Case Presentation

A 24-year old myopic patient underwent a preoperative screening evaluation for LASIK surgery. The manifest refraction was -3.25 (-0.75) @176° in the left eye and -4.75 (-2) @167° in the right eye. His corneas were analyzed with the GALILEI for topographic and tomographic evaluation. His left cornea showed a mild regular and direct astigmatism of 1.2D, a normal pachymetry map with a thinnest point of 539 μm and normal keratoconus indices with an I-S of 0.2 and an overall Keratoconus Probability Index (KPI) of 0%. The posterior surface elevation, analyzed with the BFS, showed no posterior bulging. However, the right eye showed a frank keratoconus pattern that was unknown until this screening evaluation. The left eye has, therefore, been labeled as a form fruste keratoconus (FFKC) and the patient was recused for LASIK surgery and is now followed in the department for monitoring a potential progression.

Case Discussion

Based only on the left eye information, the topographic and tomographic maps seem suitable for a LASIK surgery. However, when analyzing the posterior surface with the Best Fit Toric Aspheric map (BFTA), the posterior surface reveals a maximum elevation value of 19μm and a significant level of asymmetry, which brings this cornea from a “normal topographic looking” to a “suspect cornea”. Indeed, by matching closer to the natural aspheric-toric shape of the cornea, the BFTA reference surface would neutralize a part of the toricity and asphericity that influence the elevation calculation with the standard spherical surface (BFS). Therefore, the use of the BFTA map would help to bring out the first signs of asymmetry in elevation. This feature becomes particularly relevant when tracking subtle abnormalities in elevation maps for detecting subclinical keratoconus. The posterior Asphericity Asymmetry Index (AAI), first described by Arce et al1 and which represents the level of asymmetry in posterior elevation with the BFTA map, has been shown to be a highly discriminant parameter for differentiating FFKC from normal corneas with a cutoff value of 21.52,3. In this case, the posterior BFTA map of the left eye shows a posterior AAI of 34 (as illustrated in figure 2) with an asymmetric pattern that looks similar to the overall corneal coma mapping (figure 2).

This case demonstrates how the evaluation of the posterior surface asymmetry using the BFTA reference surface can improve the sensitivity of the subclinical keratoconus detection.

References

1. Arce C. Qualitative and Quantitative Analysis of Aspheric Symmetry and Asymmetry on Corneal Surfaces. Electronic Poster, ASCRS Symposium and Congress; April 9–14 2010; Boston, MA.