

Think Outside the Cone: Raising Keratoconus Surgery to an Art

Ophthalmic surgery should always take the patient toward better visual acuity.

BY ARUN C. GULANI, MD

All ocular surgery should provide the patient with the best vision possible. This concept of using brief, topical, aesthetically pleasing, and visually promising techniques singly or in combination is what I have introduced as a super specialty called *corneoplastique*. Corneoplastique involves all types of LASIK, cataract, and corneal surgery to manipulate the optical elements of the eye and result in a final emmetropic outcome. The backbone of this thought process and surgical planning is based on the “5S” system, which is discussed later.

Success in ophthalmology does not mean merely stopping the progression of the patient’s disease or the execution of surgical acrobatics. If the eye has the potential to see, then it is the surgeon’s job to retain or improve that visual acuity regardless of how complex the starting point may be. As long as there is no ongoing disease or irreversible blindness, every eye deserves unaided emmetropia. I tell my trainees that, even if a patient shows up in the emergency department at midnight with a dagger in his or her eye, you have to consider that every decision you make that night has the potential to take the patient away from great visual acuity. With such a dedicated thought process, every eye and every surgery becomes a customized endeavor with individualized goals for visual outcomes.

This concept can be applied to virgin eyes for LASIK and cataract surgery, where we should strive for visual acuity that is better than 20/20. It can be applied in previously operated eyes such as those with past RK or previous LASIK to bring them to present-day standards of visual acuity expectations. It can also correct complications of refractive surgeries and provide options for those who are not candidates for LASIK, such as keratoconic patients.

KERATOCONUS

I teach surgeons to approach keratoconus as a refractive disorder (ie, myopia and/or astigmatism)

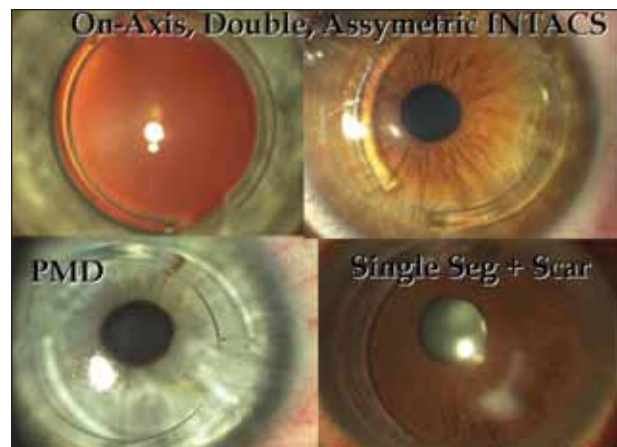


Figure 1. Intacs may be used in various forms, thicknesses, and sizes to customize the treatment.

with associated anomalies of a thin cornea, decentered apex, and a possible scar. When examining a keratoconic patient, I rely on my 5S classification system: sight, site, scar, strength, and shape.

For example, a male patient has a corneal thickness of 450 μm and a documented cone on topography. In terms of the 5S system, I first want to make sure that he has the potential to see (sight [visual acuity]). Although the patient cannot tolerate hard contacts, his optometrist has noted that he has a visual acuity of 20/25 with them. Therefore, whatever I do, the patient should still have a visual acuity of 20/25 or better. The patient has sight, there is no scar, and the site (center or periphery) is not affected. Moreover, the patient has a relatively thin cornea (strength) and a high amount of astigmatism (shape). In terms of the 5S system, I must therefore correct for sight and shape. (See *Gulani's Classification System for Laser Surgery in Keratoconus*.)

GULANI'S CLASSIFICATION SYSTEM FOR LASER SURGERY IN KERATOCONUS

I. Laser as Primary Treatment

Patients in this subset are informed that I can strive for their best visual acuity outcome with laser treatment. I keep the surgical interventions noted in level II as a backup plan to be used alone or in combined approaches to address any complication or progression of cone if needed.

Class A

Clear cornea

Class B

Scarred cornea

II. Laser as Staged Secondary Treatment

Class A

Following corneal surgery:

1. Intacs (Addition Technology, Des Plaines, IL)
2. Lamellar keratoplasty
3. Penetrating keratoplasty
4. Corneal collagen cross-linking with riboflavin
5. Conductive keratoplasty

Class B

Following intraocular surgery:

1. Phakic implant
 - a. Anterior
 - b. Posterior
2. Cataract surgery with lens implant
 - a. Monofocal
 - b. Toric
 - c. Presbyopia correcting

ADVANCED SURFACE ABLATION

Continuing with this example, I would perform advanced laser surface ablation because astigmatic treatments remove the least amount of tissue. Correcting the astigmatism brings the patient's visual acuity close to 20/20. From a medicolegal standpoint, I would explain to the patient that, with this technique, I should be able to reshape his cornea to provide predictable vision. I would remind him that the outcome will not be like that of a virgin eye with 20/20 visual acuity, and I would also inform the patient that I have Intacs (Addition Technology, Des Plaines, IL) as a backup option if his keratoconus progresses (Figure 1).

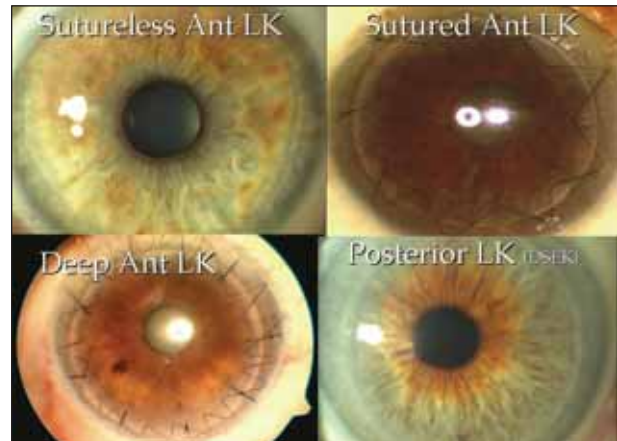


Figure 2. With the 5S system, lamellar transplantation techniques may be combined with laser surgery.

I can also use corneal collagen cross-linking with riboflavin as part of any of my surgeries, as it aims to stabilize the new shape obtained following laser vision surgery (this technique is still under study). I teach surgeons that they should first correct the scoliotic spine (shape = vision) before making that shape permanent.

INTACS

If the patient in the example had a thin cornea and a BCVA of less than 20/40, I would choose to implant Intacs. I like to tell patients that having this kind of keratoconus is like being 11 feet tall. People of normal height go to the mall and pick up a suit based on their measurements. I say, I am going to put you in braces (Intacs) and make you 6' 5" or 5' 8". I don't know for sure because Intacs are not mathematically predictable, but I know that you will be moving in the right direction. Chances are that you will be able to walk into a mall and find a suit that will fit.

Intacs help get patients back into contact lenses and glasses. I perform Intacs in various forms (single, paired, and steep axis) and in various thicknesses and sizes to customize each shape effectively. I can also perform advanced laser surface ablation over the Intacs to treat residual astigmatism.

LAMELLAR CORNEAL TECHNIQUES

What if the same patient has a scar? Using the 5S system, I would need to clear the scar, add strength, and correct the shape of this patient's cornea (he has sight). In this example, a variety of lamellar corneal transplantation techniques can address these affected "S" systems. Six months to 1 year postoperatively, I can perform advanced laser surface ablation for the

