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Topographical Changes in Anterior Corneal Curvature After LASIK

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Purpose Changes in corneal surface after refractive surgery affect several aspects of visual function as well as the ability of this surface to sustain a contact lens when needed. The aim of this study was to know how much the cornea changes its radii from center to periphery within the ablation zone after LASIK correction of myopia and astigmatism

Methods Central and peripheral curvature at the 4 and 6 mm chord of the corneal surface were measured with a videokeratoscope before and at different times after LASIK surgery. Eight corneal semi-meridians were were evaluated in each mid-peripheral area, resulting in seventeen locations being measured

Results Pre-surgical spherical equivalent ranged from -0.50 to -8.5 diopters of myopia. Mean central curvature flattened by 3.5 diopters on average. There was a good correlation between the initial spherical equivalent refraction and change in curvature at the central location (r^2=0.883; $p<0.001$); 4 mm chord (r^2=0.914; $p<0.001$) and 6 mm chord (r^2=0.761; $p<0.001$). There was also a good correlation between pre-surgical spherical equivalent and change in corneal eccentricity (r^2=0.720; $p<0.001$)

Conclusion Cornea becomes oblate after myopic and astigmatic correction with LASIK. Central refractive corneal changes represent about 70% of the net change in refraction for the central area, being 60% when we consider the 4 mm mid-peripheral area and about 40% when we consider the 3 mm chord area.

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A case of the incidental trauma lasik flap

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Purpose to report a traumatic flap injury at 3 years after laser in situ keratomileusis (LASIK).

Methods Case report: we describe the inflammation reaction determing corneal aberration in a 36 year old male after incidental ocular trauma.

Results Results The cornea was examined with slitlamp microscopy and computed corneal topography. Visual discomfort was evaluated by best correct visual acuity (BCVA) and contrast sensivity by ETDRS tables.

Conclusion The main advantage of LASIK is related to maintaining the central corneal epithelium flap created by the microkeratome. The flap is primarily held in position by its inherent shape, like a piece of a puzzle. The flap is also held in place by the normal physiologic activity of the cornea, by mucopolysaccarides (a gluey substance secreted by the corneal cells), and by the overlying corneal epithelial cells.It is well estabilished that the flap may slip out of position in the immediate post-operative period. The reported case indicate that microtrauma (by eye rubbing, or incidental injury) may also result in flap iniury also in the long after the surgical procedure. The patient should be well informed about this risk and about trauma-related complications.

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Second Generation Wavelets for Characterisation of Corneal Topography Height Data

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Purpose To demonstrate a mathematical method for multiscalar decomposition of corneal topography height data into a space-scale space using wavelet analysis techniques, and to detect surface irregularities or scars.

Methods We used the Lifting Scheme as one of the second generation wavelets to detect and to localise surface irregularities and to cluster for frequencies in the spatial domain, which is essential for the mentioned detection of high-frequency components at a particular location. The multiscalar basis components were separated and recovered from the wavelet soft thresholding techniques. Peaks and pits within the three-dimensional corneal surface topography were detected and localised using the wavelet hard thresholding techniques.

Results A number of modules were implemented in C++. Classes were written for the extraction of raw data from the output of the TMS-1 videokeratoscope as well as for the data structure of three-dimensional corneal surface and wavelet analysis including interpolation and the Lifting scheme. The implementation is object-oriented and modules from the Standard C++ Library and the Standard Template Library have been used. The methodology was applied to a set of clinical examples to evaluate the proper benchmarks for thresholdingto and to check for the validity of the decomposition.

Conclusion In our model, the absolute values of wavelet coefficients were used to detect irregularities. They inherit more information than coefficients derived with standard Fourier analysis techniques. Due to the amount of available data, training of clasifactors and the automatic detection of diseases affecting the corneal surface may be possible. Examples of tools for classification are Support Vector Machines and Neural Networks.

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Wavefront analysis of spherical and spherical astigmatic hyperopia with the MEL 80 excimer laser

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Purpose To investigate the effectivity, predictability, safety and changes in higher order aberrations following photorefractive keratectomy (PRK) in eyes with hyperopic/hyperopic astigmatic refractive error.

Methods In 64 eyes PRK treatement was performed. Treatment groups were: Group 1: +1.0 D to +3.5 D (SE); Group 2: +3.75 D to +7.5 D (SE). Before and after treatment an aberrometry was performed with a Shack-Hartmann device (Wavefront Sciences, Albuquerque, AZ, USA). Refractive treatments were carried out by the Zeiss Meditec MEL 80 (Zeiss Meditec AG, Jena, Germany) excimer laser (0.7 mm beam diameter; 250 Hz). Follow up is 6 months.

Results In Group 1, the preoperative +2.88 +/- 0.8 D(SE) decreased to +0.1 +/- 0.08 D (SE); in Group 2, the preoperative +4.88 +/- 1.4 D (SE) decreased to +0.88 +/- 0.1 D (SE). In Group 1, 100% of the eyes were within +/-1.0 D of attempted correction, while in Group 2, 72% were within +/-1.0 D. In Group 1, 95% of the eyes had the same best-spectacle corrected visual acuity (BSCVA) as preoperatively, 4% gained 1 line and 1% lost 1 line. In Group 2, 42% had the same postoperative BSCVA, while 21% lost 1 line; 12% lost 2 lines and 25% gained 1 line. Higher order aberrations increased in Group 1, from -0.1 to +0.12; while in Group 2, from -0.12 to +1.4.

Conclusion In low hyperopes a good prolaticity was reached with good uncorrected visual acuity (UCVA) and good BSCVA. In high hyperopes high prolaticity did not help acheiving better UCVA and BSCVA.