Sponsored by Alcon Laboratories, Inc.

Efficient Surgery: It's About More Than Just Speed

The right tools and techniques will improve surgical efficiency and safety.

This article continues a series that explores advanced cataract techniques and technologies. Here, Alan S. Crandall, MD, of Salt Lake City, Utah, describes his surgical approach to eyes that present a high risk for complications. To watch related videos, visit www.Eyetube.net and type the keyword "Intrepid" in the search bar.

CATARACT SURGERY IN THE HIGH-RISK EYE

BY ALAN S. CRANDALL, MD

Surgical efficiency is often regarded as a measure of how quickly we surgeons can get inside an eye, remove the cataract, and close the case. We may also consider how quietly we can execute the maneuvers as well. Efficient movements within the surgical field are more likely to affect the safety of an outcome than the total time we are moving around the anterior chamber. In this article, I present a recent case to demonstrate that using the right tools and techniques increases surgical efficiency, even in potentially complicated cataract cases, and how this increased efficiency had a positive effect on the safety of the procedure.

CASE

Background

A 40-year-old male patient previously diagnosed with diabetes presented with a grade 4 posterior subcapsular and opalescent cataract. He also had a prescription for tamsulosin hydrochloride (Flomax*; Boehringer Ingelheim) for undisclosed reasons. The young age of this patient is not altogether surprising, because patients with diabetes tend to present earlier for cataract surgery compared with the general population, depending on the level of their blood sugar control.

The Capsulorhexis and Preparing the Nucleus

Another issue related the history of diabetes is that it can lead to insufficient pupillary dilation, and that was certainly true in this case. I used DisCoVisc OVD (Alcon Laboratories, Inc.) to obtain the dilation necessary to address the cataract. After this step, I made a 2.2-mm incision to enter the anterior chamber.

I used a microcapsulorhexis forceps to create a 5.5-mm capsulorhexis and a Chang Hydrodissection Cannula (Katena Eye Instruments) on a 3-mL syringe for hydrodissection. I like the Chang cannula because it is disposable, which reduces the potential for infection. With this hard, dense nucleus, I opted to use the new UltraChopper tip on the OZil torsional handpiece (both manufactured by Alcon Laboratories, Inc.). Because it can vibrate at 32,000 cycles per second in both a torsional and longitudinal motion, the UltraChopper tip enables me to dissect even the densest and most brunescent cataract into quadrants (Figure 1).

I prefer to use the UltraChopper tip in all cases of hard cataracts, as well as for patients with pseudoexfoliation syndrome and whenever I want to debulk a cataract. In my hands, this device dramatically reduces zonular stress, which is of primary importance in complicated cases such as this one. I use the Ultrachopper tip to divide the nucleus before inserting an Akahoshi prechopper to separate the quadrants. With the lens prepared in this manner, I am ready to proceed to phacoemulsification.

Managing Potential Complications

In addition to having a dense cataract, this diabetic patient also had some zonular weakness in this eye, although not enough to warrant the use of iris hooks.

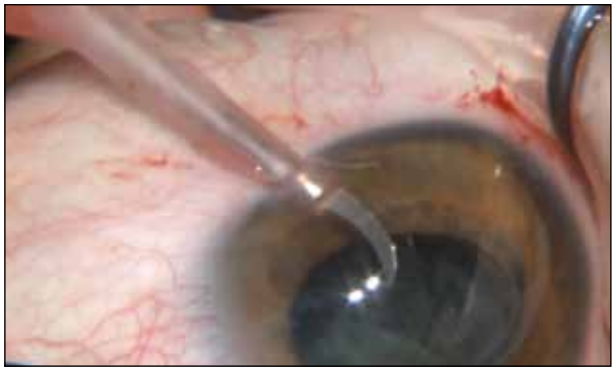

Figure 1. The UltraChopper tip is used to hemisect the lens with little stress on the zonules. If needed, these hemisections can be extracted without rotation.

For important safety information about Alcon products, please see page 4

** Trademarks are property of their respective companies.*

Still, this scenario presented the potential for laxity within the capsular bag, which could have led to zonule breakage, vitreous prolapse, lens subluxation, and other intraoperative complications. In my experience, diabetic eyes present with conditions similar to intraoperative floppy iris syndrome, as the pupil is slightly floppy compared with the average eye.

In this case, the use of the new INTREPID Plus FMS, which is part of the INTREPID Micro-coaxial system (Alcon Laboratories, Inc.), helped minimize the risks associated with the hard lens and zonular laxity. The INTREPID Plus FMS tubing has low compliance and has a much-improved ergonomic feel. Low-compliant tubing helps reduce surge that may accompany an occlusion break during the case. For phacoemulsification and I/A, I used the new 30° KELMAN Mini Tip. The Mini Tip is a non-flared tip designed for efficiency in microcoaxial surgery, and as this surgery demonstrated, there was high efficiency and minimal repulsion of lens fragments during phacoemulsification and aspiration (Figure 2).

Because I use OZil Intelligent Phaco (IP) software (Alcon Laboratories, Inc.), lens fragments stay right at the tip of the phaco handpiece. The OZil IP technology administers pulses of longitudinal ultrasound whenever the preset vacuum threshold is met, thereby repositioning the nuclear fragment and lowering the potential for complete occlusion. During this particular case, the IP activated a few times when the tip exceeded my personal setting of 95% of vacuum limit. However, I did not have to move the tip at all while adjusting the torsional energy. These factors combine to create a system with increased efficiency (because the surgeon is not chasing fragments around the chamber), less energy expenditure to the eye (because of the complimentary and efficient cutting action in the handpiece), as well as potentially safer surgery (in the form of reduced repulsion, surge, and energy expenditure).

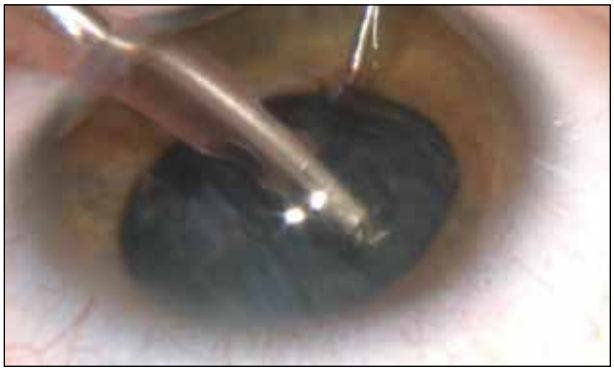

Figure 2. The combination of torsional energy, OZil IP software, and the INTREPID Plus FMS means that lens fragments stay right at the tip, improving efficiency and reducing repulsion. In this case, the author used a 30° KELMAN Mini Tip for extracting nuclear fragments.

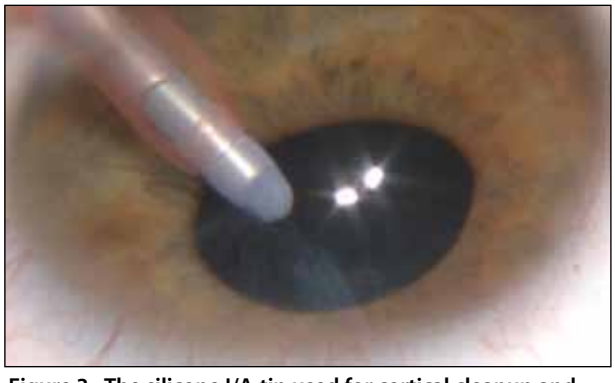

Figure 3. The silicone I/A tip used for cortical cleanup and polishing is gentle on the eye, while the INTREPID Plus FMS provides the fluidics needed to maintain a quiet and stable anterior chamber.

Maintaining the Chamber

Another advantage of the INTREPID Plus FMS is that it mitigates the risk of the chamber's shallowing, which was particularly beneficial in this eye with zonular laxity. I was able to stay right above the iris plane, because I was not worried about lens fragments moving around the chamber.

Achieving a stable chamber, although important in all cataract surgery, was additionally important in this eye because of the patient's prior use of tamsulosin, which is known to increase to the risk for intraoperative floppy iris syndrome. The risk associated with tamsulosin is not dose-dependent; any prior use can lead to iris complications.[1-3] In this particular case, my bottle height was 105 cm, the aspiration flow rate was fixed at 33 mL/min, and I kept the vacuum controlled. These are typical settings for me and did not require adjustment when moving to the new INTREPID Plus FMS.

A quiet anterior chamber, including careful control of fluidics, helped to reduce the potential for iris prolapse or incarceration. Because I was not worried about shallowing of the anterior chamber in this eye, I was also able to keep the phaco tip away from the endothelium and the capsule. Thus, as an additional benefit, there was a lower risk of vitreous prolapse through a ruptured capsule, and the patient had a better chance for postoperative healing, because the endothelium was undisturbed.

Cortical Removal

A unique feature of the INTREPID Plus system is that you do not really have to change your parameters or

technique when performing cortical cleanup and polishing. My settings stayed about the same, and I used a silicone I/A tip in this case to gently remove cortical fragments from the posterior subcapsular space (Figure 3). This combination adds up to a very stable and quiet anterior chamber.

During cortical removal, many surgeons prefer to attract a piece of nuclear material to the center of the capsule and vacuum there. My preferred technique is to strip material from around the sides, thereby decreasing the amount of pull from the center and protecting the zonules. This modification improves efficiency and allows me to easily remove the tip when the case is complete.

Inserting the IOL and Closing the Case

All the work to this point has been focused around creating a quiet and stable surgical field. The INTREPID system sets the stage for the surgeon to efficiently and safely enter the eye and evacuate the opacified lens. At this point, inserting the IOL and closing the case should be fairly routine because of all the previous steps. One step I take care to perform is to clean the wound thoroughly with a balanced salt solution prior to removing the viscoelastic, just to make sure it is clear of any cortical fragments. Another thing to be aware of in an eye like this with a small pupil—especially if a 1-piece IOL is to be used—is to be sure that the folded lens is completely in the bag before setting its final position.

CONCLUSION

One must be prepared for potential complications in any situation, but there must be a heightened awareness when patients present with unusual findings. In this case, the young age would usually be associated with a relatively soft cataract. The hardness was potentially associated with capsular or zonular problems. The new INTREPID Plus FMS, OZil IP torsional phaco, and the UltraChopper tip helped to decrease zonular stress. Capsular support systems can be used to further stabilize the complex for safe nuclear removal. ■

Alan S. Crandall, MD, is a professor, the senior vice chair of ophthalmology and visual sciences, and the director of glaucoma and cataract for the John A. Moran Eye Center at the University of Utah in Salt Lake City. He is a consultant to Alcon Laboratories, Inc. Dr. Crandall may be reached at (801) 585-3071; alan.crandall@hsc.utah.edu.

1. Schwinn D, Afshari N. 1-Adrenergic receptor antagonists and the iris: new mechanistic insights into floppy iris syndrome. *Surv Ophthalmol*. 2006;51(5):501–512.
2. Pärssinen O, Leppänen E, Keski-Rahkonen P, et al. Influence of tamsulosin on the iris and its implications for cataract surgery. *Invest Ophthalmol Vis Sci*. 2006;47(9): 3766–3771.
3. Cheung C, Awan M, Sandramouli S. Prevalence and clinical findings of tamsulosin-associated intraoperative floppy-iris syndrome. *J Cataract Refract Surg*. 2006;32(8): 1336–1339.

For important safety information about Alcon products, please see page 4

INFINITI® Vision System
CAUTION: Federal law restricts this device to sale by, or on the order of, a physician.
As part of a properly maintained surgical environment, it is recommended that a backup IOL Injector be made available in the event the AutoSert® IOL Injector Handpiece does not perform as expected.

INDICATION: The INFINITI® Vision System is indicated for emulsification, separation, and removal of cataracts, the removal of residual cortical material and lens epithelial cells, vitreous aspiration and cutting associated with anterior vitrectomy, bipolar coagulation, and intraocular lens injection. The INTREPID® AutoSert® IOL Injector Handpiece is intended to deliver qualified AcrySof® intraocular lenses into the eye following cataract removal.

The following system modalities additionally support the described indications:

- Ultrasound with UltraChopper® Tip achieves the functionality of cataract separation.

- AquaLase® Liquefracture Device achieves the functionality for removal of residual cortical material and lens epithelial cells.

- The INTREPID® AutoSert® IOL Injector Handpiece achieves the functionality of injection of intraocular lenses. The INTREPID® AutoSert® IOL Injector Handpiece is indicated for use with AcrySof® lenses SN60WF, SN6AD1, SN6AT3 through SN6AT9, as well as approved AcrySof® lenses that are specifically indicated for use with this inserter, as indicated in the approved labeling of those lenses.

WARNINGS: Appropriate use of INFINITI® Vision System parameters and accessories is important for successful procedures. Use of low vacuum limits, low flow rates, low bottle heights, high power settings, extended power usage, power usage during occlusion conditions (beeping tones), failure to sufficiently aspirate viscoelastic prior to using power, excessively tight incisions, and combinations of the above actions may result in significant temperature increases at incision site and inside the eye, and lead to severe thermal eye tissue damage.
Adjusting aspiration rates or vacuum limits above the preset values, or lowering the IV pole below the preset values, may cause chamber shallowing or collapse which may result in patient injury.
When filling handpiece test chamber, if stream of fluid is weak or absent, good fluidics response will be jeopardized. Good clinical practice dictates the testing for adequate irrigation and aspiration flow prior to entering the eye.

Ensure that tubings are not occluded or pinched during any phase of operation.
The consumables used in conjunction with ALCON® instrument products constitute a complete surgical system. Use of consumables and handpieces other than those manufactured by Alcon may affect system performance and create potential hazards.

AEs/COMPLICATIONS: Use of the NeoSoniX®, OZil® torsional, U/S, or AquaLase® handpieces in the absence of irrigation flow and/or in the presence of reduced or lost aspiration flow can cause excessive heating and potential thermal injury to adjacent eye tissues.

ATTENTION: Refer to the directions for use for a complete listing of indications, warnings and precautions.

DisCoVisc® OVD Brief Statement

CAUTION: Federal (USA) law restricts this device to sale by or on the order of a physician.
Description: DisCoVisc® Ophthalmic Viscosurgical Device has an intermediate cohesive/dispersive index (CDI) and can best be described as the first viscous dispersive viscoelastic and is optimized for the entire surgical procedure.

INDICATIONS: DisCoVisc® Ophthalmic Viscosurgical Device is indicated for use during surgery in the anterior segment of the eye. It is designed to create and maintain space, to protect the corneal endothelium and other intraocular tissues and to manipulate tissues during surgery. It may also be used to coat intraocular lenses and instruments during cataract extraction and IOL insertion.

WARNINGS: Failure to follow assembly instructions or use of an alternate cannula may result in cannula detachment and potential patient injury.

PRECAUTIONS: Precautions are limited to those normally associated with the surgical procedure being performed. Although sodium hyaluronate and sodium chondroitin sulfate are highly purified biological polymers, the physician should be aware of the potential allergic risks inherent in the use of any biological material.

ADVERSE REACTIONS: DisCoVisc® Ophthalmic Viscosurgical Device was very well tolerated in nonclinical and clinical studies. A transient rise in intraocular pressure in the early postoperative period may be expected due to the presence of sodium hyaluronate, which has been shown to effect such a rise. It is therefore recommended that DisCoVisc® OVD be removed from the anterior chamber by thorough irrigation and/or aspiration at the end of surgery to minimize postoperative IOP increases. Do not overfill anterior chamber.

ATTENTION: Reference the Physician Labeling/Directions for Use for a complete listing of indications, warnings and precautions.