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Adopting the next generation of cataract surgery: Integrating the latest femtosecond lasers, fluidics and premium IOLs into your practice

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Key contributors

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Supported by an unrestricted grant from Abbott Medical Optics Inc.

Mahipal Sachdev, MD

Integrating LACS into your practice

by Mahipal Sachdev, MD

"Femtosecond cataract surgery became our buzzword as we spread the word to all of our staff, from the front office to physicians in all departments."

Before adopting new technology, surgeons need to lay groundwork with staff and patients

At the Centre for Sight Group of Eye Hospitals, we were early adopters of refractive laser-assisted cataract surgery (LACS).

When we implemented this technology, we meticulously prepared our practice and patients—essential steps that are key to success.

Preparing the foundation

When incorporating a new technology, the price must be right. If a premium procedure is underpriced, it will devalue it and diminish returns. However, if it is overpriced, the fee will be restrictive.

Before we launched this procedure, we offered presentations to our staff that explained the technology. Femtosecond cataract surgery became our buzzword as we spread the word to all of our staff, from the front office to physicians in all of our departments.

We identified core team members, including physicians, optometrists, and counselors, developing a network of femto cataract experts.

Training continued after installation of the technology, including the surgical team, staff, and counselors. When implementing the procedure, the team examined patient flow.

Spreading the word

When LACS is promoted, it must be differentiated strongly from standard cataract surgery performed by others. Our staff informs patients that this new blade-free technology makes surgery simpler, reduces phaco time, and may increase accuracy. We also can correct preexisting astigmatism, and recovery will be faster.

We begin spreading the word at reception. All patients receive an informational brochure regarding LACS when they register, regardless of their age.

Patients should continue to receive these messages in the waiting area via an interactive computer, signboard, or other means.

Our optometrists discuss LACS with patients, and physicians offer it as the default cataract procedure.

Subsequently, our senior consultant confirms the patient's interest, and the counselor discusses the pros and cons and cost-benefit ratio of LACS, schedules the patient for an appointment, and follows up with the patient.

To market the procedure externally, clinicians can advertise in newspapers and magazines, provide informational lectures, and network with general practitioners, creating brand awareness about this advanced technology available at their premium center. An online presence, employing social media, is also necessary.

Tricks of the trade

Our practice now performs 80 or 90 LACS cases per month, and all staff members play a role. We offer them team rewards as motivation when a record number of procedures is reached in a month. It is important to set targets and track the number of procedures performed each month.

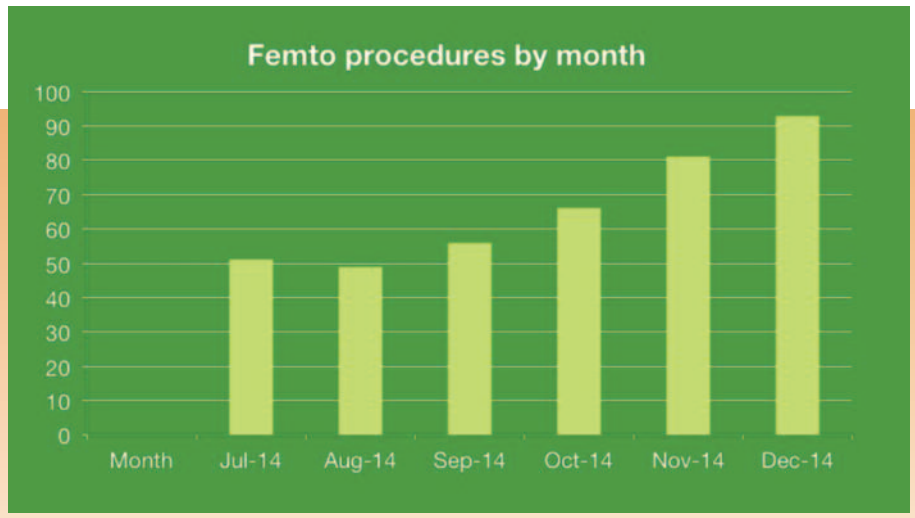
Practices should remember that marketing generates leads, but not cases. We track our leads and determine what works. When potential candidates contact us about the procedure, staff members respond promptly and schedule appointments. A dedicated refractive counselor connects with patients and continues to follow up.

LACS must be treated as a premium procedure. Patients should be treated exclusively and have a quicker and more efficient preoperative, intraoperative, and postoperative experience. They desire premium services and are willing to make the investment if they believe the results are worthwhile.

Conclusion

To achieve success in offering LACS, surgeons must believe in it and share their enthusiasm with their team. Patients will believe in this technology only if the entire surgical team believes in it.

Surgeons must prepare to lead in this process, choosing technology that works. The power of the laser will help convince patients. With these results, the technology potentially will pay for itself.



Monthly growth in LACS laser procedures

Dr. Sachdev is chairman of the Centre for Sight Group of Eye Hospitals in New Delhi, India.

Advancing astigmatic keratotomy

by George O. Waring IV, MD, FACS

George O. Waring IV, MD

Astigmatic correction is a key benefit of femtosecond technology

Refractive laser-assisted cataract surgery (ReLACS) is a simple procedure that is performed with a femtosecond laser—technology that our industry has known and loved for quite a while. The distinction between ReLACS and LACS is important because even the nomenclature is a cue that helps determine how the procedure is charged for and reimbursed.

Refractive laser-assisted cataract surgery (LACS) has been shown to be safe and effective. Its superiority in comparison with manual techniques has been debated, but more and more data are emerging that show LACS may be superior in terms of safety and predictability in achieving target outcomes.

Femtosecond lasers offer a number of potential benefits, including image guidance, femtosecond-enabled corneal incisions, capsulotomy, and fragmentation. A major benefit is the ability to perform femtosecond-assisted astigmatic incisions.

Femtosecond laser-assisted astigmatic keratotomy

In our practice, femtosecond laser technology has allowed us to expand the range of candidates for astigmatic correction, as well as candidates for multifocal intraocular lenses (IOLs).

Villegas et al. used adaptive optics to study the minimum amount of perceptible astigmatism that impacts visual acuity. They found that 0.3 D was visually perceptible. We feel that precise and reproducible laser incision architecture gives us the confidence to treat not only higher but lower degrees of astigmatism.

We anticipate continued improvements and innovations. Clinicians such as Dr. Eric Donnenfeld and Dr. Julian Stevens have developed femtosecond limbal relaxing incision (LRI) nomograms, and more are in development.

When creating an astigmatic incision with the Catalys Precision Laser System (Abbott Medical Optics, Abbott Park, Ill.) it takes only seconds, and we have full control in terms of the optical zone, depth, and other characteristics.

Case report

A 76-year-old woman presented to our clinic complaining of blurry distance vision, requesting an enhancement. She previously had cataract surgery in both eyes with monovision and a history of previous hyperopic LASIK before cataract surgery.

On examination, she had moderate dry eye with approximately 1.0 D against-the-rule residual astigmatism in her dominant eye and a spherical equivalent of near plano.

To minimize further impact on her dry eye, we wanted to consider options other than an excimer enhancement. After ocular surface optimization, we elected to use the Catalys to perform astigmatic incisions.

In this case, we programmed a paired astigmatic keratotomy of 80% with an expanded optical zone of 10.5 mm to keep the astigmatic incisions outside of the flap and inside the limbus. Our normal optical zone is set for 9.0 mm. Afterward, we simply opened the astigmatic incisions at the slit lamp.

Her preoperative tomography demonstrated 1.0 D of against-the-rule astigmatism. After her femtosecond laser-assisted astigmatic keratotomy (FLAAK), her tomographic astigmatism was reduced to 0.2 D, with a refractive result of plano and resolution of her symptoms. Qualitative analysis here is important. Historically with manual astigmatic incisional surgery, I would observe decreased tomographic astigmatism, but not typically full tomographic resolution. I observe this much more frequently with femtosecond laser astigmatic incisions, and I believe this is why we are seeing improvement in our refractive outcomes.

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"We feel that femtosecond-enabled astigmatic incisions are a key factor in the improved refractive outcomes we are observing with femtosecond laser IOL surgery."

Figure 1. High-powered magnification slit lamp photo of femtosecond LRI

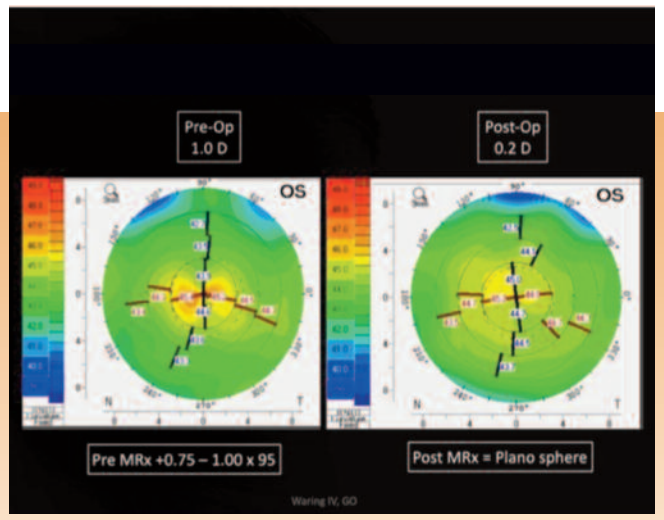

Figure 2. Comparison of preoperative and postoperative tomography with femtosecond laser-assisted astigmatic keratotomy (FLAAK)

Source: George O. Waring IV, MD, FACS

Dr. Waring is director of refractive surgery and assistant professor of ophthalmology, Medical University of South Carolina, Storm Eye Institute, Charleston; medical director of Magill Vision Center, Mt. Pleasant; and adjunct assistant professor of bioengineering, College of Engineering and Science, Clemson University, Clemson, S.C.

Next-generation lens extraction: Customizing phacoemulsification in LACS

by Tal Raviv, MD

Tal Raviv, MD

"Using the femtosecond laser and a dual pump phacoemulsification unit, we can tailor lens fragmentation to the specific cataract density and type."

Laser fragmentation options and dual pumps provide flexibility for each case

Research has demonstrated that lens fragmentation with the femtosecond laser provides measurable benefits in reduced phacoemulsification time, endothelial cell loss, and postoperative inflammation.[1–3]

With the Catalys Precision Laser System (Abbott Medical Optics, Abbott Park, Ill.) in addition to creating corneal incisions and capsulotomy, we can segment and soften the cataractous nucleus. The segmentation option enables surgeons to split the lens into large quadrants or sextants, and fragmentation patterns allow surgeons to soften the lens to almost a slurry by adjusting the grid spacing.

Relying on these features, we can customize phacoemulsification for each lens.

Tailored treatment

When I examine a patient at the slit lamp, I determine whether the lens is dense or soft. If the lens is dense, I plan for 4-quadrant segmentation and softening, typically choosing a 350-µm grid. If the lens is very soft, I soften the lens using a larger 600-µm grid, skip the segmentation, and use a supracapsular technique.

We sometimes encounter special situations. If the patient has a dense lens and small pupil, I skip the femtosecond capsulotomy and proceed with the lens segmentation and softening. With small pupil cases, I prefer to perform a manual capsulotomy instead of limiting myself to a tiny femto capsulotomy. Having the lens already fragmented in these dense nuclei still affords me the lens-softening benefits.

If the patient has a posterior polar cataract, I perform capsulotomy without fragmentation. A small case series showed a higher complication rate with the laser, likely due to the femtosecond-induced plasma bubbles creating pressure against the existing posterior capsule defect.[4]

We have been moving from ultrasound-driven lens removal to fluidics-driven lens removal, and femtosecond lens softening accelerates that trend. I use the Catalys and Whitestar Signature Phacoemulsification System (Abbott Medical Optics), which includes a dual pump, allowing me to switch pumps within each case: The peristaltic system holds large fragments at the tip (during initial "chopping" of presegmented nuclei), and the venturi pump draws small fragments to the tip.

With a soft lens, I proceed directly to venturi fluidics and perform a femto-flip. It's a very efficient way to remove the lens safely. I have found that by laser fragmenting the cataracts (lens softening), even medium density lenses can be femto-flipped easily and safely while maintaining corneal clarity. This is especially true with the followability of venturi fluidics.

Conclusion

Using the femtosecond laser and a dual pump phacoemulsification unit, we can tailor lens fragmentation to the specific cataract density

Dr. Raviv is clinical associate professor of ophthalmology at Icahn School of Medicine at Mount Sinai, New York, and founder and medical director of the Eye Center of New York.

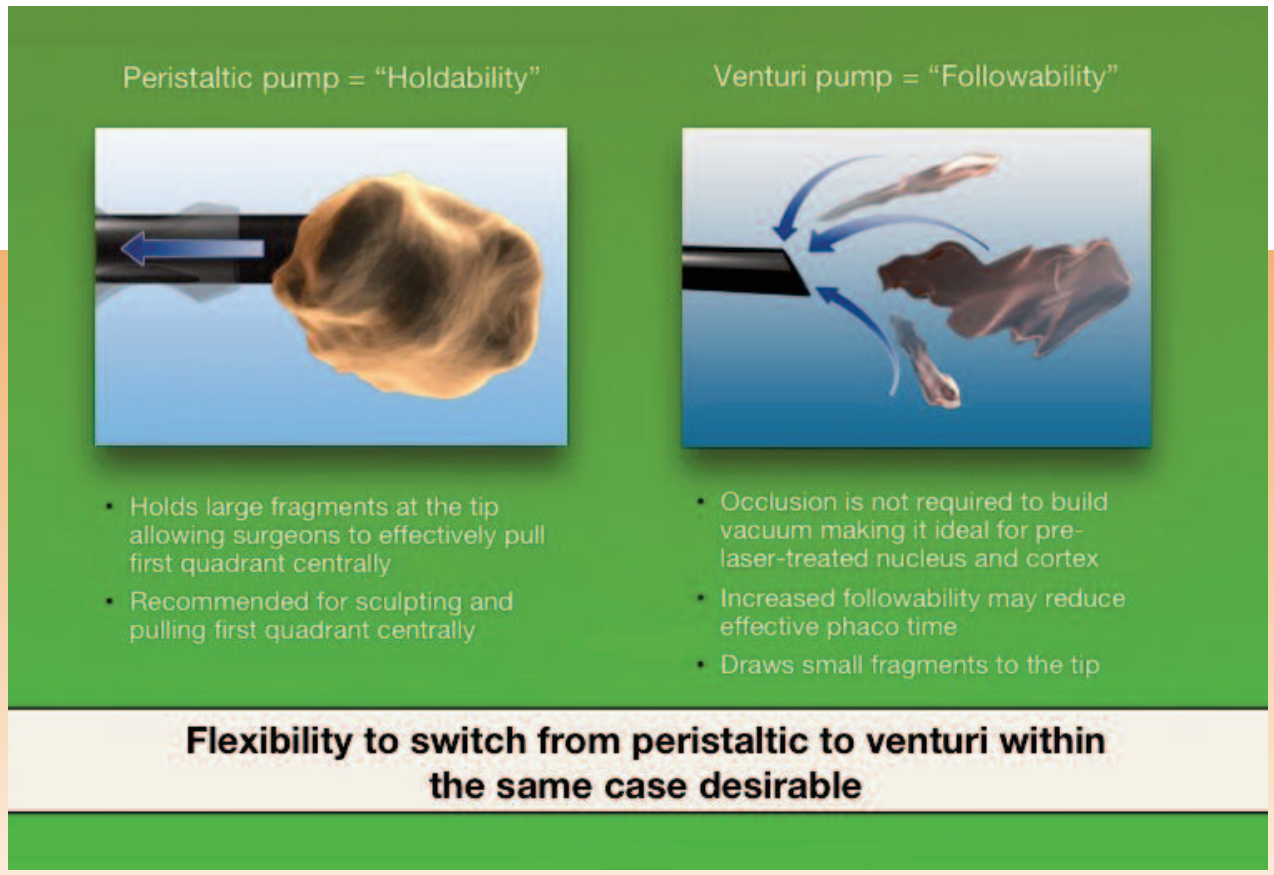

Figure 1. Pump advantages in laser-treated eye

> *"We have been moving from ultrasound-driven lens removal to fluidics-driven lens removal, and femtosecond lens softening accelerates that trend."*

and type. I plan whether to segment, soften, or perform both, and then I chose whether to use venturi fluidics alone or a combination of peristaltic and venturi with the Ellips FX Technology (Abbott Medical Optics). This provides a customized solution for all cataract types. With these two technologies, I believe we have achieved the highest level of safety.

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Conclusion

Astigmatic keratotomy is a key benefit of femtosecond lasers. We expect technologic advances, including new nomograms that ideally will be validated. In the near future, we will have integrated guidance devices to guide our laser-created incisions.

Femtosecond astigmatic LRIs allow surgeons to expand the range of candidates for upper and lower limits of astigmatic correction and, as a result, candidates for multifocal IOLs. We feel that femtosecond-enabled astigmatic incisions are a key factor in the improved refractive outcomes we are observing with femtosecond laser IOL surgery. The future is bright, and I am excited to see just how good our outcomes will be with further advances such as intraoperative guidance for femtosecond laser astigmatic incisions.

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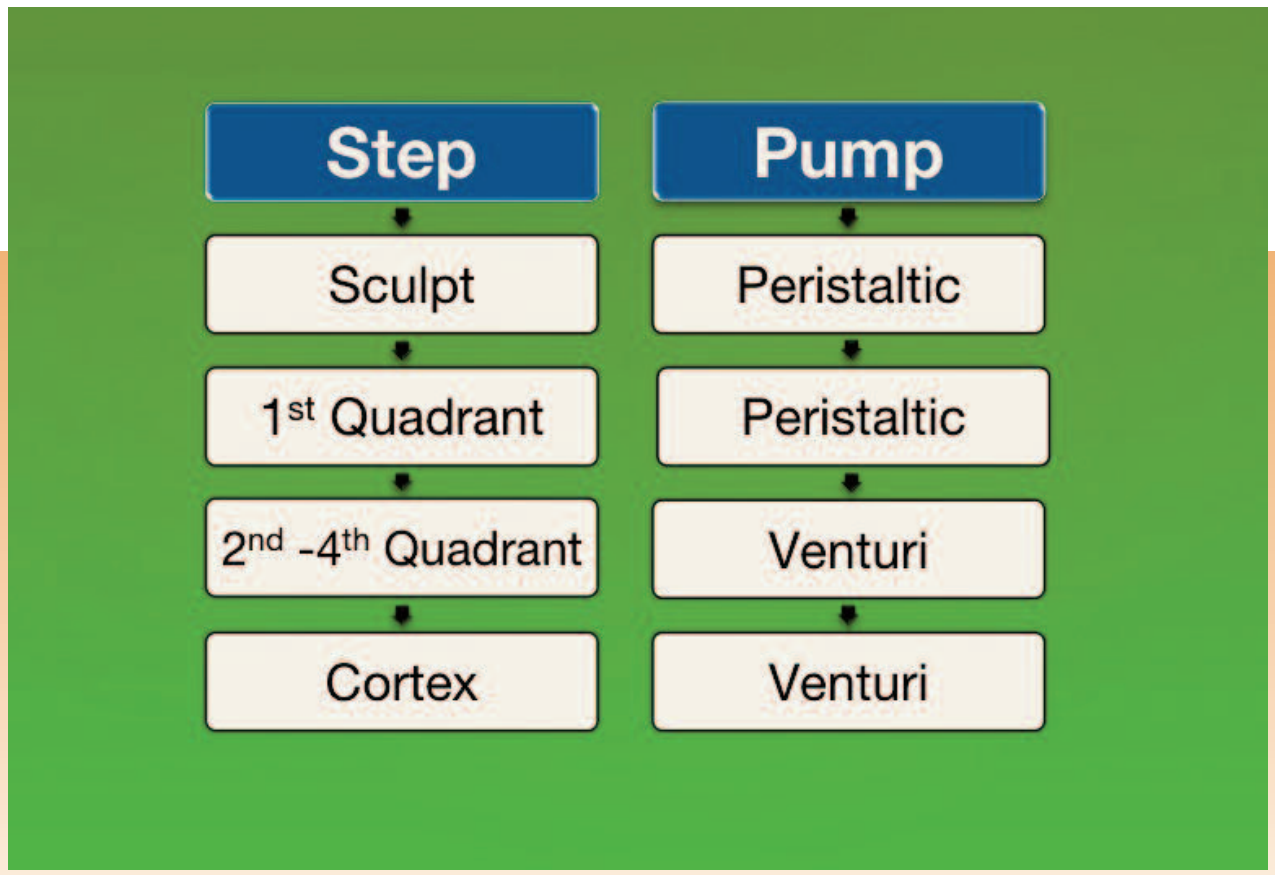


Figure 2. Fluidics settings by intraoperative step

Understanding and maximizing fluidics during cataract lens extraction

Xin Tang, MD

by Xin Tang, MD

"… using the peristaltic pump provides excellent holdability, while switching to the venturi pump provides excellent followability. The ability to switch between the two as needed during the course of the surgery thus results in increased efficiency."

We have become accustomed to ultrasound-driven lens removal—using phacoemulsification energy to remove the crystalline lens. And we have, to date, used this technique with outstanding results. However, this is not to say there is no room for improvement in our technique.

These days, lens extraction surgery has begun to undergo a change: from ultrasound-driven lens removal, we have begun moving toward fluidics-driven lens removal.

The pump is the basis of fluidics, and there are two types of pumps: peristaltic and venturi. Surgeons had previously had no recourse but to choose between the two, performing all their lens removal surgeries in their entirety with either one or the other.

Some surgeons have thus come to prefer one or the other, adapting their technique to their preferred pump. However, each type has its own set of advantages and disadvantages, and by choosing only one type of pump surgeons must relinquish whatever advantages the other pump would otherwise provide.

Fusion technology

Fusion pump technology (Abbott Medical Optics, Abbott Park, Ill.) now provides both peristaltic and venturi pumps conveniently in a single cassette. The peristaltic pump provides exceptional performance and control during surgery, while the venturi pump provides efficient tissue removal.

This technology allows the surgeon to switch control between the two pumps.

The WHITESTAR Signature Phacoemulsification System (Abbott Medical Optics) is the only phaco machine that can provide the two types of pump—two pumps in one pack. With this system, you can shift from one pump to the other whenever you need to during the surgery.

The Fusion pump thus provides the advantages of both peristaltic and venturi systems.

Fluidics as a tool

Using the Fusion pump technology, surgeons can now use fluidics as a tool to increase the efficiency of surgery.

Femtosecond laser-assisted cataract surgery (FLACS)—cataract surgery utilizing a femtosecond laser such as the Catalys Precision Laser System (Abbott Medical Optics) to create incisions and/or fragment the lens—is a hot topic in ophthalmic surgery clinics these days. Using fluidics can maximize the efficiency of an already efficient procedure.

During FLACS, the femtosecond laser is used to soften and segment the lens. The laser also creates surface maps and safety zones. The phaco machine is then used to complete the lens extraction, and the surgeon can select between the peristaltic and venturi pumps.

For fluidics-driven lens removal, using the peristaltic pump provides excellent holdability, while switching to the venturi pump provides excellent followability. The ability to switch between the two as needed during the course of the surgery thus results in increased efficiency.

The flexibility of switching from peristaltic to venturi within the same case is thus desirable. In one case, you can shift between the two pumps whenever it is necessary to do so.

Ellips FX

The WHITESTAR Signature is the only phaco machine that features the Fusion phaco technology—incorporating the Fusion pump technology together with the Ellips FX technology (Abbott Medical Optics).

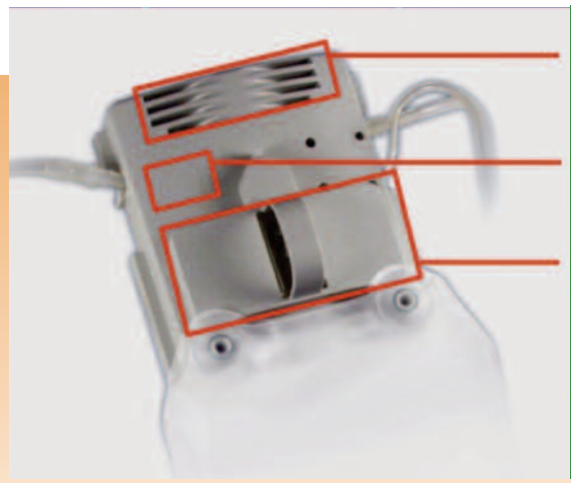
The Ellips FX simultaneously blends transversal and longitudinal energy delivery to increase cutting efficiency by emulsifying lens material in more than one direction.

The technology further enhances followability and effectively holds fragments at the tip. It also provides smoother, more efficient cutting, and works effectively with either curved or straight phaco tips.

Conclusion

With the WHITESTAR Signature Phacoemulsification System, surgeons can use fluidics as a tool to improve surgical efficiency.

The system helps surgeons optimize outcomes through Fusion phaco technology, incorporating the Fusion pump technology to safely maintain chamber stability while performing fluidics-driven lens extraction and the Ellips FX technology for maximum energy efficiency.



New technology provides both peristaltic and venturi pumps in a single cassette.

Prof. Tang is president of Tianjin Eye Hospital, Clinical College of Ophthalmology, Tianjin Medical University, China.

Improving presbyopia correction outcomes through extended range of vision IOLs

by Han Bor Fam, MD

The perfect option for presbyopia correction remains elusive. However, a new IOL design promises to improve outcomes in this population of patients.

The Tecnis Symfony extended range of vision IOL (Abbott Medical Optics, Abbott Park, Ill.) uses an advanced concept of diffraction to elongate the depth of focus in the eye, thereby extending the range of good vision.

Complementary technologies

Monofocal IOLs are designed to direct light passing through the lens toward a single, distinct point of focus. Bifocals are designed to create two distinct foci; most diffractive multifocal lenses are essentially bi- or trifocal lenses with two or three distinct foci in one lens.

Instead of creating distinct foci, the extended range of vision IOL elongates the focus.

This is achieved through the IOL's unique design. Rather than the typical diffraction rings used in standard multifocal IOLs, the Symfony uses echelettes—a fine series of reflection gratings made from parallel grooves in the anterior surface of the IOL.

In addition, the Symfony incorporates a second complementary enabling technology: achromat technology, which reduces chromatic aberration.

The average eye has approximately 2 D of chromatic aberration between 400 and 700 nm and 0.8 D between 500 and 640 nm. At the same time, increasing lens power and/or decreasing Abbe number increases chromatic aberration.

Chromatic aberration in turn increases the blurriness of vision.

To demonstrate the effect of achromat technology, the modulation transfer functions (MTFs) of three types of IOL—spherical, aspheric, and aspheric with achromat technology—were calculated for mesopic pupil sizes in clinically validated eye models. The spherical IOL had an MTF of about 0.4; the aspheric IOL about 0.5; the aspheric with achromat technology approached 0.6.

Extending range while maintaining contrast

Comparing the defocus curves of patients implanted with the Tecnis Symfony in both eyes (n=31) with those implanted with Tecnis monofocal IOLs (Abbott Medical Optics) in both eyes (n=10) demonstrates the way the former extends the range of vision.

Patients with Symfony IOLs maintained mean visual acuities of 20/40 or better through 2.5 D of defocus—a full diopter more than those with monofocal IOLs.

Importantly, this extended range does not come at the cost of compromised visual quality as seen in other presbyopia-correcting IOLs. The typical strategy for providing good near and far vision together in one IOL has been to have multiple, distinct foci. However, this redistributes the light transmitted through the lens and projected onto the retina such that contrast acuity in bifocal lenses is decreased by a factor of 2 compared to monofocals. This leads to halos and glare.

The Symfony does not create a second point of focus, thus minimizing halo. Coupling this with achromat and aspheric technology again enhances contrast.

Patient experience

Ultimately, the true test of an IOL's efficacy lies in patient experience. We conducted a survey using a directed questionnaire comparing the limitations without glasses experienced by patients who received the Symfony IOL against those who received monofocals.

At 3 months, the percentages of patients who received monofocal IOLs and had "none" or just "a little bit" of limitation in reading a magazine, doing crafts or hobbies, reading labels or prices, and doing computer work were 10%, 22.2%, 40%, and 12.5%, respectively. In comparison, 87.1%, 77.8%, 90.3%, and 92.8% of patients who received Symfony IOLs experienced "none" or just "a little bit" of limitation in these respective activities.

For the physician, these results mean that the Tecnis Symfony, in providing reliable outcomes, results in high patient satisfaction, fewer complaints in terms of contrast, halos and glare, and no significant additional chair time.

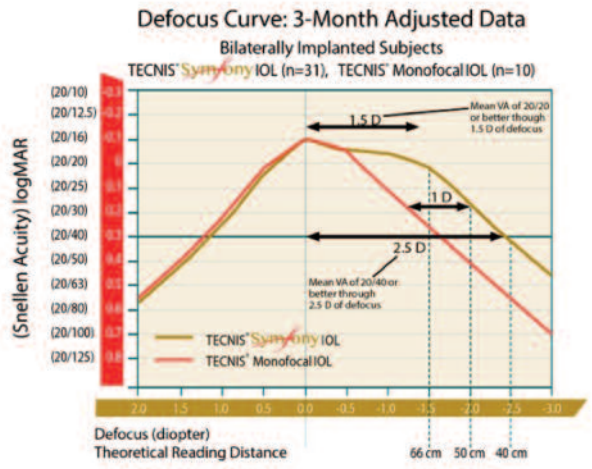
No perfect solution

To date, there remains no perfect solution, and conquering presbyopia remains an ongoing journey. However, with the Symfony, we may finally begin approaching journey's end.

Han Bor Fam, MD

"… these results mean that the Tecnis Symfony, in providing reliable outcomes, results in high patient satisfaction, fewer complaints in terms of contrast, halos and glare, and no significant additional chair time."

Dr. Fam is senior consultant at Tan Tock Seng Hospital Eye Clinic, Singapore.



Symfony IOLs extend the range of vision to about 1 D of defocus compared to monofocal IOLs.

Keys for success with toric IOLs: Preoperative, intraoperative, and postoperative considerations

Tetsuro Oshika, MD

"Bearing in mind these considerations, our clinical results with the Tecnis toric IOL speak volumes about the advantages of using toric IOLs."

by Tetsuro Oshika, MD

Across the crowded IOL landscape, Tecnis IOLs (Abbott Medical Optics, Abbott Park, Ill.) stand out with their excellent material for clear optics that remain glistening-free. Made using high-quality lathe cutting, these IOLs have a continuous 360-degree sharp edge to prevent posterior capsular opacification as well as wavefront-designed aspheric surfaces.

In addition, the Tecnis platform affords great stability in the eye. This characteristic makes the platform particularly suitable for toric correction—essential for meeting the rigorous demands for visual outcomes of the modern cataract patient.

Beyond the choice of lens, our experience has taught us several considerations that are keys to success with toric IOLs.

Regular and irregular astigmatism

Toric IOLs are indicated for regular astigmatism. Asymmetrical and irregular astigmatism cannot be corrected with toric IOLs.

These days, the Fourier maps of a TMS corneal topographer can evaluate regular and irregular astigmatism separately. We once treated a patient with both regular and irregular astigmatism. In this case, we used toric IOLs; irregular astigmatism was therefore not corrected.

Nevertheless, because the regular astigmatism was remarkably reduced, the patient was happy.

The presence and degree of irregular astigmatism should be evaluated with corneal topography, and surgeons should remember that toric IOLs cannot correct irregular astigmatism. Still, in some cases, correcting regular astigmatism can satisfy patients even with residual irregular astigmatism.

Axis registration

Accurate axis registration is important to success with toric IOLs. There are many methods available to do this, but in any case technique is important. At all measurements, the patient's head must be held straight. We perform reference marking with patients in the upright position and axis marking with patients on the bed. The reference mark is at 6 o'clock, while axis markings indicate the steepest meridian for IOL alignment.

There are different tools for reference marking, but surgeons should be careful to place their reference marker of choice appropriately—neither vertically nor horizontally deviated.

Given all the available options, surgeons can choose the most convenient method depending on their respective facility's situation.

Warming up Tecnis torics

The Tecnis toric IOL has a low refractive index, with a lens that is thicker and harder, slower to unfold.

Given these characteristics, we recommend making them warmer and softer prior to implantation. Unfolding time depends on balanced salt solution temperature, going from less than 10 seconds at 32 degrees C to almost 70 seconds at 22 degrees C. We store our balanced salt solution, OVD, and IOL at 40 degrees C, returning them to room temperature when starting surgery.

Keeping the balanced salt solution, OVD, and IOL warm help minimize axis misalignment. Axis misalignment can further be minimized by avoiding cold room temperature, ensuring complete removal of OVD behind the IOL, confirming stable in-the-bag IOL fixation, and avoiding shallowing and collapse of the anterior chamber.

Posterior astigmatism

Increasing attention has lately been paid to astigmatism of the posterior corneal surface.

While it has long been known that the astigmatism of the anterior surface shifts from with-the-rule to against-the-rule with age, the astigmatism of the posterior surface is now known to shift from against-the-rule to with-the-rule with age.

Surgeons should keep in mind that keratometry only measures the anterior surface. Thus, in eyes with with-the-rule astigmatism, the K-value is overestimated, while in eyes with against-the-rule astigmatism, the K-value is underestimated. This means that with toric IOLs, the former eyes tend to be overcorrected, while the latter eyes tend to be undercorrected.

'Forgiving' IOL

Bearing in mind these considerations, our clinical results with the Tecnis toric IOL speak volumes about the advantages of using toric IOLs.

In terms of preoperative versus postoperative astigmatism, there was a significant reduction in astigmatism ($p<0.05$) with toric IOLs. In terms of uncorrected distance visual acuity, 75% of patients receiving toric IOLs achieved an uncorrected distance visual acuity of 20/25 or better; only 30% receiving non-toric IOLs achieved this acuity ($p<0.05$).

Meanwhile, 80% of patients with bilateral toric IOLs vs. only 33% of patients with bilateral non-torics achieved spectacle independence for distance vision ($p<0.05$).

Few toric patients were unhappy—patients in this group accepted small amounts of residual astigmatism, indicating that the Tecnis toric IOL is very forgiving.

Prof. Oshika is chairman and professor of ophthalmology at the University of Tsukuba, Japan.

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