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Changes in corneal tomography following corneal refractive therapy discontinuation in a patient with history of long-term use

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1. Case report

A 24-year-old woman with a baseline refraction of -4.50–0.75×180 in her left eye and no history of ocular pathology was followed immediately after discontinuation of Paragon corneal refractive therapy (CRT) following 12 years of use. At 25 time points during the first 54 h after discontinuation, corneal tomographic images were taken and uncorrected visual acuity (UCVA), keratometry (K), spherical equivalent (SE), and pachymetry were measured. Both eyes showed similar results, and for brevity left eye data is presented in this report. Initial corneal tomography demonstrated a flattened central zone and a steep temporal mid peripheral zone. Over 54 h, tomography demonstrated steepening of the central zone and flattening of the temporal mid peripheral zone (Fig. 1). Using a linear regression model, we found that time since CRT removal accounted for 91.7% of changes in average K ($R^2 = 0.917$), 75.17% changes in SE ($R^2 = 0.717$), for 65.2% of UCVA changes ($R^2 = 0.652$), and only 14.83% changes in apex pachymetry ($R^2 = 0.148$).

2. Discussion

Previous studies demonstrated that 90% of return to baseline refraction occurs within 72 h following CRT discontinuation in highly myopic patients.[1] Complete return to baseline refraction occurs within two months.[2] To our knowledge, no previous publication has presented corneal tomographic images of short-term follow up after CRT discontinuation accompanied with close monitoring of trends in UCVA, keratometry, and SE. In this case, corneal tomography clearly illustrated that at the time of discontinuation (Fig. 1), the central cornea is flattened and has a steepened mid peripheral zone, which is consistent with results described in previous literature.[2] At 12h, 24h, and 48h we see a trend of gradual central corneal steepening and flattening of the temporal mid peripheral zone. Of the additional variables measured, only average K showed a strong positive correlation with time since removal. It is notable that visual acuity remained 20/20 at 24h despite anterior corneal steepening and myopia. Further study is warranted to investigate weather posterior corneal changes may play a role in maintaining visual acuity in CRT patients. For purposes of patient counseling and clinical decision-making, it is important for ophthalmologists to be familiar with the expected course and rate of corneal tomographic changes when patients discontinue CRT and how these changes may correlate with other ocular parameters.

Patient consent

Consent to publish this case report has been obtained from the patient(s) in writing.

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Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

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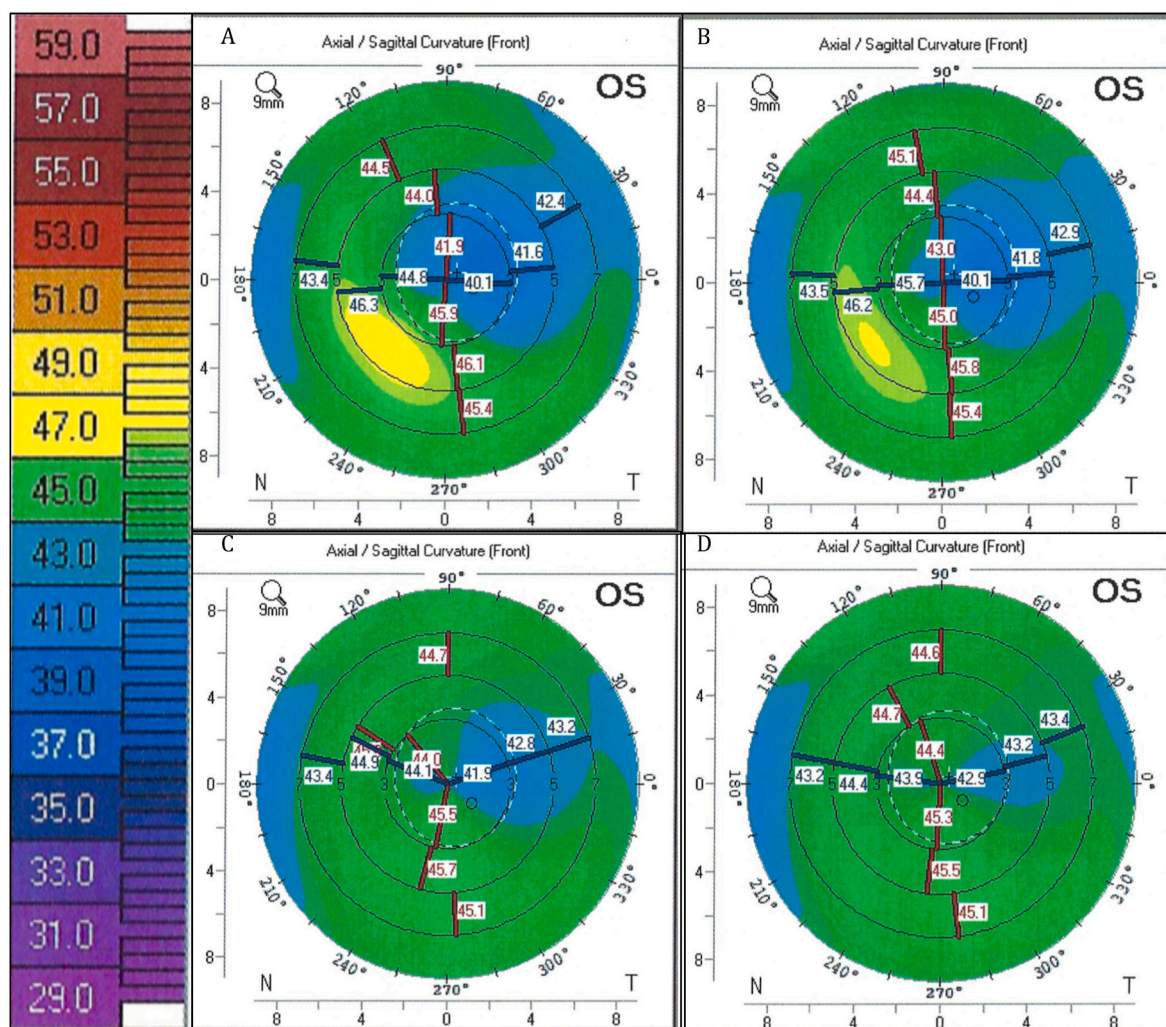 *E-mail address:* naafshari@ucsd.edu (N.A. Afshari).

Fig. 1. Corneal Tomography following corneal refractive therapy (CRT) discontinuation: A. Tomography 0h following CRT removal. Uncorrected visual acuity (UCVA): 20/25, average keratometry (K): 42.9 diopters, apex pachymetry: 552 μm, spherical equivalent (SE): −0.63 diopters, B. Tomography 12h following CRT discontinuation. UCVA: 20/30, average K: 43.2 diopters, apex pachymetry: 547 μm, SE: −1.38 diopters, C. Tomography 24h following CRT discontinuation. UCVA: 20/20–1, average K: 43.75 diopters, apex pachymetry: 549 μm, SE: −3.00 diopters, D. Tomography 48h following CRT discontinuation. UCVA: 20/125, average K: 44.1 diopters, apex pachymetry: 543 μm, SE: −3.13 diopters.

Research ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

Written consent to publish potentially identifying information, such as details or the case and photographs, was obtained from the patient(s) or their legal guardian(s).

Declaration of competing interest

The following authors have no financial disclosures: RRL, RS, SC, NAA.

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