This is a 37-year-old contact-lens-intolerant woman with myopic astigmatism and an unremarkably normal eye examination. Considering that tear-film dysfunction is a leading cause of contact lens intolerance,[2] it would be relevant to further examine the tear breakup time and perform ocular staining with trypan blue.[3]

Orbscan II data are available (Figure 1), including axial curvature topography from the Placido-disk reflection and tomographic thickness and front and back elevation maps derived from horizontal slit scanning.[4] It is critical to consider the contact lens history, determining which type of lens was used and when it was discontinued before the examination. The curvature maps are displayed with automatic 0.25 D scales, which augments color variability and thereby the sensitivity to detect irregularities.[5] In such an approach, there is an adjustment on the color scale that is calculated for every examined cornea according to the keratometric values. This has produced slightly different scales between the right eye and left eye in this case. Both eyes have an asymmetric bowtie pattern with mild inferior steepening. The highest curvature reading in the image is 47.2 diopters (D) in the right eye and 47.8 D in the left eye. Central corneal pachymetry is 531 μm and 548 μm, respectively. It seems as though there is a relatively abrupt increase in thickness from the center outward in the left eye. Calculation of thickness profile graphs, as described from Orbscan data by Luz et al.,[6] would be of interest because this was shown to enhance the ability to detect ectasia patterns in subclinical keratoconus.[7] The front and back elevation maps are relatively normal in both eyes.

Ocular Response Analyzer data are also available (Figure 2). The waveform signal is relatively low in the left eye, and there is a significant oscillation after the second applanation peak in both eyes. Both findings are consistent with relatively weak corneas.[1] Corneal hysteresis and the CRF are lower than the cutoffs for detecting keratoconus in both eyes, according to studies by Fontes et al.[8] that compared keratoconic corneas with healthy thin corneas (CH 8.95 mm Hg; CRF 7.4 mm Hg).

I would be interested to evaluate Scheimpflug-based tomography and dynamic ultra-fast-speed biomechanical assessment. However, these findings are consistent with weak corneas, with the left eye more affected than the right eye. This is related to a higher susceptibility for ectasia progression, which may also be referred to as subclinical or forme fruste keratoconus.[1,9]

Considering the patient is older than 27 years and that there is a history of refractive stability, I would consider this patient to be a candidate for custom advanced surface ablation. Topography-guided custom ablations[10] would be indicated; however, wavefront-guided ablations could also be considered if a reliable ocular aberrometry examination were available. If the same presentation were to occur in a 22-year-old patient, I would advise documenting tomographic and biomechanical stability before proceeding with keratorefractive surgery.

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REFERENCES

1. Ambrósio R Jr, Nogueira LP, Caldas DL, Fontes BM, Luz A, Cazal JO, Ruiz Alves M, Belin MW. Evaluation of corneal shape and biomechanics before LASIK. Int Ophthalmol Clin 2011; 51:11–38
2. Ambrósio R Jr, Tervo T, Wilson SE. LASIK-associated dry eye and neurotrophic epitheliopathy: pathophysiology and strategies for prevention and treatment. J Refract Surg 2008; 24:396–407
3. Ambrósio R Jr, Ahmad H, Caldas D, Caiado Canedo AL, Valbon B, Guerra FP, Alves de Souza Lima A. Novel use of trypan blue in ocular surface staining: redefining implications for this vital dye. Rev Bras Oftalmol 2011; 70:408–410. Available at: http://www.scielo.br/pdf/rbof/v70n6/a14v70n6.pdf. Accessed October 22, 2012
4. Ambrósio R Jr, Belin MW. Imaging of the cornea: topography vs tomography [guest editorial]. J Refract Surg 2010; 26:847–849
5. Wilson SE, Ambrosio R. Computerized corneal topography and its importance to wavefront technology. Cornea 2001; 20:441–454
6. Luz A, Ursulino M, Castañeda D, Ambrósio R Jr. I Progressão da espessura corneana do ponto mais fino em direção ao limbo: estudo de uma população normal e de portadores de ceratocone para criação de valores de referência [Corneal thickness progression from the thinnest point to the limbus: study based on a normal and a keratoconus population to create reference values]. Arch Bras Oftalmol 2006; 69:579–583. Available at: http://www.scielo.br/pdf/abo/v69n4/31584.pdf. Accessed October 22, 2012
7. Saad A, Gatinel D. Topographic and tomographic properties of forme fruste keratoconus corneas. Invest Ophthalmol Vis Sci 2010; 51:5546–5555. Available at: http://www.iovs.org/content/51/11/5546.full.pdf. Accessed October 22, 2012
8. Fontes BM, Ambrósio R Jr, Velarde GC, Nosé W. Corneal biomechanical evaluation in healthy thin corneas compared with matched keratoconus cases. Arq Bras Oftalmol 2011; 74:13–16. Available at: http://www.scielo.br/pdf/abo/v74n1/03.pdf. Accessed October 22, 2012
9. Ambrósio R Jr, Dawson DG, Salomão M, Guerra FP, Caiado ALC, Belin MW. Corneal ectasia after LASIK despite low preoperative risk: tomographic and biomechanical findings in the unoperated, stable, fellow eye. J Refract Surg 2010; 26:906–911
10. Koller T, Iseli HP, Donitzky C, Papadopoulos N, Seiler T. Topography-guided surface ablation for forme fruste keratoconus. Ophthalmology 2006; 113:2198–2202

■ “Primum non nocere” should be our guiding principle when assessing for refractive surgery.

At first glance, the topography and biomechanical parameter patterns are normal. But, is it really so? To obtain the right answer, we must meticulously assess the small details.

1. The anterior float shows mild inferotemporal displacement of a cone-like elevation. The maximum anterior elevation is within normal limits in both eyes. However, the anterior elevation ratio is low in both eyes (0.33 right eye; 0.44 left eye), a finding very specific to keratoconic eyes.[1]
2. The posterior float shows the maximum posterior elevation of 35 μm in the right eye and 30 μm in the left eye. Both are higher than would be expected in a healthy eye and very characteristic of keratoconus.[2] The best-fit sphere (BFS) is also increased and suspicious for keratoconus (57.1 D right eye; 57.2 D left eye).
3. The corneal thickness is rather normal in both eyes, without displacement of the thinnest point.
4. The mean simulated keratometry values in both eyes are much higher than the reported normal 43.6 D (46.3 D right eye; 46.9 D left eye), further increasing our suspicions.[3]
5. The irregularity indices in the 3.0 mm zone, and especially in the 5.0 mm zone, are borderline in the right eye and increased in the left eye.
6. The Ocular Response Analyzer presents graphs with normal pattern in the right eye but abnormally low amplitude signals in the left eye. The calculated mean CH is pathologically low in both eyes (7.7 mm Hg right eye; 6.6 mm Hg left eye) and typical of keratoconus.[4]
7. The anterior chamber depth from endothelium is within normal limits in both eyes.
8. The irregular dilated left pupil requires additional clinical assessment.

Summarizing the above, I think laser refractive surgery is contraindicated for this patient. Intraocular lens–based refractive surgery is the preferred option. Whether it will be refractive lens exchange or phakic intraocular lens implantation depends on the endothelial cell assessment and then on the patient's preferences, considering her pre-presbyopic age.

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REFERENCES

1. Fam H-B, Lim K-L. Corneal elevation indices in normal and keratoconic eyes. J Cataract Refract Surg 2006; 32:1281–1287
2. Schlegel Z, Hoang-Xuan T, Gatinel D. Comparison of and correlation between anterior and posterior corneal elevation maps in normal eyes and keratoconus-suspect eyes. J Cataract Refract Surg 2008; 34:789–795
3. Smolek MK, Klyce SD. Current keratoconus detection methods compared with a neural network approach. Invest Ophthalmol Vis Sci 1997; 38:2290–2299. Available at: http://www.iovs.org/cgi/reprint/38/11/2290. Accessed October 22, 2012
4. Luce DA. Determining in vivo biomechanical properties of the cornea with an ocular response analyzer. J Cataract Refract Surg 2005; 31:156–162

■ The scanning-slit elevation tomography seems normal. Although the asymmetric bowtie with inferior steepening is a concern, it is probably the result of selecting a low scale interval. Use of a sensitive, automated scale mode is sometimes misleading. The keratometric map of Orbscan II is Placido based. However, I would prefer to recheck it with another Placido-based topographer to obtain more valuable, conclusive data, especially in a borderline case. Regarding the other Orbscan II maps, the results are within normal limits. The posterior BFS is mildly steep (>55.0 D); however, the maximum elevation difference is less than 50 μm in both eyes. This pattern (including a mildly steep cornea with inferior steepening and borderline posterior elevation) is common in relatively small corneas, similar to this case (white to white = 11.0 mm).

The Ocular Response Analyzer result is a main concern. The low signal quality score indicates low reliability of the test; however, a low score is common in keratoconic patients. The CH and CRF values are below the normal (<5th percentile); however, studies report that some normal individuals have similarly low values.[1] In addition, although eyes with subclinical and clinical keratoconus have significantly lower CH and CRF values, a large overlap exists between normal and keratoconic eyes.[2–4]

The Ocular Response Analyzer waveform is also important. Asymmetry and lack of a sharp rise in the second peak are more common in pathologic corneas. New software (version 2) allows quantitative evaluation of the waveform, which might help distinguish different pathologies. However, our previous study[3] showed that the Ocular Response Analyzer parameters are affected by several confounding factors (eg, central corneal thickness, keratometry, corneal irregularity).

Debates exist on the sensitivity and specificity of Ocular Response Analyzer measurements.[5–7] For example; it offers very low sensitivity and specificity for discriminating healthy thin corneas from keratoconic corneas. [5] In addition, studies[6,7] have shown that the Ocular Response Analyzer is not sensitive enough to detect an improvement in cornea biomechanics after collagen crosslinking.

In this case, I would recheck all measurements carefully and evaluate the patient using the Pentacam device (Oculus). If the Ocular Response Analyzer