

# From Slipknots to Lasers

Surgeons provide a step-by-step analysis of some of the most watched videos on Eyetube.net.

**BY ALAN N. CARLSON, MD; DAMIEN F. GOLDBERG, MD; ARUN C. GULANI, MD;  
AND SUNIL SHAH, MBBS, FRCOPHTH, FRCS(Ed), FBCLA**

## ALAN N. CARLSON, MD

Adjustable-tension slipknots are certainly not new, but there is resurgence in interest among corneal and refractive surgeons and their trainees. In the 1970s, Clifford Terry, MD, developed an innovative knot, called the Terry Slipknot (Figure 1), to enhance the capabilities of his intraoperative Terry keratometer (no longer available) designed to optimize suture tension and manage astigmatism. I had the benefit of learning about this knot during my first year of residency under Jared Emery, MD, and Douglas Koch, MD, both brilliantly gifted anterior segment surgeons. This suture technique, which I demonstrate in my video, achieves a consistent and controlled tension in patients who need multiple sutures for procedures such as penetrating keratoplasty and deep anterior lamellar keratoplasty and in cases of penetrating and perforating traumatic lacerations. Furthermore, this is helpful in young children who are at risk of amblyopia and would benefit from a speedy visual recovery.

According to Dr. Terry, there are two ways to tie this knot. The first is to hold both ends of the forceps in the left hand. The forceps in the right hand goes over the top of both arms pointed toward the incision. The forceps then goes around and under both suture arms to grab the short end of the suture, which when pulled through forms a knot around the other arm. To increase friction, the top and bottom of the knot are simultaneously pulled. The tension at the incision is then titrated by controlling the tension of the knot. This step is accomplished by pulling the end without the knot to tighten and the end with the knot to loosen.

The other way to create the slipknot is to cross the sutures. The forceps in the right hand goes between the sutures pointed toward the incision. Next, the forceps in the right hand goes under the lower suture and then around it to grasp the end and form the knot.

Multiple temporary tension sutures can be adjusted under keratoscopic control for consistent and symmet-



**Figure 1.** Dr. Carlson creates a Terry Slipknot and slides it down into position.

ric suture tension. The final throw locks the suture at the desired tension, and the knot is buried.

Although much of our present-day surgery has become sutureless, it is still valuable to have this technique in our armamentarium for cases requiring sutures in which early visual rehabilitation is desired.

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## DAMIEN F. GOLDBERG, MD

The femtosecond laser brings a new level of safety and precision to cataract surgery. The training provided by Alcon's LenSx Laser team for how to perform the femtosecond laser portions of the surgery is thorough. Although the femtosecond laser's role in cataract surgery is still evolving, in my video I share eight pearls for early adoption of the LenSx Laser.



### No. 1. Practice Verbal Anesthesia

Verbally counsel your patient to look into the laser. It is critical with the first- and second-generation suction

rings to obtain good centration when the suction ring is docked onto the globe. Therefore, the patient needs to be reminded to look straight into the laser, not up at the surgeon. I also remind my patients to remain relaxed. It is important to avoid Bell phenomenon; sometimes, 1 mg midazolam with 25 mg of fentanyl administered by the anesthesiologist is helpful.

### No. 2. Achieve Centration and Suction

Similar to the IntraLase femtosecond laser (Abbott Medical Optics Inc.), head tilt and eyelid exposure are important to achieve good centration on the eye and good suction. Move the patient's eyelashes out of the way and tape the extra dermatochalasis from the upper or lower eyelids if necessary.

### No. 3. Measure the Pupil's Size Before the Case

When suction occurs, patient's pupil size will decrease. The smallest capsulorhexis that can be generated with the LenSx Laser has a circumference treatment of 4.3 mm; the laser will only treat 0.5 mm smaller than the pupil. My preference is a capsulorhexis of 5.1 mm for standard, toric, and multifocal IOLs and 6.0 mm for accommodating IOLs. By measuring the pupil size before starting a case, I have not had to cancel a surgery because of poor dilation. I counsel patients with intraoperative floppy iris syndrome ahead of time.

### No. 4. Be Aware of the Three-Plane Corneal Incision

The patient is set up in the OR in the same fashion as for cataract surgery. I typically make my incisions around 30° to 45° away from the flat plane. The femtosecond laser designs such precise three-plane incisions that the incisions at a steeper angle are around 80° to 90°. If using a Slade spatula or the Sinsky hook, aim downward to open the incisions, as this maneuver avoids generating article planes in the corneal stroma.

### No. 5. Double-Check the Capsulotomy

A laser-generated capsulorhexis will do a better job than a manually created one at obtaining the effective lens position. Sometimes, however, the laser can generate adhesions. I recommend using a cystotome or Utrata forceps to confirm that the capsulotomy is free of tags and adhesions.

### No. 6. Scrape the Cortical Material Before I/A

A capsulorhexis created by the LenSx laser will be generous and aim superior and posterior to the capsule and into the cortical material. There are no adverse side effects of this treatment. The capsulorhexis, however, is cleaved so cleanly that purchasing the cortex

with the I/A port can be challenging. Before I perform I/A, I use the Shepherd Capsule Polishing Curette or a cortex club (Epsilon USA) invented by Peter J. Cornell, MD, and scrape around the cortical material before the nucleus is removed. Roughing the cortical material allows greater cortical purchase with the I/A tips, making removal easier.

### No. 7. Release Built-Up Gas Bubbles

Capsular rupture during hydrodissection and hydrodelineation has been a concern.<sup>1</sup> The laser generates gas that can become trapped behind the lens. This is a similar phenomenon to the opaque bubble layer experienced time to time due to gas expansion during the flap's creation with the IntraLase femtosecond laser. It is not uncommon for gas bubbles to become trapped in and behind the lens fragments with the LenSx Laser. I recommend a careful hydrodissection of the fragments or completely cracking the nucleus to release the buildup of gas bubbles.

### No. 8. Confirm Residual Astigmatism

I open the limbal relaxing incisions with a Slade spatula or a Sinsky hook. I confirm the residual astigmatism via the Optiwave Refractive Analysis (WaveTec Vision) before I open incisions the next day in the office.

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### ARUN C. GULANI, MD

PRK can be performed on anterior corneal scars in patients who have the potential for best-corrected vision. In my experience of more than 10 years performing PRK on corneal scars, I have found that that most herpetic scars become part of the cornea. My corneal scar algorithm is part of my original 5S system (Figure 2).<sup>1-4</sup> My video begins with rapid movements to remove the epithelium in an atraumatic fashion, leaving the scarred area for last. I approach the scarred area from the periphery, literally raising the edges of the scar to determine whether this is an "on-cornea" scar (layered anterior to the cornea;





Figure 2. Dr. Gulani's corneal scar planning algorithm.

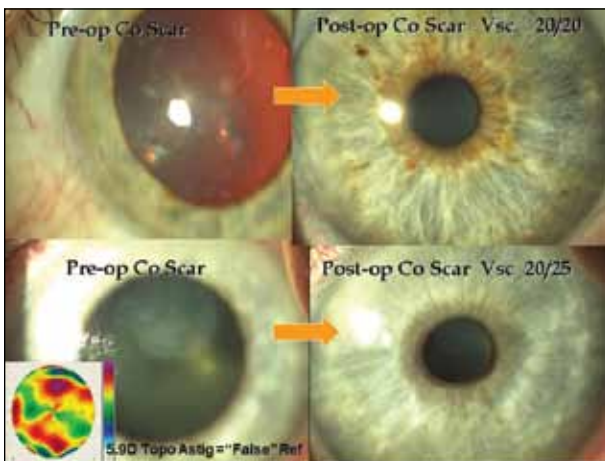


Figure 3. Refractive laser PRK for on-cornea scars up to 20/20 vision.

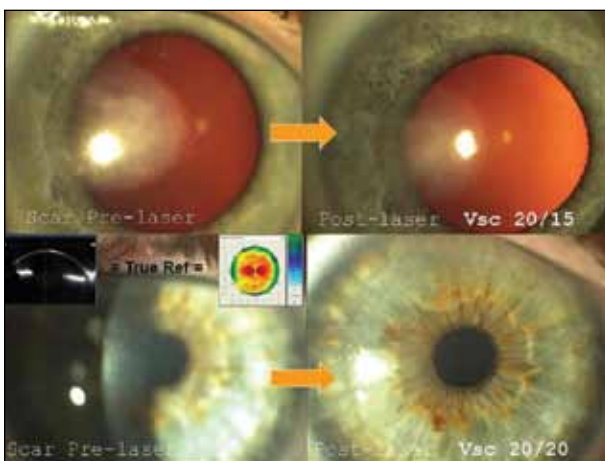


Figure 4. Staged refractive laser PRK for in-cornea scars up to 20/20 vision.

Figure 3) or an "in-cornea" scar (one that has blended with the rest of the cornea; Figure 4). The scar in the video is in-cornea, and I approach it as I would any

other refractive error, regardless of its opacity. Next, I perform PRK with mitomycin C. Upon completion of the laser procedure and following the application of balanced salt solution, the ring light reflex on the cornea, which was D-shaped, can be seen as a perfect circle. This reflex directly correlates to the improvement in the visual quality of the patient's eye. This approach allows patients with anterior corneal scars (otherwise headed for interventional surgery) with a stable cornea to undergo vision correction. This approach also helps to correct the complications of laser vision surgery that resulted in corneal scars and haze.

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**SUNIL SHAH, MBBS, FRCOPHTH, FRCS(Ed), FBCLA**

I present the use of the Lentis Comfort Toric IOL (distributed by Topcon Ltd.; not available in the United States) in a clear lens extraction for a patient with high myopia, astigmatism, multiple sclerosis, and a central scotoma from previous optic neuritis. The patient was having increasing difficulty managing contact lenses due to her multiple sclerosis and was also concerned about the long-term need for spectacles.

I chose to implant the Lentis Comfort Toric IOL (Figure 5) with a +1.50 D add. Fine near vision would not be possible in this patient because of the central scotoma. The Comfort Lens, in my opinion, offered the patient the smallest chance of experiencing dysphotopsia and a loss of contrast sensitivity.

I begin by marking the 9, 12, and 3 o'clock hours to ensure the lens is oriented correctly, with the long axis running from 6 to 12 o'clock (90°). Next, I make an incision at 90° with a 2.75-mm keratome and a small paracentesis at 180°. Using a cystotome, I create the capsulorhexis. During hydrodissection, I lift the capsule to strip the lens from it. After hydrodelineation, the lens is aspirated without needing to perform phacoemulsification, and I carefully clean the capsular bag.

After I load the IOL into the injector, I carefully inject



**Figure 5. The Lentis Comfort Toric IOL.**

it into the capsular bag. I nudge the trailing edge of the haptic plate so that it lands straight in capsular bag. I check the IOL's alignment before and after I remove the viscoelastic, reexamining the lens' orientation against the ink marks. I inject intracameral cefuroxime after I hydrodissect the wound.

My video introduces the use of a toric multifocal lens in an unusual scenario. Many patients may benefit from multifocal lenses, and ocular pathology should not exclude them from that opportunity. ■

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