

Laser Cataract Surgery in the Glaucoma Population

These patients present unique considerations and challenges, but many of them can benefit from the use of a femtosecond laser.

BY ROBERT J. NOECKER, MD, MBA

In many patients, laser cataract surgery presents an opportunity to improve refractive outcomes over phacoemulsification cataract surgery. Additionally, laser cataract surgery can be less traumatic to the eye overall.¹ Is glaucoma, however, a contraindication for the procedure? Not necessarily. Patients' rising expectations have made me consider laser cataract surgery for individuals whose glaucoma is medically controlled, those who have undergone glaucoma surgery, and those who are undergoing combined cataract and glaucoma procedures.

SUCTION

An important step of the laser cataract procedure is docking the unit. Patients who use prostaglandin analogues for a long time can develop periorbital fat atrophy² that may make both exposure of the eye with a lid speculum and docking of the patient interface to the ocular surface difficult. Moreover, the drugs' well-known side effect of eyelash growth can obstruct placement of the suction ring on the eye. Usually, I am able to prolapse the eye carefully with gentle downward pressure on the lid speculum and navigate around the eyelashes.

The presence of a filtering bleb can also make achieving suction challenging (Figure). Typically, blebs that have a low profile and have developed posteriorly do not present a problem, but a high bleb that extends onto the cornea does not make using the laser impossi-



Figure. View of an eye with a preexisting Ex-Press Glaucoma Filtration Device (Alcon) and bleb immediately after laser treatment and before cataract extraction. The bleb did not prevent completion of the laser ablation and was undamaged by the laser portion of the procedure.

ble; care must be taken to ensure proper suction, which necessitates some temporary compression of the bleb. A concern is possible trauma to the bleb, which could lead to leakage. Thus far, I have not encountered this complication when the bleb is well established and the patient has no history of leakage. A thin, avascular bleb would be at greater risk of this complication.

FEMTOSECOND LASERS MAY HAVE FUTURE ROLES IN GLAUCOMA SURGERY

By Malik Y. Kahook, MD

There has been a great deal of discussion recently about the use of femtosecond lasers to assist with cataract extraction. Ophthalmologists' use of this technology to perform a well-centered capsulorhexis that has a predictable size, to segment the lens, and to create corneal incisions promises to revolutionize the way they perform cataract surgery today and in the future. Glaucoma surgeons will be particularly interested in combining femtosecond laser-assisted cataract surgery (FLACS) with microinvasive glaucoma surgery procedures and devices such as the iStent Trabecular Micro-Bypass Stent (Glaukos), the Trabectome (NeoMedix), and endocyclophotocoagulation. FLACS should also be attractive for cases of loose zonules and compromised corneal endothelium such as in eyes with pseudoexfoliation cataracts, because the laser will decrease manipulation of the lens and the total amount of phacoemulsification energy required. An exciting prospect is using the laser to facilitate glaucoma surgery—independent of microinvasive glaucoma surgery and other ancillary devices—in conjunction with cataract surgery and in standalone procedures to reduce IOP.

Ophthalmologists could combine femtosecond laser-assisted glaucoma surgery (FLAGS) with FLACS by creating microholes in the trabecular meshwork, which would allow aqueous to bypass the diseased trabecular meshwork and drain into Schlemm canal through the natural outflow system. According to Nakamura and colleagues, the FLAGS-FLACS approach is feasible using a gonioscopy lens, and it causes negligible collateral damage to surrounding tissues.¹ More recently, Chai and colleagues created partial-thickness subsurface drainage channels in the sclera of rabbits in vivo with a 1.7- μm -wavelength femtosecond laser. These channels reduced IOP, suggesting the approach's utility for the treatment of glaucoma.²

Customizing the surgical approach to each patient's anatomy will require refinement of the available laser platforms. Femtosecond lasers may also enhance the implantation of novel glaucoma devices not yet on the market. The combination of FLACS and FLAGS represents an exciting possibility for glaucoma patients and glaucoma surgeons alike.

Malik Y. Kahook, MD, is the Slater family endowed chair in ophthalmology; vice chair, clinical and translational research; and director, Glaucoma Service and Glaucoma Fellowship, for the Department of Ophthalmology at the University of Colorado School of Medicine in Denver. He is a consultant to Alcon and holds intellectual property interests in Abbott Medical Optics, ClarVista Medical, Glaukos, New World Medical, OcuTherix, and ShapeTech. Dr. Kahook may be reached at (720) 848-2020; malik.kahook@ucdenver.edu.



1. Nakamura H, Liu Y, Witt TE, et al. Femtosecond laser photodisruption of primate trabecular meshwork: an ex vivo study. *Invest Ophthalmol Vis Sci.* 2009;50(3):1198-1204.

2. Chai D, Chaudhary G, Mikula E, et al. In vivo femtosecond laser subsurface scleral treatment in rabbit eyes. *Lasers Surg Med.* 2010;42(7):647-651.

Placement of the suction ring may be difficult or impossible if a glaucoma drainage device is located in the limbus and/or covered by an elevated patch graft. When the tube is uniformly covered by low-profile patch graft material and positioned well behind the limbus, however, I find laser treatment to be no different than in eyes without these devices.

SUBCONJUNCTIVAL BLOOD

It is not uncommon to see some subconjunctival blood after the laser procedure similar to that seen after LASIK. The incidence has become much less with time, as the duration of laser ablation and therefore suction has decreased significantly. If present, subconjunctival

blood may need to be addressed. Its occurrence can be minimized by the preoperative topical administration of vasoconstrictors and the use of additional antiinflammatory agents such as steroids pre- and postoperatively.

In my experience, the problem is most likely to occur in patients with blebs on anticoagulants in whom multiple attempts at achieving suction are required. In these cases, I administer subconjunctival antimetabolites or steroids to minimize the chance of significantly compromised outflow, because standard cataract surgery induces at least low-level inflammation. The procedure can also stimulate a wound-healing response, producing subconjunctival scarring that decreases flow from the filtering site.³

CAPSULORHEXIS

Pros

I find laser versus manual creation of the capsulorhexis to be easier in cases involving suboptimal visualization, a poor red reflex, and/or an unstable crystalline lens. The laser makes the use of capsular dyes unnecessary.

Laser cataract surgery can also be extremely helpful in complex scenarios frequently associated with glaucoma patients. For example, pseudoexfoliation may cause the pupil to be somewhat smaller than desired for cataract surgery. With the femtosecond laser, I find that I can maximize the size of the capsulorhexis and perhaps place the ablation pattern extremely close to the pupillary margin without risking pupillary injury or a radial tear underneath the iris. Moreover, I can easily place the capsulorhexis eccentrically in eyes with preexisting lens decentration. In eyes with poor zonular support due to pseudoexfoliation or trauma, creating the capsulorhexis with a laser is gentler on the remaining zonules.

Cons

The presence of posterior synechiae can make it difficult to complete the capsulorhexis with a laser. I instruct patients to discontinue using pilocarpine well in advance of cataract surgery so that I can determine whether or not posterior synechiae are present and, if so, how much they encroach on the dilated pupillary zone. Centrally located synechiae may not permit use of the laser for nucleofractis and the capsulorhexis. It could still be employed for the creation of arcuate, primary, and secondary corneal incisions.

If the adhesions were not centrally located, then a laser capsulorhexis and nucleofractis could be attempted, but the capsulorhexis might require manual intervention to be completed. Similarly, the laser might not be able to complete the capsulorhexis beneath a tube shunt that extends into the pupillary zone.

CORNEAL ENDOTHELIUM

Use of the laser tends to reduce the overall ultrasound energy administered to the eye during the cataract procedure. This benefit is particularly important, I find, in eyes with shallow chambers or endothelial compromise, common findings in the glaucoma population.

ASTIGMATISM

Some of my happiest patients are those with astigmatism induced by glaucoma procedures who undergo laser cataract surgery. I find laser arcuate incisions to be highly effective at reducing low levels of cylinder during

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cataract surgery. Patients greatly value a reduction in their astigmatism, and the laser gives me greater confidence in using accommodating or toric IOLs in patients who have had prior glaucoma surgery by helping me to minimize residual refractive error.

COMBINED PROCEDURES

Which glaucoma procedures can be combined with laser cataract surgery? I have achieved excellent results with myriad combinations. For patients with mild glaucoma, I tend to combine endocyclophotocoagulation, the implantation of an iStent Trabecular Micro-Bypass Stent (Glaukos), or both with laser cataract surgery. I consider these glaucoma procedures refractively neutral, so I do not alter my usual approach. Because other glaucoma procedures can have a refractive effect, I have reviewed my own data, and I make adjustments to the laserarcs.com (Illinois Eye Surgeons) calculations that I use preoperatively.

CONCLUSION

The femtosecond laser is a powerful new tool that I believe improves the safety and refractive predictability of cataract surgery. Because glaucoma patients are at increased risk of having abnormal ocular anatomy and tend to be a less intraoperatively predictable population, I use the laser when appropriate to optimize the outcome of their cataract surgery or combined cataract and glaucoma surgery. ■

Robert J. Noecker, MD, MBA, practices at Ophthalmic Consultants of Connecticut in Fairfield. He is a consultant to Alcon. Dr. Noecker may be reached at (203) 366-8000; noeckerrj@gmail.com.



1. Alió JL, Soria F, Abdou AA, et al. Comparative outcomes of bimanual MICS and 2.2-mm coaxial phacoemulsification assisted by femtosecond technology. *J Refract Surg.* 2014;30(1):34-40.
2. Kucukcaviloglu M, Bayer A, Uysal Y, Altinsoy H. Prostaglandin associated periorbitopathy in patients using bimatoprost, latanoprost and travoprost. *Clin Experiment Ophthalmol.* 2014;42(2):126-131.
3. Zhang N, Tsai PL, Catoira-Boyle YP, et al. The effect of prior trabeculectomy on refractive outcomes of cataract surgery. *Am J Ophthalmol.* 2013;155(5):858-863.