

Forme Fruste Ectasia

Until a strong scientific study demonstrates the risk factors for this complication, surgeons should be conservative about the eyes on which they perform LASIK.

BY LEE T. NORDAN, MD



During the Storm Eye/ASCRS Clinical Update 2007, held from May 31 to June 3, one of the hot topics of the corneal section was attempting to identify the risk factors for ectasia before LASIK. During this session, I conducted a written poll of

the eight panelists for this discussion and discovered some interesting facts (Table 1). My interpretation of this small but important sampling is as follows. Keratoconus and corneal pellucid marginal degeneration are part of the same ectatic disease complex, but they have a different primary location (Figure 1). Nonetheless, these areas of thinning can overlap. If forme fruste keratoconus or forme fruste corneal pellucid marginal degeneration exists, either can cause the inferior cornea to be equal to or thinner than the central cornea. All of the experts agreed that this inferiorly thinning profile was abnormal.

This article shares some of my thoughts on forme fruste ectasia.

DEFINITION

I define forme fruste ectasia as a condition of the cornea that includes reduced corneal strength and corneal thinning (usually centrally or inferiorly) without irregular astigmatism. The term *forme fruste keratoconus* is a misnomer, primarily because the presence of even a small degree of irregular astigmatism generally indicates overt—albeit mild—keratoconus. By definition, *forme*

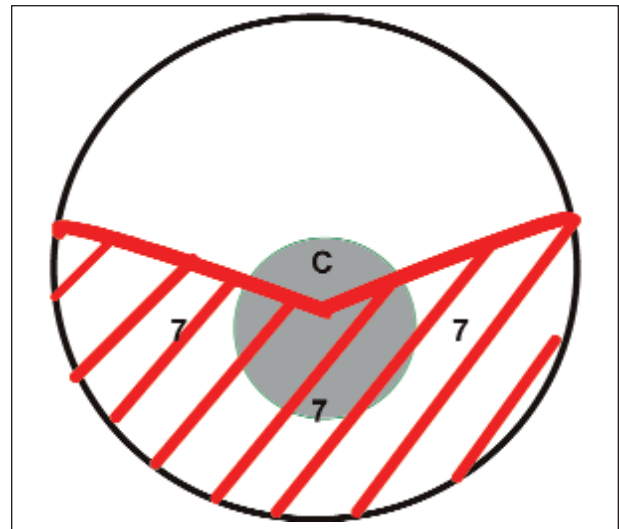


Figure 1. The primary location of thinning for keratoconus (gray) and corneal pellucid marginal degeneration overlap. Comparing the central and inferior pachymetry measurements at the 7-mm optical zone is therefore important. In this diagram, C is the center of the cornea, and 7 represents the 7-mm optical zone.

fruste describes an existing medical condition that cannot be diagnosed directly. In this situation, we are trying to predict the presence of a weakened cornea by associating areas of stromal weakness with areas of abnormal pachymetry. Any cornea that develops manifest kerato-

TABLE 1. DR. NORDAN'S POLL

Question	Response (Number of Panelists)
In an otherwise normal cornea, what is the minimum central pachymetry for LASIK?	460 μm (1), 480 μm (4), 500 μm (2), 510 μm (1)
Would you proceed with LASIK if there were evidence of irregular corneal astigmatism (even subtle) on automated topography?	No (8)
Should an eye with a cornea that is 10% thinner inferiorly (7-mm optical zone) than centrally undergo LASIK?	No (8). Four respondents believed that the inferior corneal pachymetry should be at least 20 μm greater than the central pachymetry.

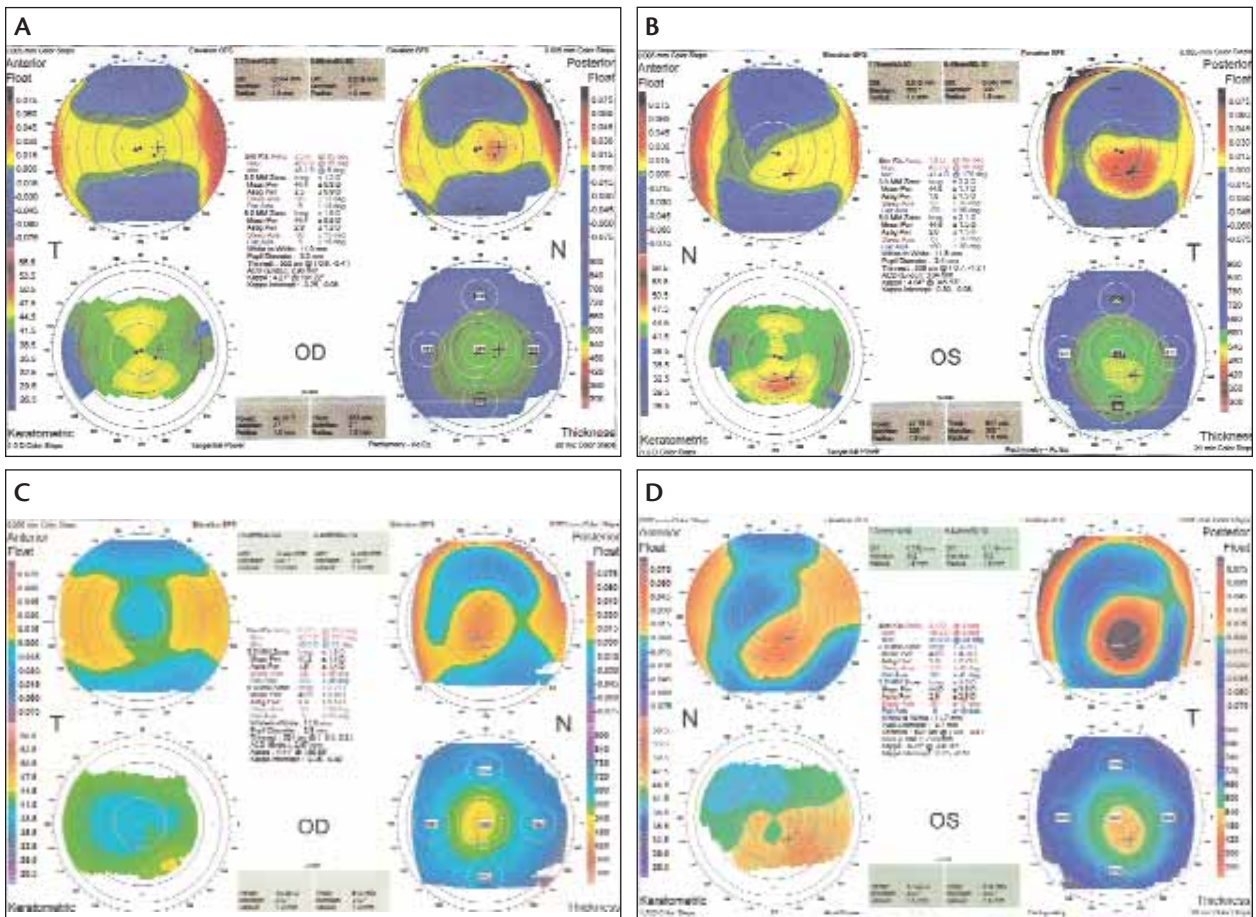


Figure 2. Preoperative automated topography of the patient’s right eye revealed a mild but definite hot spot of increased steepness inferiorly. This area would appear much more severe if the scale was changed to 0.50 D increments (A). Preoperative automated topography of the patient’s left eye demonstrated severe corneal irregularity inferiorly indicative of corneal pellucid marginal degeneration (B). Post-LASIK topography of the patient’s right eye (C). Notice the inferior steepening that is developing 7 years postoperatively, confirming that the subtle preoperative irregular astigmatism was a significant warning sign. Post-LASIK topography of the patient’s left eye demonstrated corneal pellucid marginal degeneration (D). As is common but curious, the refractive astigmatic error is with the rule (corneal vertical meridian steeper), but the keratometric readings exhibit against-the-rule astigmatism (corneal horizontal meridian steeper).

TABLE 2. PREOPERATIVE DATA FOR PATIENT 1*							
36-Year-Old Male	Preoperative Refraction	Pachymetry	Preoperative K's	Flap Thickness	Ablation Depth	No. of Enhancements	Residual Stromal Bed
OS	-7.00 +2.00 X 96	561 µm	45.6 @ 95 43.1 @ 5	180 µm	54 µm	0	327 µm
OD	-6.00 +1.50 X 85	555 µm	45.3 @ 86 43.4 @ 176	180 µm	49 µm	0	326 µm

* Patient 1 provided by Ed Holland, MD

conus or corneal pellucid marginal degeneration will become progressively thinner inferiorly and develop irregular corneal astigmatism.

CONTRAINDICATIONS TO LASIK

A key question is whether or not there is a significant correlation between a thin central cornea and an abnormal decrease in inferior pachymetry. If there is, then a thin central cornea alone would be a contraindication for LASIK. In the absence of a correlation, the inferior (7-mm optical zone) pachymetry alone remains important as a preoperative measurement.

I continue to believe that a preoperative central cornea of 500 μm is often abnormal and that the chance of ectasia after LASIK in these eyes is unacceptably high. Even an ultra-thin LASIK flap created with a laser could sufficiently weaken a cornea with forme fruste corneal ectasia to cause ectasia.

If corneal irregular astigmatism is present preoperatively, then the cornea is virtually always too weak to maintain a regular shape against the force of IOP after LASIK (Table 2 and Figure 2). Because further weakening of such a cornea with LASIK will actually increase the irregular astigmatism, I think performing the procedure is ill-advised in such a case.

Based upon my experience and my discussions with numerous corneal experts, I think that the presence of any of the following three preoperative factors should preclude LASIK:

1. A central corneal pachymetry of less than 500 μm ;
2. A central/inferior pachymetry ratio (7-mm optical zone) of less than 1.00 (comparing the superior to the inferior pachymetry is not useful); and
3. Any degree of unexplained irregular corneal astigmatism, usually inferior, on automated topography.

CONCLUSION

R. Doyle Stulting, MD, PhD, of the Emory Eye Center in Atlanta is conducting an extensive study that will correlate corneal pachymetry, other corneal factors, and LASIK outcomes. His research is sorely needed and may answer many questions about the risk factors for ectasia after LASIK. For now, given the known efficacy of PRK and the grave consequences of ectasia following LASIK, I recommend that surgeons not perform LASIK on corneas that have a central thickness of 500 μm or less preoperative irregular astigmatism. ■

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