CATARACT SURGERY **FEATURE STORY**

eyetube.net

Phacoemulsification Plus CO_2 Laser-Assisted Sclerectomy

When combined with cataract surgery, the CLASS procedure can be a simple and effective means to treat patients with open-angle glaucoma.

BY RENGARAJ VENKATESH, MD

Glaucoma is the second leading cause of blindness worldwide; an estimated 8.4 million individuals are blind from the disease, and an additional 60 million have optic neuropathy.[1] Traditional treatment begins with hypotensive topical medications, which have proven efficacy at lowering intraocular pressure (IOP) when used as directed.[2] However, patients' compliance with their regimens is low, mainly due to a combination of factors including high cost, lack of accessibility, and difficulty inserting drops into the eye.[3] Surgical options are explored only when the state of the disease has progressed far enough to mitigate the risks posed by the current surgical gold standards for glaucoma treatment: trabeculectomy and tube shunts. Despite overall good outcomes, these procedures are commonly associated with complications, from mild effects such as foreign body sensation and dellen formation to more serious complications including leaking blebs, hypotony, blebitis, and endophthalmitis as a result of eye penetration and/or the insertion of a foreign object into the eye.

Carbon dioxide (CO_2) laser sclerectomy surgery (CLASS) is emerging as a less invasive and simpler treatment option for patients with primary open-angle glaucoma (POAG) or pseudoexfoliative glaucoma (PEXG). This nonpenetrating solution is simple and can be performed by a skilled glaucoma and cataract surgeon (eyetube.net/?v=idina).

TECHNOLOGY AND TECHNIQUE

The IOPtiMate system (IOPtima) consists of a 10.6-µm wavelength CO_2 laser, a micromanipulating scanner, and a control unit. The laser ablates the sclera in a preselected grid pattern, allowing percolation of aqueous fluid without penetrating the eye or inserting a foreign object into it.

In adopting this system, I experienced virtually no learning curve with the CO_2 laser. After the correct positioning of the laser on the eye is identified, the machine performs the ablation with a precision and speed that significantly reduces the possibility of unnecessary eye perforations or punctures.

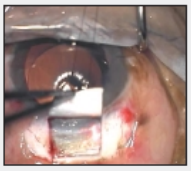
Before the procedure, I take particular care in identifying the corneal limbus, as targeting the laser precisely on this area ensures successful opening of the Schlemm canal and allows the percolation of aqueous fluid. In my experience, use of the correct laser position yields accurate outcomes every time; placing the laser too anterior increases the risk of perforating the corneal epithelium, whereas posterior placement may

TAKE-HOME MESSAGE

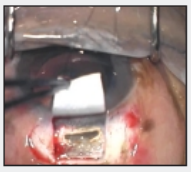
- Because CLASS, a less invasive and simpler option for glaucoma patients with POAG and PEXG, does not penetrate the eye, it can be combined with phacoemulsification.
- In a prospective, single-arm, nonrandomized clinical trial of 17 patients, IOP decreased from 29 mm Hg preoperatively to 14.6 and 13 mm Hg at 12 and 24 months, respectively.
- Because of its fast learning curve, CLASS can potentially be performed by general ophthalmologists rather than exclusively by glaucoma specialists.

SURGICAL STEPS

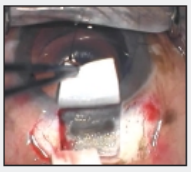
Step No. 1
A standard scleral flap is created.



Step No. 2
The laser beam is scanned rapidly in a preselected ablation pattern, repeatedly ablating thin layers of sclera and exposing and unroofing the Schlemm canal.



Step No. 3
When adequate percolation is achieved, the fluid absorbs the laser energy and prevents further ablation.



Step No. 4
A thin layer remains intact, and penetration of the eye is avoided.

Step No. 5
The scleral flap is closed and sutured.

result in the laser hitting only the sclera and failing to open Schlemm canal.

To initiate CLASS, I expose the limbus by creating a fornix-based conjunctival flap. I then make a standard scleral flap (5 X 5 mm) in the clear cornea, thereby creating a bed that serves as a reservoir for aqueous fluid. Next, the grid pattern of the CO_2 laser beam rapidly ablates thin layers of the dry sclera to unroof the Schlemm canal, permitting aqueous fluid to percolate into the canal. The fluid absorbs the laser energy and automatically terminates the ablation process, preventing penetration of the eye. I complete this phase of surgery by closing and suturing the scleral flap and conjunctiva (see *Surgical Steps*).

CLASS AND PHACOEMULSIFICATION

Because CLASS does not penetrate the eye, I can perform the procedure in combination with cataract surgery. We recently conducted a prospective, single-arm, nonrandomized clinical trial that included 17 patients with POAG or PEXG. All patients had a baseline IOP that was greater than 21 mm Hg (mean ±standard deviation, 29 ±12.3 mm Hg), but only some were taking antiglaucomatous medications.

Surgery was performed through two sites. A half-thickness rectangular scleral flap was first created in the superior scleral area, followed by phacoemulsification and IOL implantation performed through a temporal clear corneal incision. After completion of cataract surgery, the CO_2 laser was used to achieve deep scleral ablation; unroofing of the Schlemm canal was confirmed by fluid percolation.

IOP was measured at baseline and at all follow-up visits. Complete success and qualified success were defined as $5 \leq IOP \leq 18$ mm Hg without and with one medication, respectively. After the combined procedure, mean IOP decreased to 14.6 ±4.3 mm Hg at 12 months (n=17; *P*=.0001; paired t test) and to 13 ±2.2 mm Hg at 24 months (n=4, *P*=.08). The complete success rate at 12 months was 70.5%, whereas qualified success (with or without medication) was 88.1%. Mitomycin-C was used in 88% of patients.

CONCLUSION

CLASS is a minimally invasive option for glaucoma treatment in patients with POAG or PEXG. The fast learning curve and ease of performing the procedure may open the door for it to be performed by general ophthalmologists rather than exclusively by glaucoma specialists. My observation and experience lead me to conclude that phacoemulsification combined with CLASS is a simple, safe, and effective technique for treating patients with POAG. Use of a CO_2 laser allows precise and easy ablation of the deep scleral space and delicate dissection of Schlemm canal and Descemet membrane. ■

Rengaraj Venkatesh, MD, is the Chief Medical Officer of Aravind Eye Hospital, Pondicherry, India. Dr. Venkatesh states that he has no financial interest in the products or companies mentioned. He may be reached at e-mail: venkatesh@pondy.aravid.org.

1. Cook C, Foster P. Epidemiology of Glaucoma: What's New? *Can J Ophthalmol.* 2012;47:223–226.
2. Kass MA, Heuer DA, Higginbotham EJ, et al. The Ocular Hypertension Treatment Study: A randomized trial determines that topical ocular hypotensive medication delays or prevents the onset of primary open-angle glaucoma. *Arch Ophthalmol.* 2013;1(20):701–713.
3. Friedman DS, Quigley HA, Gelb L, et al. Using pharmacy claims data to study adherence to glaucoma medications: methodology and findings of the glaucoma adherence and persistency study (GAPS). *Invest Ophthalmol Vis Sci.* 2007;48:5052–5057.