

Image J software in ophthalmic research of retina with optical coherence tomography

Abstract:

ImageJ is a public domain Java image processing program inspired by NIH Image for the Macintosh. It runs, either as an online applet or as a downloadable application, on any computer with a Java 1.4 or later virtual machine. Downloadable distributions are available for Windows, Mac OS, Mac OS X and Linux. There are some publications on method of successful using light reflectivity profiles (LRP) to analyze OCT images in glaucoma patients (Huang et al., Ishikawa et al 2005) and in patients with retinal diseases (D. Barthelmes et.al., 2006).

Purpose To study possibilities of Image J software in evaluation of the optical coherent tomography retinal images in myopic patients of different degree.

Materials and methods. 11 patients (22 eyes) with myopia (4,5-10,5 dptr) and 10 patients without myopia (control) underwent full ophthalmologic observation. OCT scanning was done with Stratus OCT 3 software, version 4.0.1 (Carl Zeiss Meditec, Germany). Ten OCT images of the central retina were recorded in each patient. Radially oriented scans with a scan length of 6 mm (standard macular thickness map scan protocol of the OCT software) were used for image analysis. 8-bit images (256 grayscale values) of sections through the fovea were exported with the built-in export function of the OCT Stratus software without changes. Images were analyzed in the fovea and paramacular zone. Total width of cross sections analyzed was 0,2mm). Image analysis was performed using ImageJ (<http://www.rsb.info.nih.gov/ij/>). Within these selected areas, longitudinal reflectivity profiles (LRPs), arranged in a cross-sectional parallel manner were calculated. An average LRP from the 10 profiles was calculated for each of the 10 OCT scans recorded. Statistical analysis was done with applying parametric (unpaired t-test, ANOVA) and nonparametric (Mann-Whitney, Kruskal-Wallis) test (STATISTICA for Windows). Statistical significance was defined as $P < 0,05$.

Results OCT scans through a normal foveola showed four clearly distinguishable, highly reflective bands (peak (P)1-P4 as was reported (D. Barthelmes et.al., 2006). These highly reflective bands have been presumed to be (from vitreous to sclera) the internal limiting membrane (P4), the external limiting membrane (P3), the layer between the inner and outer segments of photoreceptors (P2), and the RPE (P1). Assuming P1 represents the RPE and P4 the internal limiting membrane, foveal thickness (distance from P1 to P4) measured $186 \pm 16 \mu\text{m}$. In myopic patients it was thinner ($126 \pm 18 \mu\text{m}$, $P < 0,05$). Analysis of OCT images in patients with myopia revealed distinguishable reflection profiles in control and myopic patients in foveal and paramacular zones. In patients with average myopia of $(5,5 \pm 1,2)$ dptr and $(7,5 \pm 1,5)$ dptr. Difference in reflectivity was found in reflectivity profiles between peaks P1 and P4. Peaks P1 were less reflective in myopic patients in comparison with control in foveal segment and P4 were less reflective in patients above 6,5 dptr in paramacular zone.

Conclusion Obtained results showed that Image J software is useful for analyze OCT images quantitatively in patients with myopia and open new approach to use it in diagnostics of ophthalmologic pathology

Keywords:

ImageJ ,OCT, myopic patients

Authors

Boychuk I.M., Slobodyanik S.B.

Organisation

Filatov Institute of Eye Diseases

Homepage

Short Biography

Educated in Medical Institute,Odessa, Ukraine,internship in eye diseases and work in Filatov Institute of Eye Disesas as PhD,researcher and senior researcher in Lab.of binocular disturbances and functional methods of invest. Defended dissertations on stereoscopic vision and amblyopia in children.Last years work in analysing of OCT in patients with congenital disorders and acquired mopia. Have publications on OCT analysis in amblyopic and myopic patients in EVER,SOE and ESA transactions,2006,2007.

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Last update: 2009/11/24 13:08