

# The Interpretation of Topography Preoperatively

Evaluating all visual parameters before surgery is extremely important.

BY WILLIAM TRATTLER, MD

Success with presbyopia-correcting IOLs starts with selecting the right patient. Before considering a person's personality, perform a preoperative evaluation that will identify less-than-ideal candidates for these lenses. In my practice, the two key preoperative tests are corneal topography and macular optical coherence tomography (OCT). In particular, it is imperative to evaluate a patient's preoperative topography just as you would if the patient were considering LASIK.

## ASSESSMENT OF BOTH EYES

Always evaluate both of a patient's eyes with topography. A 45-year-old female patient presented for presbyopia-correcting IOL surgery. Her left eye exhibited pellucid marginal degeneration. In all likelihood, although her right eye appeared normal on topography (Figure 1), it would have been at high risk for post-LASIK ectasia. If the patient requires a refractive touchup after the implantation of a presbyopia-correcting IOL in her right eye, she will not be eligible for a LASIK enhancement due to an increased risk of ectasia. Although a piggyback IOL or perhaps surface ablation are possibilities, it is important to identify pellucid marginal degeneration preoperatively and to explain its implications to the patient prior to surgery.

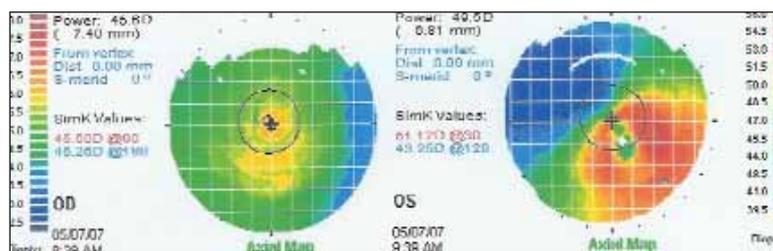


Figure 1. The patient's right eye has a normal appearance on corneal topography, but her left eye exhibits pellucid marginal degeneration.

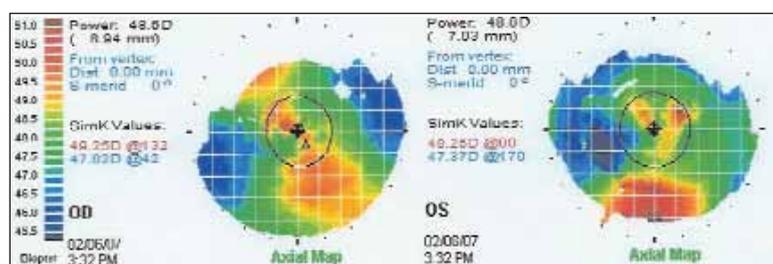


Figure 2. Bilateral irregular astigmatism is the noteworthy finding on this preoperative topography of a patient scheduled to receive presbyopia-correcting IOLs.

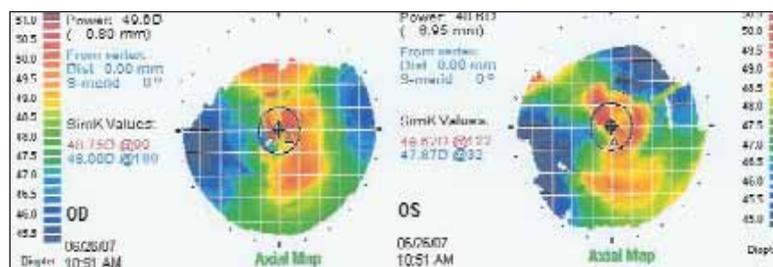


Figure 3. After receiving a Crystalens implant in both eyes, this patient had bilateral irregular astigmatism.

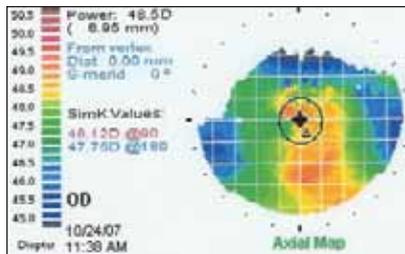


Figure 4. Topography after surface ablation on this patient's right eye shows irregular astigmatism. The patient continued to complain of poor quality of vision in this eye.

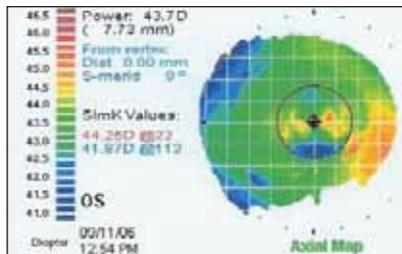


Figure 5. A patient's topography prior to cataract surgery. Early pellucid marginal degeneration is noted (OS).

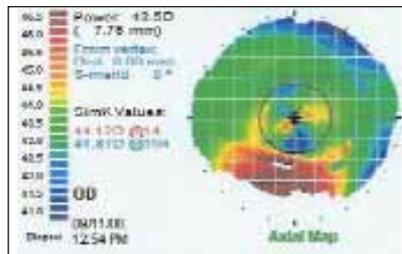


Figure 6. The topographic map of the patient's contralateral eye (OD) reveals pellucid marginal degeneration.

## CORNEAL ABNORMALITIES

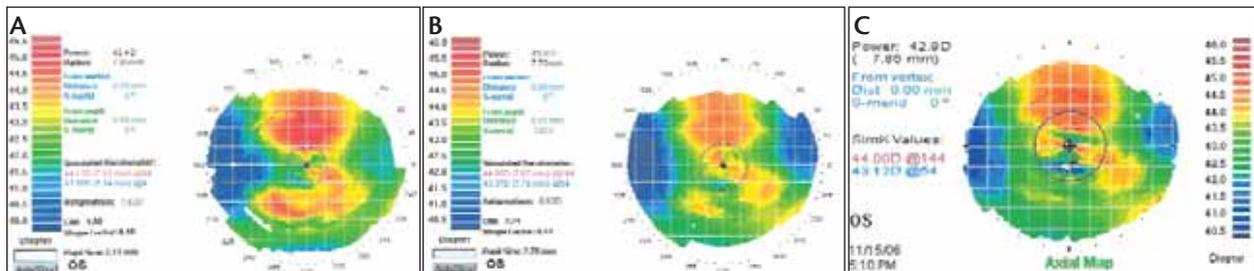
### My Experience

When I routinely began obtaining preoperative topographies prior to implanting presbyopia-correcting IOLs, I was surprised by the high rate of corneal abnormalities I observed. I would estimate that approximately 10% of patients will have a finding on topography. Interestingly, most of them do not have a history of keratoconus or pellucid marginal degeneration. I have personally found that even mild cases of forme

fruste keratoconus or early pellucid marginal degeneration can reduce patients' satisfaction with presbyopia-correcting IOLs, and the results of surface ablation, typically with conventional treatments, have been underwhelming.

### Case Example No. 1

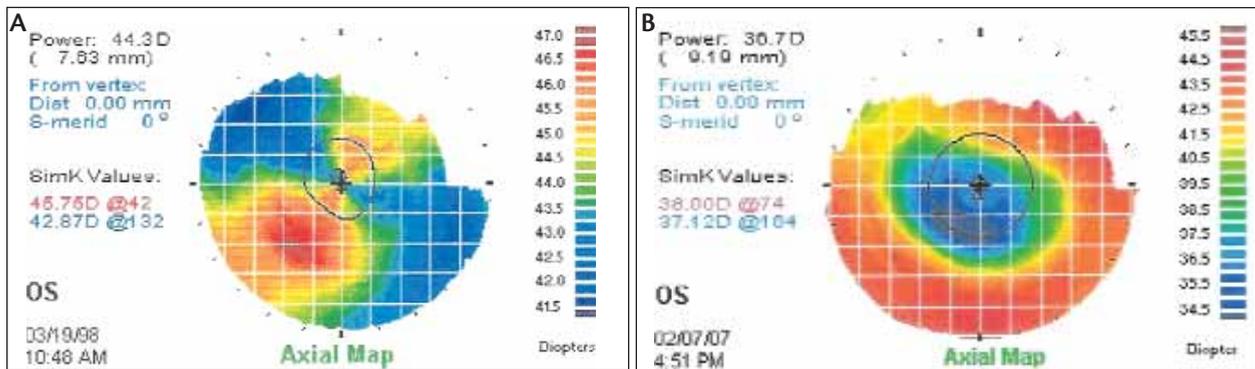
A 68-year-old female undergoing cataract surgery received a Crystalens (Bausch & Lomb, Rochester, NY). Her preoperative topography might have raised a little con-



**Figure 7.** This patient received the AcrySof Restor IOL and limbal relaxing incisions (LRIs) placed at 3 and 9 o'clock 2 weeks after cataract surgery. She achieved an overcorrection of her astigmatism in addition to the area of superior steepening (A). Four weeks after receiving the AcrySof Restor IOL and LRIs, irregular astigmatism with superior steepening and a shifting of the axis were observed via topography (B). At her 6-week follow-up, the patient presented with superior steepening along with an area of horizontal astigmatism (C).

cern, with keratometry (K) readings above 49.00 D OD and 48.00 D OS (Figure 2). Also, the astigmatism was not symmetrical in her left eye. The patient had clear corneas without epithelial basement membrane dystrophy, and she had minimal dry eye, which are two conditions that can produce a similar type of topographic map. Following surgery, the patient was disappointed with both her distance and near vision. She had a residual refractive error in both eyes that could not be corrected to 20/20 despite

healthy maculas as determined by OCT. An evaluation of the corneal topography revealed some irregular astigmatism (Figure 3). The patient underwent surface ablation in her right eye that slightly improved her BCVA (Figure 4), and she is scheduled for surface ablation in her left eye. In retrospect, this patient's steep corneas and irregular astigmatism should have been a warning sign that she had a reduced chance of achieving excellent distance and near vision with presbyopia-correcting IOLs.



**Figure 8.** The patient's pre-LASIK topography shows a high refractive error of -9.50 -5.50 X 165 (A). She underwent LASIK in 1998. Nine years after LASIK, she presented with a significant gradient of astigmatism in the pupillary axis (B). She underwent cataract surgery and only achieved a BCVA of 20/50 due to the irregular astigmatism.

### Case Example No. 2

A patient presented with a desire for functional distance and near vision, and the surgeon recommended the implantation of an AcrySof Restor IOL (Alcon Laboratories, Inc., Fort Worth, TX). The surgeon performed preoperative topography (Figures 5 and 6), and he judged the maps to be normal. The surgeon proceeded with standard cataract surgery and implanted an AcrySof Restor IOL in her left eye. Her astigmatism was addressed with LRIs at the 3- and 9-o'clock meridians.

Two weeks postoperatively, the patient was extremely disappointed with her vision. She had reduced BCVA, and her corneal topography revealed a large overcorrection (Figure 7A). The patient returned for her 4-week postoperative examination, and repeat topography revealed superior irregular astigmatism (Figure 7B). At her 6-week follow-up appointment, topography revealed further changes with significant irregular astigmatism present superiorly in addition to a return of horizontal astigmatism centrally (Figure 7C).

In retrospect, the patient's preoperative corneal topographies were consistent with early pellucid marginal degeneration, which would explain the initial overcorrection of her astigmatism with LRIs as well as the development of irregular astigmatism.

### PATIENTS WHO PREVIOUSLY UNDERWENT LASIK

Some patients considering a presbyopia-correction IOL have a history of LASIK surgery and now, years later, have developed a cataract. LASIK patients have invested in their eyes in the hope of achieving excellent UCVA, and, in my experience, LASIK patients typically opt for a presbyopia-correcting IOL when they develop cataracts. Even though most LASIK patients end up with excellent results, it is critical to review the topography to deter-

mine whether the laser treatment was centered and to determine whether any irregular astigmatism has developed. In addition, obtaining old records including old topographies is helpful.

Figure 8 shows the pre- and postoperative topographies of the same patient described in case no. 2 who underwent LASIK 9 years before developing a cataract. Her recent topography reveals significant asymmetry in the visual axis. After cataract surgery with a standard IOL, she could only attain 20/60 BCVA despite a healthy macula. She was eventually fitted with rigid gas permeable lenses, and the patient has now achieved 20/20 BCVA.

### CONCLUSION

With presbyopia-correcting IOLs, we cataract surgeons can provide patients with satisfactory visual results. Success with this modality requires that we think like a refractive surgeon, however, by carefully performing tests such as corneal topography to make sure that patients are appropriate candidates. Because a percentage of patients receiving presbyopia-correcting IOLs will require a refractive touchup, we must determine during the preoperative evaluation whether or not LASIK enhancements will be an option. Overall, corneal topography plays a vital role in our success with presbyopia-correcting IOLs. ■

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