

Newer Endoilluminators Ease 25-Gauge Surgery

Using xenon-based light systems, vitreoretinal surgeons can reduce potential phototoxicity risks while performing difficult surgeries.

BY ALLEN C. HO, MD

Endoillumination has caused concern for vitreoretinal surgeons for years.¹ Technology that could refine surgical endoillumination and lighted instrumentation has lagged far behind the improvements in vitreous cutters and fluidic control, as well as surgical wide-angle viewing. Balancing the benefit of higher light output with increased risk of phototoxicity has always been a challenge for both industry and surgeons. Furthermore, new microincisional vitrectomy systems (eg, 25-gauge pars plana vitrectomy) have not only reduced incisional trauma but have also necessarily reduced the diameter of handheld endoilluminators compared with 20-gauge systems. This has the potential to reduce surgical illumination.

The potential damaging effects of light to the retina have been documented since 1916, when Verhoeff first brought it to our attention. The lesions were assumed to result from thermal energy of the sun, but it was not until the rigorous experimental of Noell in 1966 — which helped define the conditions that led to photochemical injury to the retina — that intensive research in the area of retinal phototoxicity and associated retinal degeneration began. It soon became recognized that retinal light damage could occur from surgical instrumentation or simply the operating microscope light source.²

INDUSTRY HAS MET THE CHALLENGE: BRIGHTER AND SAFE

Today, industry has met the challenge with the development of xenon illumination systems for endoillumination. If you are going to embark on 25-gauge surgery, the xenon system is highly suggested — if not mandatory — to increase surgical illumination. The Alcon Accurus halogen system (Fort Worth, Texas), however, may be reasonable with the company's second-genera-



Figure 1. The Accurus Xenon Illuminator from Alcon (A) and the Photon box from Synergetics (B).

tion endoilluminators. With the xenon illumination system, one gets exceptionally bright white light that is filtered for both ultraviolet and infrared energy with the xenon system. We have found that we can drive more light into the posterior segment using the xenon box with a 25-gauge endoilluminator than with a 20-gauge endoilluminator with halogen illumination.

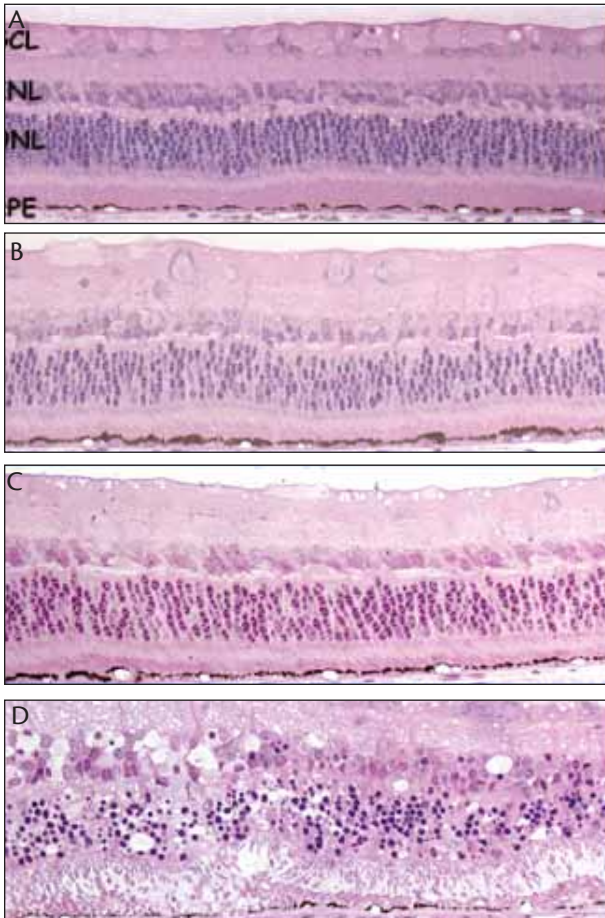


Figure 2. Normal and 1.5-hour light exposed retina with a fixed position endoilluminator. Images show a normal rabbit retina (A), a tungsten-halogen exposed retina (B), a xenon-bypass exposed retina (C) and a metal-halide exposed retina (D).

We have performed >2,000 vitrectomy cases with the Accurus Xenon Illuminator or Synergetics' Photon box (O'Fallon, Mo) (Figure 1), and we have seen no phototoxicity issues with the usual surgical precautions. It is important to remember that any endoillu-

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minator driven by any light source — halogen, xenon or metal halide — has the potential to create phototoxic lesions with clinical significance. Our experience at Wills Eye Hospital in Philadelphia and the collective

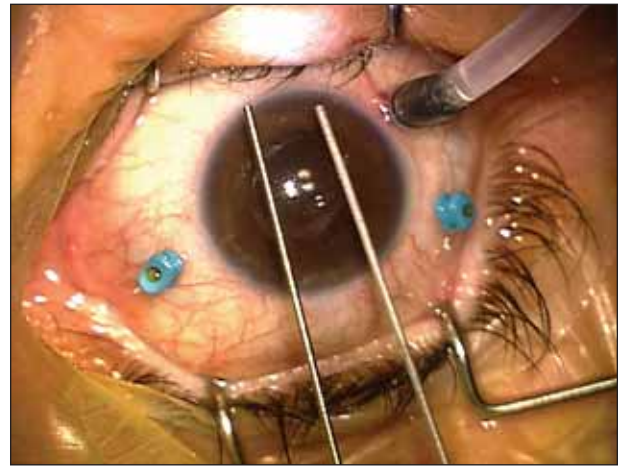


Figure 3. Second-generation 25-gauge endoilluminator versus original probe: Stiffness is increased by 70%, there is a wider cone angle of 79° versus 40° illumination and the transmission increased by 50%.



Figure 4. Tornambe Torpedo 25-gauge plug in illumination.

safety experience of surgeons using the Accurus and the Synergetics' systems provide support for the understanding that these illuminators can be used safely in the real-world operating room setting.

Alcon conducted a rabbit study comparing halogen, xenon and metal halide light sources with a fixed exposure of light near the surface of the rabbit retina (Figure 2). The study found halogen and xenon to be equivalent, which is reassuring because most of our experiences are with halogen, and now, xenon. They showed that at 90 minutes versus 120 minutes, and then again at the 1-hour to 1.5-hour light exposure, there were no significant differences between the halogen and xenon sources. At exposure durations longer than 120 minutes, however, all types of light, whether halogen, xenon or metal halide, will cause more dam-



Figure 5. Torpedo 25-gauge surgery: Image shows video of halogen versus xenon.

age in this rabbit study. The rabbit data appear to corroborate our clinical experience of safety with both xenon and halogen light sources in the human eye.

The new endoilluminator probes, which are now included in the 25-gauge pack, are stiffer by almost 70%, and offer an almost-doubling of the cone angle (Figure 3). The xenon boxes clearly facilitate 25-gauge surgery. I think initial barriers to small-gauge vitrectomy surgery were twofold — one was light and the second was the flexibility of the instruments. Chandeliers can also be used to improve illumination that afford bimanual surgery.

HELPFUL ADVANCEMENTS — ILLUMINATED INSTRUMENTS, CHANDELIER LIGHTING

Products such as the dual-mode cannula (illuminated infusion cannula), Tornambe Torpedo (Insight Instruments, Stuart, Fla), tissue manipulator and viscodelamination light probes are making their way off the shelf and on to sterile fields (Figure 4). With these light probes connected to a bright xenon light, the surgeon is able to perform bimanual surgical techniques such as forceps grasping in one hand and tissue cutting with the other such as required by intuitive bimanual surgical delamination of diabetic traction membranes.

The increased rigidity of the new second-generation Alcon 25-gauge endoilluminators gives the surgeon a better feel for moving the eye, particularly for the surgeon who is transitioning from 20-gauge to 25-gauge procedures. This light probe provides a cone angle of 79°, compared with its original 40° angle. The transmission capacity was also increased by nearly 50%, and a shaft stiffness increase of nearly 70%.

Synergetics also has a new wider 25-gauge endoilluminator with increased shaft stiffness and both the Alcon and Synergetics products are significant

improvements over initial experiences with 25-gauge vitrectomy surgery.

Chandelier illumination afforded by Insight's 25-gauge Tornambe Torpedo (Figure 5) or Synergetics 25-gauge Awh Chandelier are particularly helpful for cases requiring wide-angle illumination and where the need for bimanual surgical maneuvers may be helpful, for example, in complex diabetic vitrectomy surgery.

Here are some suggestions for chandelier use: Go in straight, do not bevel. Try it on an aphake or pseudophake and tape it down. Be mindful of the fiber, which will then determine the angle and therefore how well you are illuminating it or how much distracting glare you will get. It is worth the few moments it will take to adjust and steristrip the curvature of the chandelier fiber to direct the lighting posteriorly to minimize distracting reflections and maximize internal light reflection that provides the ora to ora view.

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SUMMARY AND CONSIDERATIONS

- Xenon illumination can and has been used safely in the real-world clinical setting.
- Any illumination system can be phototoxic, therefore usual precautions apply.
- Xenon illumination sources can significantly improve 25-gauge endoillumination (even beyond levels achieved with 20-gauge halogen endoillumination).
- New 25-gauge endoilluminators are more rigid and provide wider cone angles of illumination despite smaller light fibers.
- Chandelier endoilluminators work well in complex cases requiring bimanual maneuvers or peripheral scleral depression. Try first on an aphake or pseudophake and tape down the fiber for the best angle. ■

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2. McDonald HR, Irvine AR. Light-induced maculopathy from the operating microscope in the extracapsular cataract extraction and intraocular lens implantation. *Ophthalmology*. 1983;90:945-951.