrasound, many surgeons have blended longitudinal and torsional ultrasound for dense cataracts in order to prevent clogging that can slow down phacoemulsification. This combined approach wastes energy, however, especially when the cataract is not rock hard. Working in the background, Ozil IP applies longitudinal energy only when an occlusion is imminent. Now that I have become used to the software, I feel like I am struggling when I have to use a machine without it.

CENTRATION OF THE IOL

The advent of aspheric IOLs has improved visual outcomes by decreasing spherical aberrations, but these and other premium lenses demand accurate centration, especially in eyes with large pupils. The most important factor in achieving the targeted refraction is for the capsulorhexis to be slightly smaller than the IOL's optic and to cover the optic's edge for 360°. To ensure that an IOL is well centered with proper coverage of its rim, I have begun using a Capsulorhexis Marker (Mastel Precision, Inc., Rapid City, SD) at the start of each case.

I usually begin with an undilated pupil in the OR and ask the patient while he or she is lying on the OR bed to stare directly at the microscope's light. I then place the marking ring on the cornea with the crosshairs centered in the Purkinje image within the undilated pupil. The ring is 5.75 mm in diameter and leaves a faint epithelial imprint to guide the capsulorhexis. I perform an intracameral injection of 1% MPF lidocaine with 1:25,000 epinephrine to dilate the pupil. This mixture delivers about 75% maximal dilation in less than 10 seconds. I then begin the capsulorhexis with a goal of "tracing" its path directly under the outline from the Capsulorhexis Marker. The result is a round capsulorhexis measuring about 5 mm that is centered in the visual axis. It is amazing to see how decentered the capsulorhexis appears relative to the pharmacologically dilated pupil. After phacoemulsification and cortical removal, I use the I/A tip to center the IOL in the capsulorhexis. The sticky nature of the single-piece hydrophobic acrylic IOL encourages it to remain where the surgeon positions it.

A video demonstration of these technical pearls is available at http://eyetube.net/v.asp?gotaro.

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Positioning Toric IOLs

By Uday Devgan, MD

Alignment at the correct meridian and centration are essential to the successful implantation of toric IOLs.

MARKING THE STEEP CORNEAL AXIS

Surgeons must accurately mark the steep corneal axis in order to properly align the toric IOL. This step is best accomplished while the patient is seated upright to avoid cyclotorsion of the eye, which happens in the supine position on the OR bed. One option is to use a surgical marking pen at the superior and inferior 90° meridians (the 12- and 6-o'clock positions) before surgery and then to mark the steep corneal axis intraoper-

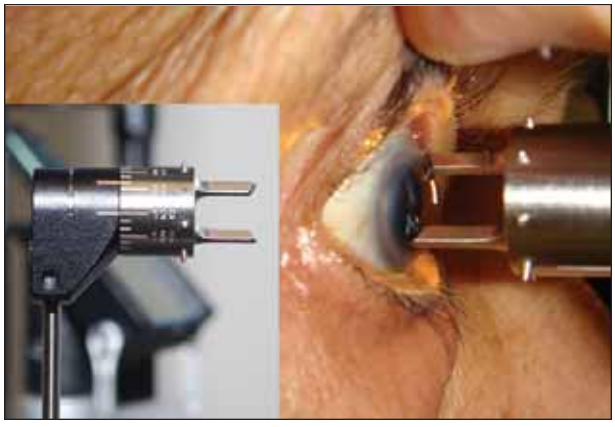

Figure 1. With the Devgan Axis Marker, the author marks the steep corneal axis at the slit-lamp microscope prior to surgery. He enhances the epithelial marks by using a cystotome to puncture the anterior stroma to create marks that are visible at the time of surgery via the red reflex of the operating microscope.

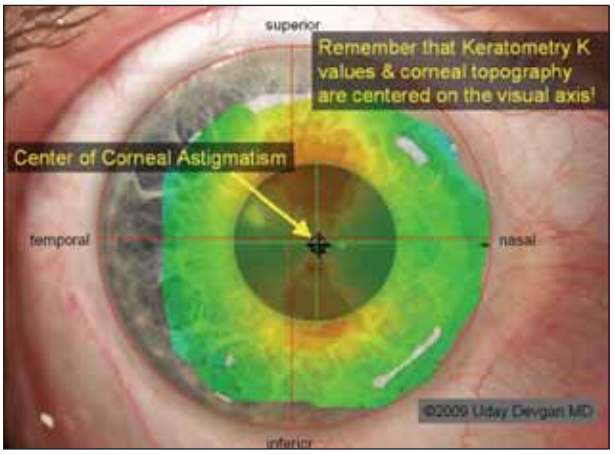

Figure 2. The corneal astigmatism is centered with the patient's visual axis, and the center of the cornea (intersection of dotted red lines) is not the same as the center of the pupil (intersection of the dotted green lines). Centration of the toric IOL in the center of the patient's visual axis—which is closer to the middle of the pupil than the center of the cornea—is important for optimal visual results.

Figure 3. The author places the AcrySof IQ Toric lens (model SN6AT5) in the capsular bag and orients it to the correct axis. The alignment dots of the IOL are at the same axis as the corneal stromal puncture marks, all of which are within the highlighted yellow box. The edge of the capsulorhexis (visible inferiorly) securely overlaps the optic's edge to help ensure stability of the toric IOL.

atively with a Mendez gauge. Doing so will mark the correct meridian of astigmatism, centered on the cornea. The patient's astigmatism, pupil, and visual axis are not the center of the cornea; rather, they are all somewhat nasally displaced.

To center the toric IOL in the pupil, closer to the patient's visual axis and the center of the astigmatism as seen on the corneal topography, I prefer a technique in which I mark the actual steep axis before surgery while the patient is seated at the slit-lamp microscope. The Devgan Axis Marker (Accutome, Inc., Malvern, PA) is placed in the applanation tonometer holder and rotated to the exact axis to be marked. Looking through the hollow core of the marker helps me to center the marks on the pupillary axis. I use gentle but firm pressure to score the epithelium (Figure 1). For more lasting alignment marks, which can be seen many days later, Byron Stratas, MD, uses a cystotome to puncture the corneal stroma.

POSITIONING THE TORIC IOL

It is important to make the capsulorhexis smaller than the optic to securely hold the toric IOL in position during the postoperative period. The lens should be placed just short of the mark while viscoelastic is in the eye to make it easier to rotate the IOL clockwise. After removing all viscoelastic from behind the toric IOL, I nudge the IOL into the correct alignment while keeping the eye inflated with the I/A probe. Owing to the tacky nature of the hydrophobic acrylic toric IOLs (AcrySof Toric and AcrySof IQ Toric lenses; Alcon Laboratories, Inc., Fort Worth, TX), a light tapping motion helps to secure the IOL in position against the posterior capsule.

To ensure correct alignment, I simply align the toric IOL's orienting dots with the corneal stromal puncture marks (Figures 2 and 3). During the first postoperative examination, the surgeon can confirm the IOL's position by noting this same alignment. If the toric IOL is rotated or misaligned, it should be repositioned in a timely manner.

CONCLUSION

Correcting astigmatism at the time of cataract surgery with toric IOLs provides patients with better visual outcomes. The keys to success are marking the axis at the steep corneal meridian and ensuring that the IOL is aligned and centered.

A video demonstration of these technical pearls is available at http://eyetube.net/v.asp?kugegu.

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Avoiding Complications in Routine Surgery

By Steven H. Dewey, MD

I love complex cataract surgery, but I despise complications (ie, the difference between what I knew before the procedure and what I found out as I executed the surgery). I believe the best defense is to expect complexities that cannot be anticipated. How many times after unexpectedly complicated surgery has a patient suddenly remembered a snowball injury from childhood or his or her past use of Flomax (Boehringer Ingelheim Pharmaceuticals, Inc., Ridgefield, CT)? This article shares four keys to how I keep routine surgeries routine.

No. 1. Lose the Sharp Edge on the Phaco Needle

The real rule is never to touch the capsule during phacoemulsification, but that rule is destined to be broken. I will not perform cataract surgery with a sharp needle except in rare circumstances. Every surgeon I have ever spoken with has described a case in which a sharp needle interacted with the capsule and the capsule survived. I have as well, but I cannot be confident that a sharp edge will not cut anything it touches.

The Dewey Radius phaco tip (MicroSurgical Technology, Redmond, WA) has a safety profile that significantly reduces the likelihood of capsular damage.[1] This advantage holds whether the tip touches the edge of the capsulorhexis upon entry or the patient sneezes as the last quadrant clears the needle, causing the capsule to follow into the lumen and become exposed to the forces of vacuum and ultrasound. Rounding the edge of the phaco needle requires no changes on the part of the surgeon using a current-generation phaco platform. The Infiniti Vision System (Alcon Laboratories, Inc., Fort Worth, TX), Stellaris Vision Enhancement System (Bausch & Lomb, Rochester, NY), and Whitestar Signature System (Abbott Medical Optics Inc., Santa Ana, CA) have ultrasonic modifications and fluidic controls that make a sharp edge obsolete. For sculpting and very dense nuclei, the rounded phaco tip will be somewhat less efficient, but I feel its safety profile more than makes up for this difference.

On a related note, I have abandoned 19-gauge needles for 20-gauge bent needles with a 30º bevel. I have had the good fortune to try everything from 700-µm tips to 19-gauge needles in virtually every bent, straight, and beveled configuration. A 19-gauge needle likely uses less power per case, but interestingly, surgery is not quicker. The unstable chamber that ensues makes this a less useful routine needle. Smaller-gauge needles restrict flow, which can substantially improve the chamber's stability. Not surprisingly, my limited experience with the 700-µm needles has been favorable.

No. 2. Assume Every Patient Is Taking Flomax

I do not really. As the list of drugs associated with intraoperative floppy iris syndrome grows,[2] however, I have exchanged preoperative phenylephrine for intracameral epinephrine. This month, I had not one but two male patients who began Flomax therapy between the time of their surgical evaluation and surgery. Epinephrine needs to be supplemented by topical tropicamide preoperatively,[3] but I mix the preservative-free epinephrine in a stronger concentration (50:50 with 1% unpreserved lidocaine). The dilation is not as great in magnitude as with preoperative topical drops given sufficient time for application. The pupil rarely fails to reach 6 mm, however, and the iris' tone is much more conducive to a routine surgery.

Anecdotally, I did not have routine success with epinephrine until I stopped using phenylepherine. In theory, the weaker phenylephrine will compete with the alpha-andrenergic receptors and block the effect of epinephrine. In my experience, all preoperative atropine seems to do is worsen the urinary obstruction.

No. 3. Improve the Consistency of the Capsulorhexis

Properly sized and centered, an intact capsulorhexis is the last best defense against an unwanted outcome. The optic can be captured in the capsulorhexis in the case of a lost posterior capsule. This configuration will reduce the likelihood of posterior capsular opacification. An aberrantly sized and shaped capsulorhexis will not consistently provide these benefits.

If the edge of the capsule does not consistently (ie, at least 85% of the time) cover the edge of the optic, I would suggest considering a change in how one performs this step. One might find a template such as an optical zone marker or Siepser forceps (MicroSurgical Technology), switch from a bent needle to a forceps or vice versa, or change to a dispersive (my preference) or a super-cohesive viscoelastic (an excellent alternative in my estimation).

No. 4. Avoid Contact Between an Active I/A Tip and the Posterior Capsule

I use a 26-gauge McIntyre-Binkhorst J-cannula on a luer-lock syringe to displace cortex with irrigation prior to using the I/A handpiece. In this way, the cortex can be removed from the anterior chamber, or many times, the cortex will simply flow out of the capsule and the incision.

Video demonstrations of these technical pearls are available at http://eyetube.net/v.asp?frosup and http://eyetube.net/v.asp?moruvi.

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1. Olson R. Phacoemulsification efficacy: systems, ultrasound variations and parameters. Paper presented at: XXVII Congress of the ESCRS; September 15, 2009; Barcelona, Spain.
2. Fine IH, Dworetzky J, Hoffman RS, Packer M. Range of drugs associated with IFIS. *J Cataract Refract Surg.* 2009;35:202.
3. Myers WG, Shugar JK. Optimizing the intracameral dilation regiment for cataract surgery: prospective randomized comparison of 2 solutions. *J Cataract Refract Surg.* 2009;35(2):273-276.

Enhancing My Practice Through Video

By Jason Jones, MD

Video display and recording have become one of the most useful elements of my surgery. I feel the time that I devote to video in my practice is a valuable investment in my patients' results, my staff's involvement in patients' care, and my development as a surgeon.

PREOPERATIVELY

Occasionally, a patient in my clinic—whether a health care professional or layperson—has questions about how cataract surgery is performed. If a picture is worth a thousand words, video must have value in the tens or hundreds of thousands. On my iPhone (Apple Inc., Cupertino, CA), I have several surgical videos that I can share with these individuals. Most often, these patients have an interest in a particular part of surgery, which I can easily select from the complete, edited videos I have on my iPhone. Also, if a patient is making a return trip to the OR, I find it helpful to review the original surgery the night before the procedure.

INTRAOPERATIVELY

Video monitors in both of my ORs allow my staff to know the stage of surgery. Because video is linked between the two ORs, the staff in the next room can anticipate my arrival and have the patient ready. Better yet, video engages my staff in the surgical process. I take time to educate them with video. They can then understand what each step of the surgery accomplishes. Moreover, because they are able to view the surgery as it happens, staff members can better anticipate both the routine and special needs of individual patients. No longer does the Chang cannula (Mastel Precision, Inc., Rapid City, SD) just represent hydrodissection; now, my staff understands that hydrodissection allows nuclear rotation, which prepares the nucleus for phacoemulsification. Special circumstances further enhance my staff's knowledge base (eg, cases illustrating why I do not perform hydrodissection in a case of posterior polar cataract or how I manage to implant the intended IOL successfully despite a broken capsule).

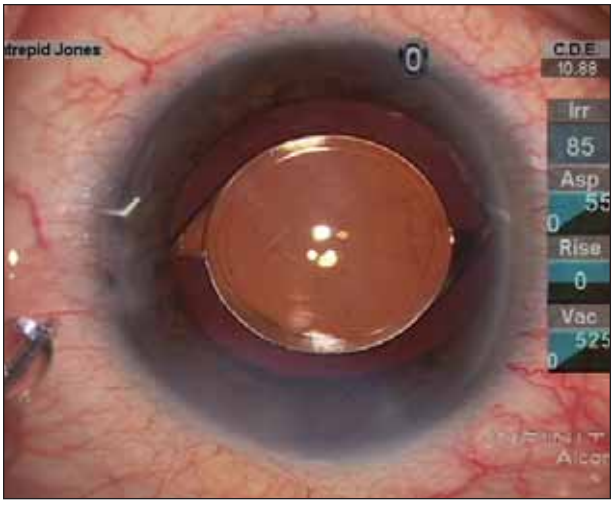

Figure 1. An example of a successful continuous curvilinear capsulorhexis.

POSTOPERATIVELY

I find reviewing my surgeries cathartic. I can physically and mentally distance myself from the heat of the battle, and if a complication occurred, I can analyze the events of surgery calmly and thoroughly. Reviewing even routine cases has improved many aspects of my surgical technique, and I feel that it has allowed me to become a better surgeon. When I review the video, I often realize my recall of events is neither precise nor complete. Video allows me to relive decisions that led to the final outcome.

As Alan Crandall, MD, reminded me during my residency, "Neither the video camera nor I can see where you are working." Maintaining proper focus and alignment for the video has become second nature, and it allows me to record a more worthwhile video that I may wish to share with colleagues. When I am testing a new instrument or technique, video permits a comparative review of the new

element so that I can understand how some events happen and habits form, both good and bad.

By observing my surgeries, I realized that I did not always achieve an ideal continuous curvilinear capsulorhexis. I want a basically round, centered, and appropriately sized (0.5 to 1.0 mm smaller than the optic) capsulorhexis with 360º anterior capsular overlap to allow my patients to get the most from their surgery (Figure 1). A properly formed capsulorhexis provides axial IOL stability (ie, improved refractive predictability), improves centration of the IOL, reduces the formation of posterior capsular opacification, facilitates IOL exchange, and allows optic-capture techniques of IOL fixation in the event of posterior capsular rupture.

CONCLUSION

Video documentation of my surgery has been invaluable to my development as a surgeon. It helps my staff and me to improve outcomes, increase OR efficiency, and enhance patient-staff interaction.

A video demonstration of the author's technique of capsulorhexis and some of its benefits is available at http://eyetube.net/v.asp?zileso.

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Advice for Easier Surgery and More Comfortable Patients

By Erik L. Mertens, MD, FEBOphth

The techniques of modern cataract surgery are well established, but small differences in phaco steps exist among surgeons. This article shares some tips that have made my life easier and increased my patients' comfort.

BEFORE SURGERY

If necessary, I initiate treatment of meibomian gland disease and blepharitis at the preoperative visit. I instruct patients not to wear any cosmetics on the day before and the day of surgery.

One-and-a-half hours before surgery, the operative eye receives one drop of lomefloxacin 3 mg/mL, and dosing is repeated every 30 minutes until surgery. The eye is anesthetized with three drops of preservative-free oxybuprocaine hydrochloride 0.4% in 2- to 4-minute intervals.

DURING SURGERY

In the OR, a nurse applies povidone-iodine 10% to the patient's eyelids and drapes the patient. After covering and isolating the eyelids with Tegaderm (3M, St. Paul, MN), I insert a lid speculum.

Since 1999, I have used topical anesthesia for almost all of my cataract cases. I reserve general anesthesia for rare situations involving patients who are extremely anxious or who cannot cooperate during surgery due to their mental state.

Three minutes before making the corneal incision, I apply povidone-iodine 5% to the ocular surface. With a 1-mm paracentesis knife, I create two sideport incisions without grasping the conjunctiva. This method greatly enhances my patients' comfort, because the conjunctiva remains sensitive to pain. Another advantage of this approach is the avoidance of subconjunctival hemorrhages, which are bothersome to both the patient and me. Due to the 90º angulation between the knife's blade and its handle, I am easily able to create the sideport incisions safely (Figure 1), without risk of perforating the anterior capsule. To reduce patients' discomfort during manipulation of the ciliary body, I perform an intracameral injection of preservative-free 1% lidocaine hydrochloride solution[1,2] through one of the sideport incisions.

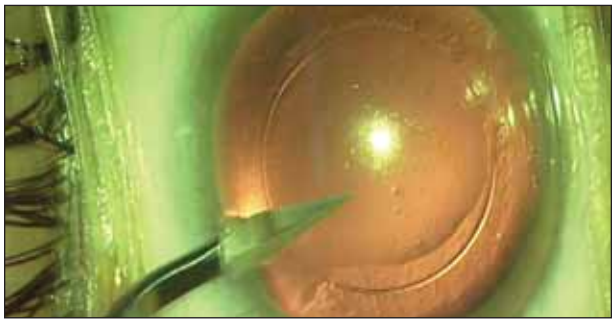

Figure 1. The 90º angled metal knife safely creates a 1-mm paracentesis.

Using my left hand, I instill viscoelastic through the paracentesis (Figure 2). After filling the anterior chamber, I leave the injection cannula (Figure 3) positioned in the paracentesis and create the main 2.2-mm clear corneal incision with my right hand. I am thus able to stabilize the eye without using a second instrument to grasp the conjunctiva or crushing the limbus. I find that patients' comfort is much greater, and extra trauma to the conjunctiva or corneal epithelium is avoided.

To create a well-centered, perfectly sized capsulorhexis in every case, I recommend pressing a 5.0-, 5.5-, or 6.0-mm marker onto the corneal epithelium to create a circular mark (Figure 4) that will last throughout surgery. Con-

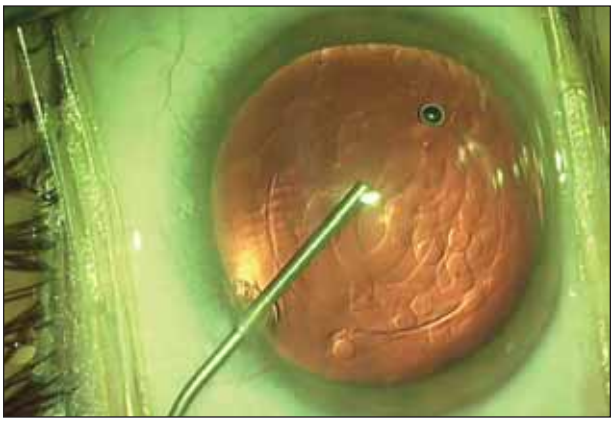

Figure 2. The surgeon injects viscoelastic into the anterior chamber through the paracentesis.

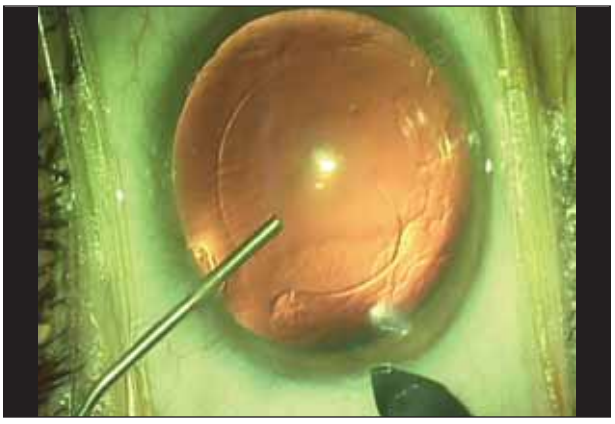

Figure 3. Positioned in the paracentesis, the injection cannula stabilizes the eye while the surgeon creates the main clear corneal incision.

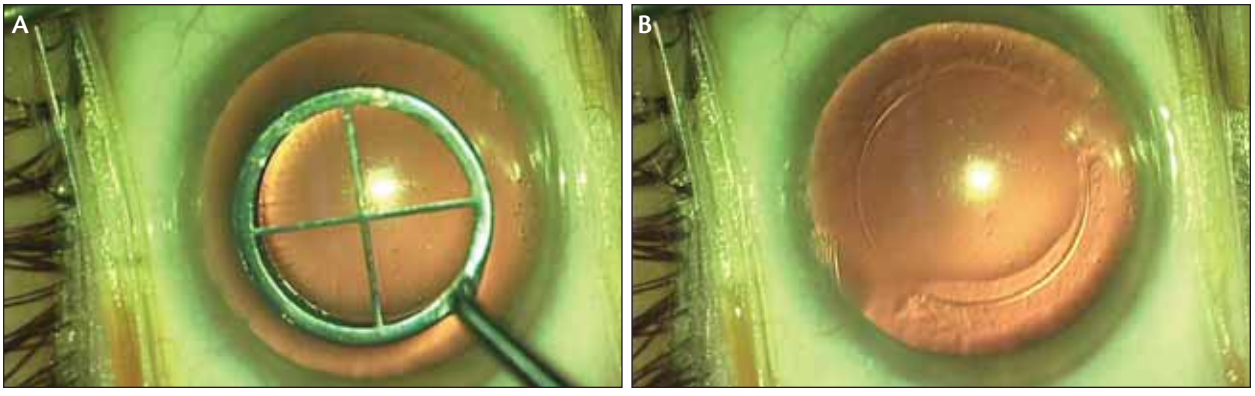

Figure 4. The surgeon presses a 6-mm marker onto the corneal epithelium (A) and creates a circular indentation to guide the capsulorhexis (B).

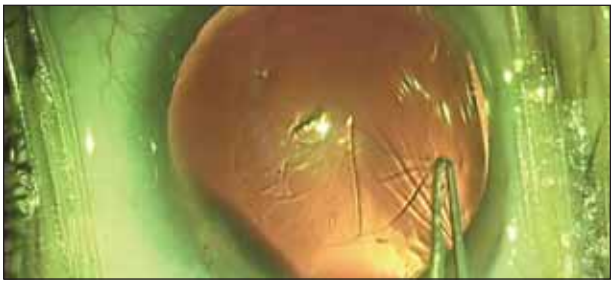

Figure 5. The surgeon centers the capsulorhexis by using the circular indentation marks on the cornea.

tinuously checking the size and centration of the capsulorhexis and comparing it with the circular epithelial indentation guides me during the creation of the anterior capsulorhexis (Figure 5). These easy, inexpensive steps have allowed me to perfect my technique, which is of the utmost importance with premium IOLs.

At the end of surgery, I instill 5 to10 mL of vancomycin 6 mg/mL into the anterior chamber. I then administer one drop of lomefloxacin 3 mg/mL and a Terra-Cortril suspension (hydrocortisone acetate 17 mg, oxytetracycline 5.7 mg, polymyxin B 11,400 IE/g; Pfizer Inc., New York, NY).

AFTER SURGERY

Postoperative medications include lomefloxacin 3.0 mg/mL four times a day for 1 week starting on the day of surgery and tapered to one drop per day at 4 weeks postoperatively. This regimen has significantly reduced the incidence of postoperative endophthalmitis in my practice.

A video demonstration of these technical pearls is available at http://eyetube.net/v.asp?robimu.

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1. Lofoco G, Ciucci F, Bardocci A, Quercioli P. Efficacy of topical plus intracameral anesthesia for cataract surgery in high myopia: randomized controlled trial. *J Cataract Refract Surg.* 2008;34(10):1664-1668.
2. Ezra D, Nambiar A, Allan B, Supplementary intracameral lidocaine for phacoemulsification under topical anesthesia. A meta-analysis of randomized controlled trials. *Ophthalmology.* 2008;115(3):455-487.

Burst Hemiflip

By R. Bruce Wallace III, MD

Two factors in modern lens surgery have led me to approach phacoemulsification in a different way than standard chop or quadrant divide and conquer. The first is the probability that the popularity of refractive lens surgery will grow as aging baby boomers likely become better candidates for lenticular refractive than corneal refractive procedures. Lens surgery on younger (and softer) nuclei means that regular chopping will not work as reliably. I needed a better way to remove a 1+ to 2+ nuclear sclerotic cataract and still to be able to perform the same procedure on 3+ to 4+ nuclei. In that way, when performing refractive lens surgery on patients with very high expectations, I would not have to abandon my usual surgical technique and comfort zone.

The second factor motivating my change is the recent improvements in phacofluidics with more responsive connectivity between the phaco handpiece and the machine. Surgeons now enjoy much more stable anterior chambers and more efficient nuclear disassembly and removal. I am a big fan of the newer venturi-like phaco technology found on the Stellaris Vision Enhancement System (Bausch & Lomb, Rochester, NY) and, more recently, the Whitestar Signature System (Abbott Medical Optics Inc., Santa Ana, CA). The venturi-style fluidics are simply quicker and more reliable, allowing for stable chambers at high vacuum levels.

This article details how I have developed and currently use the burst hemiflip approach to phacoemulsification.

THE ORIGINS OF BURST HEMIFLIP

My current technique was initiated more than 10 years ago after I visited David Brown, MD, in Fort Myers, Florida. Dr. Brown is the most efficient lens surgeon I have ever had the pleasure to observe. At the time, he was performing full nuclear flips with remarkable control of rapid nuclear removal. I immediately adopted his technique, but two challenges emerged compared with standard phaco chop or divide-and-conquer phacoemulsification: (1) the necessity for a larger-diameter anterior capsulotomy (approximately 7 mm) and (2) a closer proximity between phacoemulsification and the corneal endothelium.

On various phaco machines, I began to work to modify Dr. Brown's method without significantly compromising its efficiency. To me, the easiest option was simply to bisect the nucleus first and then remove each half through a 5-mm capsulotomy. At first, I had difficulty, because the phacofluidics at the time were not responsive or "tight" enough to hold an entire heminucleus and pull it forward to emulsify. As better equipment became available (first, the Sovereign system with breakthrough variable micropulsing vibration of the tip), I learned that I could regularly perform this phaco procedure without resorting to chop or quadrant divide. A feature on the early Sovereign was the burst mode, so I called this technique *burst hemiflip*.

THE STEPS

No. 1. Initial Nuclear Groove and Separation

As with stop-and-chop phacoemulsification, the groove is deep and extends close to the lens equator. Multiple spins and grooving are sometimes required for hard nuclei. A complete separation of the halves is important. If I am unable to bring the first half into the pupillary space, it is usually because the separation is incomplete.

No. 2. Attraction of the First Nuclear Half Into the Iris Plane and Emulsification

With the latest venturi phacofluidics, I can complete these steps simply by impaling the top one-third of the split nuclear half and, in position 2, pulling the material up to emulsify. Chopping is an option for hard nuclei but is rarely needed. In many ways, I am really just getting out of the way of the phaco machine and letting it do its job. On occasion, the first nuclear half will not come forward. In these instances, I have learned to tease a corner of the nuclear half up and then to impale it at that corner. An instrument I designed with Storz, the Wallace Guardian (Bausch & Lomb), helps with this maneuver.

No. 3. Removal of the Second Nuclear Half

With more room now available, removing the other nuclear half is relatively straightforward. I depend on the Wallace Guardian (a dull-ended chopper) to protect the posterior capsule as I emulsify the last portion of the nucleus.

CONCLUSION

Burst hemiflip is easy to learn. If the surgeon cannot pull the first nuclear half forward safely, he or she can always complete the procedure by means of whatever technique is most familiar to him or her. ■

A video demonstration of these technical pearls is available at http://eyetube.net/v.asp?kiripa.

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