The Clinical Value of an Efficient Laser

How the design and functionality of the LENSAR Laser System facilitates femtosecond cataract surgery.

Based on videos produced on behalf of LENSAR, Inc., this is the final article in a series that has highlighted features of the LENSAR Laser System. Related videos may be found at Eyetube.net or by following the QR code at right. This installment explains why Mark Packer, MD, CPI, prefers to use the LENSAR Laser System for cataract laser surgery over any other laser system currently on the market.

eyetube.net

eyetube.net/?v=enivo

Without disregard for the critical importance of technical performance, the functionality and ergonomics of a femtosecond laser are, in my mind, equally essential components in clinical practice. In my experience, the LENSAR Laser System (LENSAR, Inc.) delivers the most efficient and functional femtosecond cataract procedure available today.

I love the LENSAR Laser's sleek, compact design and flexibility. It fits comfortably in an average-sized OR, rolls in and out of the room with ease, and can be tucked away when not in use. The laser's head retracts to maximize space, and it is easily deployed at the time of surgery. The LENSAR's design adapts to any environment, rather than requiring the environment to adapt to the demands of the laser.

DESIGN AND FUNCTIONALITY

The LENSAR Laser is accommodating to the surgical flow of an in-office minor procedure room, an ambulatory surgery center, or a hospital outpatient department. Its design allows the surgeon complete control over the surgical procedure. The laser's monitors can be positioned for maximum visibility of treatment parameters and the graphic interface, regardless of the surgeon's position relative to the patient. The interface itself is facile enough to be operated by the surgeon alone, although I prefer to employ a technician so I can give the patient my full attention.

To further extend its flexibility, the LENSAR Laser is designed to be used with any rolling bed or chair. In my opinion, the fixed beds that accompany other laser systems are problematic. They can be difficult to position without disturbing the existing workflow, and they can also pose challenges as staff members attempt to maneuver around them. By comparison, the LENSAR Laser's rolling bed model allows staff to transfer patients from room to room without the patient having to get up. Obviously, this is more natural and comfortable for the patient, but it also enables a familiar, efficient, and seamless procedural flow from holding area, to laser, to microscope, and back to holding.

LASER DOCKING AND CALIBRATION

One of the most important factors that determines the efficiency of a laser system—and often the rate-limiting step in the procedure—is the docking mechanism. The LENSAR Laser's patient interface and docking system are simple and straightforward to use. Simplicity, after all, begets efficiency. The low-pressure, nonapplanating suction ring fits comfortably on the eye, and the laser docks smoothly every time, saving the patient and the team the annoyance of repeated docking attempts. The joystick control is flawless. Its fine calibration provides ease of movement and accurate alignment.

OPERATING SPEED AND PRECISION

A unique imaging system lies at the heart of the LENSAR Laser. Dubbed *Augmented Reality*, it provides crisp, clean images. Structured illumination from a superluminescent diode adjusts its intensity when imaging each specific structure so that dim features appear brighter and bright features do not oversaturate (Figure 1). Structured scanning results in uniform image brightness from the anterior cornea to the posterior lens capsule, ensuring the accuracy and reliability of automated surface detection. Moreover, the

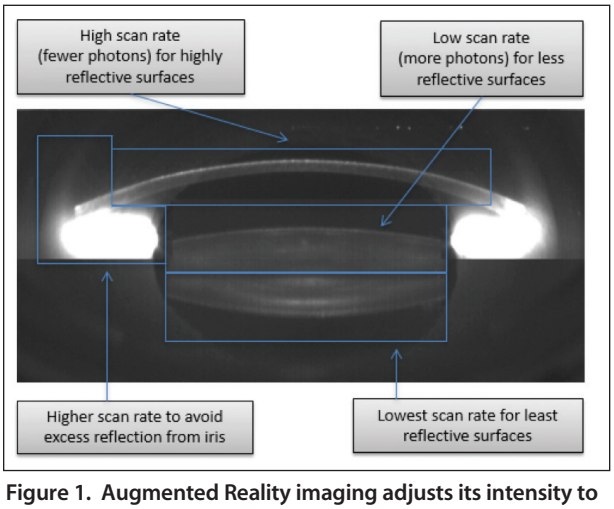

Figure 1. Augmented Reality imaging adjusts its intensity to provide uniform brightness throughout an image.

LENSAR Laser is the only femtosecond cataract laser that displays a three-dimensional reconstruction of the entire anterior segment. It is capable of revealing the eye's anatomy, the intended capsulotomy, nuclear fragmentation, and the incision's design before the laser fires.

Although the time required for nuclear fragmentation normally varies according to the density of cataracts and the complexity of selected patterns, I feel that the LENSAR Laser has the advantage in speed. The total docking time is almost always under 3 minutes. The LENSAR Laser's capsulotomy appears to be instantaneous, and fragmentation is complete in less than 30 seconds. Even with additional time for intraoperative re-imaging prior to the construction of each corneal incision, the incisions consistently appear in short order. The re-imaging process is worth an extra few seconds, because it allows the surgeon to adjust the incision's location and depth in order to compensate for any unintended movement caused by the capsulotomy, fragmentation, and previous corneal incision construction.

CATARACT GRADING AND FRAGMENTATION PATTERNS

I am particularly excited about a new feature of the LENSAR Laser: automated grading of cataract density. Similar to the way the Pentacam Comprehensive Eye Scanner (Oculus) grades cataracts, the LENSAR Laser's grading function identifies the densest part of the cataract and grades it as accurately as the LOCS III system, which has remained the gold standard for years.

A team of clinicians is now working to define the optimal fragmentation pattern for each grade of nucleus. Eventually, the laser will recommend a specific fragmentation pattern based on the density of the cataract that is identified by the imaging system (Figure 2). This process will optimize fragmentation, emulsification, and extraction, because it will predefine the best fragmentation pattern to minimize femtosecond and ultrasound energies. Of course, surgeons will have the option to choose different fragmentation patterns at their discretion, but the recommended fragmentation pattern based on nuclear density may be the most efficient method of lens extraction, whether for a refractive lens exchange or removing a 4+ nuclear sclerosis.

IRIS REGISTRATION

The effectiveness of arcuate incisions to reduce astigmatism depends entirely on placing them in the right location: centered on the steep axis of the cornea. However, the steep axis can be difficult to locate after the suction ring is placed, particularly if the patient's eye has rotated. The LENSAR Laser System can image and register features of the iris while the suction ring is in place. The laser then compensates for any cyclotorsion that occurred relative to an imported preoperative image from a topographer, and

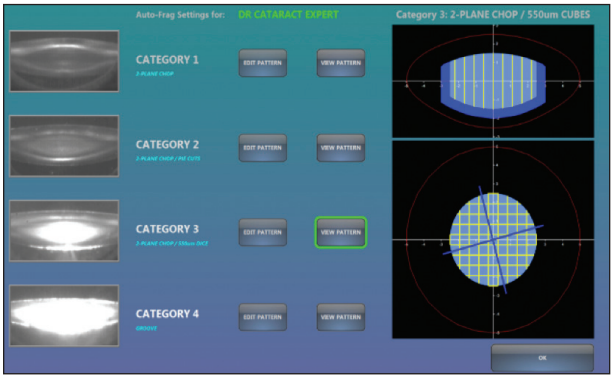

Figure 2. In the future, the LENSAR Laser will recommend a fragmentation pattern based on a cataract's density.

it automatically repositions the arcuate incisions in order to achieve the most effective cuts and reduce astigmatism without requiring any marking of the eye. The location and extent of the arcuate incisions can still be changed manually with the graphical interface touch screen, if necessary.

SAFETY FEATURES

Safety is, of course, paramount to all surgery. What attracted me initially to the LENSAR Laser over other options was the accuracy and precision of the Augmented Reality imaging system. I was impressed by the variable superluminescent diode that can image the posterior capsule and the anterior cornea with equal precision. Safe surgery depends on the software's ability to detect and recognize intraocular surfaces and guide the laser to the correct location in space. Moreover, it is critical that the imaging system be able to measure and account for any lens tilt relative to the cornea or interface device. The LENSAR Laser System has the unique ability to do that. It also re-images the cornea before executing each corneal incision in order to account for any change in the cornea's position that may have occurred as a result of previous steps in the procedure. The LENSAR Laser's automatic imaging and guidance technology ensures the highest level of accuracy and safety.

IMPROVED PATIENT OUTCOMES

Simply put, the LENSAR Laser gives my patients a high quality of vision. I feel assured of a perfect, free-floating capsulotomy, efficient fragmentation, pristine incisions that heal rapidly, and the minimal use of ultrasonic energy to remove a cataract quickly and safely. I truly appreciate the confidence the LENSAR Laser gives me when I walk into the OR. ■

Mark Packer, MD, CPI, is president of Mark Packer MD Consulting, Inc. He is a consultant to LENSAR, Inc., and has a financial interest in the company. Dr. Packer may be reached at mark@markpackerconsulting.com.