

Epithelial ingrowth is a LASIK complication that involves the presence of epithelial cells in the interface. A new approach to detecting and treating this condition may lead to better treatment.

Retroillumination check after dilating the pupil is a simple yet very effective technique for detecting epithelial ingrowth. It permits early detection by visualization of subtle lines, pearls and whorl patterns close to the flap edge. This is particularly important in cases at risk, such as LASIK after radial keratotomy (RK).

It also allows for full delineation of the extent - which can be underestimated on direct visualization - and thereby total removal on surgical management. In some cases, it also allows visualization of the leading track for epithelial ingrowth, so the surgeon can then concentrate on closure of the track with sutures.

Also, following surgical removal of the epithelial ingrowth, this technique allows a thorough postop confirmation of total removal.

### Density grading system

In a previously published report, I outlined a stratified classification system for corneal complications of LASIK. Now I have developed a density grading system based on this retroillumination technique:

**Grade 1:** If the epithelium is seen as an island/pearls in a localized form (the emerging red reflex is not distorted).

**Grade 2:** If the epithelium is seen in a diffuse form along with a faint line of extension in front of it (the emerging red reflex is distorted).

**Grade 3:** All the features of grade 2 along with blockage of the

emerging red reflex at the site of involvement.

### The 2-3-4 rule

Ingrown epithelium involves two kinds of tissue: epithelium and scariform tissue.

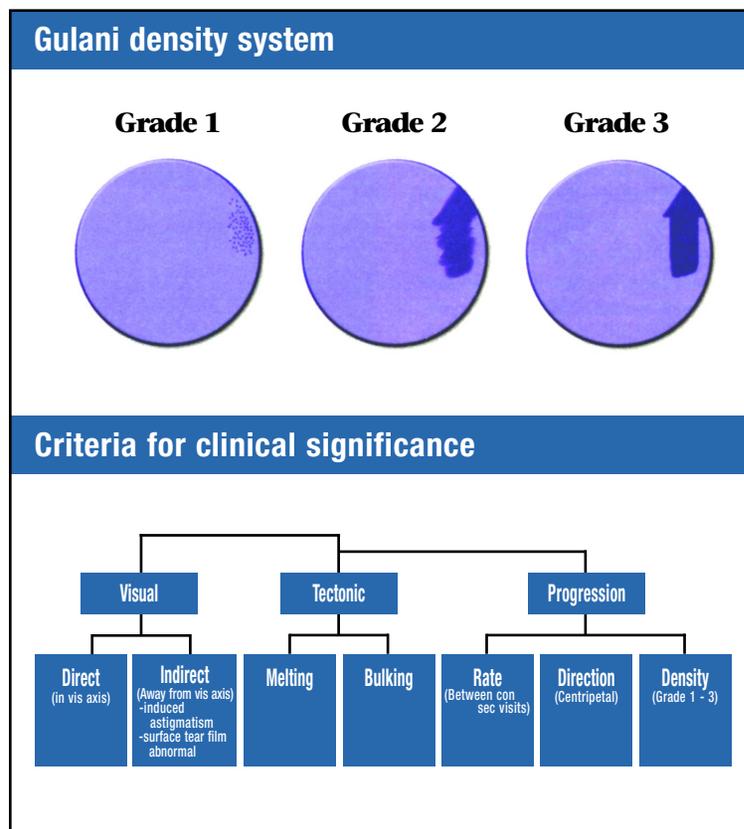
Epithelial ingrowth requires the presentation of three factors: source of surface epithelium; surface deficit (abrasion, ulcer, epithelial defect, edge fistula, etc.); and space to grow into (such as the lamellar flap or existing incisions in the cornea from RK or other procedures, which allow epithelial cells to track along their path of least resistance). Epithelial ingrowth involves four surfaces: stromal bed, underside of the corneal flap, flap edge and flap hinge.

### Intervention criteria

Diagnosing epithelial ingrowth is routine, but deciding when to intervene is difficult. To address this concern while attempting to standardize the management protocol, I propose intervention criteria based on the qualification of clinically significant epithelial ingrowth.

This proposed system uses three criteria categories: visual, tectonic and progression.

Visual significance concerns direct involvement of the visual axis or indirect distortion of the visual axis by causing adjacent astigmatism or a surface irregularity.



Tectonic significance involves melting of the corneal tissue or bulking up under the flap.

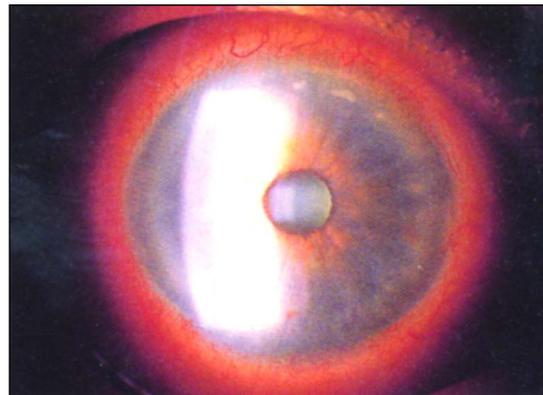
Progression significance is further divided into elements of rate (documented speed of growth), direction (centripetal, ie, toward the visual axis) and density (based on the proposed retroillumination technique grades 1 to 3).

### Management

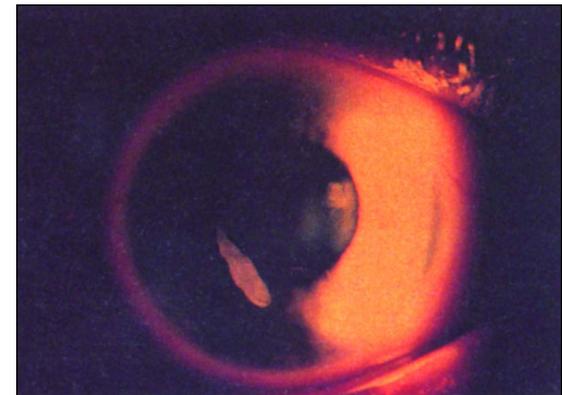
Having confirmed the epithelial ingrowth to be clinically significant, a course of management can be designed based on site and extent of involvement. Thus, using the proposed protocol, focal growths in the center can be managed by the Nd:YAG laser (as described by G. Avalos, MD). Focal growths in the periphery can be treated with surface cryotherapy, where the incisions can be used to our advantage in milking out the epithelium. This is especially true in the presence of previous RK incisions, where relifting the flap is dangerous because it may result in multiple pieces of the corneal flap.

Relifting the corneal flap and debriding the epithelium is the most effective and definite way to remove epithelial ingrowth, keeping the 2-3-4 rule in mind and addressing the same. Partial or pocket dissection is not to be undertaken - unless it only involves the peripheral 1 mm of the flap - because it can cause torque and irregular astigmatism, provide a track for recurrence, and cause nonuniform or poor flap adherence.

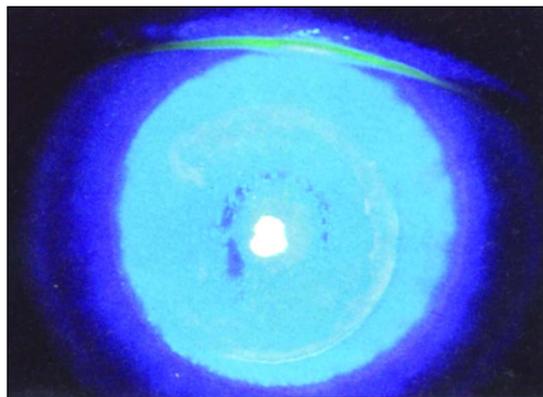
I do not advocate the use of chemical modulators in the corneal interface. I believe that epithelial ingrowth does not occur by implantation but rather by continuance (source plus growth). In



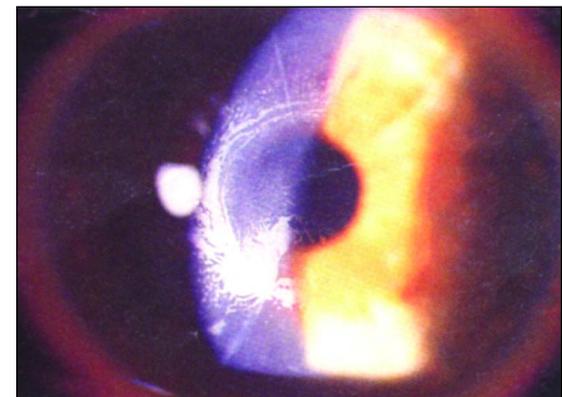
**Clinically insignificant peripheral epithelial ingrowth.**



**Clinically insignificant central epithelial ingrowth.**



**Clinically significant peripheral epithelial ingrowth.**



**Clinically significant central epithelial ingrowth.**

my opinion, closing the tract is more important than killing the existing cells. In any recalcitrant cases, suturing the flap firmly is more effective than repeated inter face treatment with chemicals or laser or mechanical scrape.

Prevention is still key, and we have seen the incidence of this complication decline worldwide chiefly due to heightened awareness, minimal and delicate flap handling and increased care in the presence of predisposing factors such as unstable epithelium (corneal dystrophies), epithelial defects, dry eye or previous incisional surgery.

Thus, early detection, standardized protocols and effective management will address this complication of LASIK and will lead to more predictable and safer outcomes.

#### **A note from the editors:**

This article is derived from a presentation given by Dr. Gulani at the European Society of Cataract and Refractive Surgeons meeting in Amsterdam.

