Tear film changes can skew topography

Meibomian gland lipid secretions can produce misleading topography findings that are not correlated with any slit-lamp pathologic findings, reported Greek researchers at the 2nd Annual Meeting of ESONT.

Videokeratography (VKG) is used for preoperative screening of refractive surgery candidates, to test for warpage, keratoconus or other cornea abnormalities. Following refractive surgery it is also used for the evaluation of the outcome, and to check for eccentric ablations and ectasia. It can also provide a guide for custom corneal laser ablations.

However, some corneal changes caused by lipids can produce a false reading of keratoconus or other pathologies.

“Tear film changes in dry eye patients may lead to irregularities on the corneal surfaces and chronic ocular desiccation. Aqueous tear deficiency can produce superior corneal steepening and high astigmatism resembling keratoconus,” noted Nikos Astyrakakis OD.

To identify these potential errors, Dr Astyrakakis ran a non-randomised, non-comparative observational series of case studies with four patients. All had tear-film lipid layer excess (TFLE), which correlated with the presence of a superior or central corneal steepening in VKG in both eyes.

In three of the patients, careful lid washing reversed this VKG effect either completely or partially. Dr Astyrakakis also described a case where VKG readings were artificially increased by the patient’s tear film lipid content.

The first case was a 47-year-old man, with uncorrected visual acuity of 20/40 in the right eye and 20/50 in the left eye. His best-corrected acuity was 20/20. Slit lamp examination revealed posterior blepharitis in both eyes, with facial features of rosacea and TFLE. Dr Astyrakakis found that the topographic profile improved after eyelid washing.

“Of course this can be very important for your preoperative evaluation. With preoperative corneal topography we're looking for warpage, ectasia and keratoconus, in this case we demonstrated alterations in superior topography, cloudlike asymmetry before the eyelid washing, though this disappeared after washing,” Dr Astyrakakis said.

The second case involved a 46-year-old woman who wore contact lenses. In both eyes, uncorrected acuity was counting fingers (CF), while best-corrected acuity was 20/20. The patient was a myope, -4.75 D in the right eye and -4.50 D in the left eye, with some astigmatism in both eyes. Slit lamp again revealed posterior blepharitis bilaterally with facial features of rosacea and TFLE.

“This case again showed that after the eyelid washing there were changes in the topography. This is also very important in devices that use K readings like biometry or some microkeratomes that require the K readings in order to select the proper ring for the flap,” Dr Astyrakakis explained.

The third case was a 42-year-old myope with a medical history of mild bilateral optic nerve hypoplasia. His uncorrected acuity was counting fingers in both eyes, which could be corrected to 20/25. Slit lamp showed posterior blepharitis bilaterally with facial features of rosacea and TFLE. VKG readings changed once the eyelids were washed.

Unlike the first three cases, the last case was postoperative. Six weeks post-operatively, VKG showed a tendency for superior corneal steepening, suggesting eccentric ablation or early post-LASIK corneal ectasia. But, again, after eyelid washing there was almost a reversal of the topography. The eccentric ablation pattern substantially improved. Before the washing there was a reading of 39.66 D, but after washing the reading was 37.92 D.

Eye washing can rule out other potential causes
Dr Astyrakakis cautioned delegates that not every superior corneal topography steepening represents a tear-film abnormality. He said it could be pre-existing corneal scars, contact lens induced changes, eccentric ablations or post refractive keratectasia. In this case washing does not have any impact on the topography, which can be significant for diagnoses.

“Computerised corneal topography can help detect such corneal abnormalities and their reversibility may distinguish them from other pathologic conditions, such as contact lens induced warpage, eccentric ablations, irregular astigmatism, and superior keratoconus,” he commented.

He noted that generally the patient assumes the upright head position and the excessive lipid layer tends to accumulate in the upper cornea, producing the observed superior steepening. There is also a tendency for the lipid layer to ‘float’ when mixed with an aqueous medium.

“Corneal topography may become the ultimate tool of ‘proving’ to the ophthalmologist that the surgery did not go as well as it should, which is important for medicolegal issues. Sometimes it could even compel the surgeon to take additional steps in correcting those imperfections,” concluded Dr Astyrakakis.