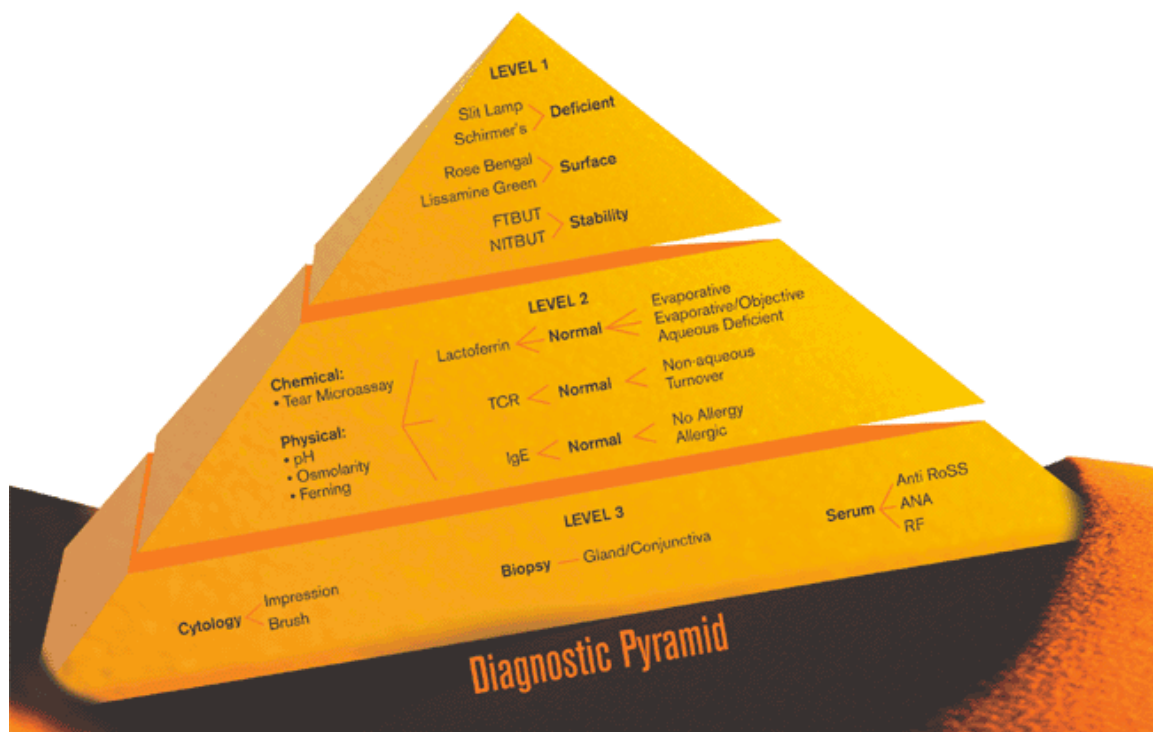


## Decision pyramid helps clinician in diagnosis of dry eye

by Arun C. Gulani, MD & Lynda Charters



In any disease, the differential diagnosis is paramount to ensure proper treatment. This is also true for patients who complain of dry eye before and after LASIK. Arun C. Gulani, MD, created a decision pyramid that allows him to get to the root of complaints of dry eye in his patients.

"When a patient presents with an interest in refractive surgery because his or her eyes are too dry and gritty to tolerate contact lenses, the surgeon's first reaction may be to treat for dry eye before performing LASIK," noted Dr. Gulani, chief, cornea external disease and director, refractive surgery, University of Florida, Jacksonville.

"In my experience, it might be better first to determine the source of the complaint, because the patient's problem may not be the result of dry eye, but rather a different condition," Dr. Gulani explained.

In order to diagnose and treat refractive surgery patients with tear-film abnormalities properly before and after the surgery, Dr. Gulani designed a decision pyramid. "The method of diagnosis begins at the top with the more straightforward, routinely used methods and eventually leads downward toward the more involved methods for patients whose problems are harder to pinpoint. I try to turn the subjective symptoms into an objective diagnosis, thus determining whether a patient has dry eye or yet another condition. If a patient is pigeonholed as having dry eye when he or she actually is suffering from something else, the patient could be relegated to years of using the wrong drops without obtaining relief," Dr. Gulani emphasized.

**Level 1: Routine tests** After the patient describes his or her symptoms, the first step toward determining their cause is to perform standard in-office tests such as Schirmer's tear test; fluorescein, rose bengal, and lissamine green staining; and tear-film clearance and breakup time.

"The physician can also gather important information by examining the tear film at the slit lamp with the room light dimmed. The presence of a tear lake and excessive tear splashing in the ocular fornix indicates a deficiency in the oil layer in the tear film. In this case, the patient may not have aqueous-deficient dry eye but instead meibomitis that can be treated with lid scrubs, warm compresses, or oral doxycycline, but not artificial tears. A liposomal spray also may be helpful in such conditions," Dr. Gulani said.

He also advised questioning the patient about whether the symptoms worsen or improve during the day. If they are worse in the morning, the condition is probably meibomitis, not dry eye, because as the day progresses the ocular tears wash the toxic tears away. If it were dry eye, however, the opposite would be true; that is, the eyes would be comfortable in the morning after having had the lids closed all night, but then would become drier during the day as they remain open. A complaint of itching is a key sign of allergy, and bulbar edema and papillae in the upper lid clinch the diagnosis.

**Level 2: Tear-film analysis** After performing the in-office tests, if there is still uncertainty about what is causing a LASIK patient's complaints of dryness and grittiness, tear-film analysis and measurement of lactoferrin and IgE levels and tear osmolarity can be performed.

If it is dry eye, a lactoferrin microassay with a device such as the Tear Film Analyzer (Corneal Sciences, Raleigh, NC) can determine whether it is aqueous-deficient dry eye, in which the lactoferrin levels are below 0.9 mg/ml, or evaporative dry eye, in which the lactoferrin levels are greater than 1.8 mg/ml.

IgE levels indicate ocular allergies, and if they are high, the patient needs antiallergy medication rather than artificial tears. In the near future, gram-negative and gram-positive testing will also be possible with this equipment, according to Dr. Gulani.

Is it really dry eye? "This testing can be a great help in determining the appropriate treatment, for example, if a patient has meibomitis, but dry eye was diagnosed," Dr. Gulani said. "When artificial tears do not work, clinicians naturally proceed to insertion of punctal plugs, which is the opposite of what this patient needs. Now, instead of having open puncta that allow the toxic tears to flow away from the ocular surface, the toxins remain and can cause surface damage."

He added, "I have used (the tear-film analyzer) and believe it has the potential to specify where the patient is in the dry-eye disease spectrum. Although the cost of the device can be prohibitive, some practices offset the expense by sending their patients' lactoferrin samples to a central hub (usually a hospital or large practice with the machine) for testing."

Level 3: Tissue sampling Brush and impression cytology can show the stages of ocular surface involvement by detecting keratinization, changes in cell morphology, loss of goblet cells, and other indicators. This information might help determine the severity of the condition and help in planning surgery such as stem cell grafting with amniotic membrane transplantation.

Biopsies of the lacrimal and/or salivary glands are next in terms of invasive procedures. These could be useful in Sjogren's syndrome, in which inflammatory, degenerative, and infiltrative changes will be evident. Biopsies can also reveal a more serious systemic disorder for which dry eye may have been merely a presenting symptom. Blood or serum tests might be necessary to confirm this.

"The patient being evaluated for LASIK or examined postoperatively could have classic dry eye, LASIK-induced dry eye, or another condition. By eliminating any false diagnoses, you can begin effective treatment," Dr. Gulani said.

If a patient presents after LASIK with complaints of dryness, there is a good chance it is the temporary post-LASIK condition that mimics dry eye. Among the causes of this condition is neurotrophic keratitis, which was investigated extensively by Eric Donnenfeld, MD, who indicated that making the corneal flap in LASIK, especially if the hinge is superiorly located, can sever the corneal nerves, resulting in a temporary neurotrophic keratitis, Dr. Gulani explained.

Watch corneal curvature Another important cause of dry eye after LASIK is change in corneal curvature between treated and untreated zones caused by the ablation, Dr. Gulani pointed out.

"This creates an abrupt change in corneal curvature, which results in the ineffective bathing of the cornea by the tear film. Subsequent stagnation of the tears with iron deposition forms a ring that resembles the deposits seen in keratoconus, the Stocker's line in pterygium, and the Ferry's line associated with a filtering bleb in trabeculectomy. I refer to this as the pseudo-Fleischer's ring, and it points toward the cause of dry eye in these patients," he said.

With post-LASIK dry eye emerging as the most common complication after the procedure, Dr. Gulani underscored the importance of taking the patients' complaints seriously and using integrated approaches to treating them.

Dr Gulani has designed a new punctal plug and has designed a new set of instruments for complete dry eye management. He also performs advanced amniotic membrane procedures to complete the full spectrum of dry eye care.

In summary, he believes that with so many dry eye products from so many companies, this could also provide a much-needed integrated platform for every doctor to utilize in standardizing effective dry eye diagnosis and thereby successful management of the same.

"Only by doing this will we be able to progress toward the 'super vision' that LASIK will provide our patients," he said.