Ophthalmology Times
CUTTING-EDGE ADVANCEMENTS

Aspiring for zero tolerance of residual astigmatism

When considering premium surgeries and high expectations from patients along with an unrelenting quest for vision exceeding 20/20, the tolerance of residual astigmatism must be zero. Like bespoke tailors, ophthalmologists need to be bespoke surgeons who tailor vision in each eye to the highest level possible. We cannot claim to design the best suit using the best technology and tailoring materials, and yet, in our minds, find it "acceptable" to have the suit length within a half-inch to three-quarters of an inch too short or wide.

Gloves Off With Gulani by Arun C. Gulani, M.D., M.S.

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In my practice-in which I see numerous patients from all over the world who are seeking second opinions and correction of complications-it is common to see patients who express dissatisfaction with their eye surgeons. These surgeons in many cases might have performed good surgeries, but after using expensive technologies (including premium IOL implants), they left their patients with residual astigmatism that was considered to be within an acceptable range (for that surgeon).

I corrected many of these patients using laser Corneoplastique techniques even up to as low as 0.4 D of astigmatism that resulted in a night-and-day difference (for the patient). This turned distressed patients into those who were very happy with outcomes, which emphasizes my zero tolerance of astigmatism.

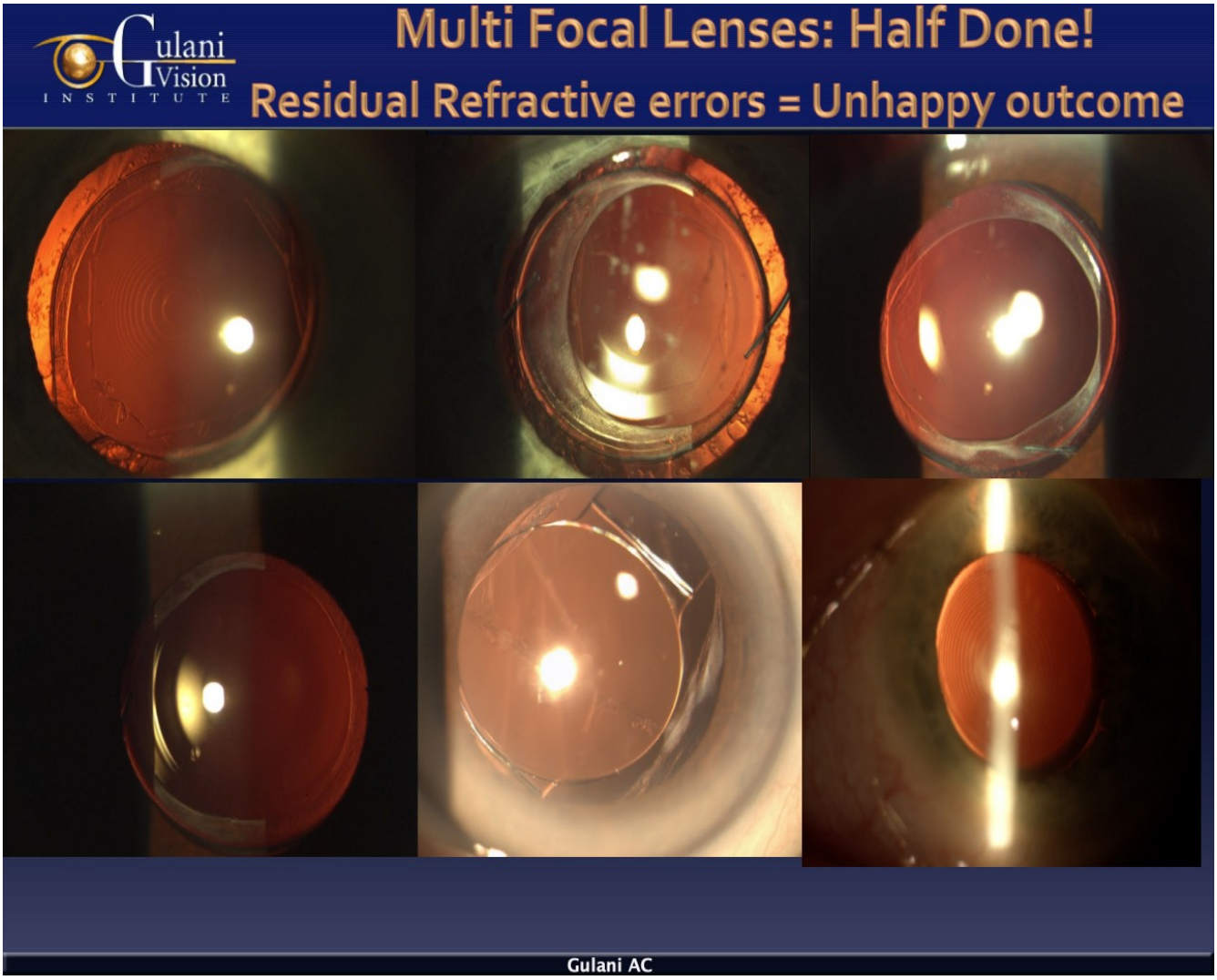


Figure 1 demonstrates the preoperative status of many of my patients who have had premium cataract surgery with their surgeons, which, despite having undergone well-performed surgeries, resulted in half-done outcomes with residual astigmatism that could have been corrected easily.

Residual astigmatism is the common culprit in most of these cases.

Astigmatic correction can range from techniques using corneal relaxing incisions created using diamond knives to femtosecond laser correction performed conveniently in the office at intraoperative and postoperative settings, including intraocular scenarios that include the use of toric implants (monofocal/multifocal), and finally laser corneal surgery to correct planned or residual astigmatism to bring every patient to their visual end zone.

In certain cases, astigmatism also can be used to our advantage as in the cases of patients who have a corneal scar that I approach using Corneoplastique principles. In these cases, I flip the axis of the corneal astigmatism by implanting a toric IOL during cataract surgery in such a way that the axis comes to lie in the direction of the corneal scar.

I then treat them with laser to both bring the vision to 20/20 and achieve a clear central cornea.

Astigmatism also can be useful in some cases to help reading vision (as in our experience with monofocal IOLs), while in some cases it can be used to our advantage to help cope with the delicate balance between visual improvement and visual distortion (irregular to regular astigmatism in an advantageous position for vision).

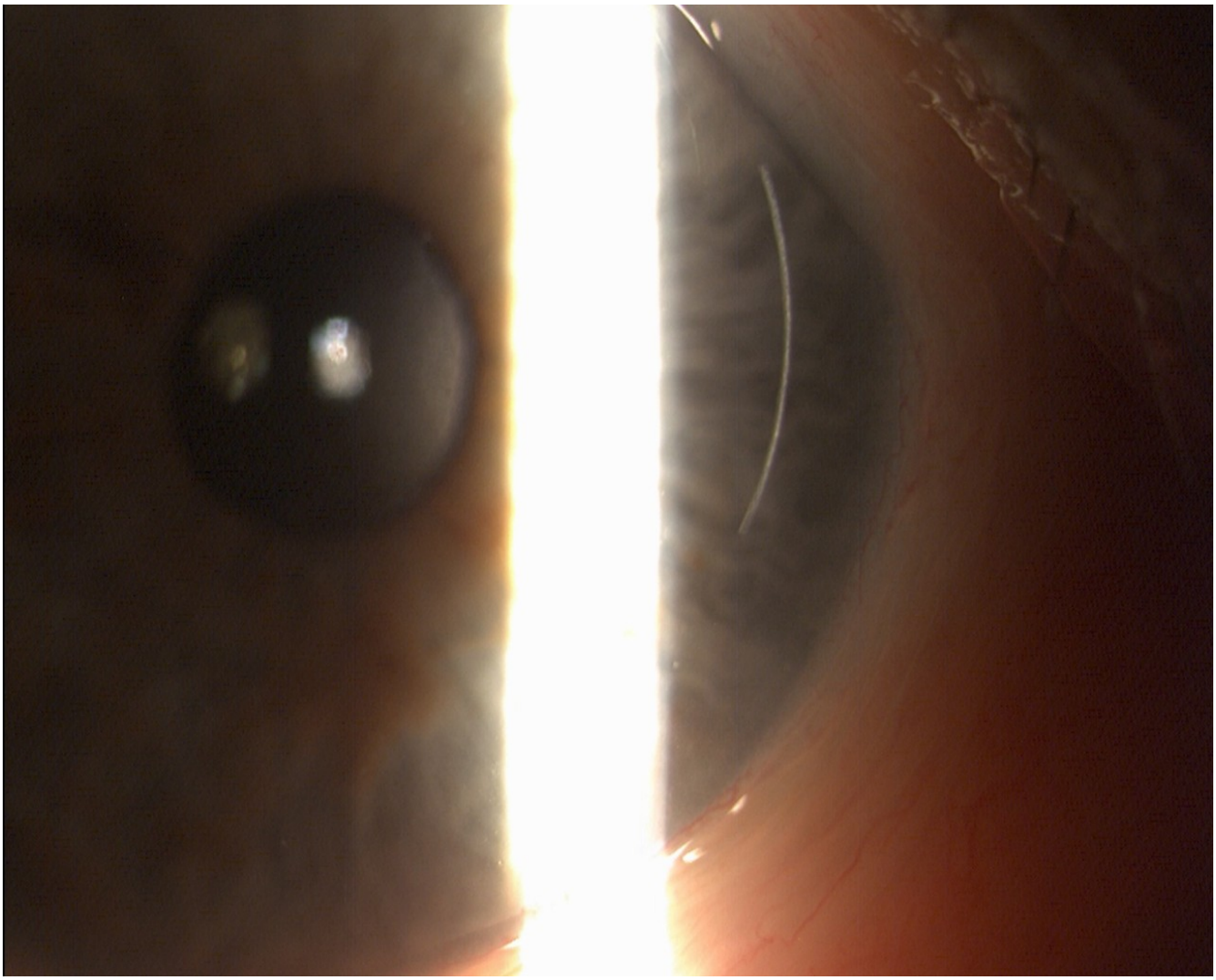


Figure 2 shows a femtosecond laser limbal, arcuate keratotomy that was performed to correct astigmatism. A similar technique can be used even at the slit lamp or intraoperatively using specially designed diamond blades.

The advantage of the femtosecond laser over diamond blade could be when used simultaneously for cataract surgery, especially in cases of anterior basement membrane dystrophy where there is no distortion of the weak epithelium, precision-wise as long as parameters of personal “fudge factors” are followed results could be equally satisfying.

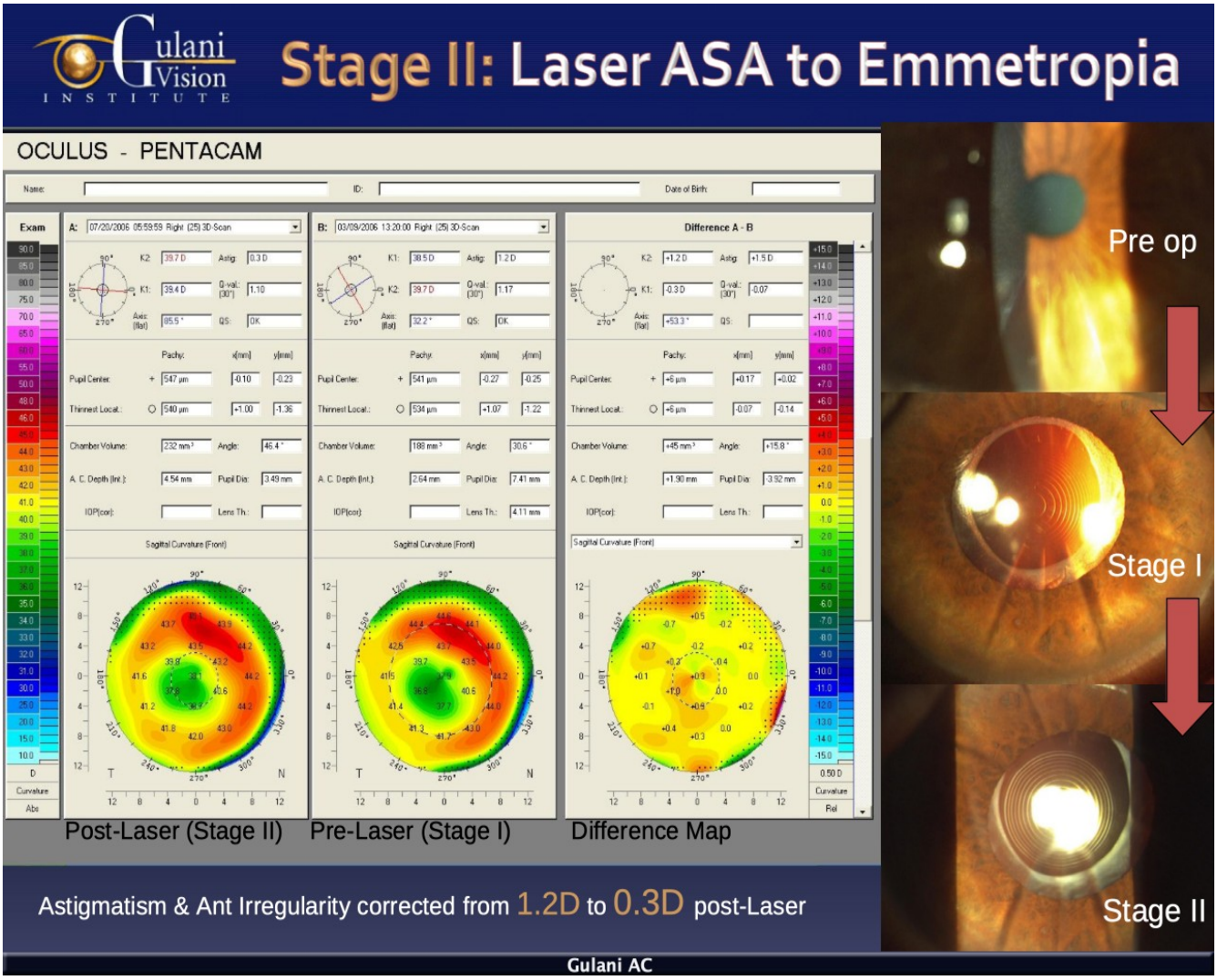


Figure 3 explores how the confidence of correcting astigmatism with the excimer laser also can help surgeons to correct patients who have undergone a previous refractive surgery, such as lens-based multifocal IOL implantation during cataract surgery in an eye with RK. Laser advanced surface ablation (ASA) in Corneoplastique mode was performed as a staged procedure to correct astigmatism to bring the patient to emmetropia even in complex cases that had undergone multifocal IOL implantation with a previous RK.

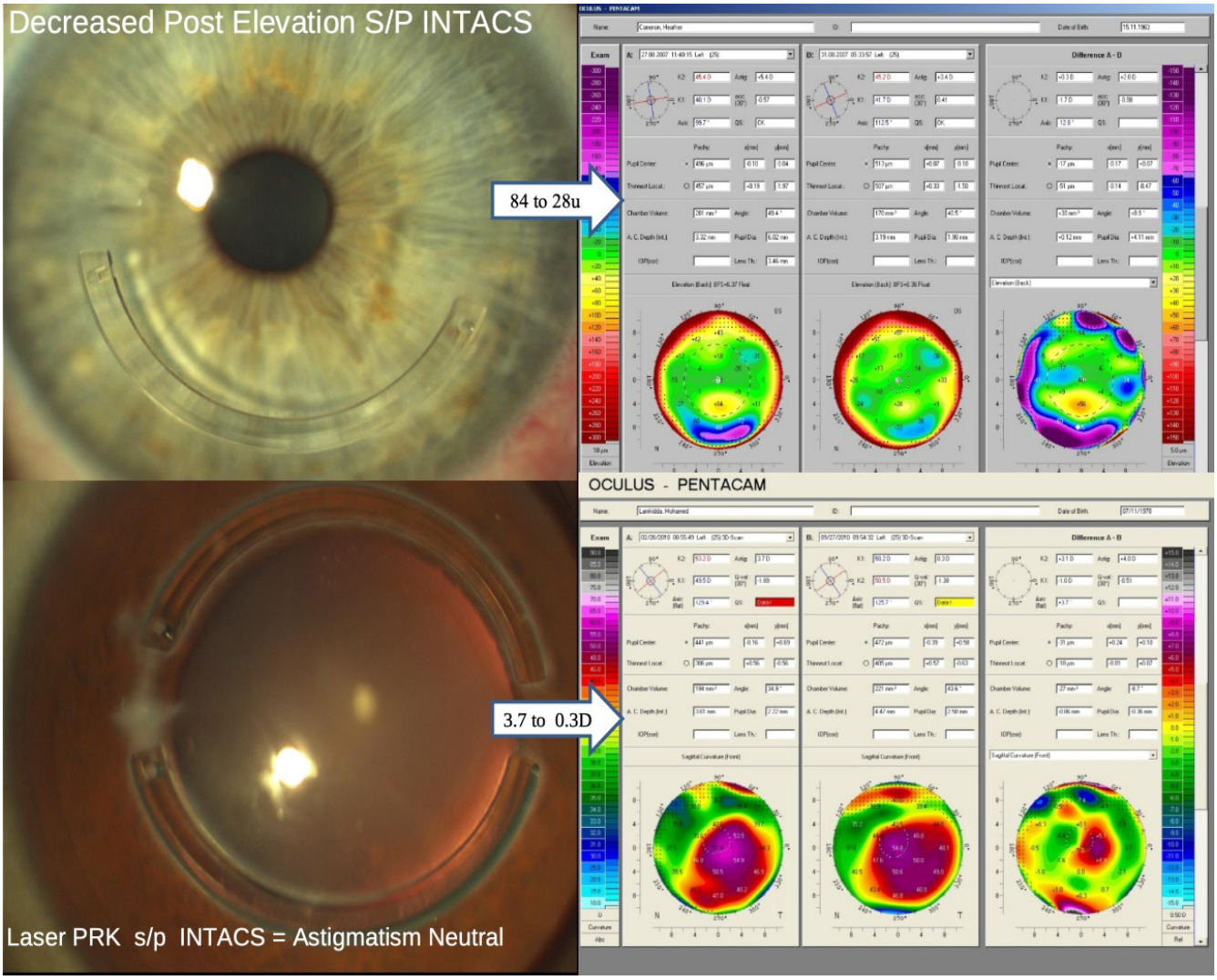


Figure 4 In patients who underwent surgery to implant Intacs segments (Addition Technology) to treat keratoconus and return to contact lens but were left with residual astigmatism, they might be able to achieve vision without the need for contact lenses by undergoing laser ASA correction of the residual astigmatism after Intacs implantation (astigmatism requires removal of the least amount of tissue with the excimer laser, which is the most common disorder in cases of keratoconus).

Also, Intacs acting like braces are stabilizing this cornea. Crosslinking also can be done before and after if needed.

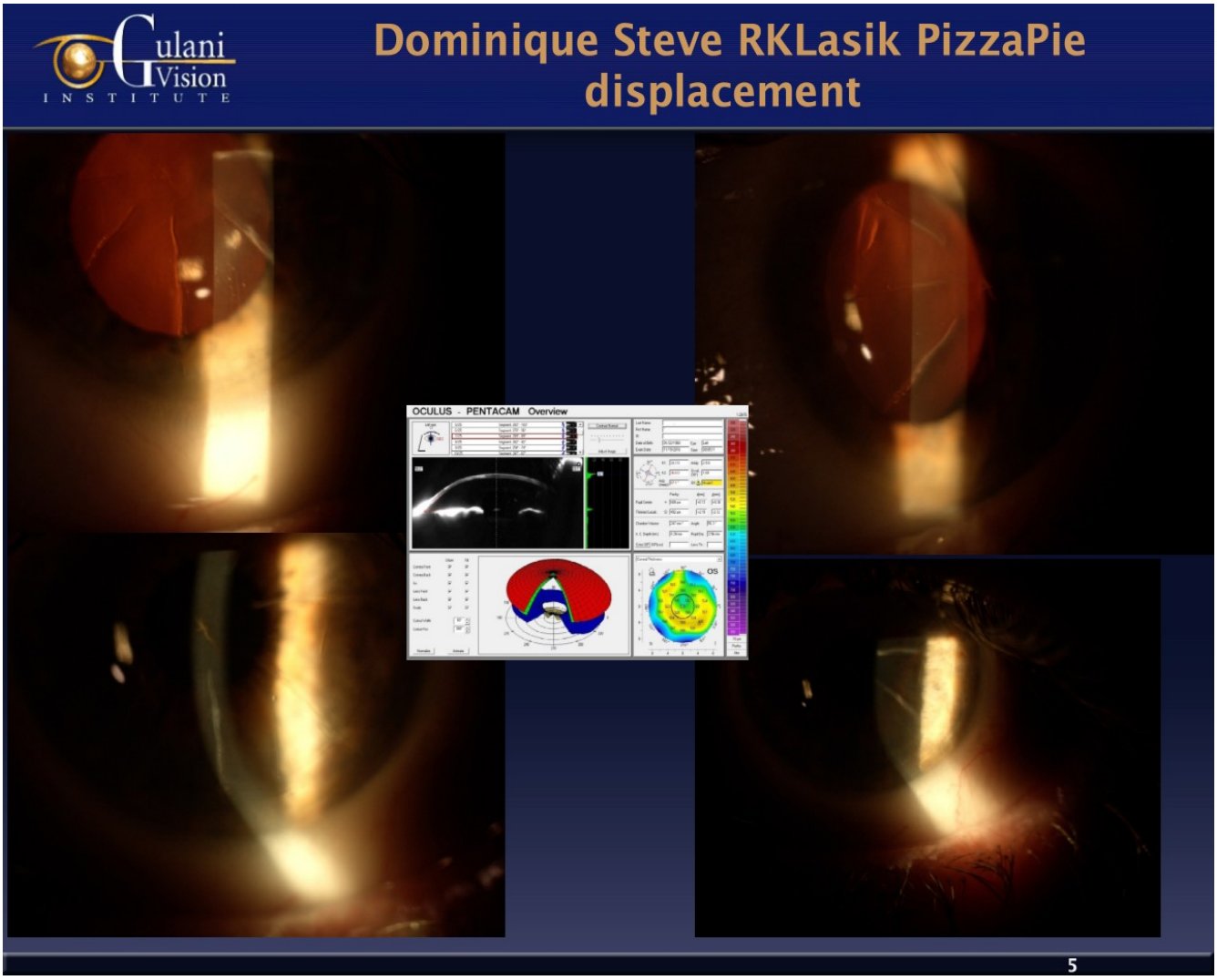


Figure 5 shows a patient who had undergone RK, LASIK, and cataract surgeries. The image shows displaced portions of the cornea between the RK incisions, which is typical in some cases when LASIK is performed on corneas after a previous RK procedure.

In these cases, irregular replacement of the corneal sections can result in irregular astigmatism and poor vision. Laser refractive correction can be performed in such patients in the ASA mode, with the effect of placing a new carpet over broken tiles, and result in emmetropic outcomes despite malpositioning of those corneal portions.

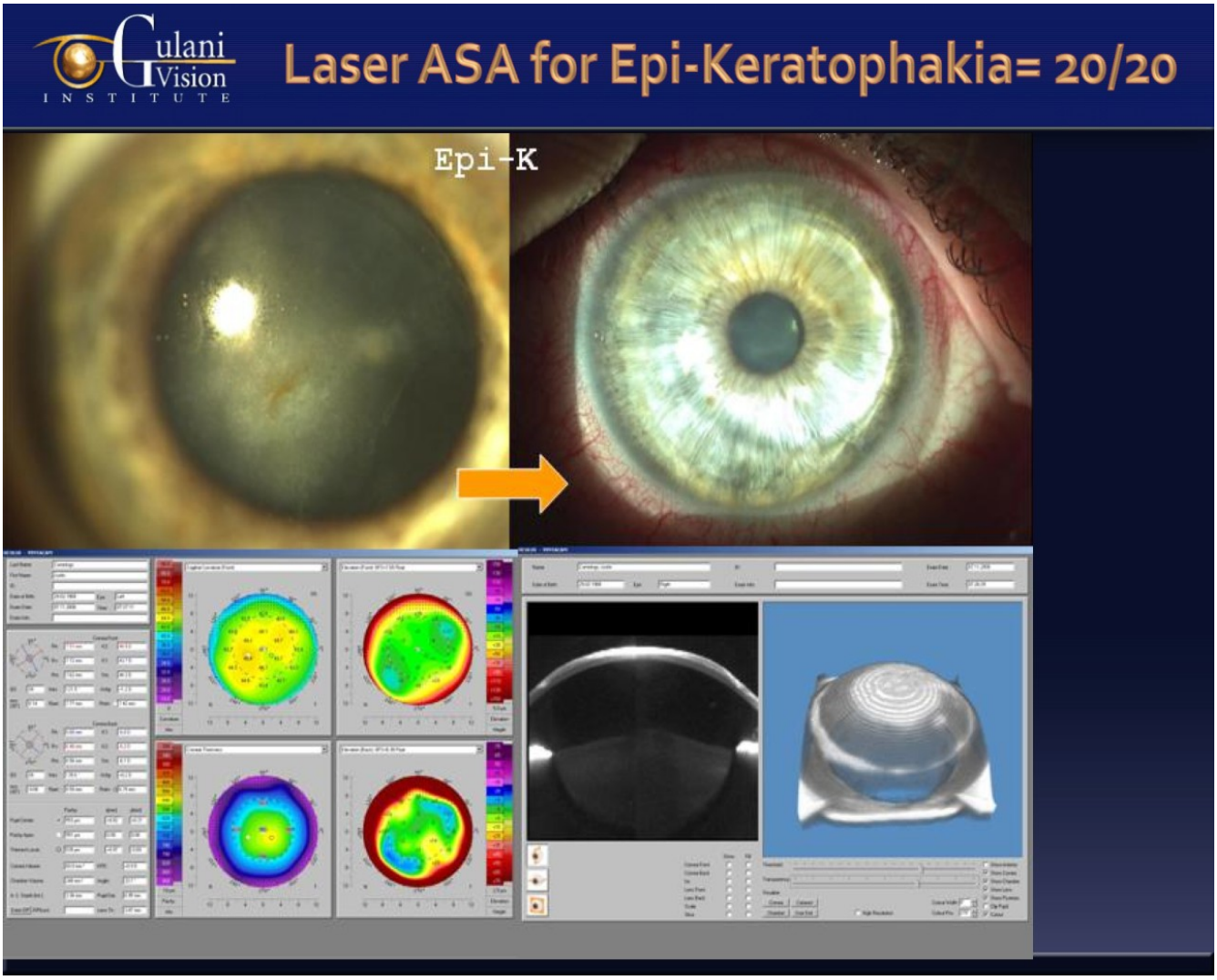


Figure 6 shows a Pentacam study of a case of epikeratophakia with residual high myopia and astigmatism and corneal scar.

By performing laser PRK (without removing the epikeratophakia lenticle), the patient can achieve emmetropia despite the previous epikeratophakia surgery.

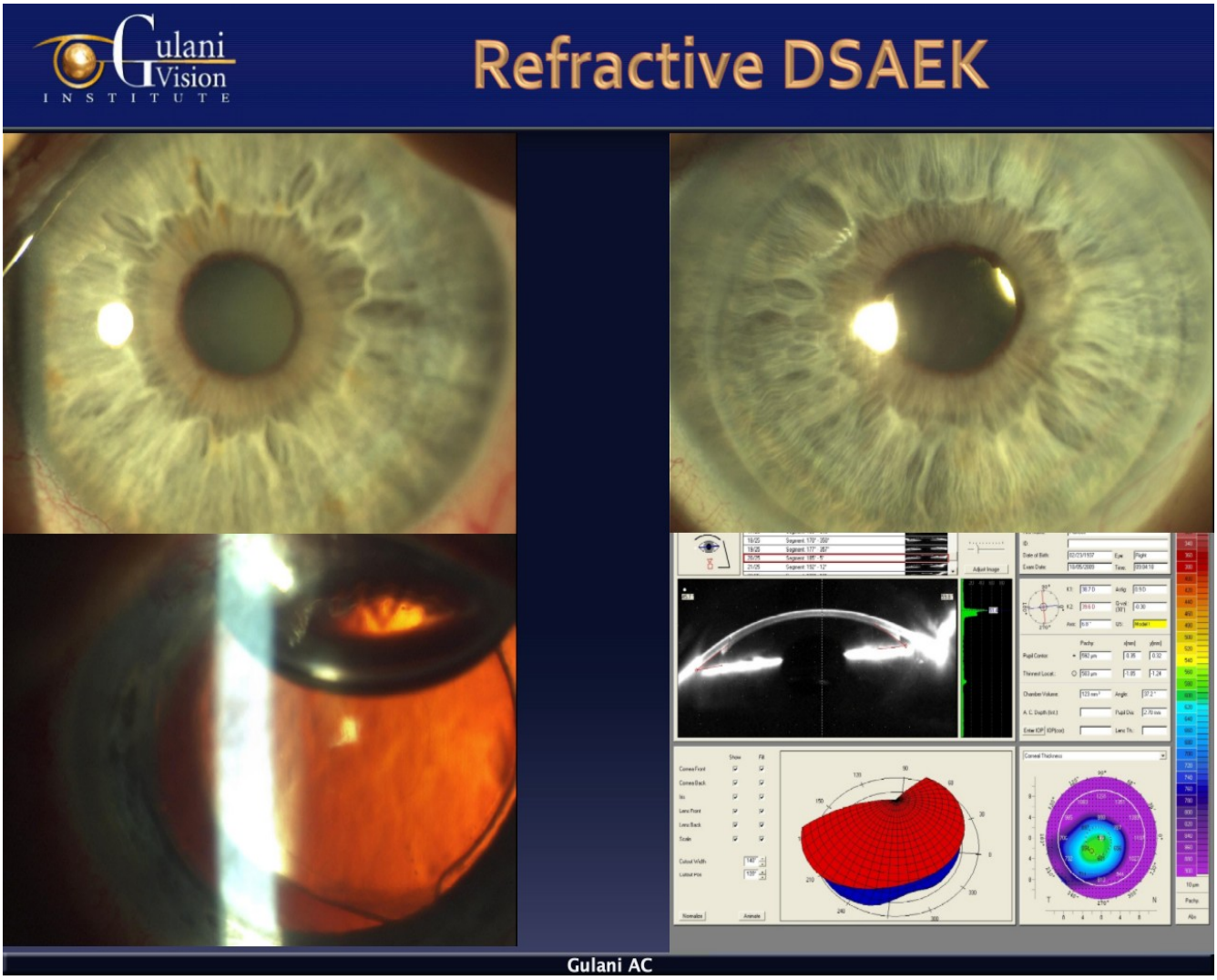


Figure 7 illustrates how Descemet's stripping automated endothelial keratoplasty and other posterior transplant procedures-including Descemet's stripping endothelial keratoplasty, Descemet's membrane endothelial keratoplasty, and pre-Descemet's endothelial keratoplasty-should all be performed with a refractive mindset (Gulani REFEK techniques) by which surgeons perform sutureless small corneal incisions and deliver the posterior corneal transplant.

I also place relaxing incisions anteriorly to simultaneously release interface fluid based on the topographic images and to correct astigmatism to achieve emmetropia. In addition, in these cases, toric IOLs also can be implanted with high confidence to reach emmetropia.

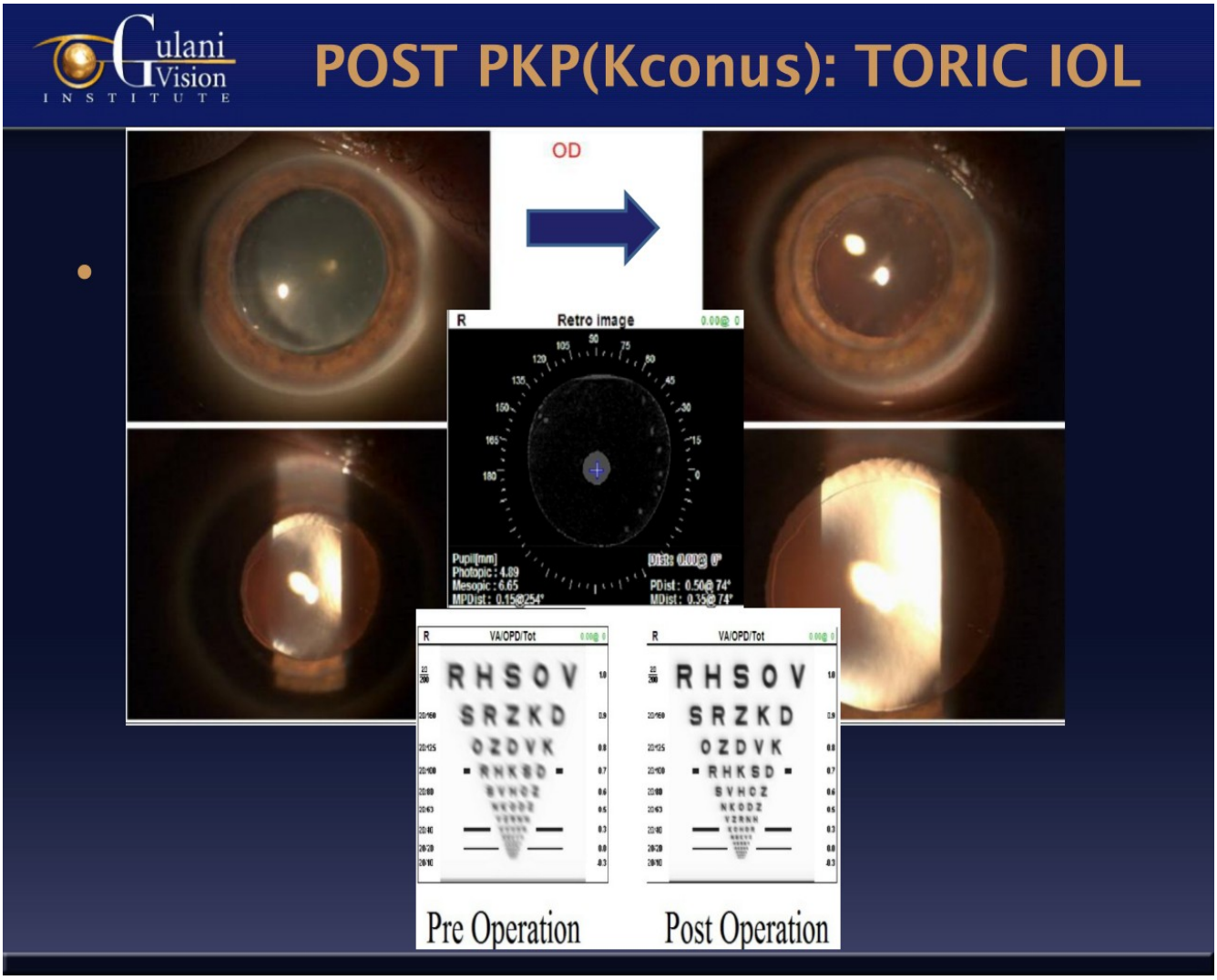


Figure 8 shows how even patients who underwent corneal transplantations decades ago can undergo a procedure to successfully correct their astigmatism using a laser ASA technique. They also can receive toric IOL implants and achieve very successful outcomes and refractive stability.

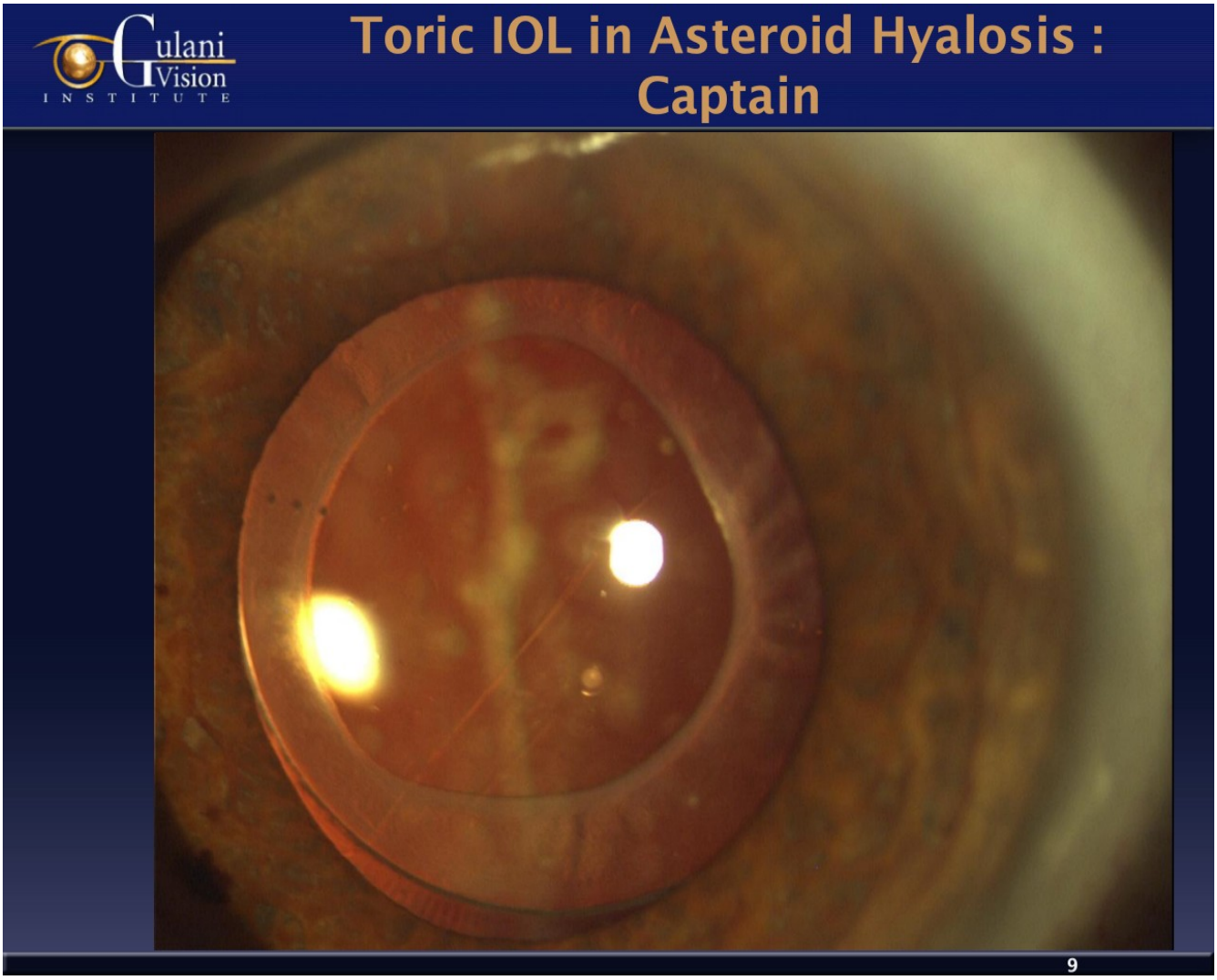


Figure 9 shows the case of a ship’s captain who required superior vision in his only seeing eye.

The functioning eye had severe asteroid hyalosis and high astigmatism. I performed a cataract surgery with implantation of a toric IOL, with high confidence that the patient would achieve unaided 20/20 vision and continue his visually demanding lifestyle.

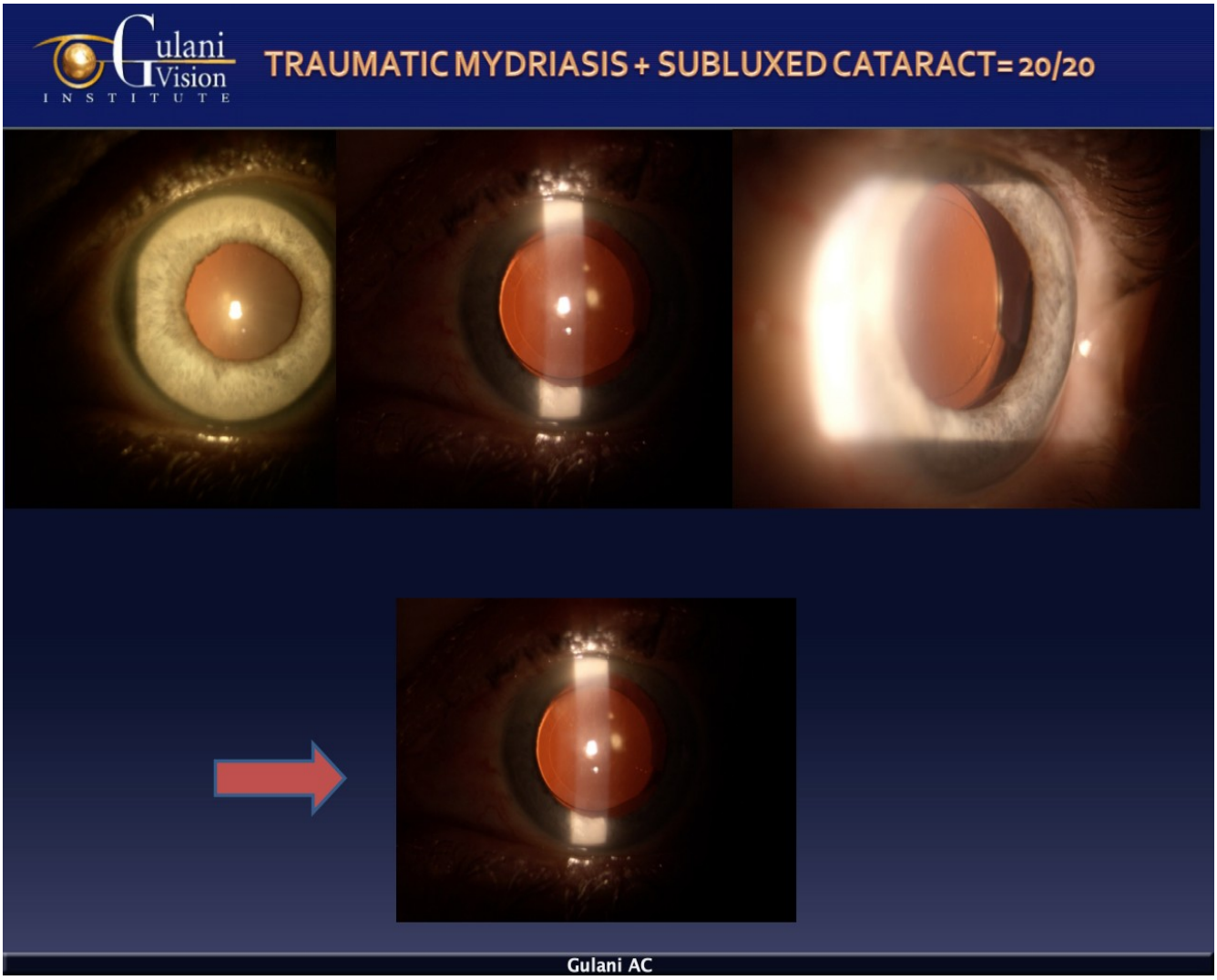


Figure 10 shows the case of a patient with traumatic mydriasis and a subluxated cataract. Instead of focusing on the iris distortion, one can simulate vision preoperatively and aim for emmetropia by implanting a toric IOL and placing a capsular tension ring with a small capsulorhexis (so it opacifies, acting to make up for the compromised iris).

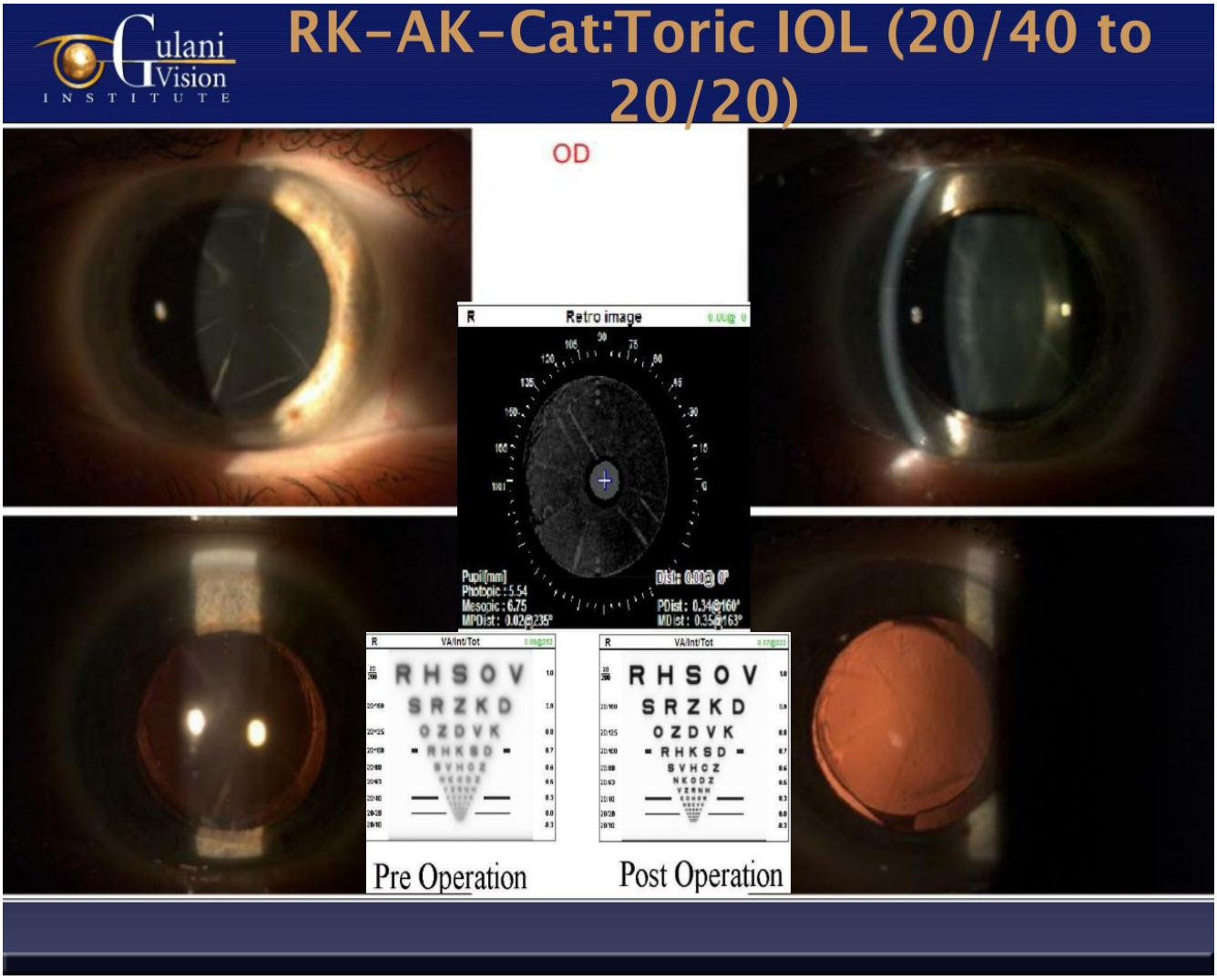


Figure 11 shows a patient who underwent a series of RK procedures. This patient was an artist who required a high level of vision that exceeded her preoperative level of 20/40.

The current confidence in the toric IOL implants and correction of astigmatism despite previous RK procedures allowed me to proceed to heed to her request and bring this patient to achieve 20/20 vision and improved quality of life. This is an example of cases surgeons shall see more and more of when what we perceive as “good enough” vision (20/40) is “debilitating” to certain patient’s work demands and we must commit to helping them.

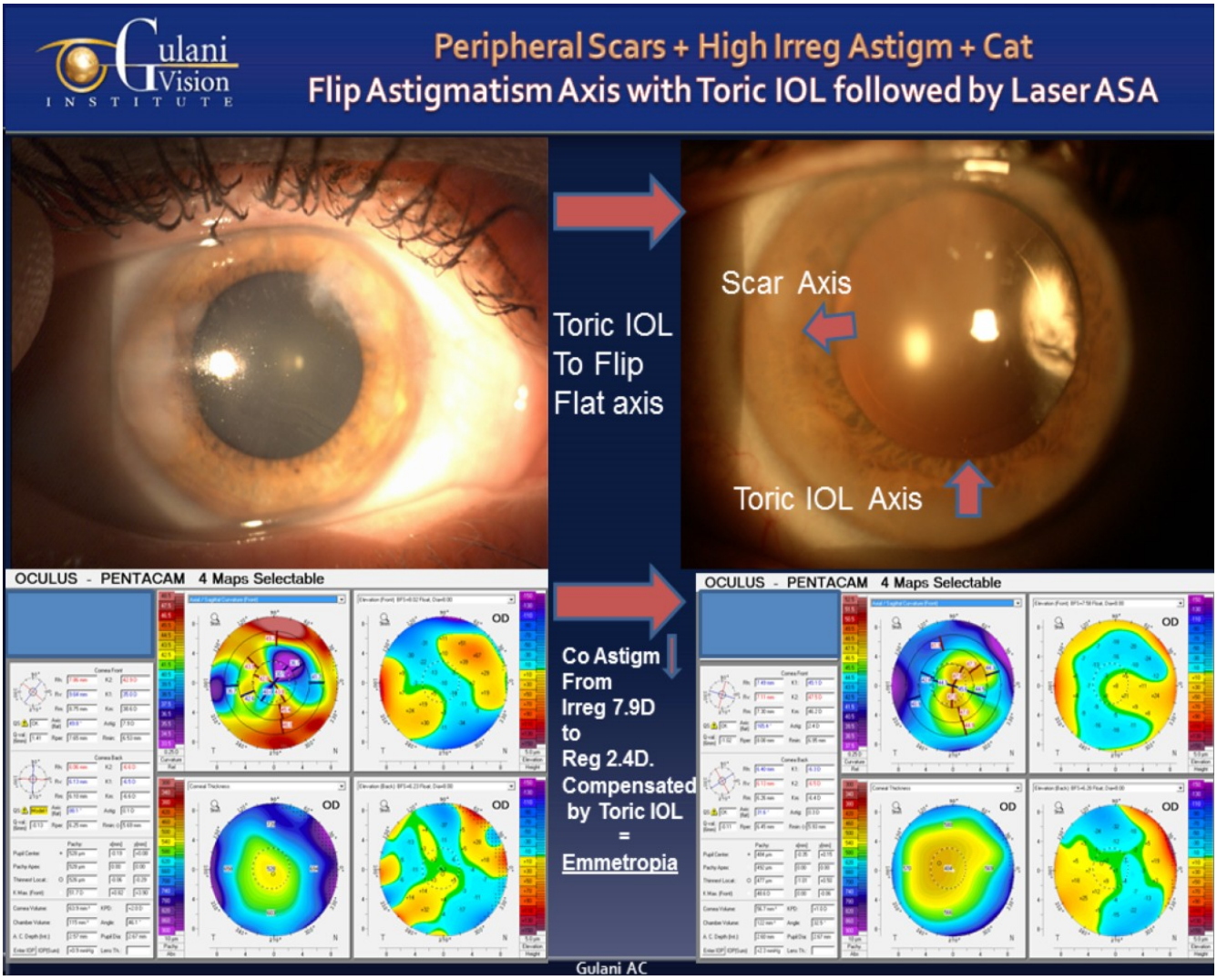


Figure 12 shows how the surgeon can use astigmatism to his or her advantage.

In this case, I was able to align the resultant astigmatism to be in the axis of a corneal scar. Using the VISX laser in Corneoplastique mode can clear the corneal scar and correct the astigmatism to emmetropia. Flipping the axis using a toric IOL can be used to correct the cornea with the “inside-out” technique.

The topographic results at the bottom of the slide show the results in patients who have had correction of a corneal scar and irregular astigmatism to a measurable, regular refractive astigmatism endpoint, which then was corrected during cataract surgery with implantation of a toric IOL to achieve emmetropia.

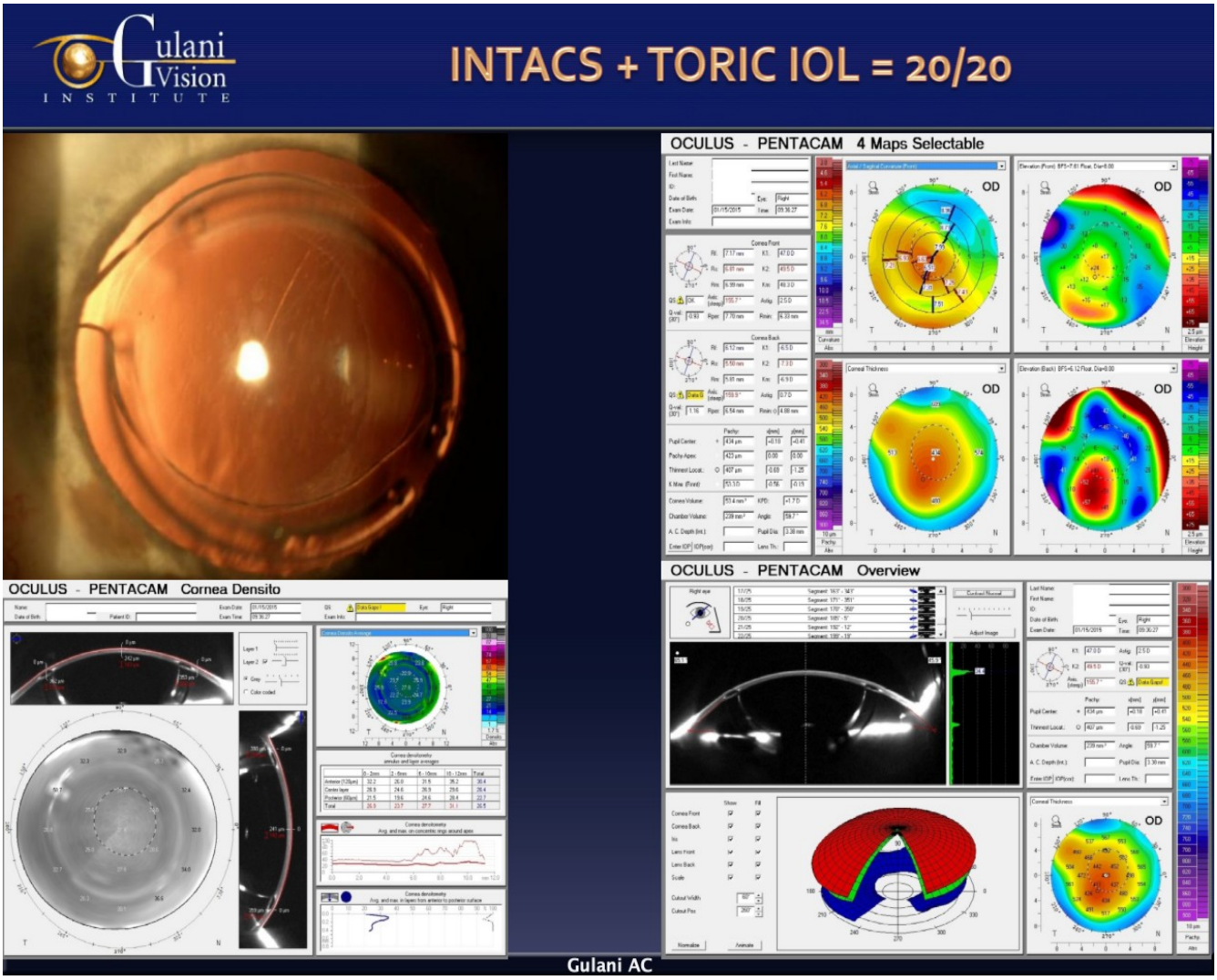
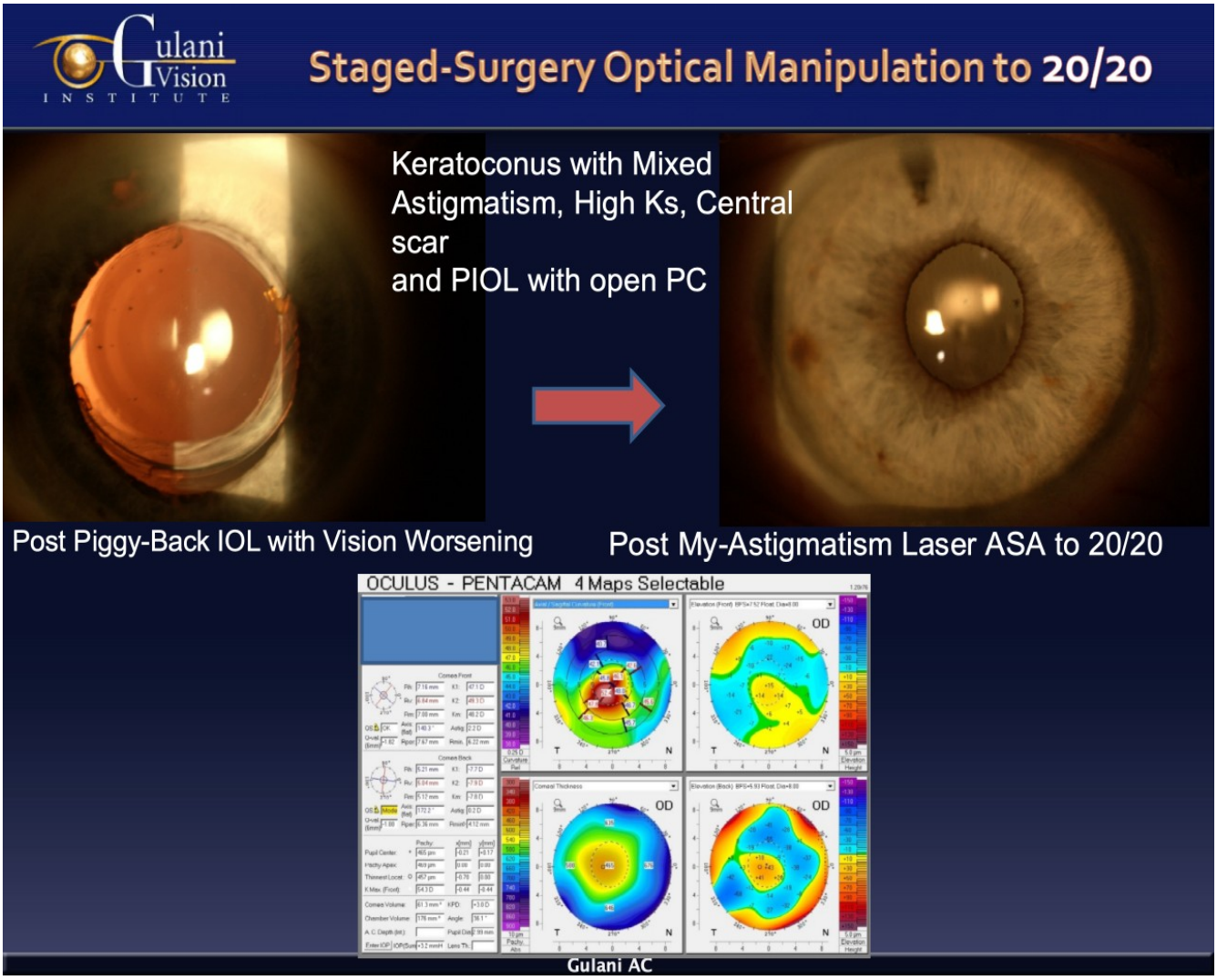


Figure 13 shows a patient with keratoconus, a thin cornea, extremely high myopia, astigmatism, and a congenital cataract. My confidence in correcting the astigmatism and my zero tolerance for it, led me to a staged surgery that began with Intacs implantation to stabilize and make the cornea measurable. This was followed by cataract surgery with implantation of a toric IOL, which achieved 20/20 vision.



In another staged surgery (Figure 14), this patient had had cataract surgery performed in a keratoconic eye that resulted in a lens surprise and a hyperopic outcome. Given the presence of mixed astigmatism, high keratometry values, and a central scar, the goal was to avoid additional steepening using laser procedures. I implanted a piggyback lens to induce myopic astigmatism and then performed laser ASA to correct all the astigmatism, thereby flattening the central cornea (and simultaneously clearing it) to achieve a 20/20 outcome.

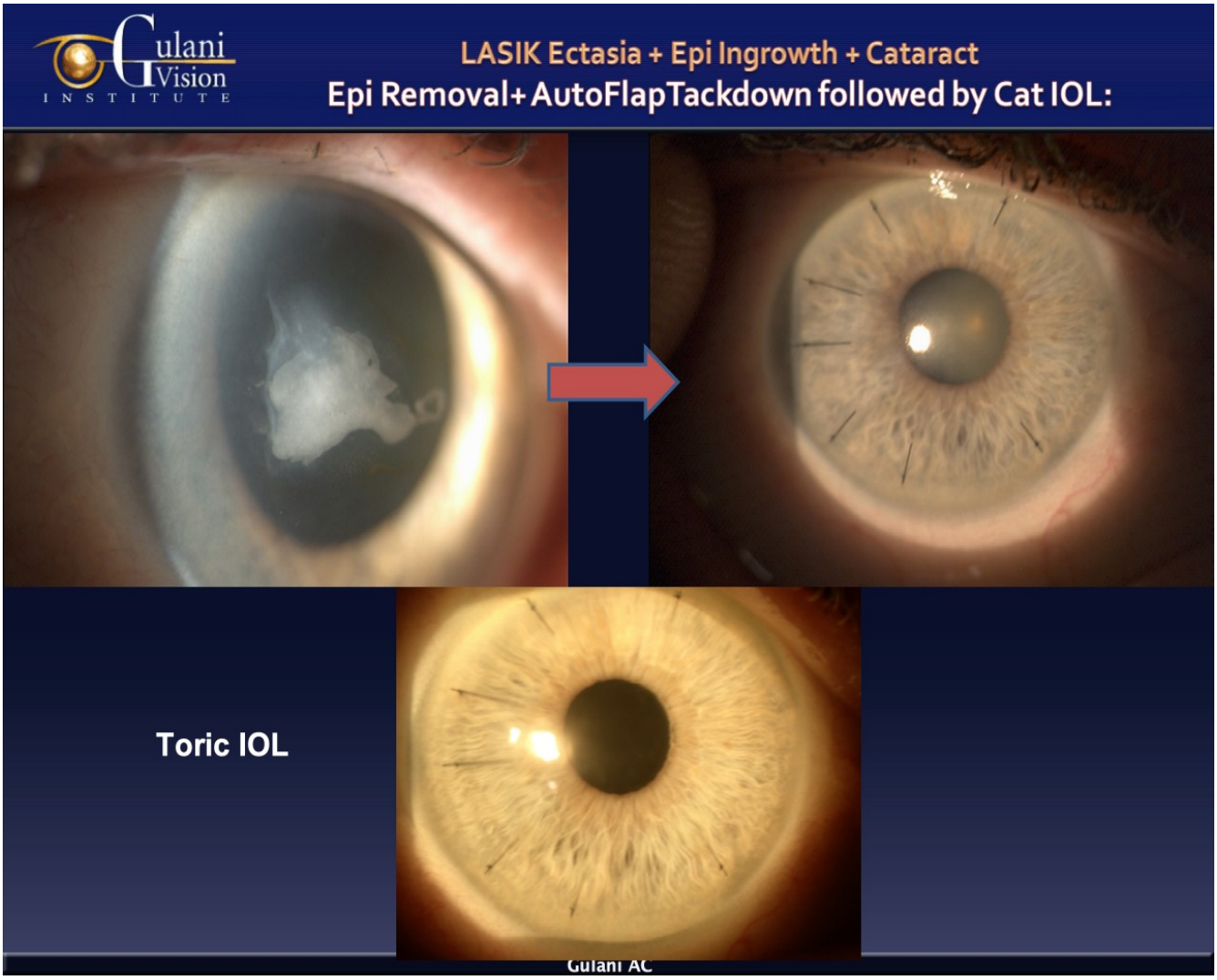


Figure 15 illustrates a case of a patient referred to me with epithelial ingrowth under a LASIK flap with repeated epithelial ingrowth of dense central location. I lifted the flap, removed the epithelial ingrowth, and reaffixed the flap with little induced astigmatism. After a period of 3 months to achieve stabilization, I left the cornea untouched (since it was measureable and consistent), and implanted a toric IOL to achieve an excellent outcome.

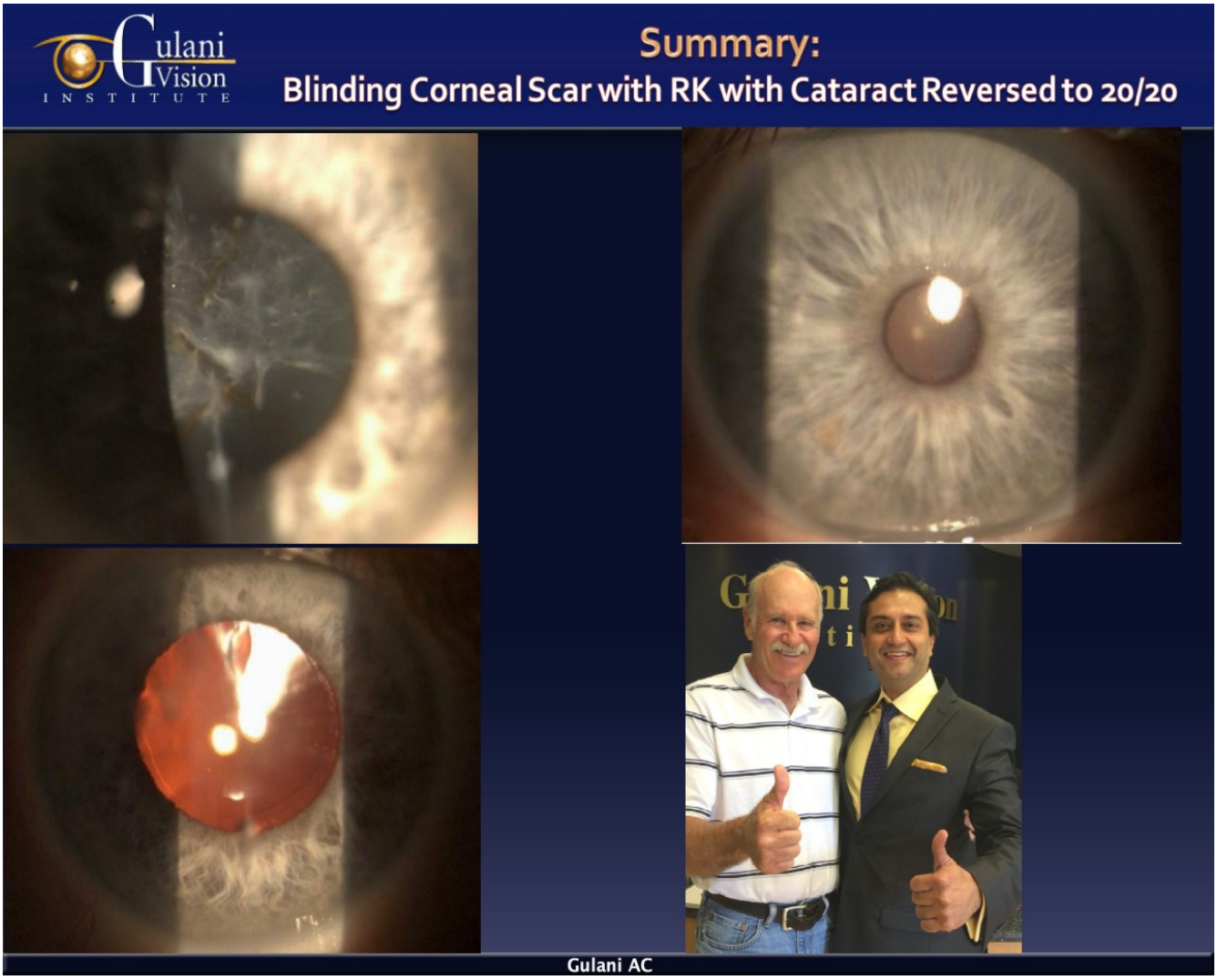


Figure 16 shows the case of a patient who had a dense central corneal scar who had undergone RK and cataract surgery. I cleared the scar using a laser Corneoplastique procedure followed by implantation of a toric IOL that resulted in emmetropia.

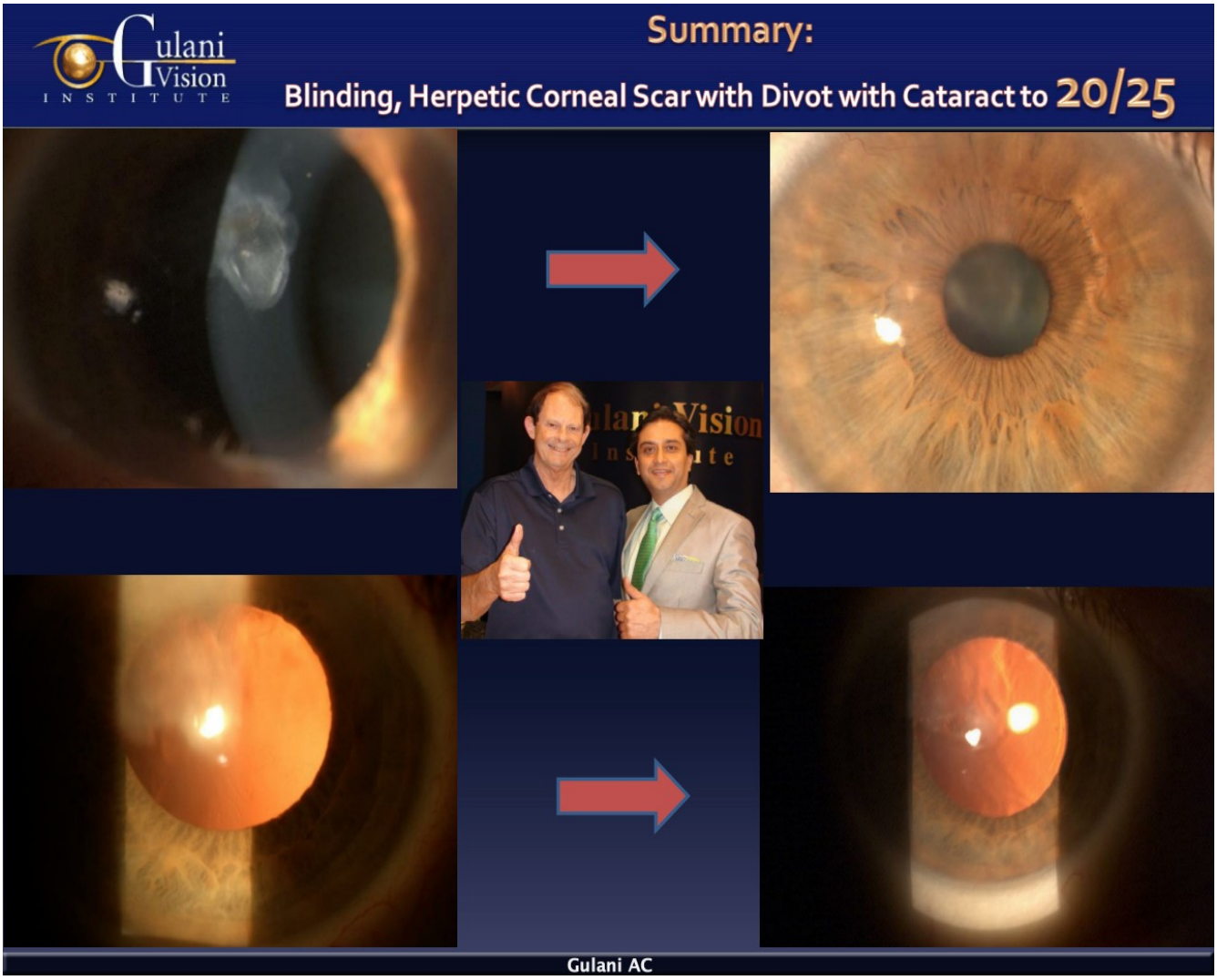
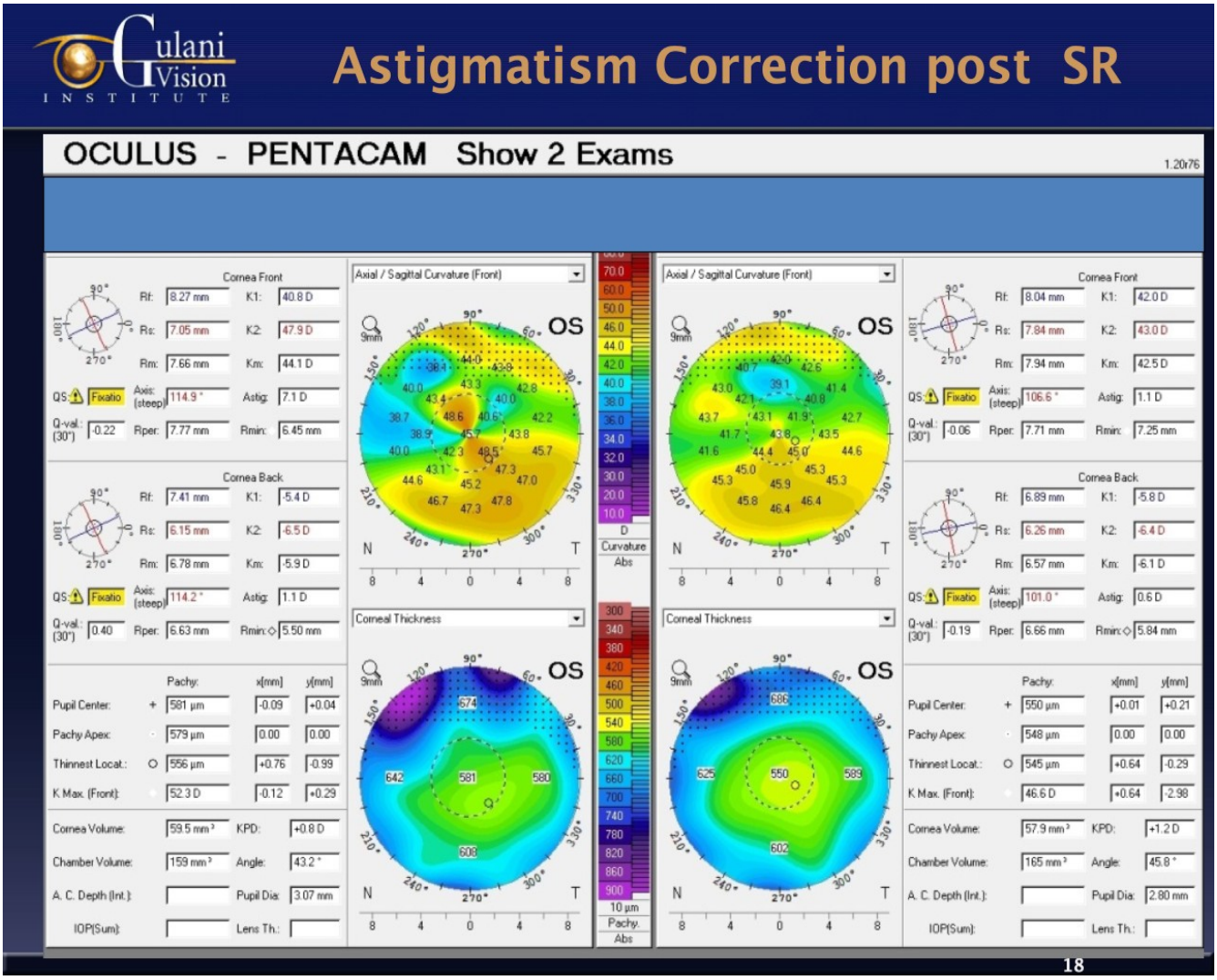
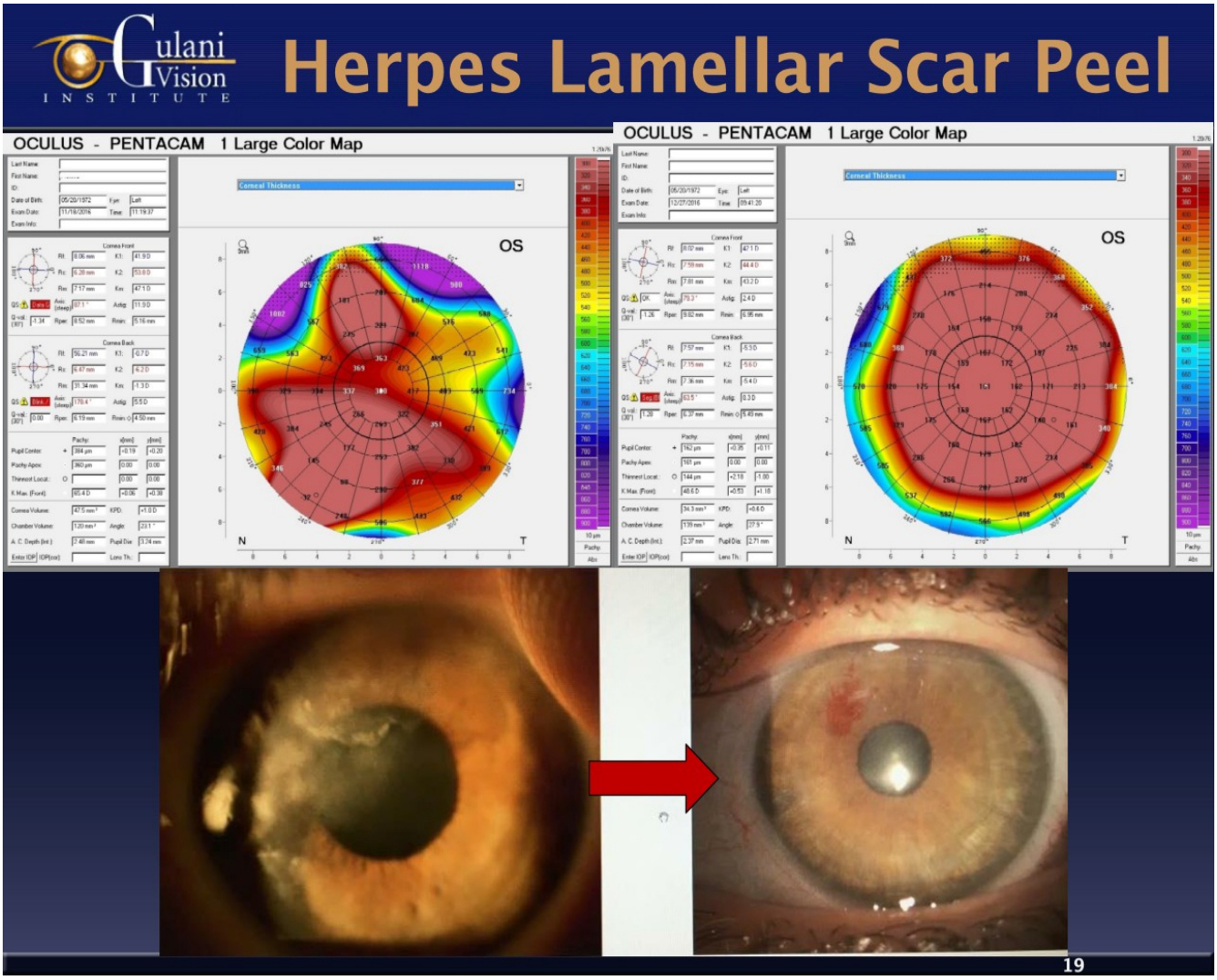


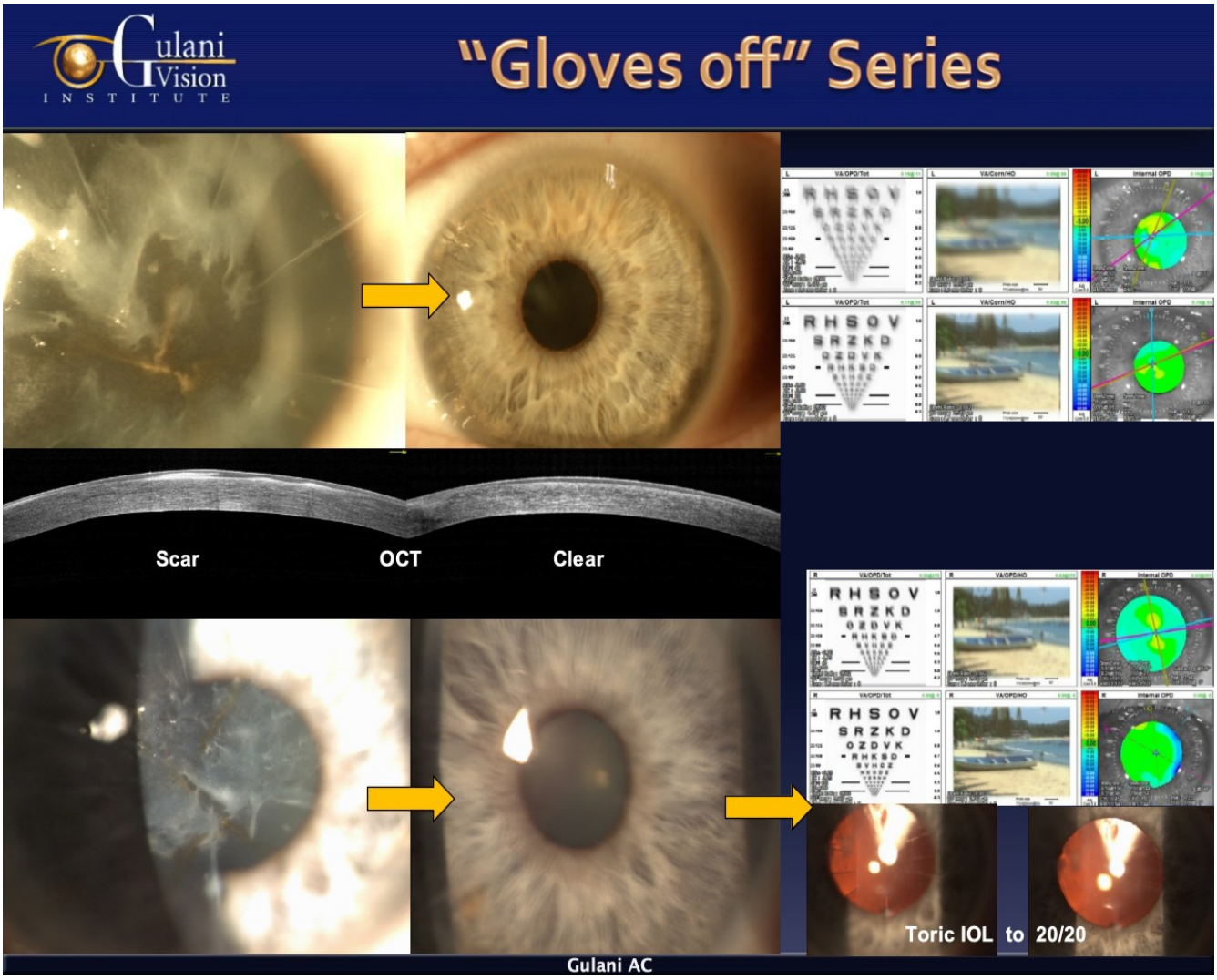
Figure 17 illustrates the next patient with a central herpetic excavating scar. I first performed a Corneoplastique procedure to make the cornea measurable followed by implantation of a toric IOL in a staged cataract surgery (femto aphakia followed by toric IOL implantation) to bring the patient to emmetropia.



The patient in Figure 18 demonstrates what should have been a simple diagnosis. Many patients who are referred to me have high astigmatism, and in this case, the referring surgeon should have looked under the upper lid rather than focusing on what the previous surgeon did wrong. Examination showed a suture deep under the conjunctiva superiorly that was the culprit causing the high astigmatism, in this case 7.1 D. Removing the suture led to immediate recovery of 20/20 vision within minutes in the office. Surgeons should look for the culprit causing the astigmatism in each case and then approach it from that direction instead of first considering their surgical options.



In this case of a deep dense herpetic scar in a thin cornea in Figure 19, lamellar peeling of the scar resulted in a marked improvement of the astigmatism from 11.9 to 2.4 D.



In a number of my "Gloves Off" series (Figure 20), I have shared the concept of outside in/inside out techniques in which the cornea can be made measureable by removing a scar and irregularity including astigmatism to then proceed with confidence with a toric IOL implant to an excellent visual endpoint.

These cases and concepts presented in this column explain the wide array of tools and techniques to correct astigmatism as well as the zero tolerance of residual astigmatism in any case and therefore driving to a promised excellent visual endpoint for each patient.

If you do end up with astigmatism despite your planning, it is not a crime-but to not have aspired for a "zero astigmatism" endpoint is in my mind unacceptable.

I believe that when considering premium surgeries and high patient expectations along with our unrelenting pursuit of "super vision," the tolerance of residual astigmatism, like a bespoke tailor, must be zero. Only then will we have the commitment, resilience and ability to reach these goals and the results from then on will speak for themselves.

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