Implementing advanced cataract technologies

by Richard L. Lindstrom, MD

Despite advances in femtosecond laser technology, overall only 4.8% (5.8% U.S.; 3.6% non-U.S.) of ASCRS members’ patients are receiving femtosecond laser-assisted cataract surgery (LACS), as reported in the 2014 ASCRS Clinical Survey (Figure 1).

This survey, focusing on the most compelling and controversial issues, includes data points from 137 questions on key clinical opinions and practice patterns from more than 1,500 unique respondents. The survey included 11 specialty sections.

Survey responses

When respondents were asked in which clinical areas LACS may provide a significant clinical benefit compared with conventional cataract surgery, 42.2% believe it does not provide improvements in the capsulorhexis, 47.9% believe it does not improve lens fragmentation, and 40.7% do not believe it improves arcuate incisions (Figure 2).

“Although large, high-volume cataract practices may be able to provide LACS on their own, a shared access model may provide options for many surgeons.”

–Richard L. Lindstrom, MD

Kerry D. Solomon, MD, has received a retainer, ad hoc fees or other consulting income from, is a member of the speakers bureau of, and has an investment interest in: Abbott Medical Optics Inc., Bausch + Lomb, LENSAR Inc., LenSx, Sightpath Medical, Transcend Medical Inc., TrueVision, Vision Solutions Technology, and 3D Vision Systems. He has received a retainer, ad hoc fees or other consulting income from: Advanced Refractive Technologies, Alcon Laboratories Inc., Foresight Venture Fund #3, ForSight Labs, Hoya, ISTA, Lumineyes Inc., OSM, Omeros Corporation, Seres Medical LLC, Stratuspay Crown, Versant, and ViraMed. Dr. Lindstrom has investment interests in: Confluence Acquisition Partners, Curveright LLC, CXL Ophthalmics LLC, Vision Medical Laser, FoxMed, Healthcare Transaction Services, Heaven Fund, Nisco, One Focus Ventures, OnPoint, Rainwater Healthcare, Sarbox NP, SARcode Corp., Solbeam, Triflirma, and WaveTec Vision.

Accreditation Statement

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint providenance of the American Society of Cataract & Refractive Surgery (ASCRS) and EyeWorld. ASCRS is accredited by the ACCME to provide continuing medical education for physicians.

Educational Objectives

Ophthalmologists who participate in this activity will:  
• Analyze the quantity and quality of the available literature and studies demonstrating the key safety and efficacy improvements of LACS over conventional cataract surgery;  
• Describe different reimbursement and practice flow models in a variety of practice settings that permit the viable integration of LACS into a refractive cataract practice; and  
• Assess the impact of improving the management of residual corneal error, pre-cleaved lenticular material and the ocular surface in LACS and premium IOL patients.

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Staff members: Laura Johnson and Erin Schallhorn
In my experience, I have found that I can make much better corneal relaxing incisions with a femtosecond laser than with a diamond knife even though I performed diamond knife incisions for almost 30 years.

When respondents were asked about the barriers to adoption of the technology, the number one obstacle was reimbursement/financial concerns (61.7%) (Figure 3). More than 32% reported a lack of access to the technology, and 35% believe data showing clinical benefits are lacking.

Although large, high-volume cataract practices may be able to provide LACS on their own, a shared access model may provide options for many surgeons.

Almost 60% of respondents are not confident that there is currently an adequate reimbursement solution (private pay and/or insurance) to support LACS today (Figure 4). In addition, almost 45% do not believe there is an adequate reimbursement solution to pay for LACS technology even 5 years from now.

**Experienced panel**

Based on educational gaps identified in this survey, ASCRS has developed programs to meet members’ educational requirements. In this supplement, our panel of LACS experts will share clinical and practical recommendations for implementing this technology and achieving optimal surgical outcomes.

Dr. Lindstrom is founder of and attending surgeon, Minnesota Eye Consultants, adjunct clinical professor emeritus, Department of Ophthalmology, University of Minnesota, associate director, Minnesota Lions Eye Bank, and visiting professor, University of California, Irvine, Gavin Herbert Eye Institute. He can be contacted at rllindstrom@mneye.com.
Making femtosecond laser-assisted cataract surgery work in your practice

Femtosecond laser technology has advanced significantly during the last several years. Surgeons who are exploring laser-assisted cataract surgery (LACS) need to weigh its potential benefits and consider the best strategies to incorporate it into their practices.

Determining advantages

The femtosecond laser increases precision in some aspects of cataract surgery, said Kerry Solomon, MD, director, Carolina Eye Research Institute, and adjunct clinical professor of ophthalmology, Storm Eye Institute, Medical University of South Carolina, Charleston, who presented with Eric Donnenfeld, MD, Ophthalmic Consultants of Long Island and Connecticut, and clinical professor of ophthalmology, New York University, during the 2015 ASCRS•ASOA Symposium & Congress.

They reported that the automated technology performs capsulotomies more precisely, pre-softens and pre-segments the lens and reduces ultrasound energy, creates arcuate incisions to correct astigmatism (with an option for intrastromal incisions), and creates cataract incisions with a 3D architecture for greater sealability and reproducibility.

The femtosecond laser is particularly important in creating arcuate incisions. “If we’re going to become refractive cataract surgeons and meet the needs of our patients to produce excellent, uncorrected visual acuity, we have to be able to perform astigmatic incisions,” Dr. Donnenfeld said.

In addition, a number of studies have shown less endothelial cell loss with femtosecond laser procedures, Dr. Solomon said.1

“One of the real benefits of the laser is using high-definition optical coherence tomography,” Dr. Solomon said. “You can precisely measure real time the thickness and depth. You can image the cornea. Then you can very precisely determine the depth and the actual length of the arcuate incisions, and those provide for better, more accurate outcomes.”

“In addition, we’re all accustomed to doing limbal relaxing incisions, while intrastromal incisions, I believe, will become the mainstream,” Dr. Donnenfeld said. He explained that intrastromal incisions reduce pain and the risk of infection and offer better astigmatic predictability; however, they cannot be performed manually.

Incorporating LACS

Seven of 10 cataract patients have astigmatism that can be treated with toric intraocular lenses, arcuate incisions, limbal relaxing incisions, or other techniques, but it is treated in only 15% of cases, Dr. Solomon said. “Eighty-five percent of your patients are interested in being less dependent on glasses,” he said. “These are conversations you need to have, and femtosecond lasers are a way to make that happen.”

They offered pearls for integrating LACS into a practice or ambulatory surgery center (ASC) (Figure 1).

If integrating the technology, surgeons must believe LACS is good for patients and demonstrate their commitment to their staff and partners. “If they sense that from you, they’re more likely to adopt it and pass that along to the patients,” Dr. Solomon said.

The practice should provide educational materials to patients. However, physicians should avoid overselling the procedure. “I never pressure patients to feel like they are having something suboptimal if they are going with phacoemulsification alone,” Dr. Donnenfeld said.

Surgeons may offer refractive packages including non-covered services that are not part of the routine practice, Dr. Solomon said. Furthermore, clinicians should prepare to manage enhancements themselves or refer patients to a partner or colleague for enhancements, Dr. Solomon said.

In their ASC, surgeons need to understand the financial impact of performing LACS and develop a business plan to be financially successful.

In addition, clinicians need to educate their ASC staff. They should develop a flow and have a traffic coordinator. Staff should develop a rhythm and modify procedures accordingly.

Conclusion

Advances in femtosecond laser technology offer numerous benefits for surgeons interested in integrating laser-assisted cataract surgery into their practices. Surgeons who are exploring this technology need to understand the benefits and take steps to ensure a successful launch.

Reference


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Mobile laser-assisted cataract surgery
by David M. Dillman, MD

Tapping into the benefits of shared-access models

When entering the arena of laser-assisted cataract surgery (LACS), shared access through a mobile laser program may give clinicians an innovative pathway to offer this technology to their patients.

Weighing options

When I began investigating this option approximately 3 years ago, I visited 3 facilities and watched 5 surgeons perform approximately 100 LACS procedures. Even more importantly, I talked with them about why they adopted this technology and its advantages for patients (Figure 1). I quickly became a believer.

To adopt femtosecond laser technology, surgeons must believe it is a better technology for their patients compared with the techniques they used previously—not a moneymaker.

I recommend LACS to everyone, but I especially ask patients with complex cases to have this procedure. However, many patients cannot afford it, so I discount my fee by approximately two-thirds in those cases. Some patients cannot afford even the discounted fee, so I perform the procedure at no charge. Although I lose money in those cases because I still need to pay per-use fees for the laser, I consider this practice worthwhile.

When I initially adopted this technology, I could not afford it, so I explored other avenues. In my area outside Chicago there were no femtosecond lasers, so I could not perform LACS procedures in a nearby facility.

I had partnered with a mobile company, Sightpath Medical, in 1998, so we developed the first mobile LACS program. This company uses the LenSx platform. There are now 2 additional companies that offer mobile LACS programs: ForTec Medical, which uses the Catalys platform, and Precision Eye Services, which uses the LENSAR platform.

We performed the first mobile laser cases in 2013 in Hoopeston, Ill., with 2 surgeons sharing access to 1 laser. I performed 12 cases the first day. Two years later there are 174 sites in 36 states, with 311 active surgeons and 27 lasers in the field (Figure 2). This program has been used for nearly 23,000 cases.

Committing to mobile

Although shared access through a mobile LACS program reduces expenses associated with purchasing the femtosecond laser, the practice must commit to a specific amount of time, as well as a certain number of cases per quarter and per operating room day (Figure 3). For example, surgeons cannot ask the company to deliver the laser for 1 case on a specific day.

In addition, clinicians must purchase disposable docking devices and pay laser user fees for each case. In some instances, surgeons may be required to pay a penalty if they do not meet the quotas specified in their contracts.

Conclusion

Although shared access through a mobile LACS program requires a commitment, it is less than that required when purchasing a femtosecond laser. The mobile laser program made it possible for us to implement this technology and offer the benefits of this device to our patients.

Dr. Dillman is in private practice at Dillman Eye Care Associates, Danville, Ill. He can be contacted at Dadomer@aol.com.

Investigating LACS

- Summer 2012
- Visited 3 facilities, 5 surgeons
- Observed 100 LACS cases
- Talked with surgeons about advantages of technology

Mobile LACS growth

March 4, 2013
- 1 site: Hoopeston, Ill. (pop: 5,262)
- 2 surgeons
- 1 laser
- 12 cases

March 25, 2015
- 174 sites in 36 states
- 311 surgeons
- 27 lasers
- 22,863 cases

Potential contract commitments

- Certain amount of time
- Certain number of cases per quarter
- Certain number of cases per OR day
- Pay for disposable docking device per case
- Pay “user” fee per case
- Pay penalty if do not meet quota

Figure 1. Dr. Dillman began investigating LACS by following this process.

Figure 2. In 2 years, the mobile LACS program has grown.

Figure 3. Although mobile LACS necessitates a smaller commitment, contracts may require surgeons to commit to time and case quotas and pay for other expenses.
Deep impact

by Robert J. Weinstock, MD

Femtosecond laser-assisted cataract surgery offers increased precision and advantages in lens fragmentation

Femtosecond lasers are transforming cataract surgery, enabling surgeons to create laser arcuate incisions to correct astigmatism and perform laser fragmentation of the lens to reduce ultrasonic energy.

Arcuate incisions

After using the femtosecond laser to create arcuate incisions, we quickly see how precise those incisions are compared with manual incisions. Most surgeons who perform refractive cataract surgery agree that we can correct up to 1.5 D of regular corneal astigmatism consistently with this laser.

Eighty percent to 85% tends to be a commonly used corneal thickness depth, and an 8.5- to 9-mm optical zone is an ideal location when positioning these incisions.

Many nomograms are available, including those of Skip Nichamin, MD, and Eric Donnenfeld, MD. (LRIcalculator.com provides additional information on manual limbal relaxing incisions.) Surgeons can start with nomograms based on manual diamond blade incisions and then customize them based on their own results.

At the slit lamp the arcs and arc length are perfect, and optical coherence tomography shows how clean they are, with a consistent depth compared with manual incisions. Arcuate incisions created with the femtosecond laser open easily with a Sinskey hook or small cannula either intraoperatively or at the slit lamp postop.

Two femtosecond laser manufacturers have released software and additional hardware for axis registration to avoid cyclotorsion errors. This feature, along with automated surgical planning software, allows surgeons using the Verion Image-Guided System and LENSAR Streamline to be even more precise in their cataract procedures.

Lens fragmentation

I have found that the femtosecond laser reduces phacoemulsification time and power (Figure 1). It softens dense cataracts and prechops and pre-cracks the nucleus, so the surgeon can dismantle the nucleus more effectively.

The femtosecond laser reduces the need for ultrasonic energy and facilitates nuclear disassembly. Endothelial cell damage is reduced because there is less heat and thermal damage compared with traditional (not femto) ultrasound-only cases. Ultimately, I have noticed that there is less risk of posterior capsular tears due to excessive nuclear manipulation and time in the eye.

Surgeons should research femtosecond lasers for themselves. I have used 3 different laser platforms. All have shown a statistically significant reduction in effective phacoemulsification time by using fragmentation to remove the cataract. Surgeons can choose from an array of fragmentation patterns (Figure 2). For dense cataracts, I prefer a grid pattern, where I can chop the cataract, pretreating and softening it. We use much less ultrasound, and the case is quicker and easier.

Clinical pearls

When incorporating this technology into a practice, surgeons

Figure 1. Dr. Weinstock’s first 200 femtosecond laser cataract surgeries required less phacoemulsification time and power compared with standard techniques.

“After using the femtosecond laser to create arcuate incisions, we quickly see how precise those incisions are compared with manual incisions.”

– Robert J. Weinstock, MD
Beyond the laser

by William B. Trattler, MD

Surgeons need to consider the ocular surface, residual refractive error, and other factors to deliver optimal results with laser-assisted cataract surgery

Patients receiving femtosecond laser-assisted cataract surgery (LACS) have high expectations regarding their visual recovery. To provide the outcomes patients desire, surgeons need to perform a careful preoperative examination and take steps to minimize corneal swelling, avoid cystoid macular edema, and prevent ocular surface disease after surgery.

Case report
A 68-year-old cataract patient had a best corrected visual acuity of 20/50 before surgery. The optical coherence tomography (OCT) scan of the macula appeared healthy, and the cornea was crystal clear, with no guttata. She had a 2+ NS cataract. While she appeared to be a good candidate for cataract surgery, performing preoperative topography was important in this case to properly set expectations for the anticipated visual result. This is because the corneal topography revealed early keratoconus, which will reduce her quality of vision postoperatively.

Preoperative assessment
I recommend corneal topography for all cataract surgery candidates to determine whether they have a corneal condition that could affect postoperative vision.

Many experts estimate a keratoconus incidence of approximately 1 in 2,000 in the United States. I believe it is much more common in our cataract surgery population.

When we studied 400 consecutive eyes scheduled for cataract surgery, approximately 30% had abnormal preoperative topography. Excluding eyes that had previous RK or LASIK, approximately 25% still had abnormal topography. Three percent had keratoconus. Abnormal corneal topography in the presence of a normal-appearing slit lamp exam appears common in patients scheduled for cataract surgery, so it is useful to identify any corneal shape changes before surgery.

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We also need to detect and treat dry eye and blepharitis preoperatively, which can lead to incorrect intraocular lens (IOL) power calculations and affect
should educate their staff and patients about laser cataract surgery. If we do not speak confidently about it, they will not believe in it. We have to feel comfortable telling patients that we consider it better for their eyes. The only way to gain this confidence is to use it yourself and track your complication rates and outcomes.

To obtain optimal results, surgeons should develop a surgical plan before surgery. We should not enter data on the fly. There is always the risk of transcription error, so surgeons and staff must be vigilant in their protocols and processes with surgical planning.

For the procedure, patients should be lightly sedated; 1–2 mg of IV Versed is usually enough. If they are oversedated, they will fall asleep or wake during the procedure, causing a suction break.

Because the laser can induce slight miosis, I place a drop of 10% phenylephrine in the eye after the laser procedure to dilate the pupil slightly as long as this is not a cardiac risk for the patient.

Cortical cleanup is slightly different with femtosecond laser cataract surgery. Although it may appear that there is no cortex after the nucleus is removed, due to the presence of a perfectly clear red reflex, there may actually be a full untouched, undissected layer of cortex that is still present.

Figure 2. Lens fragmentation patterns. Left: A basic 2-cut cross pattern used for soft cataracts. Right: More elaborate cube pattern used for denser cataracts.

A 360-degree whitish ring at the edge of the capsulotomy is the tipoff that there is still cortex there. Bimanual irrigation and aspiration can help remove the sticky cortex because the surgeon can switch hands for the subincisional space.

**Conclusion**

Femtosecond lasers offer clinical benefits for cataract surgery, including the creation of arcuate incisions and fragmentation of the lens. Surgeons should educate their staff and patients about what laser cataract surgery can offer. This technology continues to mature and will likely continue to prove its worth in delivering better refractive outcomes for patients undergoing cataract surgery.

**Reference**


Dr. Weinstock is in private practice at the Eye Institute of West Florida, Largo. He can be contacted at rfweinstock@yahoo.com.

our ability to correct astigmatism because we will have inaccurate measures of the magnitude and axis of astigmatism.

**Postoperative strategies**

After cataract surgery, patients may have residual astigmatism or be under- or overcorrected. We can prescribe contact lenses or glasses, perform laser vision correction, implant a piggyback IOL, perform an IOL exchange, or perform arcuate incisions to correct these cases. I base my choice on the patient’s corneal topography and residual refractive error.

We prepare patients for the potential need for a second procedure to fine-tune their vision if they have factors that may increase the chance of being off-target, such as patients who had previous refractive surgery, various corneal diseases, or very long or short axial lengths or those in whom it is difficult to determine the exact astigmatism magnitude or axis.

If a patient’s postoperative vision is off-target, I perform a comprehensive examination, including topography and an OCT of the macula because there could be a new onset of mild macular swelling. We need to identify and treat that early, as well as dry eye and meibomian gland dysfunction (MGD) that may be present.

One major controversy is whether we should perform a YAG before PRK or LASIK enhancements. If we perform a YAG, it might impact our ability to perform an IOL exchange in the future. However, in most cases I feel confident that optimizing the refractive error will result in a satisfied patient, so I tend to perform a YAG before PRK or LASIK. That is because there can be a shift in the refractive error following YAG. If we perform LASIK or PRK first and perform a YAG 6 months later, the patient’s vision may be off-target.

After treating dry eye and MGD and performing a YAG, I repeat corneal topography and refraction before performing the laser vision correction enhancements.

With multifocal IOLs, we usually aim for plano. With an accommodative IOL, our goal may be slight myopia.

**Conclusion**

To optimize success with LACS, a thorough preoperative assessment is essential. If patients have postoperative residual refractive error, we need to optimize the ocular surface and consider performing YAG before laser vision correction. When weighing enhancement options, surgeons should consider the patient’s residual refractive error, refractive surgery history, and corneal topography.

**Reference**


Dr. Trattler practices with the Center for Excellence in Eye Care, Miami. He can be contacted at wtrattler@gmail.com.
CME questions (circle the correct answer)

1. According to Dr. Weinstock, most refractive cataract surgeons believe surgeons can correct up to ____ of regular corneal astigmatism consistently with the femtosecond laser.
   a. 0.5 D
   b. 1.0 D
   c. 1.5 D
   d. 2.0 D

2. According to Dr. Donnenfeld, intrastromal incisions ____________.
   a. Are associated with more pain
   b. Increase the risk of infection
   c. Can be performed manually
   d. Offer better astigmatic predictability

3. According to Dr. Solomon, 7 of 10 cataract patients have astigmatism that can be treated with toric intraocular lenses, arcuate incisions, limbal relaxing incisions, or other techniques, but it is treated in ____ of cases.
   a. 5%
   b. 15%
   c. 20%
   d. 33%

4. Dr. Trattler prepares patients for the potential need for a postoperative procedure to fine-tune their vision if they have factors that may increase the chance of being off target, such as ________.
   a. Previous refractive surgery
   b. Various corneal diseases
   c. Very long or short axial lengths
   d. All of the above

5. So he could afford to provide laser-assisted cataract surgery to his patients, Dr. Dillman explained that he:
   a. Purchased a femtosecond laser, taking advantage of financing options
   b. Performed LACS at a nearby facility
   c. Partnered with a company to develop a mobile LACS program
   d. All of the above

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