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Cataract & Refractive Surgery TODAY

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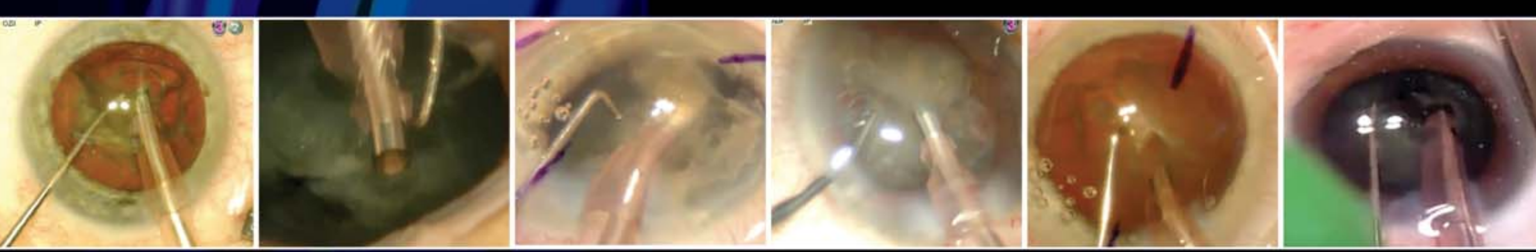
OZil IP in Challenging Cataract Surgery



Using Intelligent Phaco for controlled energy delivery.

Using Intelligent Phaco for Controlled Energy Delivery

Since the advent of OZil Torsional Phacoemulsification on the INFINITI Vision System (Alcon Laboratories, Inc., Fort Worth, TX) in 2006, cataract surgeons have witnessed the benefits of torsional versus longitudinal ultrasound. The primary difference between the two technologies is that OZil Torsional Ultrasound moves the phaco needle in a side-to-side shearing motion that cleaves nuclear material on each pass. Longitudinal ultrasound causes the phaco tip to move forward and backward, not unlike a jackhammer, and only emulsifies material on the forward thrust. This motion generates more repulsion at the tip and reduces followability. Thus, the oscillatory movement of the OZil Torsional phaco tip provides surgeons these two advantages: twice the emulsificative efficiency and less chatter at the tip for improved followability.

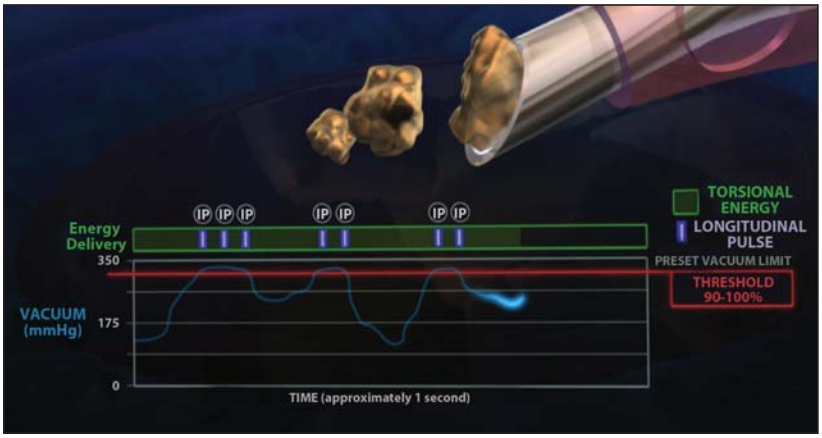


Figure 1. OZil IP helps prevent occlusion of the phaco tip, allowing the INFINITI Vision System's peristaltic pump to continue to draw material in for emulsification.

The latest development in OZil Torsional Technology is Intelligent Phaco (IP), which is an intelligent energy software package. IP senses vacuum levels at the phaco tip (the surgeon presets the activation threshold for IP to his or her preference) and responsively emits pulses of longitudinal ultrasound to keep lens material at the ideal shearing plane (Figure 1). OZil Torsional Ultrasound works best when lenticular material stays in front of the distal end of the phaco tip. As a result, the IP software adds another level of safety to the OZil phaco procedure, allowing surgeons to emulsify the densest cataracts without worrying about fluctuations in IOP and postocclusion surge. In fact, a recent study presented at the October AAO meeting found a lower cumulative dissipated energy and shorter total ultrasound time in surgeries performed with OZil IP versus OZil Torsional Phacoemulsification alone.[1]

This monograph demonstrates how experienced torsional phaco surgeons use OZil IP to manage complex cataract surgery. Corresponding surgical videos are available at www.Eyetube.net. Search the keyword "CRSTnov2010." ■

1. Titiyal JS, Ghatak U, Sharma N. Comparison of phacoemulsification using torsional ultrasound (Ozil) with and without Intelligent Phacoemulsification. Poster presented at: The AAO Annual Meeting; October 18, 2010; Chicago, IL.

Contents

Cataract Surgery With Extreme Positive Pressure

In difficult surgery, the phaco machine's versatility is paramount.

BY ROBERT H. OSHER, MD

An African American female in her 70s presented with congenital ptosis, bilateral chronic uveitis, proptosis, bilateral peripheral iridotomies, and hand-motion visual acuity in both eyes from advanced cataracts. She had extremely tight eyelids as well as intense blepharospasm to the point that I could barely perform the preoperative examination. Systemically, she was morbidly obese with many related medical illnesses. Given these factors, I anticipated and prepared for significant positive pressure during her cataract surgery.

LID RETRACTOR TO CAPSULORHEXIS

In the OR, I encountered enormous resistance to opening her eyelids. I had to abandon my Cionni speculum in favor of the speculum I developed that rotates a very thin wire to pull the lids up off the globe (Crestpoint Management Ltd. [St. Louis, MO] and Storz [Bausch + Lomb, Rochester, NY]). Although this maneuver relieved some pressure off the eyelids, the patient still had an extremely bulbous globe with significant adipose tissue in the orbit.

I began the surgery by making my standard near-square, near-clear corneal incision that was 2.2 mm externally and 2.4 mm internally. The anterior chamber collapsed violently upon the needle's entry, so I injected OVD to deepen the chamber in preparation for attempting the capsulorhexis with a 22-gauge needle (Figure 1). I was careful to make a 5.0- to 5.5-mm capsulorhexis to ensure that the IOL's optic would be less likely to catapult forward out of the bag in response to the positive pressure. The anterior chamber was so volatile that only the OVD was keeping it formed. Next, I gently hydrodissected without losing the OVD; I knew that if I allowed too much OVD to escape, the iris would rush forward.

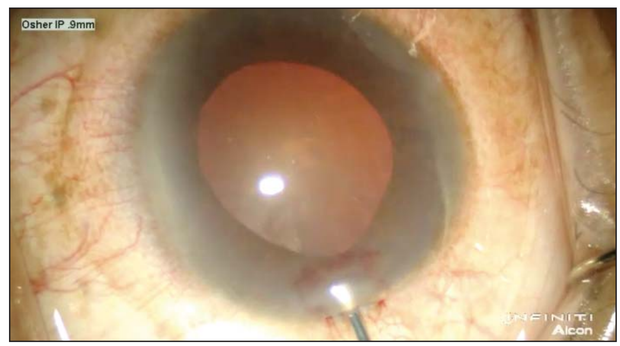


Figure 1. The anterior chamber violently collapses upon the instrument's entry.

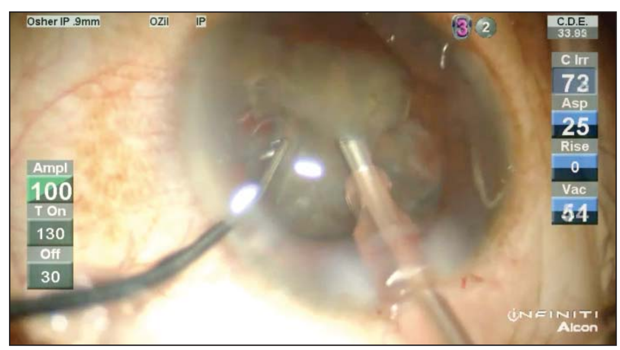


Figure 2. The author places one nuclear quadrant just in front of another in order to prevent capsular damage during emulsification.

NUCLEAR DISASSEMBLY AND PHACOEMULSIFICATION

I inserted a 30°, 0.9-mm, 12° bent OZil phaco tip (Alcon Laboratories, Inc., Fort Worth, TX) of my own design that features a reverse bevel. I turned the bevel downward in an effort to preserve the OVD while I created a divot in the nucleus. With the vacuum limit at 250 mm Hg, I kept the beveled tip against the lens to direct the ultrasonic energy away from the cornea. Then, I rotated the tip bevel-up and lowered the vacuum limit to 40 mm Hg as I sculpted the groove. The low vacuum also prevented the OVD from being aspirated into the trough. I raised the vacuum limit to 180 mm Hg to remove the nuclear quadrants, and again the chamber became volatile and began to collapse.

I withdrew the phaco handpiece and refilled the OVD through the sideport incision. There was no way to get the phaco needle in and out of the eye safely, despite the well-constructed incision, so I inserted it dry, without irrigation. Once the tip was safely in the anterior chamber, I initiated the infusion. I was able to complete the cataract extraction using a strategy of emulsifying one quadrant at a time in the deepest part of the chamber adjacent to another quadrant to prevent the posterior capsule from trampolining forward (Figure 2). Since the capsule is most vulnerable during removal of the final quadrant, I placed the second instrument behind the remaining nuclear quadrant to physically restrain the posterior capsule. Again, I used low phaco parameters as much as possible with OZil Torsional ultrasound, a duty cycle, and Intelligent Phaco (IP; Alcon Laboratories, Inc.).

Phacoemulsification does not get much more challenging than in an eye such as this, and it demands optimal performance from the phaco machine. Torsional ultrasound is the best choice in the presence of both positive pressure and an unstable anterior chamber, when it is critical to avoid nuclear repulsion and chatter as well as occlusion and surge. As the system senses the approach of maximum vacuum, the OZil IP software activates a pulse of ultrasonic energy that repositions the material and thereby eliminates occlusion and prevents surge. Because the pump does not have to stop, the system provides excellent followability, requires less fluidic volume, and reduces the amount of ultrasonic energy in the eye.

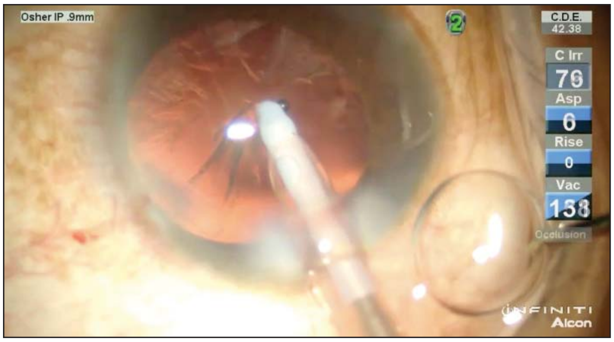


Figure 3. The author removes the subincisional cortex first to allow the remainder of the cortex to keep the bag open.

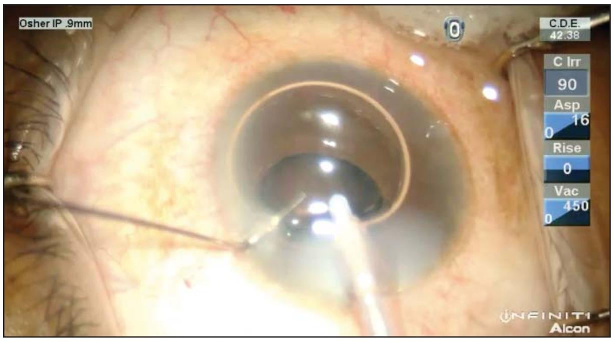


Figure 4. After extracting the remaining OVD from the anterior chamber, the author instills an air bubble to keep the IOL in place when he withdraws the I/A tip.

CAPSULAR POLISHING AND IOL IMPLANTATION

I proceeded to remove the subincisional cortex first (Figure 3). I knew that if I removed the distal cortex first, the bag would collapse from the positive pressure before I got to the most difficult cortex. After vacuuming the convex posterior capsule and inflating the bag with OVD, I used a one-handed injector on a C cartridge (Alcon Laboratories, Inc.) to fill the incision and prevent the loss of OVD as the IOL was being injected. I placed an AcrySof IOL SN60WF (Alcon Laboratories, Inc.) into the bag and removed the OVD from behind the lens only. I instilled Miochol-E (Novartis Ophthalmics, Inc., Duluth, GA) directly onto the iris to constrict the pupil, anticipating that the lens would prolapse forward once the rest of the OVD was out of the bag. As expected, the chamber collapsed so dramatically that I had to inject additional OVD. Before trying to remove the remaining OVD, I hydrated the incision to close it as much as possible in an effort to retard chamber loss. I placed the Miochol cannula on top of the implant to physically hold it back, and I eased my foot off the foot pedal. I could feel that the chamber was going to collapse violently, so I changed my game plan and injected air as I removed the I/A tip so the chamber could not collapse (Figure 4). Next, through the sideport, I used a special cannula that has an irrigation hole uniquely located to allow the exchange of air for aliquots of BSS solution (Alcon Laboratories, Inc.).

At the conclusion of the procedure, the eye's primary incision was watertight, and the chamber was deep. The patient enjoyed an uneventful postoperative course, and her second eye will be scheduled as soon as my coronaries reopen!

DISCUSSION

The INFINITI system platform with OZil IP Torsional ultrasound performed admirably in this case. Having performed phacoemulsification for more than 30 years, I have seen the technology evolve, and I consider OZil Torsional ultrasound to be a major step forward. It is an elegant, safe technology for a number of reasons. It conserves ultrasonic energy and has eliminated repulsion, occlusion, and surge. The anterior chambers are rock-stable in routine cases. Because OZil Torsional ultrasound is constantly repositioning the nucleus in optimal cleaving planes, it is highly efficient, and I have already mentioned its excellent followability and reduced fluid use. For all these reasons, I depend on this technology,

(Continued on page 11)

Grade 3 Cataract With Astigmatism

Using higher torsional energy effectively emulsifies dense cataracts.

BY DAVID LUBECK, MD

I have been using the INFINITI Vision System (Alcon Laboratories, Inc., Fort Worth, TX) for 7 years to perform cataract surgery, and I adopted the OZil Torsional Ultrasound package as soon as it became available. After 6 months of gaining experience with the OZil technology and learning how to use it in conjunction with the Fluidic Management System (FMS) on the INFINITI Vision System, I realized that I could remove cataracts under much lower fluidic parameters than I had been able to use with traditional longitudinal ultrasound. As a result, I can perform cataract surgery with much greater efficiency, significantly more intraocular stability, and significantly less energy and fluid than I could previously. In my opinion, the new Intelligent Phaco (IP) software further enhances the safety and efficiency of OZil Torsional Phacoemulsification. This article explains how I use OZil IP Torsional Ultrasound and describes its role in a challenging surgery.

OZIL IP TORSIONAL ULTRASOUND

Fundamentally, OZil Torsional Ultrasound is nonrepulsive phacoemulsification. The oscillatory motion of the phaco tip shears nuclear material off of a nuclear fragment without repelling it, so the surgeon does not need to use high levels of vacuum or aspiration to hold these fragments at the phaco needle. In contrast, longitudinal ultrasound moves the phaco tip in a forward-and-backward motion, which creates a force that repels nuclear material and makes it challenging for the tip to maintain purchase of the fragment. This is why longitudinal ultrasound requires high levels of vacuum and aspiration to keep the fragments at the cutting edge of the tip.

In the first months following the introduction of the OZil technology, Alcon Laboratories, Inc., recommended using a combination of torsional and longitudinal ultrasound for denser cataracts. I first tested these lower phaco parameters on soft- and medium-density nuclei, but I found that I did not need longitudinal power for any density of cataract and have used 100% torsional ultrasound in 100% of my cases for the past 2.5 years. I discovered, however (as have other surgeons who have used OZil technology), that OZil Torsional Ultrasound is less efficient at the low end of its amplitude range. The technology is most efficient at 30% to 100% power, depending on the grade of nucleus. Thus, before the advent of the IP software, I modified my settings to maintain a low rate of aspiration and vacuum for all grades of cataract, and I increased the low threshold "on" level for denser cataracts.

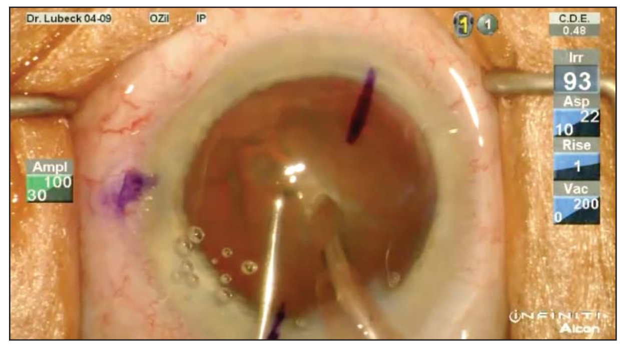


Figure 1. For chopping at these fluidic levels, the most important step is being deep enough in the nucleus and creating a flat nuclear face that the phaco tip can hold, even with little or no vacuum.

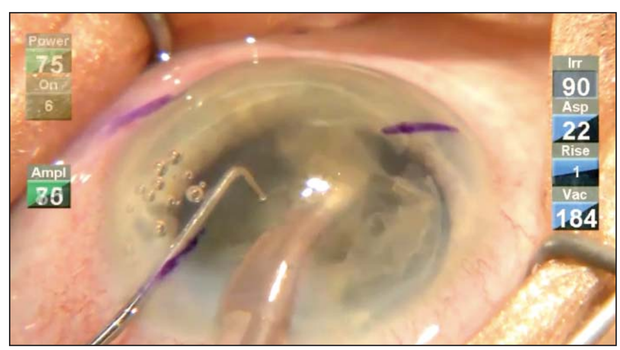


Figure 2. For quadrant removal, the author will depress the footpedal further if he hears the IP engage. He will increase the torsional power as high as 70% to 100% depending on the density of the nuclear material.

I feel the IP software compliments my torsional surgical technique for safe and more efficient surgery. It generates a pulse of longitudinal ultrasonic energy at the phaco tip when it senses that complete occlusion is about to occur. The surgeon may preset the degree of occlusion at which the pulse will activate (I have IP set to activate at 90% occlusion).

INTREPID MICROCOAXIAL SYSTEM

The INTREPID Microcoaxial System allows me to perform microincisional cataract surgery through a 2.2-mm incision. The system includes the INTREPID FMS, which manages fluid during the microcoaxial procedure, as well as noncompliant tubing, which increases the stability of the anterior chamber. I use the 45° KELMAN Mini Flare phaco tip with the MicroSmooth Ultra Infusion Sleeve (Alcon Laboratories, Inc.), which is precisely designed to pass through incisions of 2.2 to 2.4 mm. The combination of the beveled KELMAN tip, MicroSmooth Infusion Sleeve, and a 2.2-mm incision, along with low fluidic parameters, enables me to maintain stability in the anterior chamber with a bottle height of 90 cm H_20. With these technologies, in addition to IP Torsional Ultrasound, my average fluid use is 50 to 60 mL per case.

CASE EXAMPLE

Presentation and First Steps

This case is of a healthy eye with a moderately dense (grade 3) nuclear cataract and 0.75 D of pre-existing against-the-rule corneal astigmatism. The patient requested a multifocal IOL.

I begin all my cataract cases with topical tetracaine hydrochloride 0.5% (TetraVisc; Ocusoft, Inc., Rosenberg, TX). I coated the cornea with DisCoVisc OVD (Alcon Laboratories, Inc.) and made a temporal clear corneal incision with a 2.2-mm dual-beveled ClearCut HP keratome (Alcon Laboratories, Inc.). I have used DisCoVisc OVD since its release, because it truly is a multipurpose viscoelastic. It acts as a dispersive agent when needed and as a cohesive agent during lens insertion and OVD removal. Because each syringe of DisCoVisc OVD contains 1.0 mL of product, I almost never need to open a second syringe. There is enough OVD for intraocular use and to coat the cornea, so I only have to place BSS solution (Alcon Laboratories, Inc.) on the corneal surface once.

Hydrodissection and Phacoemulsification

After filling the anterior chamber with DisCoVisc OVD, I made a 4.5- to 5.0-mm capsulorhexis with standard Utrata forceps (ASICO LLC, Westmont, IL). I performed cortical cleaving hydrodissection with an Akahoshi-designed disposable cannula (Alcon Laboratories, Inc.). Then, I inserted the KELMAN 45° mini-flared phaco tip with the MicroSmooth Sleeve. I usually begin phacoemulsification with the grade-1 setting and increase the ultrasound according to the lens' density (Figure 1). Using a Nagahara chopper (ASICO LLC) in my second hand, I divided the nucleus into four to six segments. As I do in all cases, I used the INFINITI Vision System's fluidics to draw nuclear fragments to the phaco tip and maneuvered the second instrument to corral fragments to the tip as necessary.

My use of OZil IP Torsional Ultrasound may differ somewhat from other surgeons'. I interpret the IP's activation to mean that I am not using enough torsional ultrasound to emulsify the nucleus efficiently. The IP is my signal to press down further in foot position 3 and increase the torsional amplitude to the point that IP is no longer needed to emulsify the fragment (Figure 2). In other words, I prefer to use higher torsional energy so that longitudinal energy is not required to clear the tip.

Irrigation/Aspiration and IOL Implantation

In this case, I performed I/A with an Akahoshi I/A tip (ASICO LLC). The sinusoidal design of this tip enables me to retrieve subincisional cortex effectively. Its diameter is slightly smaller than that of most tips, which allows more fluid flow into the eye and thereby improves the stability of the capsular bag and anterior chamber. I use performance-adjustable settings for I/A; a fixed aspiration rate of 40 mL/min and linear vacuum up to 650 mm Hg. Thanks to better inflow fluidics and surge suppression pump control, I am able to maintain a consistent IOP and safe intraocular working environment.

Next, I polished the capsular bag and filled it with DisCoVisc OVD. I implanted an AcrySof IQ ReSTOR IOL +3.0 D via a MONARCH D cartridge (Alcon Laboratories, Inc.). After the lens had unfolded in the bag and before I removed the OVD, I created a 3.5-mm penetrating limbal relaxing incision nasally to treat the eye's 0.75 D of against-the-rule corneal astigmatism. Then, I used the same I/A tip to remove the OVD from behind and in front of the lens implant. I used the microscope's coaxial light reflex to center the lens in its final position.

OUTCOME

On the first postoperative day, the patient had 20/25 UCVA. At 1 week, his UCVA was 20/20 at distance and J1 at near. I attribute this excellent initial outcome to the low fluidic parameters that were maintained throughout the case—my total fluid usage during this case was 56 mL. I comfortably completed the case in 7 to 8 minutes. I do not believe there is a comparable phaco system available on the market today. ■

David Lubeck, MD, is in private practice at the Arbor Center For Eyecare in Orland Park, Illinois, and he is on the teaching staff at the Illinois Ear and Eye Infirmary. He acknowledged no financial interest in any product or company mentioned herein. Dr. Lubeck may be reached at (708) 466-7485; dmaclubes@earthlink.net.

Small-Pupil Strategies With the INFINITI System

The advantages of OZil Torsional Ultrasound and INTREPID FMS.

BY RICHARD TIPPERMAN, MD

Because phacoemulsification is all about control and predictability, my staff and I adopted the INFINITI Vision System (Alcon Laboratories, Inc., Fort Worth, TX) when it was first released. We initially used the NeoSonix handpiece, which offered advantages for certain types of surgeries, but it was not the quantum leap that OZil Torsional Ultrasound and the INTREPID Fluidic Management System (FMS) (Alcon Laboratories, Inc.) have been. The combination of these technologies enhances both control and predictability, especially in tough cases such as eyes with small pupils, loose zonules, and pseudoexfoliation. This article describes my use of the INFINITI Vision platform and the OZil Intelligent Phaco (IP) and INTREPID technologies in small-pupil cases.

OZIL IP TORSIONAL ULTRASOUND

Although the INFINITI Vision System has great technology built into it, OZil Torsional Ultrasound is the centerpiece. Torsional ultrasound technology has dramatically changed phacoemulsification by significantly improving its speed, versatility, and safety (see *Benefits of OZil IP Torsional Ultrasound*). Every sweep of the OZil phaco tip removes nuclear material, making it twice as effective as longitudinal ultrasound, which only emulsifies fragments on the forward motion. This efficiency reduces the amount of irrigation and vacuum forces required for cataract extraction, which not only lessens the impact on endothelial cells, but also increases the stability of the anterior chamber. Greater stability in the anterior chamber in turn prevents shallowing, which is paramount when working around small pupils or floppy irides.

The IP software is a seamless upgrade to the OZil handpiece technology that further increases the safety and efficiency of phacoemulsification without affecting the surgeon's technique. IP simplifies phacoemulsification by preventing nuclear fragments from occluding the OZil phaco tip. When the software senses that the phaco tip is nearing occlusion, it will fire a pulse of longitudinal energy to reposition the fragment and give the phaco tip the space it needs to continue its shearing motion. Before IP existed, I would simply adjust the phaco energy. IP does this for me with a more seamless response. I liken IP to the autopilot function on aircraft; a machine has better sensors and more control than a human does in terms of firing the longitudinal pulse (although you can control the IP pulses to a degree with the foot pedal). I expect the software to continue to improve as researchers gain experience with the IP settings.

BENEFITS OF OZIL IP TORSIONAL ULTRASOUND

Efficiency
Each sweep of the phaco tip emulsifies nuclear material, whereas longitudinal ultrasound only emulsifies fragments on the forward thrust.

Versatility
Surgeons do not have to change their disassembly technique, and they have the option of microcoaxial surgery.

Safety
Less fluid in the eye means more protection for endothelial cells, greater stability in the anterior chamber, and a reduction in postoperative inflammation.

INTREPID FMS

The other big change my staff and I made in the past year on the INFINITI Vision System was to upgrade to the INTREPID FMS. The INTREPID system enables microcoaxial phacoemulsification via stiff-compliance tubing and phaco sleeves as small as 0.9 mm. The benefit of this microcoaxial system is not just in shrinking the incision's size, although this certainly offers advantages in terms of controlling astigmatism. I think the greatest benefit of the INTREPID FMS is its fluidics. The tubing's compliance decreases surge and makes the anterior chamber very stable during the surgery. The INTREPID FMS works synergistically with OZil IP Torsional Ultrasound to make routine cases even easier and difficult cases more routine.

MANAGEMENT OF SMALL-PUPIL CASES

Strategy

In an eye with a small pupil, you have to insert the OZil phaco needle underneath the level of the iris plane to begin chopping the nucleus, and then bring the fragments up into the anterior chamber. The better you can control the vacuum and flow, the easier it will be to perform these maneuvers in the limited space.

Nuclear Disassembly

I begin phacoemulsification by inserting the 0.9-mm KELMAN Mini Flared tip encased in the 2.2-mm Ultra Sleeve (Alcon Laboratories, Inc.) through a 2.2-mm incision. (Some surgeons may worry about losing efficiency and mechanical advantage with such a narrow tip, but OZil Torsional Ultrasound enhances control and efficiency so significantly that even with the smaller needle, you keep the same level of efficiency but gain safety.) I do not vary the settings on the INFINITI system during this stage as much as I manipulate the foot pedal. Although many surgeons have moved to using higher vacuum and aspiration levels in recent years, these are unnecessary with OZil Torsional Ultrasound, because it minimizes repulsion at the phaco tip and allows lens fragments to pass through easily.

I like to use a horizontal chopping technique with a Nichamin-style chopper, so I first sculpt out some of the anterior cortex so I can see to slide the chopper underneath the plane of the capsulorhexis as I pass it through the cortical material. The first chop of the nucleus does not require significant torsional energy or vacuum; my flow rate is typically in the mid-20s to 30 mL/min, and my vacuum averages 150 mm Hg in almost all cases. I no longer impale the nucleus with the phaco tip after I have achieved the first crack. Instead, I place the phaco needle at the mid-depth of the lens and then reinsert the chopper under the capsulorhexis, passing it out to the periphery of the lens. I draw the chopper toward the phaco needle to create counterpressure to split the lens in half. Then, I rotate the halves and break them into as many fragments as necessary for emulsification. I break average-density lenses into four quadrants and denser nuclei into seven or eight fragments that are easier to work with. Chopping is so mechanically efficient that I find it easy to break dense lenses into many small pieces.

Phacoemulsification

For emulsification of nuclear fragments, I switch to a quadrant setting with a higher rate of vacuum and flow, which allows me to attract the individual pieces to the phaco tip without having to chase them (Figure 1A and B). Because OZil Torsional Ultrasound does not cause the anterior chamber to shallow, the fluidics do not fluctuate, and the eye remains very stable. I appreciate how OZil Torsional Ultrasound and the INTREPID FMS create a controlled environment for cataract surgery.

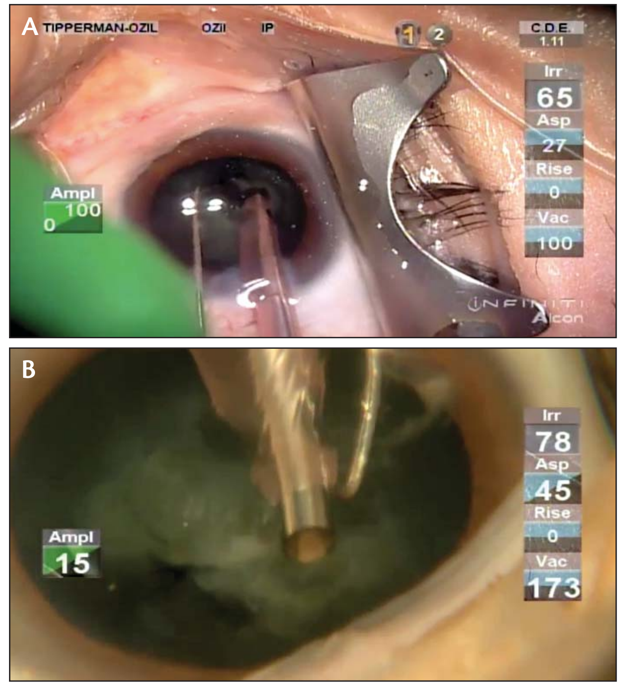


Figure 1. The author moves to higher vacuum and IP for quadrant removal (A, B).

The impact of the IP feature depends somewhat on the surgical technique you use. I never experienced much occlusion with OZil Torsional Ultrasound before IP, but it activates more often with dense lenses and certain dissection techniques. I do not feel IP is as significant an advance as the OZil handpiece, but it certainly improves the efficiency and safety of phacoemulsification.

Considerations of Phaco Tip Style

For surgeons who are adapting to the OZil Torsional Technology, I think one of the biggest learning hurdles is switching to a KELMAN style tip. I used the KELMAN tip for phacoemulsification before adopting the NeoSonix handpiece because I felt it required much less energy and effort to use than other designs. Therefore, I did not have a significant learning curve with the OZil technology. In my opinion, OZil Torsional Ultrasound does not work as efficiently with a straight needle, although Alcon recently created a 12° bent phaco needle that I feel is a good training wheel, so to speak. It lets surgeons who are used to this technique transition to the OZil handpiece more easily. ■

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Low Parameters With Dense Cataracts

OZil Torsional Ultrasound enables low fluidic parameters without compromising efficiency.

BY MICHAEL L. NORDLUND, MD, PhD

I have extensive experience with surgical products by Alcon Laboratories, Inc. (Fort Worth, TX). I trained on the LEGACY system phaco platform, and our clinic (the Cincinnati Eye Institute) tested a prototype of the INFINITI Vision System before it was released commercially. My colleagues and I have used the OZil Torsional Ultrasound technology and Intelligent Phaco (IP) software since these technologies became available. The two main advantages OZil Torsional Phacoemulsification offers over traditional longitudinal systems are that (1) it uses less ultrasonic energy and therefore impacts the endothelium less, and (2) it emulsifies nuclear material much more efficiently, especially denser nuclei. I typically use 100% linear torsional ultrasound for the duration of my surgeries. This article describes how I approach dense nuclei with the OZil Torsional Ultrasound system.

TRANSITIONING FROM LONGITUDINAL ULTRASOUND

OZil Torsional Ultrasound emulsifies nuclear material twice as efficiently as traditional longitudinal phacoemulsification. In contrast to longitudinal phaco tips, which move forward and backward and only emulsify lenticular material on the forward motion, the OZil Torsional phaco tip sweeps side to side, emulsifying material with each pass. To further keep the anterior chamber stable and minimize endothelial trauma, I use relatively low fluidic parameters during phacoemulsification. Low settings also help me keep as much ophthalmic viscosurgical device (OVD) in the eye as possible during the case, yet they do not compromise the efficiency of OZil Torsional Ultrasound.

I changed a few aspects of my surgical technique when I adopted OZil Torsional Ultrasound. Because the INFINITI Vision System's Fluidic Management System (FMS) permits microcoaxial phacoemulsification, I transitioned to a smaller incision. I began using a 45° beveled mini-flared phaco tip because it works more effectively with the oscillatory movement of torsional

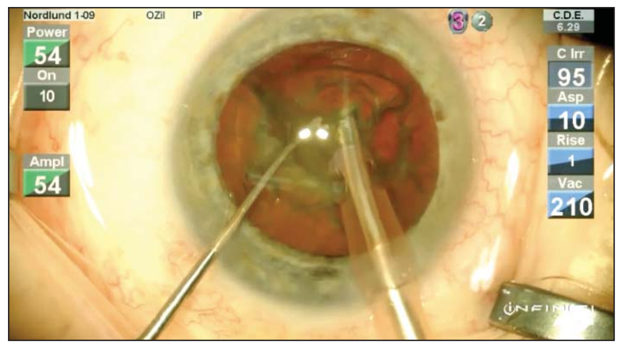

Figure 1. The author uses a divide-and-conquer technique to disassemble the nucleus.

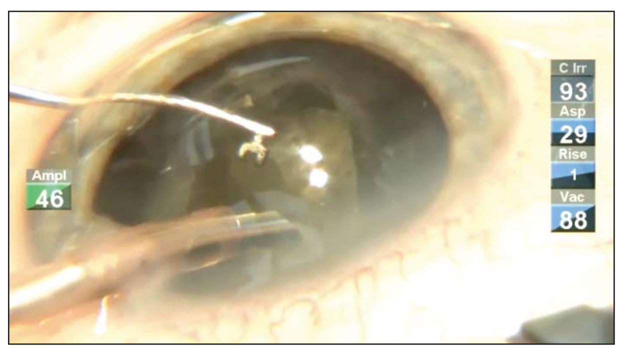

Figure 2. OZil Torsional Phacoemulsification provides excellent followability; quadrants tumble easily to the tip.

phacoemulsification than a straight tip. As a result of a smaller tip diameter that restricted fluidic flow, I had to raise the bottle height and slightly increase my aspiration and vacuum rates to achieve the same fluidics behavior intraocularly that I was used to with a larger phaco tip. I currently use a 300 mm Hg vacuum limit in chop mode.

I did not have to change my nuclear disassembly technique, which is a mix of chopping and divide-and-conquer, depending on the density of the nucleus and how it responds to the initial groove. The softer the lens, the less need for chopping. I use 100% linear torsional ultrasound for all cataracts, even the most dense. The OZil system allows the surgeon to mix torsional and longitudinal power if desired.

OZIL IP TECHNOLOGY

The OZil IP software, which I have been using for about a year, emits micropulses of longitudinal ultrasound if the phaco tip approaches occlusion. The IP software simplified my ability to emulsify the densest nuclei. Before this technology, I occasionally had to remove the phaco tip from the eye to clear it. Since getting IP, I have never needed to do that. The software senses the amount of occlusion and activates a pulse of longitudinal ultrasound at the surgeon's predetermined setting to reposition the fragment. IP prevents tip occlusion and makes the surgery that much faster because there is no need to adjust the fluidics or reposition the tip.

VISCOELASTIC

Before adopting OZil Torsional Ultrasound, I regularly used Healon5 OVD (Abbott Medical Optics Inc., Santa Ana, CA) because it is a dense viscoelastic that that stays in position and protects the endothelium. Its density, however, requires dramatically low fluidic parameters. At another surgeon's suggestion, I tried DuoVisc OVD (Alcon Laboratories, Inc.), which includes the dispersive VISCOAT OVD and the cohesive agent PROVISC OVD in one package. I found that VISCOAT OVD stayed in the eye better than Healon5 under higher fluidic settings, yet it offered the same coating and endoprotective properties.

PEARLS FOR DENSE CATARACTS

Because dense nuclei tend to have much less cortex than normal cataracts, the entire anterior capsular system surrounding these lenses has less elasticity, and surgical maneuvers affect the capsular bag and zonules more directly. If sculpt mode is not sufficiently cutting a dense lens, I will often switch to chop mode, which I can use with my relatively low parameters to sculpt the nucleus. The higher vacuum and 100% linear torsional ultrasound settings, however, increase the cutting efficiency and minimize horizontal displacement of the lens and stress to the zonules. The goal is to disassemble the lens as efficiently as possible.

If the capsular bag complex is loose, before I crack the sculpted nucleus, I will instill OVD into the areas from which I have already removed lens material to keep the bag formed. This technique was more necessary before the advent of OZil IP, when postocclusion surge was a common with dense cataracts.

Other surgical strategies that can be helpful in dense cataracts are the use trypan blue dye if there is an inadequate red reflex, placing a capsular tension ring in eyes with a floppy capsular bag, and the use of a Malyugin ring (MicroSurgical Technology, Redmond, WA) in eyes with poor dilation or a floppy iris.

Figure 3. An AcrySof IOL SN60WF in position at the conclusion of the case.

CASE EXAMPLE

Presentation

A recent case of a patient with a 2.5 to 3+ nuclear sclerotic cataract illustrates the advantages of OZil Torsional Ultrasound and the INTREPID FMS. An 84-year-old female presented with increased difficulty driving because of glare and a reduced ability to see fine print. Her BCVA was 20/60 in each eye, which fell to 20/100 under bright lights. The patient's manifest refraction was +2.00 +0.50 X 78 OD and +1.75 +0.75 X 35 OS. The preoperative examination revealed 2 to 3+ milky nuclear sclerosis in each lens.

Incision and Capsulorhexis

I began the surgery by placing 1% nonpreserved lidocaine on the cornea. I instilled VISCOAT OVD (Alcon Laboratories, Inc.) into the anterior chamber and made a primary clear corneal incision using a 2.4-mm keratome. I inserted a cystotome to start the 5.5-mm capsulorhexis and then switched to Utrata forceps to finish it. A perfectly centered capsulorhexis is critical for centering an IOL in the capsular bag and achieving a reproducible outcome.

Hydrodissection and Phacoemulsification

Next, I hydrodissected the nucleus with a flattened, 25-gauge cannula before I inserted the KELMAN 45° Mini Flared phaco tip (Alcon Laboratories, Inc.). I initiated 100% torsional phaco with my usual divide-and-conquer technique (Figure 1). I try to perform phacoemulsification in the bag as much as possible; if the lenticular fragments come forward, I push them back with the second instrument. I can emulsify the first half of the nucleus in the center of the bag because the second half holds the bag back. As described previously, I may chop a fragment if necessary. The followability of OZil Torsional Phaco is terrific; pieces come to the tip easily (Figure 2). Its efficiency is unparalleled. My parameters during this phase of the surgery were 100% linear torsional power, 0% longitudinal, 300 mm Hg vacuum limit, 29 mL/min of aspiration flow rate, and a bottle height of 95 cm H_2O.

Capsular Polishing and IOL Insertion

I do not mind leaving a little epinucleus to remove with the I/A tip, because today's silicone tips are efficient and provide an extra level of safety during capsular polishing. I find that I can grasp material more securely than I could with a metal I/A tip, and even if I catch the epinucleus, the soft tip will not tear it as easily.

In this case, I used PROVISC OVD (Alcon Laboratories, Inc.) to reinflate the capsule, and I implanted my standard lens, the AcrySof IOL SN60WF (Figure 3). These lenses are easy to work with: they are very forgiving, they unfold easily in the eye, and they stay put after implantation. Finally, I removed the OVD using 650 mm Hg vacuum limit, a bottle height of 110 cm H_2O, and aspiration flow rate of 60 mL/min. I like to leave the IOP at between 30 and 40 mm Hg to reduce the chance of the incision leaking. Postoperatively, the patient did well, achieving a UCVA of 20/25 on postoperative day 1. ■

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along with IP, for both routine and challenging cases. I use this technology in all cases, because I often cannot predict when surgical challenges will present.

I also find the microcoaxial approach to be everything that I hoped it would since its introduction. A 2.2-mm incision allows the implantation of a full-sized AcrySof lens (either the SN60WF, the AcrySof IQ ReSTOR IOL, or the Toric lens) into the eye through a reproducible, secure, watertight incision while inducing only 0.30 D of cylinder. Moreover, I strongly prefer a silicone I/A tip, not only in cases of positive pressure, where the posterior capsule can be convex and trampolining, but in every case because of the enormous degree of safety it imparts to the posterior capsule. ■

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