

Favorite Surgical Pearls of 2013

An offering of tips and tricks learned over the past year.

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The Blue Pearl: Staining the Capsule

By Suven Bhattacharjee, MS, DO, DNB, FRF



In these times of femtosecond, nanosecond, and picosecond technologies, surprisingly, my favorite surgical pearl of 2013 is a new and safer technique for trypan blue dye staining of the capsule.

I used to prefer injecting trypan blue under an air bubble. It is a quick and simple technique that prevents staining of the corneal endothelium. However, this seemingly innocuous technique once gave me a nightmarish experience in a very hard mature cataract. As the cannula was exiting the eye after injecting trypan blue, air escaped through the sideport incision, the anterior chamber shallowed, and the tip of the cannula nicked the anterior capsule in the midperiphery. The nick led to a tear that ran out to the periphery.

Despite the tear in the capsule and a super-hard cataract, phacoemulsification with implantation of a posterior chamber IOL was successful. Unfortunately, in an effort to stabilize the hard nucleus in the presence of a compromised capsulorrhexis, the initial part of the phacoemulsification procedure was performed under Healon (Abbott Medical Optics Inc.), and a wound burn resulted, requiring sutures. A video of the procedure (available at eyetube.net/?v=ninif) was recently selected for a video symposium on com-

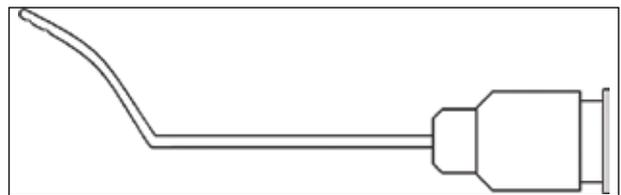


Figure 1. The Bhattacharjee cannula.

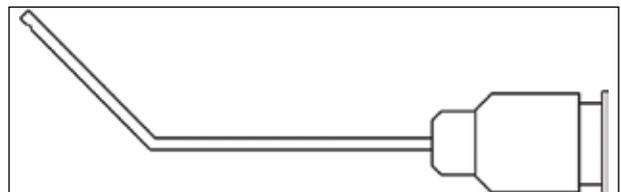


Figure 2. The Fogla cannula.

plicated and challenging cases in cataract surgery. As a result of that case, I vowed to discontinue injecting trypan blue under air.

Since that time, I have adopted a safer technique for trypan blue injection and have had gratifying results. The technique involves injecting trypan blue under an ophthalmic viscosurgical device (OVD), with little modification of the cannula I use. The Bhattacharjee cannula (Joja Surgicals; Figure 1) is a modification of the Fogla air-injection cannula used for creating a big bubble during deep anterior lamellar keratectomy (Figure 2). The Bhattacharjee 27-gauge cannula has a blunt and blind tip, an anteriorly vaulted shaft, and two bottom irrigating ports for dye injection.

Trypan blue is injected under the OVD and onto the anterior capsule through the irrigating ports, and the can-

Photos courtesy of Suven Bhattacharjee, MS, DO, DNB, FRF

nula is moved around to paint the dye onto the capsule. The blunt tip and vaulted shaft ensure absolute safety of the capsule, even with a hypermature intumescent cataract. The blind tip and bottom ports ensure that the dye stains only the visible anterior capsule and that no dye migrates into the OVD. To ensure better dye contact and to wash away excess dye, more OVD can be injected when needed. After waiting for about 1 minute, the capsulorrhexis can proceed under the protection of the OVD. The staining can be patchy, but it is more than adequate to perform a safe capsulorrhexis.

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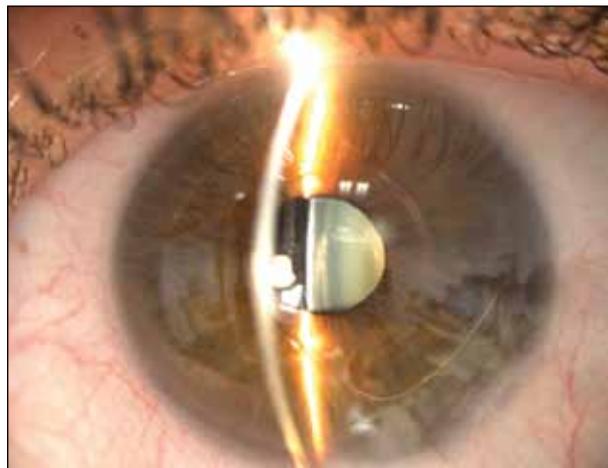
Learning Bilensectomy for Corneal Decompensation and Cataract

By Julián Cezón, MD



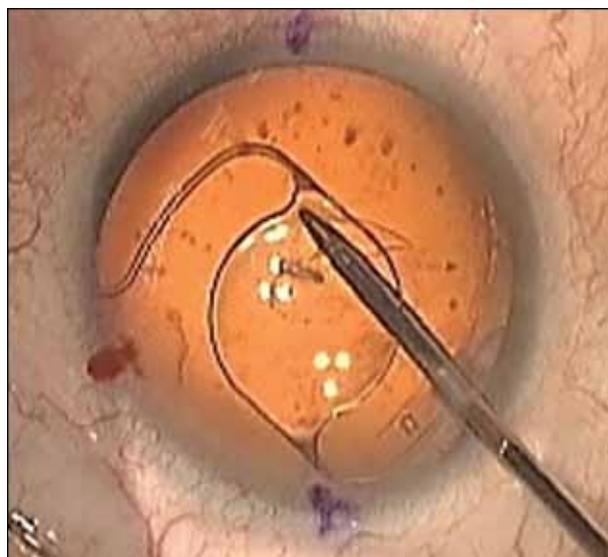
The two main causes of angle-supported phakic IOL explantation are cataract development and progressive endothelial cell loss.¹ Bilensectomy—phakic IOL explantation followed by phacoemulsification of the crystalline lens in a single procedure—was described by Gavris et al;² however, it requires a large incision (as large as 6 mm) and can complicate subsequent surgical steps. My favorite surgical pearl I learned this year is to invert the order of phakic IOL explantation and phacoemulsification. I now perform bimanual microincision cataract surgery (MICS) first, followed by removal of the phakic IOL and implantation of a posterior chamber IOL. Below is a case presentation that describes this technique.

A 46-year-old woman who had undergone bilateral angle-supported phakic IOL implantation for high myopia in 1994 was referred to our clinic with dimmed vision in both eyes. No records were provided, but on examination BCVA was 0.5 in her right eye and 0.2 in her left, which was also amblyopic. In both eyes, the cornea was clear and the IOL was stable, though slightly decentered. Endothelial cell density measured by confocal microscopy (Confoscan 3; Nidek Co. Ltd.) was 1,683 cells/mm² in the patient's right eye and 1,635 cells/mm² in the left, with high levels of pleomorphism and polymegathism. Slit-lamp examination revealed cataract in each eye (Figure 3).



Courtesy of Julián Cezón, MD

Figure 3. Angle-supported phakic IOL and cataract.



Courtesy of Julián Cezón, MD

Figure 4. The capsulorrhexis was fashioned underneath the angle-supported phakic IOL.

The patient was counseled regarding treatment options, during which the bilensectomy procedure was described in detail.

Surgery was performed under sub-Tenon anesthesia. I created two 1.4-mm clear corneal incisions, followed by injection of a dispersive OVD over and below the phakic IOL. Using 23-gauge forceps (Geuder AG), I fashioned the capsulorrhexis underneath the phakic IOL (Figure 4). After smooth hydrodissection, I performed bimanual phacoaspiration of the nucleus with the Cezón irrigating chopper on the Megatron S4 phacoemulsifier (both by Geuder) using very low parameters (0% phaco energy; 300 mm Hg aspiration rate; 30 mL/min flow; 70 cm bottle height). Next, I created a 5.5-mm clear corneal incision, through which the phakic IOL was removed. I first had to cut the proxi-

mal haptic, as it was stuck to the iris. I implanted a posterior chamber IOL (AcrySof MA60MA; Alcon) and closed the incision with three nylon 10-0 stitches. No complication was observed. At 1 month, UCVA was 0.8. For a video of this case, visit eyetube.net/?v=gomuf.



Bilensectomy as described by Gavris and colleagues is safe and effective, but it can breed potential complications including fluid leakage, anterior chamber collapse, choroidal hemorrhage, iridodialysis, bleeding, and endothelial deterioration. I suggest inverting the surgical steps, first emulsifying the nucleus and then explanting the phakic IOL. Using a closed-chamber surgical technique, hemorrhage is virtually absent and the angle-supported phakic IOL continues to protect the endothelium. Because I am able to reduce the incision size, I can use microinstruments for explantation, avoiding the endothelial damage associated with larger incisions.

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Implanting a New IOL

By Shamala Ganesan, MBBS, FRCS(Edin), MMed(Ophth)



This year, I started implanting the Lentis M-plus multifocal IOL (Oculentis GmbH). Initially, I created my usual capsulorrhexis size of 5.4 mm; however, in three early cases I inadvertently placed the trailing edge of the haptic into the sulcus. These cases occurred in eyes with small pupils or in eyes with pupils that were difficult to dilate, and throughout phacoemulsification I noted further pupil constriction. On postoperative day 1, all three patients had 20/20 distance visual acuity, but none could read well. Upon dilation, I detected that the lower edge of the lens was in the sulcus. Although I had no problem repositioning the Lentis M-plus lens in the capsular bag, and near visual acuity subsequently improved, I wanted to address the initial problem.

Therefore, in my next series of patients, I enlarged the

capsulorrhexis slightly to 5.6 mm, and with this change I was able to consistently implant the entire lens in the capsular bag. A larger capsulorrhexis also simplifies OVD removal. I use a cannula, placing it between the IOL and the capsulorrhexis margin, to slowly inject balanced saline solution into the capsular bag and wash out the OVD. Removing all OVD from the capsular bag should prevent postoperative lens rotation.

In our practice, we offer patients laser-assisted cataract surgery with the LenSx Laser System (Alcon). I find it helpful in these eyes to avoid extending the primary wound during lens implantation. Instead, I dock the lens thru the 2.2-mm primary incision and guide the leading edge of the lens into the capsular bag with a Sinsky hook. Then I guide the trailing edge and tuck it into the capsular bag.

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Operating on Patients With Fuchs Dystrophy

By Soosan Jacob, MS, FRCS, DNB



The primary change I have made to my cataract surgery technique in 2013 is how I operate on patients with Fuchs dystrophy who require not only cataract extraction but also Descemet membrane endothelial keratoplasty (DMEK) due to endothelial dysfunction. In these patients, I now use a new technique that I call *endoilluminator-assisted DMEK* (E-DMEK).

DMEK, despite being superior to Descemet-stripping automated endothelial keratoplasty in terms of visual outcomes and decreased risk of graft rejection, has not gained widespread acceptance. This is mostly due to a long learning curve with respect to graft unfolding, orientation, and positioning.

The technique is further hampered by compromised visibility secondary to corneal edema and washout of dye from the graft. Also, it is often difficult to confirm the position, orientation, and morphology of the thin, transparent, and flimsy DMEK graft, even through relatively clear corneas.

In patients who require cataract surgery and DMEK, routine phacoemulsification is completed, after first removing the epithelium for better visibility if required.

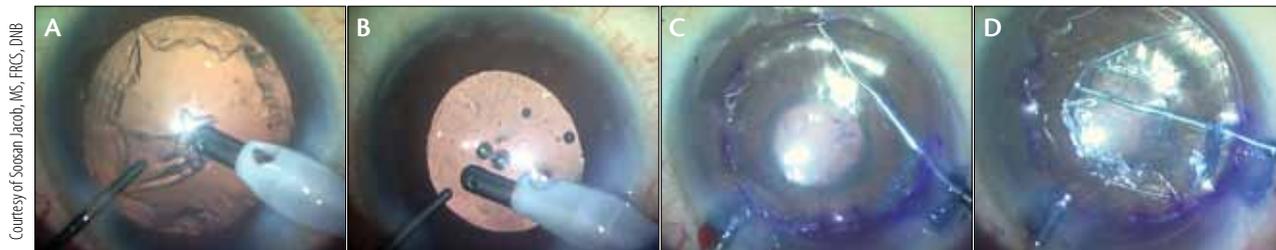


Figure 5. Cataract extraction in a patient with cataract and Fuchs dystrophy (A). In-the-bag IOL implantation is followed by thorough OVD removal (B). The host Descemet membrane is scored and stripped under air (C and D).

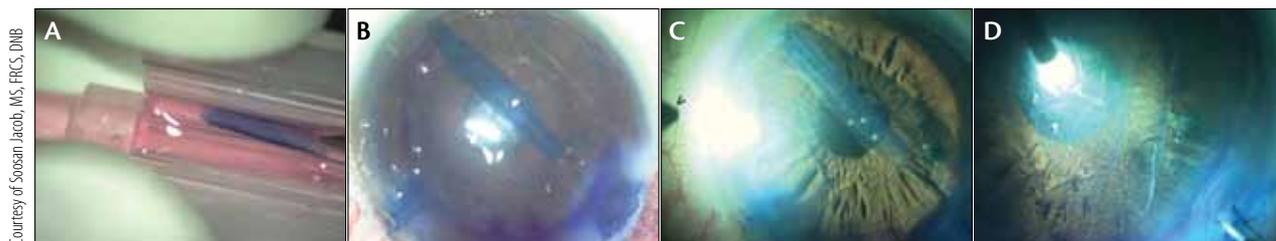


Figure 6. The DMEK graft is prepared and loaded into a MICS injector (A). The DMEK graft is injected into the anterior chamber. However, under the light of the microscope, the graft shows poor detail and depth perception, despite a clear cornea and stained graft (B). E-DMEK utilizes oblique light from an endoilluminator light pipe, held at the limbus, with the microscope light switched off. Excellent detail with regard to scrolling, folds, and edges of the graft and enhanced three-dimensionality are obtained; the arrowhead shows the tip of the endoilluminator (C). The endoilluminator light bounces off edges and folds of the graft, creating reflexes that help determine if the graft is right-side up (D).

Following IOL implantation, the OVD is removed and intracameral acetylcholine chloride is used to constrict the pupil (Figure 5A and 5B). The host Descemet membrane is then scored and stripped (Figure 5C and 5D).

Once donor graft injection is complete (Figure 6A and 6B), the microscope light is turned off and an endoilluminator, a tool commonly used in vitreoretinal surgery, is turned on and held externally near the limbus. This light is directed on the eye (Figure 6C and 6D) to highlight the details and folds of the DMEK graft and the position and orientation of the Descemet membrane versus the endothelium with respect to overlying stroma.

I love the striking 3-D depth perception that E-DMEK provides, secondary to reflexes from the light bouncing off the edges of the graft and from the movement induced in the graft by fluid currents and gentle tapping (Figure 6D). The tip of the light probe is moved around the limbus, focusing it tangentially while checking the direction of curvature of the graft's edges to know if the graft is right-side up or flipped inside the eye. Graft orientation is confirmed by tapping the host cornea gently and appreciating the light reflexes. Using the endoilluminator, the graft is oriented the right way up, unfolded, centered, and then floated up with air (Figure 7; eyetube.net/?v=fidos).

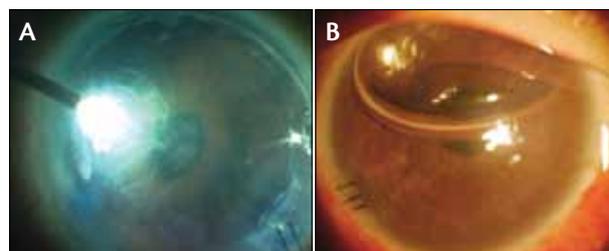


Figure 7. The DMEK graft is floated up against corneal stroma using an air bubble (A). At 1 day postoperative, the cornea is clear (B).

The big advantage of E-DMEK is that the entire graft can be visualized three-dimensionally at the same time, thus clearing any doubts regarding orientation, morphology, and position. With better comprehension of the graft's dynamics, surgery can be completed more easily and quickly, thereby decreasing the risk for graft damage due to prolonged surgery, excessive fluidics, and unnecessary surgical manipulations.

I use E-DMEK routinely, but it is even more invaluable when visibility is already compromised secondary to corneal edema or dye washout. I no longer need to insert an instrument under the scroll edge to check the direction of the curled edges, which is vital to rule out a flipped graft. Additionally, I can check orientation while maintaining a no-touch technique, thus decreasing cell

loss in the graft. Throughout surgery, as I am more certain about the graft position, I can avoid all unnecessary manipulation. I finish the procedure by checking intraocular pressure (IOP) and light perception. The patient is instructed to maintain a supine position for 24 hours.

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Mobilizing a Nucleus From the Capsule

By Björn Johansson, MD, PhD

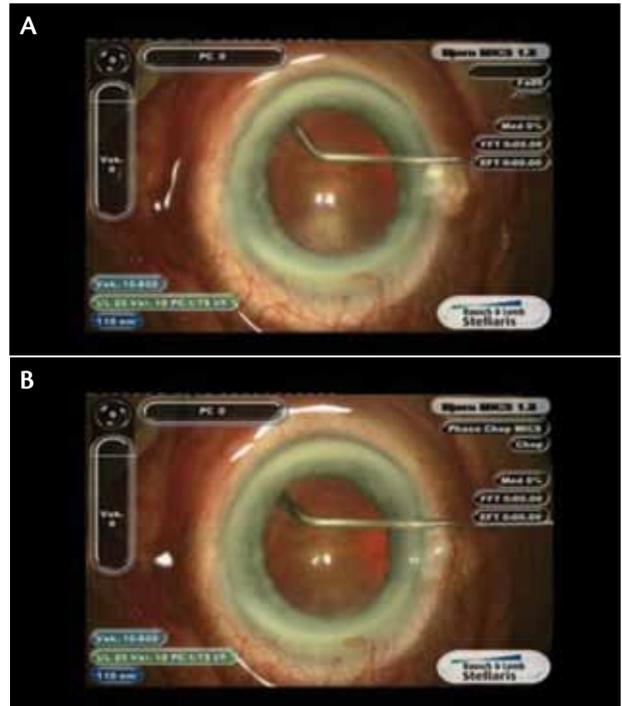


After 20-odd years' experience as a phacoemulsification cataract surgeon, my favorite surgical pearl this year has nothing to do with groundbreaking advances in laser technology, new developments in phaco equipment, or optical refinements in IOL technology. Much to my surprise, the most exciting surgical tip I learned in 2013 came to me during the annual Congress of the European Society of Ophthalmology in Copenhagen, Denmark, while attending a session on increasing your skills in cataract surgery.

In this basic skills course, several speakers contributed tips for different aspects of the phacoemulsification procedure. Khiun F. Tija, MD, demonstrated his technique for mobilizing the nucleus from the capsule with hydrodissection and hydrodelineation, something I have been doing—in my humble opinion—rather successfully and efficiently for years.

Dr. Tija showed how, after injecting balanced saline solution between the rim of the capsulorrhexis edge and the lens cortex (to create a fluid wave travelling across the inside of the posterior capsule), he uses the tip of the cannula to gently nudge and depress the pole of the lens where the fluid has been injected. This movement, although small, breaks the connections between cortex and capsule efficiently (Figure 8; video available at eyetube.net?V=dahil). As a result, little additional force and injection of balanced saline solution is required to make the lens freely movable within the capsule.

When I returned to my clinic and put effort into performing hydrodissection in this precise man-



ner, I discovered that I reached my surgical goal more successfully and efficiently than with my previous technique. There are three reasons why I chose to present this experience as my surgical pearl of 2013. First, I like that it is not only about a technique but also about the insight that, no matter how advanced one's own surgical skills, there are colleagues who can teach more. Second, it was not an advanced skills course that provided me with this competence and insight but a basic one. This is an important reminder to never hesitate revisiting the basics, as it was probably a long time ago that we were young surgeons attending and appreciating these events. The more time you have had to gather your own experience, the more time the speakers at these sessions have

Courtesy of Björn Johansson, MD, PhD

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had to evolve as well. Third, this pearl is about limiting the number of surgical maneuvers needed to complete cataract surgery. Any tip that decreases the amount of movement inside the eye (and outside as well), reduces the time to finish any part of the procedure, or saves energy will reduce the risk of complications and decrease surgical time.

To summarize: From the ocean of knowledge that surrounds us we must learn to gather pearls, both small and large. Depending on how the pearl is set, a small pearl may turn into a precious, larger one once the piece of jewelry is finished.

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Simplifying the CCC in Eyes With a Shallow Anterior Chamber

By Florian T.A. Kretz, MD, FEBO



Besides advancements in femtosecond cataract and refractive surgery, the development of new, sturdy instruments has changed my perspective on anterior segment surgery in 2013. Like most surgeons, I prefer instruments that do not break easily to fragile ones that must be handled carefully. The Auffarth Pure Efficiency Phaco (PEP) double-cross-action capsulorrhexis forceps (Figure 9) fulfill my needs. They feel like Utrata forceps but are easy to handle through incisions as small as 1.1 mm. A video demonstration of these forceps in use in cataract surgery can be viewed at eyetube.net/?v=kidav.



After evaluating the Auffarth PEP forceps in our clinical research group (International Vision Correction and Research Centre), we introduced them quickly into clinical practice. These forceps do not elongate surgical time in standard cases and are especially useful in eyes with shallow anterior chambers, as they simplify creation of the capsulorrhexis (Figure 10). The biggest benefit is that, even through a standard microincision of 1.8 to 2.2 mm,



Figure 9. The design of the Auffarth PEP double-cross-action capsulorrhexis forceps.

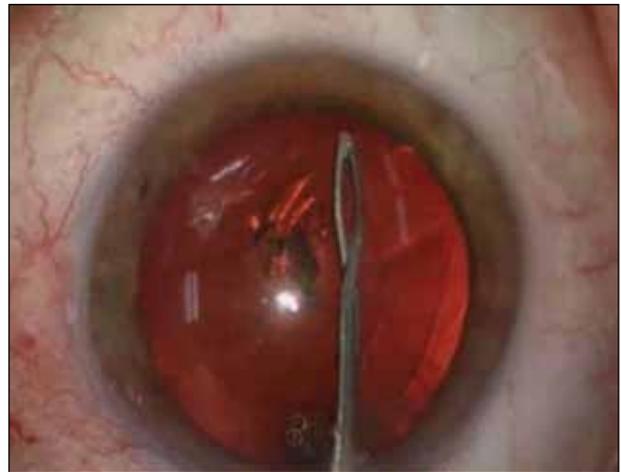


Figure 10. The double-cross-action forceps are used during creation of the capsulorrhexis.

there is plenty of room to utilize the instrument.

The Auffarth PEP forceps are also useful in small eyes and for pediatric cases, in which the capsular bag is flexible and space is limited. With the double-cross-action design, the surgeon can work effectively, using the strong forceps to guide the capsular tear.

Another reason I like this new tool is that it enables me to maintain an astigmatism-neutral incision. Often, incisions must be enlarged to accommodate the phaco tip and sleeve; however, other instruments, including forceps, can also be the cause. Today, we can achieve a small incision size, but the industry must come up with new lens

Courtesy of Florian T.A. Kretz, MD, FEBO

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delivery systems and phaco technologies to fulfill our needs as surgeons and the needs of our patients.

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Managing a Subluxated Lens

By Ruth Lapid-Gortzak, MD, PhD



A subluxated crystalline lens or dislocated IOL-bag complex can be surgically challenging. Prior to this year, I would use one of several strategies to manage these complications:

- IOL exchange with anterior vitrectomy, peripheral iridectomy, and implantation of an iris-fixed anterior chamber IOL;
- IOL exchange with anterior vitrectomy followed by implantation of a three-piece IOL using the Scharioth technique, in which the haptics are fastened through intrascleral tunnels;
- Insertion of a Cionni Capsular Tension Ring (Morcher GmbH) to stretch the capsule, with transscleral suturing of the eyelet of the device to secure the IOL-bag complex;
- IOL exchange and vitrectomy followed by transscleral suturing of a lens, using eyelets on the haptics for suturing; or
- Implantation of a foldable IOL with a transscleral suture passed directly through the edge of the optic.

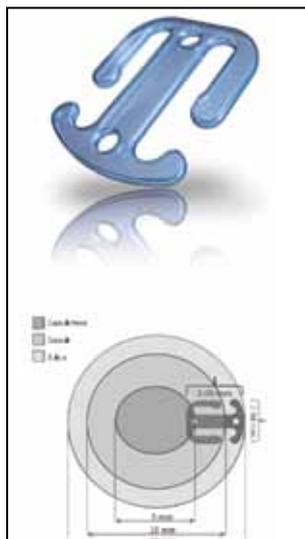


Figure 11. The AssiAnchor has two eyelets—one to allow manipulation and secure the anchor after implantation, if needed, and another that acts as the point of attachment for the transscleral suture.

Recently, however, I learned a technique with a device that has assisted me greatly in these challenging cases. The AssiAnchor (Hanita Lenses; Figure 11), named for Ehud Assia, MD, has turned out to be the most important innovation I have introduced to our clinical tertiary care anterior segment service at the Academic Medical Center of the University of Amsterdam in 2013. This anchor-shaped PMMA device fits through a 2.5-mm incision. It is colored blue to enhance visualization intraoperatively and has two eyelets—one to allow manipulation and secure the anchor before implantation, if needed, and another that acts as the point of attachment for the transscleral suture.

After the AssiAnchor is threaded onto a polypropylene 10-0 suture with a straight needle (Figure 12), it is inserted in the eye through a 2.5-mm incision (Figure 13). Next, the prongs of the AssiAnchor are hooked over the rhexis edge, securing the capsule and allowing phacoemulsification to take place as usual. If needed, a second anchor can be placed to increase the stability of attachment of the IOL-bag complex. In some cases, securing the capsular complex obviates the need to perform vitrectomy, leaving the compartments of the eye intact.

A video of the device being inserted into an eye can



Figure 12. The AssiAnchor is threaded onto a polypropylene 10-0 suture with a straight needle.



Figure 13. The AssiAnchor is inserted through a 2.5-mm incision and gently pulled by the transscleral suture.

Courtesy of Ruth Lapid-Gortzak, MD, PhD

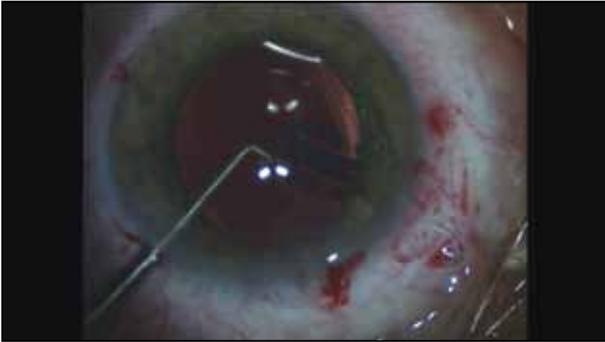


Figure 14. The device is anchored at the capsulorrhexis edge.

Courtesy of Ruth Lapid-Gortzak, MD, PhD



Figure 15. After it is attached to the capsulorrhexis edge, the AssiAnchor is pulled into place on the transscleral suture, adjusting position and tension.

Courtesy of Ruth Lapid-Gortzak, MD, PhD



Figure 16. At the end of the surgery, the zonulolysis is stabilized by the AssiAnchor, and the IOL-bag complex is centered and stable. The limbal-based scleral tunnel is closed with a 10-0 nylon suture.

be viewed at eyetube.net/?v=wokis. The prongs or lateral flukes of the anchor are attached behind the capsulorrhexis edge, at the point where the most support is needed (Figure 14). The main stem or shank of the anchor is then pointed toward the sulcus, and a transscleral suture is placed (Figure 15). Once attached, the anchor remains behind the iris, obscured from view. The anchor promotes pla-



nar stability, preventing tilt of the bag or lens that can occur with single-point transscleral fixation or with segmented devices (Figure 16).

In the case presented in the video, a patient experienced zonulolysis after implantation of a trifocal IOL, resulting in degradation of visual quality secondary to lens decentration and tilt. The AssiAnchor was secured to the rhexis edge at the site of the zonulolysis, allowing centration of the bag and, more important, of the trifocal IOL. The patient's distance UCVA returned to -0.14 logMAR.

My preferred technique for transscleral sutures includes creation of a limbus-based scleral pocket, as this allows easy access and good closure, and preventing erosion of the transscleral suture through the conjunctiva.

The AssiAnchor is not intended for routine cataract procedures. The capsular anchoring device is an excellent solution for eyes with zonular weakness or zonulolysis.

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Creating a Nomogram for Laser-Assisted Cataract Surgery

By Edoardo A. Ligabue, MD;
and Cristina Giordano, OD

Addition of femtosecond laser technology to cataract surgery allows the surgical team to optimize the centration and circularity of the capsulotomy and to reduce the amount of ultrasound required for phacofragmentation, thereby enhancing results with premium IOLs. In the past year, my key collaborator Cristina Giordano, OD, and I have worked to obtain complete capsulotomies and good phacofragmentation with the Victus femtosecond laser (Bausch + Lomb Technolas). We have found that these steps enhance IOL positioning,¹ especially for toric IOLs, and help us to achieve better rotational stability.²

We have learned some valuable lessons over the past year. The first challenge we encountered was selecting,

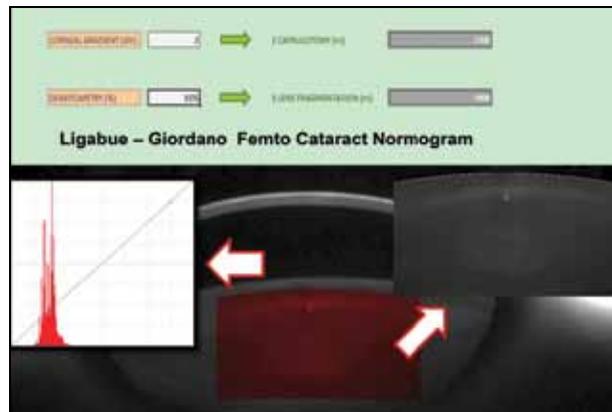


Figure 17. Cataract density evaluation and nomogram display.

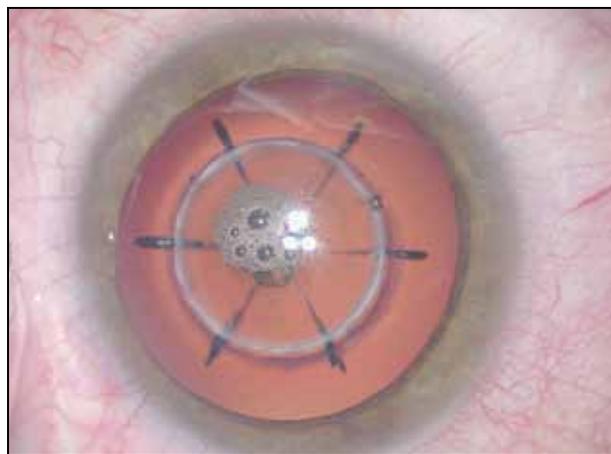


Figure 18. Capsulotomy and phacofragmentation after Victus treatment.

and then standardizing, the right level of laser energy for capsulotomy and phacofragmentation. We analyzed pre-operative nuclear density (Figure 17) and anterior corneal surface curvature gradient in 100 eyes undergoing laser-assisted cataract surgery. Once we determined the necessary amounts of energy for phacofragmentation and capsulotomy, we transferred the values to a nomogram that automatically selects the energy required for these steps of the Victus procedure.

Using the Scheimpflug and Placido-disc modalities on a corneal topographer (Sirius; Costruzione Strumenti Oftalmici S.r.l.), we examined crystalline lens refractivity for each acquisition, considering all sections acquired in a 5-mm area of interest. The value we extracted was not the maximum value but the 95th percentile, in order to take into account corneal scattering. In the anterior corneal surface curvature evaluation, the software calculated the average change in axial curvature from the center to the periphery in all sections of the 5-mm zone.

Courtesy of Edoardo A. Ligabue, MD

Courtesy of Edoardo A. Ligabue, MD

Our results led to the development of the Ligabue-Giordano Femto Cataract Nomogram, which is further described in a video at eyetube.net/?v=hefig. By entering the value in diopters of a particular eye's anterior corneal surface curvature gradient, we can determine the amount of energy (in nanojoules) to program into the Victus display for capsulotomy. Likewise, entering the percentage value of the nucleus density provides the value required for fragmentation energy.



Since we have been using the Ligabue-Giordano Femto Cataract Nomogram, we have not created any tissue bridges during capsulotomy or any irregular bubbles during fragmentation. Additionally, we have not experienced turbulence and have achieved good fragmentation in all cases (Figure 18).

This nomogram has allowed us to predict the performance of the femtosecond laser, to customize every treatment, and to decrease effective phaco time from an average 0.600 to 0.003 or 0.002 seconds and phaco power from 30% to 2%. This innovation can help surgeons to reduce their learning curves and obtain better and more predictable results with the Victus femtosecond laser.

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Treating Concomitant Cataract and Glaucoma

By Tobias H. Neuhann, MD

In addition to cataract surgical techniques and lens technologies, improved options for treating comorbid pathologies can have an impact on patient satisfaction. I have

discovered that, when my patients are properly educated, they are often eager to take advantage of new technologies.

My cataract surgical technique has evolved in the past year: Now I simultaneously treat glaucoma when appropriate, instead of referring these patients to a specialist after cataract surgery.

For patients using topical glaucoma therapy, I offer the iStent Trabecular Micro Bypass (Glaukos Corp.), implanted at the time of cataract surgery. Nearly 100% of covered patients elect the combination procedure, which produces an average decrease in IOP of 8 to 10 mm Hg compared with 1.5 mm Hg after cataract surgery alone. In my experience, 74% of patients who received the iStent in conjunction with cataract surgery eliminated their use of glaucoma medications.¹

Implanting the iStent does not significantly alter the safety profile of cataract surgery.² I implant the stent immediately following IOL placement. I fill the anterior chamber with a cohesive OVD such as Healon 5 (Abbott Medical Optics Inc.), then tilt the patient's head 45° and visualize the chamber angle using a gonioscopic lens. Once the stent is implanted into the trabecular meshwork, the patient's head is returned to its original position and the OVD is aspirated from the eye. Many times, a small amount of blood reflux can be seen, indicating correct placement of the stent.

With the number and scope of IOL models increasing, a law was passed in Germany mandating that patients must be informed of all lens options. Although insurance companies are required to cover the cost of the surgical procedure and a spherical IOL, we must educate our patients on all other options including aspheric, toric, multifocal, and accommodating lenses. What this law has taught me is that proper patient education increases the likelihood that patients will accept an additional charge for a premium service. In my practice, approximately 70% of patients elect an aspheric monofocal IOL or another premium lens.

Science is not static. With laser-assisted cataract surgery becoming more widespread, we will see additional changes to how we perform surgery. Likewise, physicians and scientists are investigating additional lens technologies and innovations, such as electrooptical and fluid optic lenses, that may be available in a few years. In the meantime, many of the technologies we have available today are not being offered to cataract patients.

The pearl I offer readers of *CRST Europe* is this: Take advantage of the wide spectrum of IOL options and combined cataract and glaucoma procedures we have available to us as ways to improve patient outcomes and quality of life.

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Incorporating Computer-Guided Surgery With Dynamic Optimization

By Jonathan D. Solomon, MD



In 2013, one exciting change to my practice involved the addition of the TrueGuide cataract surgical guidance software (TrueVision 3D Surgical; Figure 19), which I use in conjunction with the TrueVision 3D visualization system. I had previously tried using the visualization system with preoperative image capture from a slit-lamp-mounted 3-D camera and registration of that image with the live surgical view for toric IOL guidance. Now, with the TrueGuide software, capturing real-time images and calculations is easier.

The key change this year for me was the system's integration with the Cassini color light-emitting diode (LED) topography device (i-Optics; Figure 20), feeding the eye image and topography data to the TrueGuide software. This made a significant change in the workflow and data input used by the TrueGuide software algorithms to create precise guidance overlays. The overlays now incorporate more data specific to my surgical preferences and increase the amount of data specific to each cataract case.

It is nice to see that the eye image used for registration is matched to the keratometry (K), white-to-white, corneal apex, and other data, all captured in one sitting. This is more efficient for my technicians and patients. I also find



Courtesy of TrueVision 3D Surgical

Figure 19. The TrueGuide software is a component of the TrueVision 3D visualization system.

TABLE 1. INITIAL OUTCOMES IN 14 EYES

Mean Preoperative Keratometric Astigmatism	1.65 ±0.96 D (range, 0.54–3.34 D)
Mean Absolute Value Postoperative Refractive Cylinder	0.39 ±0.35 D
TrueGuide Mean Absolute Value Predicted Error	0.37 ±0.28 D
Mean Axis Identification Error	3.29 ±0.94° compared with reference image
Mean Toric IOL Axis Alignment Error	2.50 ±0.60° compared with intended axis

Courtesy of TrueVision 3D Surgical



Figure 20. Cassini image/data capture.

Courtesy of TrueVision 3D Surgical

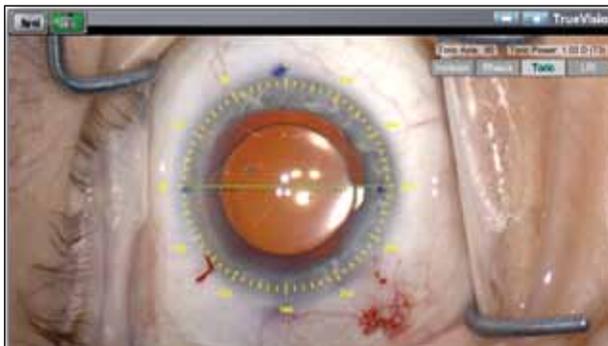


Figure 22. TrueGuide live surgery guidance overlay.

that the K readings obtained with the Cassini device are highly accurate and provide greater consistency than other methods of measuring K, particularly for determining the intended axis of astigmatism. The device obtains instantaneous front surface corneal shape data with the smallest central scotoma.

The TrueGuide software allows me to account for my specific level of surgically induced astigmatism and to see the predicted residual astigmatism in real time when I vary the positioning of my entrance incision. It also depicts the corresponding toric IOL alignment axis for each case. The software makes it easier for me to predict the impact of varying my incision location or lens axis, and I am beginning to account for posterior astigmatism adjustments within the software according to data previously published by Douglas D. Koch, MD, from Baylor College of Medicine.¹ The surgical workflow has been refined and streamlined so that we are able to quickly obtain registration (Figure 21)

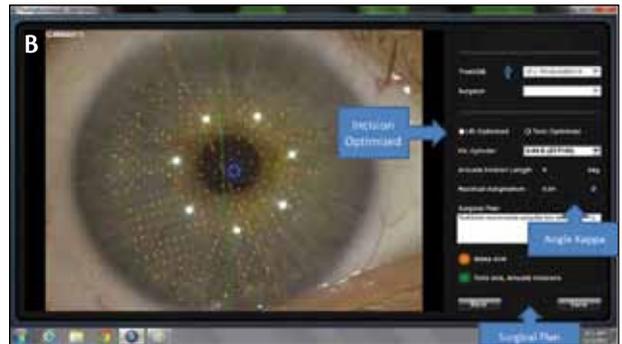
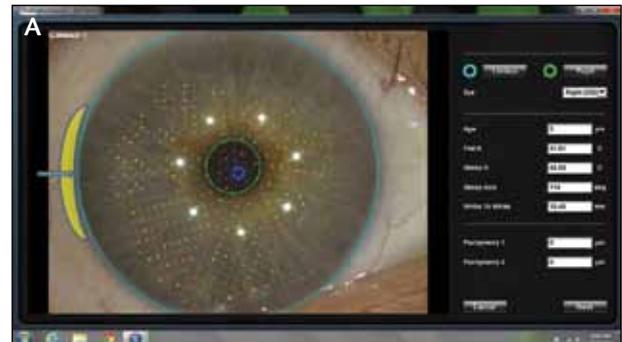


Figure 21. TrueGuide preoperative planning (A, B).

and move to surgery with the eye-tracked overlays (Figure 22).

During a recent users' event at the American Academy of Ophthalmology (AAO) meeting in New Orleans, Louisiana, I presented my initial data obtained on 14 eyes that were implanted with a toric IOL using the TrueGuide guidance software and Cassini data input (Table 1).² I was pleased with the initial outcomes and look forward to further refining my data input into the guidance software as additional features are added in 2014. ■

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Courtesy of TrueVision 3D Surgical

Using a Disposable Device for Capsule Cleaning



By **Khiun F. Tjia, MD**

My biggest step forward this year is using a disposable capsule-cleaning device.¹ Cleaning the capsule with a metal aspiration cannula used to be a nerve-racking part of cataract surgery—one that I tended to avoid when I thought it was safe to do so. But the truth is that every remaining cell on a patient's posterior capsule potentially decreases his or her vision postoperatively. In modern refractive cataract surgery, complete posterior capsule cleaning is mandatory.

The polymer tip of the disposable bimanual polymer I/A cannula (Alcon) has a higher outflow resistance than that of a metal cannula. As a result, it is necessary to increase vacuum by 20% and aspiration flow by 10% to get the same performance characteristics as with a metal cannula.

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Managing Prolapsed Vitreous During a PCR

By **Abhay R. Vasavada, MS, FRCS**

Posterior capsular rupture (PCR) with vitreous prolapse into the anterior chamber is a dreaded complication for every cataract surgeon. The surgical challenges include performing an adequate vitrectomy and preventing further extension of the rupture. The approach preferred by most surgeons is to perform a closed-chamber automated limbal anterior vitrectomy, guided by triamcinolone staining of the vitreous. However, it is important to understand that there are two forces acting on the prolapsed vitreous during anterior vitrectomy: a cutting force and an aspiration force. As the prolapsed vitreous is aspirated anteriorly, this also exerts an anterior pull on the larger mass of the vitreous body. Responding to this anterior tractional force, the posterior vitreous mass must pass through the small dehiscence of the capsular tear. This leads to turbulence in the anterior and posterior chambers. More often than not, the stress of the bulging vitreous leads to an enlarged tear, jeopardizing stable fixation of the IOL (eyetube.net?v=himap).

In these cases, I prefer to tackle the vitreous from the pars plana. Because the vitreous is being attacked from behind, the aspiration force is inside the central vitreous body. Therefore, the traction force acts only on the vitreous that has prolapsed through the tear. The anteriorly prolapsed vitreous can be aspirated and slipped through the PCR without stressing the tear, thus preventing enlargement (eyetube.net?v=weemo).

The advantages of confining the tear are obvious. With a small tear that does not extend to the equator, the surgeon has the opportunity to convert the tear into a strong continuous posterior capsulorrhexis. When this is successfully completed, the surgeon can achieve the final goal of safely implanting the IOL in its desired position (eyetube.net?v=mutik).

Performing pars plana vitrectomy is not difficult for the anterior segment surgeon. A transconjunctival sutureless 23-gauge vitrectomy is preferred due to the increased patient comfort, faster postoperative recovery, and less conjunctival scarring compared with larger-gauge vitrectomy techniques. The key is the use of a trocar-cannula system, allowing the surgeon to simultaneously create a small-gauge sclerotomy and insert the cannula.

The trocar is introduced into the pars plana region transconjunctivally in a biplanar fashion. Once it is situated, the trocar can be withdrawn as the cannula is held in place by its collar. Irrigation is supplied by the handpiece of the bimanual I/A cannula, introduced through a limbal paracentesis, and the vitrector is introduced through the cannula until it is visible in the pupillary area. Vitrectomy is performed under direct visualization using the highest cut rate the machine offers and modest vacuum, aspiration, and bottle height. Triamcinolone injected into the anterior chamber serves as a useful guide to ensure adequate and thorough anterior vitrectomy.

Once an adequate vitrectomy is ensured, the posterior capsular tear can be converted into a posterior capsulorrhexis with strong margins to facilitate in-the-bag IOL implantation. The understanding that I should perform anterior vitrectomy through the pars plana has significantly helped me optimize outcomes in eyes with PCR. ■

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