Corneal Topographical and Biomechanical Variations Associated With Hypothyroidism

There is increasing evidence that hormonal influences may play a key role in the pathogenesis of corneal ectasia.[1,2] Furthermore, transitory corneal topographical variations due to hormonal influences during pregnancy have been recently reported.[3] We highlight a case of corneal topographic fluctuations associated with exacerbated hypothyroidism.

A 47-year-old woman without medical history was referred for ophthalmic evaluation by an optician because of progressive loss of corrected distance visual acuity in March 2012. Corrected distance visual acuity was 6/10 in the right eye and 6/10 in the left eye. Objective refraction was -3.0/-3.0/15° in the right eye and -1.0/-5.5/170° in the left eye. Slit-lamp examination and fundus examination revealed normal findings bilaterally. Maximal keratometry (Kmax) readings were 49.7 diopters (D) in the right eye and 51.0 D in the left eye, as evaluated by Scheimpflug imaging (Pentacam HR; Oculus Optikgeräte GmbH, Wetzlar, Germany). Corneal thickness was 552 µm in the right eye and 542 µm in the left eye. Although Kmax was above normal, there was no indication in other Pentacam parameters that the patient was suffering from mild/forme fruste keratoconus and her cornea appeared entirely normal. Moreover, the patient provided the results of her corneal topographic evaluation performed 10 years ago in another hospital, which showed Kmax values were 46.0 D in the right eye and 46.5 D in the left eye and corneal thickness was 538 µm in the right eye and 530 µm in the left eye. The patient also complained of fatigue, anorexia, and mild depression during the past 6 months, but she did not consult any physician for these symptoms.

Laboratory investigation showed a high concentration of thyroid-stimulating hormone in plasma (4.3 mUI/L), thereby confirming the diagnosis of hypothyroidism in this patient. The patient was referred to a physician for management of her hypothyroidism and her glasses were adjusted to her actual refractive values, providing corrected distance visual acuity of 10/10 bilaterally.

Under thyroxine supplementation therapy, we observed a gradual reduction of the Kmax values and normalization of the thyroid-stimulating hormone plasma concentration. The fluctuations of the Kmax and corneal pachymetry measurements are depicted in **Figure 1**. Interestingly, measurement of corneal hysteresis and corneal resistance factor with the Ocular Response Analyzer (Reichert, Inc., Depew, New York) revealed significant worsening of the cornea on presentation, which improved after subsequent treatment with thyroxine supplementation (**Figure 1**).

The implication of thyroid hormones in corneal physiology is increasingly being investigated. Conrad et al. reported the presence of thyroxin receptors alpha and beta in the chicken cornea,[4] whereas our research group has recently documented in vitro the expression of thyroxine receptors in human cornea (unpublished data). Interestingly, a case of keratoconus progression with development of acute corneal hydrops induced by hypothyroxinemia has been reported during pregnancy.[5]

Hypothyroidism occurs mostly in middle-aged women with a prevalence of 0.6 to 12 per 1,000

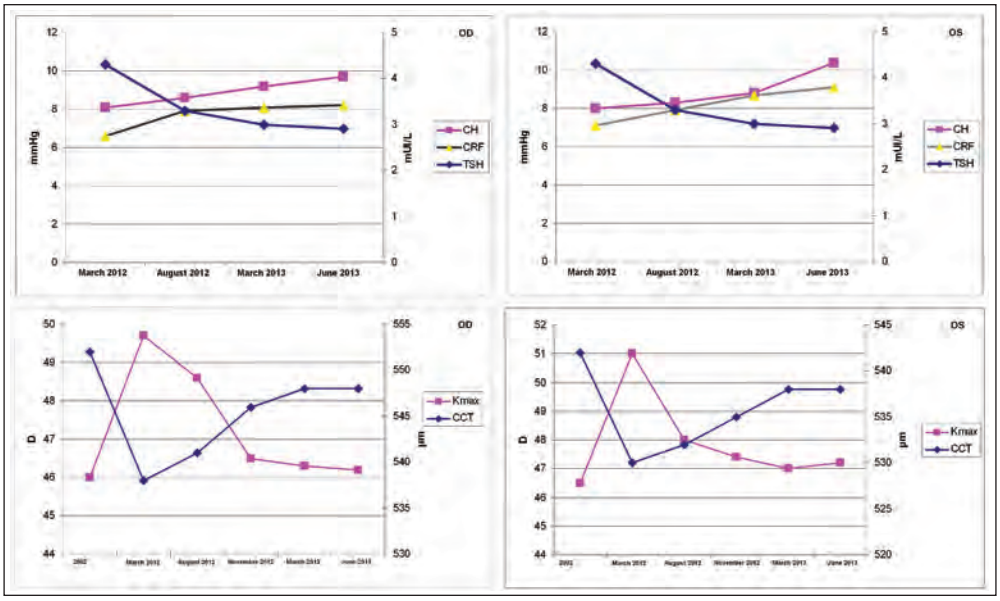

Figure 1. Chronological evolution of maximal keratometry (Kmax) readings, central corneal thickness (CCT), corneal hysteresis (CH), corneal resistance factor (CRF), and thyroid-stimulating hormone (TSH) concentration in the patient.

females[6] and causes a wide range of symptoms, such as the ones that our patient presented. Ophthalmological examination (also Schirmer test and tear break-up time measurement) did not reveal any signs of marked dry eye, which could have caused the corneal topographical fluctuations. Corneal pachymetry was increased during the hypothyroid phase, which is in agreement with the findings of Bahçeci et al.,[6] who reported that hypothyroidism may cause a reversible increase in corneal thickness. Moreover, preliminary data from our ongoing clinical study confirmed that thyroid disease has an impact on corneal biomechanics and corneal topographic readings in distinct patients. The current report supports these preliminary data, indicating that consideration of the patient's endocrinological status when evaluating and interpreting corneal topographical and biomechanical findings is not without importance.

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