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INNOVATIVE REAL-TIME ILLUMINATION SYSTEM AIDS IN LASIK

The system enhances visualization at each step of refractive surgery.

by Arun C. Gulani, MD

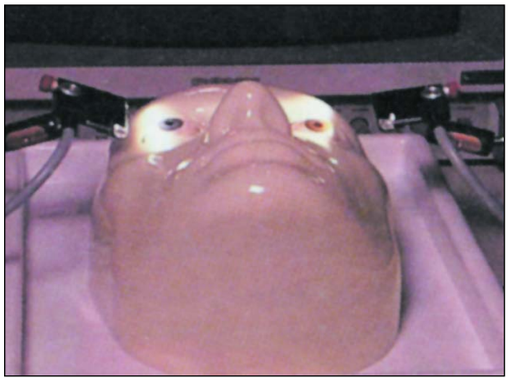
The pursuit of perfection is never ending. The desire to see clearly during laser ablation with an invisible ultraviolet laser has always intrigued me.

I have been searching for various ways to control laser delivery in real time, and I have experience with devices that include specialized cameras to look at laser beam profiles and the Molectron Inc. unit to measure energy output at the laser head.

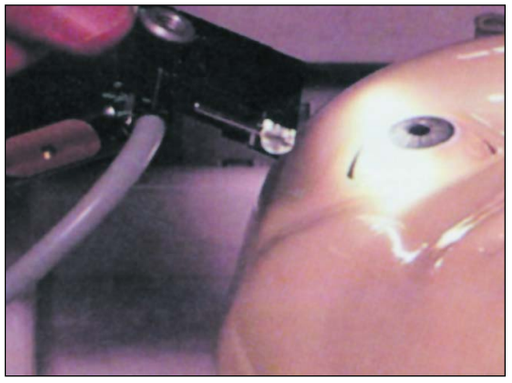
During recent surgery I used a new illumination system designed by Avi Grinblat of Advanced Visual Imaging. It has two hinged arms with fiberoptic lights that can be brought into the surgical field. The hinged arms are custom-fitted to the laser bed. The module allows the lights to be used at various angles, to be adjusted from diffuse to slit illumination and to be evenly scanned in different directions.

These special lights can illuminate the corneal interface during and immediately after laser ablation to visualize the ablation pattern and look for interface debris in any form.

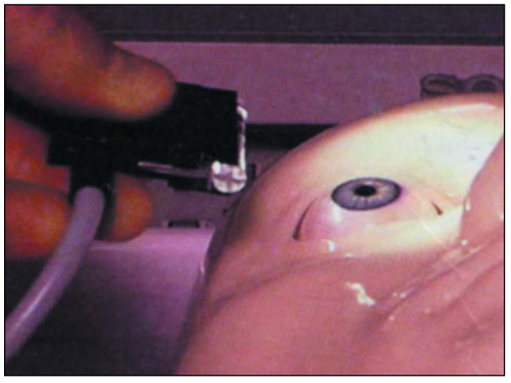
I have used them in tandem with infrared trackers, and I alternate their placement with the tracker arms on the Bausch & Lomb laser.



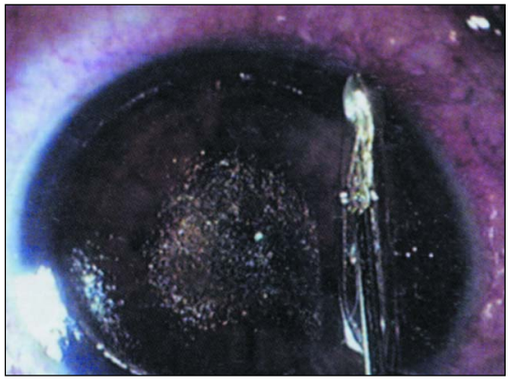
The illumination system on a model head.



Diffuse illumination.



Slit illumination.



Illuminated ablation pattern;
direct diffuse illumination

Useful throughout surgical stages

I feel this system has an important role to play as we perfect our approach to flawless refractive surgery. It can be used at all stages of LASIK surgery:

Before the microkeratome pass it helps look for subtle epithelial disturbances and irregularities.

After the microkeratome pass it helps determine the quality of the stromal bed. During the laser ablation it can discern the laser ablation pattern.

After ablation it can help search the interface for any debris.

After flap replacement, it allows visualization of the flap alignment and seal.

The visualization of each step in surgery decreases postop surprises and provides feedback for the operating surgeon in real time.

Ongoing research

I have been investigating and working on various avenues that I feel are vital as we progress from surgical excellence to achieving supernormal vision. This illumination system is a welcome addition in this direction.

Other fields require due attention.

One area is ocular surface categorization toward predictable outcomes, thus decreasing the incidence of postop surprises (refractive and otherwise).

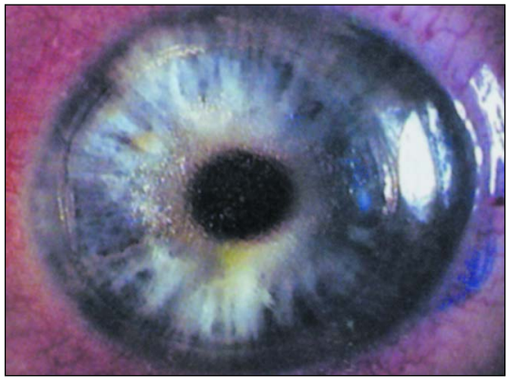
I have been working on devising a microkeratome sensing device that will assess IOP and give a signal to proceed.

On the drawing board, we have a visual system that will accurately show — not just predict — the exact flap size and thickness before and during the microkeratome translation.

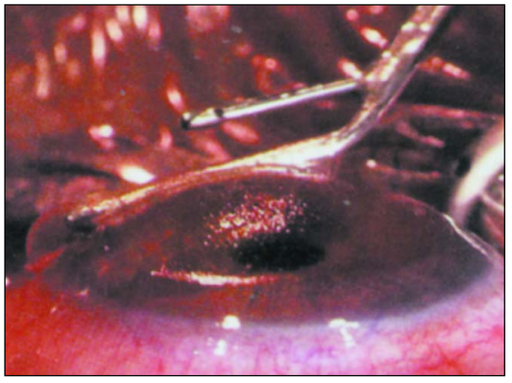
Also to be considered are chemical modulators (beyond general toxic agents) that can be topically delivered, leading to surface healing modification as well as alternate outcomes to suit the expected refractive end point.

In summary, the aim of any surgical procedure is to make it foolproof in every form so that it becomes attainable by all surgeons. This will lead to standard platforms of information exchange and skills transfer.

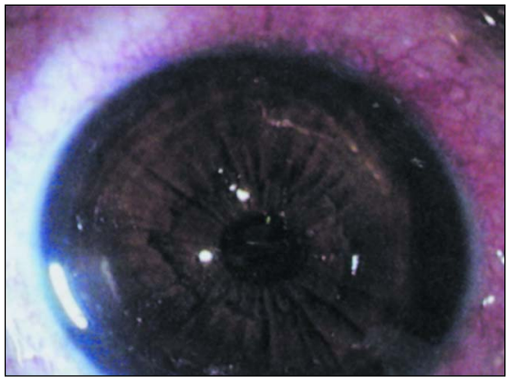
■ Presented at the Innovator's Lecture Series at the American Academy of Ophthalmology meeting.



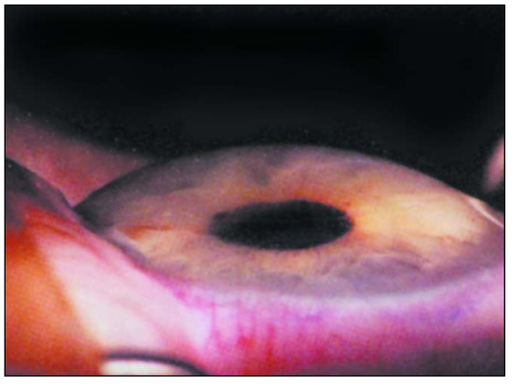
Illuminated ablation indirect diffuse illumination



Interface debris seen by scanning slit view.



Flap replacement with the Gulani triple function cannula.



Flap edge check.