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Refractive Surgery

New Flap instruments are created as LASIK goes mainstream

There are spatulas, flippers, cannulas, forceps, and instruments too unusually shaped to put into a category — all competing for the attention of the growing number of ophthalmologists performing laser in-situ keratomileusis (LASIK).

LASIK is booming and so is the number of handheld instruments designed to manage the corneal flap.

One LASIK surgeon can name five instruments he uses to manage flaps. Louis E. Probst, MD, of London, Ontario, Canada, said he seeks instruments that minimize epithelial trauma. After the keratome cuts, Probst lifts the flap with a smooth LASIK Forceps or a Machat Retreatment Spatula (both from ASICO) for retreatment cases.

"When using the ACS [Auto-mated Corneal Shaper] microkeratome, I protect the flap with the Slade Flap Spatula (ASICO), which is angled to allow placement over the nasal hinge. When using the Hansatome with the superior hinge, I protect the flap with the Probst Hansatome Flap Spatula (Bausch & Lomb), which I designed to allow protection of the superior flap while maintaining my hands in the superior position."

Probst also designed an irrigating cannula to replace the flap. The Probst Hansatome LASIK Cannula (Bausch & Lomb) is bent to allow the surgeon to maintain a 12 o'clock hand position. Probst is director of clinical care for TLC The Las Center and is its London Office's medical director. He is also an assistant clinical professor at University of Western Ontario.

For Mastel Precision, Richard A. Erdey, MD, of Columbus, Ohio, designed a two-instrument retreatment set (not yet named) that is due for release this spring. The first piece is a 9-mm optical marker, which is applied over the original keratectomy site. Its imprint will allow the flap to be relifted where it was originally cut, he explained. Other instruments permit the epithelium to tear in sheets, extending the tear beyond the original cut, he said. "This device allows the epithelium over the edge of the flap to be more cleanly cut — like tearing a piece of folded paper, "Erdey said.

Another instrument due out this spring is the Johnston LASIK Flap Applanator (Rhein Medical).

"Everyone's doing it differently and nothing's working well," said Robert M. Johnston, MD, of Leesburg, Va., of dehydrating and realigning the flap. He said 5% to 10% of patients develop visual problems due to micro striae.

His device "applies pressure on the flap, emanating from a central point and distributing it with diminishing force to the edges," he said. "It largely eliminates lines of stress."

Since using the applanator, a ring of metal with a dear, convex bottom, "I can't remember the last time I had to reposition the flap," said Johnston, a clinical instructor at Howard University.

Ernest W. Kornmehl, MD, of Boston, has designed flap instruments for Atorn, including the LASIK Sweep. It is longer than a cannula, so its blunt side can reach the entire stromal bed, and its curvature matches the cornea, he explained. He uses it every 20 seconds during the procedure.

This LASIK Press is used postoperatively to remove excess fluid with its round, smooth head. On rare occasions, he uses it the day after surgery to remove extra hydration, which could render a patient's vision only 20/50, for example. The patient usually will be restored to 20/20 or 20/25 immediately, said Kornmehl, medical director at Center for Laser Vision Correction and a professor at five universities.

ARUN C. GULANI, MD, of New York City, has designed 10 LASIK flap instruments, each for a specific purpose. He said the five-piece Gulani LASIK Revision Set (Bausch & Lomb) is "for revising and fine-tuning previous LASIK surgery without the re-use of the intimidating microkeratome and its inherent complications…" This set comprises the Corneal Indentor, Flap Outliner, Periphery Dissector and Interface Spatula, and the Corneal Shovel designed to achieve "resistance-guided uniplanar dissection."

He designed the Triple Function Gulani LASIK Cannula (Eagle Labs) for simultaneous interface cleansing, flap opposition, and squeegee. Gulani also created the Gulani Edge Delineator and Liftor (Bausch & Lomb) for corneal flap lift at a slit-lamp; Gulani LASIK Globe Stabilizer and Flap Restrainer (ASICO), for use in nystagmoid apprehensive patients; Gulani LASIK Edge Marker for flap realignment (Bausch & Lomb); and Gulani Hyperopic Flap Liftor (Duckworth & Kent) for corneal flap lift with minimal erosion of the sculpted central stromal steepening.

Charles H. Williamson, MD, Baton Rouge, La., uses an irrigating cannula to replace a flap, with the "curved blunt portion [used like a squeegee [to get] some extra fluid out." Then he stretches the flap gently with a Wexel sponge.

Williamson, an associate professor at Louisiana State University Medical School, also designed a retreatment spatula for use at his own surgical center. The instrument, made for him by Diamatrix has a point that is used to break bonds in a can-opener style, not cut them. ■

Proposed classification systems for LASIK reporting

Arun C. Gulani, MD, recently proposed two new laser in-situ keratomileusis (LASIK) classification systems at the 1999 Contact Lens Association of Ophthalmologists meeting in Las Vegas.

LASIK complications classification

Gulani said that the potential complications related to LASIK require intensive preventive efforts and close attention to detail in this micron-precision surgery. "It is important to shed our routine surgical complication nomination and adapt to the present era of micron thinking and analysis," Gulani said. He proposes visualizing the **LASIK tissue components as tiers:**

- **Corneal section:** Corneal flap made by the microkeratome
- **Interface:** Intervening space between the corneal flap and stroma
- **Stromal bed:** The ablation bed of the cornea

He assigns LASiK complications to their respective levels of affliction in the cornea **(Figure 1)**. This three-tier classification gives a comprehensive, yet lucid, visualization of LASIK corneal complications. "It can also be updated periodically as we encounter newer complications...." he said.

Excimer laser beam profile classification

In another presentation at the CLAO meeting, Gulani discussed the prevention of excimer laser malfunction during LASIK.

He said that the "excimer laser is a personified extension of our own precision, at submicron tolerance." Gulani emphasized the need for physicians to monitor the invisible laser beam on a regular basis to achieve predictable refractive surgery.

The excimer laser output is nonhomogenous at the source and requires a precise combination of lenses, prisms, and mirrors to achieve the homogenous beam profile output, Gulani said. This is directly responsible for predictable homogenous refractive sculpting, he said.

In order to address beam variations, Gulani classified beam-profile testing into direct and indirect techniques. The direct technique analyzes the beam profile and homogeneity directly resulting from a three-dimensional top-hat pattern. The indirect technique uses ablatable material with the laser to analyze, observe, and record beam profile.

There are numerous materials available for this indirect testing, including Chiron plates, PMMA plates, Wrattin gelatin, CIBA ExACT Beam profile film, and others, Gulani said.

He has been using a different, more visually informative technique of analyzing excimer beam homogeneity and profile using ExACT film. In this technique, he stops ablation after breaking through the film on the plate. The plate is then tilted at an angle and a fiber-optic light is projected at an incident angle to the plate to reveal a wave pattern from the excimer beam. Gulani has termed this appearance the "excimer-beam profile topography," since it is a direct correlate of the laser ablation pattern on the patient's cornea.

He also has classified laser beam profiles to simplify and standardize reporting and discussion. This nomenclature, termed the "excimer-beam-profile classification" **(Figure 2),** will help the exchange of information in a more systematic manner with respect to the type, position, size, and area, he said.

"Presently, we report laser-beam abnormality in a descriptive way only. Once we use this classification, we can record beam profiles and send accurate beam description by telephones, fax, or e-mail to service personnel across the world, as well as among peers on the same standardized level of information exchange," Gulani said. ■

Figure 1. Gulani 3-Tier LASIK Complications Classification System

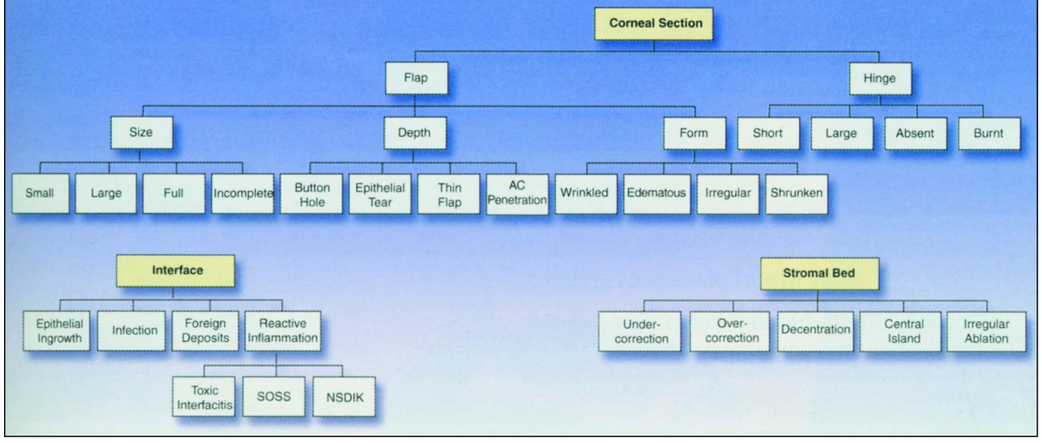

Figure 2. Gulani Excimer Laser Beam Profile Classification System