

Cornea Research: Is Keratoconus (KC) Detectible Using Photo-Refracton?

One of the advantages of the marriage of optical physics and ophthalmic medicine is the ability of physics to model and predict quantitative realistic outcomes of simulated diagnostics. Clinical trails test these predictions. The possible quantitative detection of keratoconus using PR is one example.

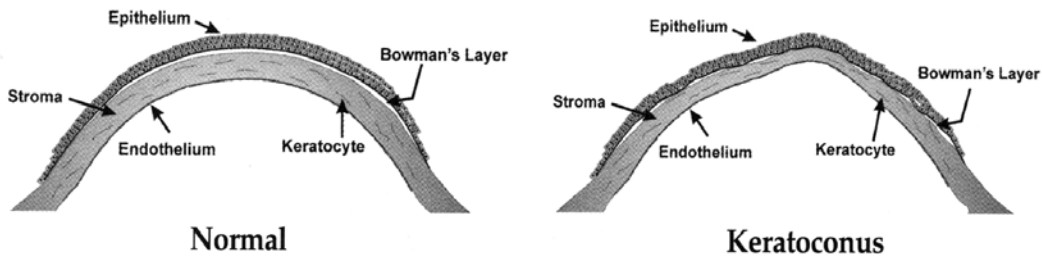


Figure 1 Normal cornea and thinning cornea of keratoconus (KC) patient

Keratoconus is an abnormal condition of the eye that results from cone-shaped features on the cornea that degrade the quality of vision. The condition affects about 1 per 2000 people, and often begins in the teenage years. These corneal features result from thinning and subsequent bulging due to intraocular pressure, and Figs.1 and 2 indicate the corneal shapes. The abnormal corneal curvature increases the refractive power asymmetrically and can be misdiagnosed by examiners as combined astigmatism and nearsightedness. Corrective lens may help, but vision remains impaired. Hard contact lens have been used with some success in the short term to “squeeze the corneal bulge”, but those with dry-eye syndrome, who cannot wear hard contacts, are left with no treatment but corneal grafting. Recently, the use of segmented lens' inserted into the cornea (INTACS) offer hope for vision correction. Early detection of this condition is desirable. The question is whether the photo-refractive screening method can detect keratoconus and can differentially diagnose keratoconus and myopia/astigmatism.

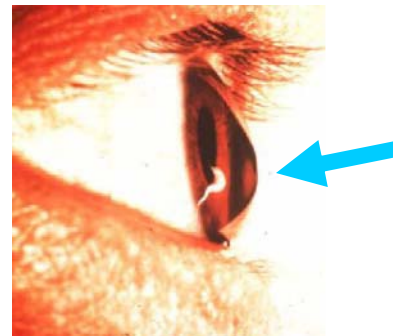
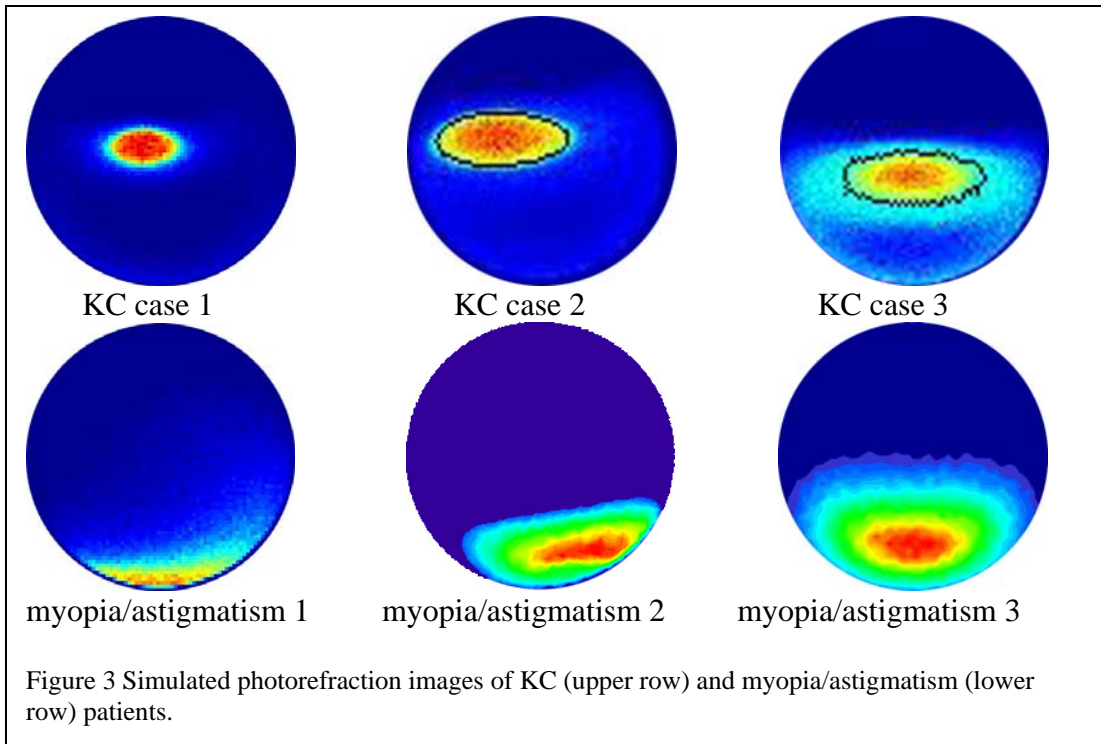


Figure 2 KC patient: weakened cornea results to a bulging shaped cornea

The CLA eye model was modified to include keratoconus features of varying sizes, locations and shapes. Using published results of measurements of keratoconus patients studied using clinical instruments, PR images were computed for mild, moderate and severe keratoconus cases. Comparison was made with PR images of myopic/astigmatic eyes without keratoconus, and Fig.3 shows distinctive differences in the PR images for keratoconus and myopia/astigmatism. These results indicate that photorefractive screening offers the exciting prospect of the probable detection of the keratoconus abnormality.



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