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Correlation Between Visual Acuity and Retinal Sensitivity Before and After Surgery for Macular Diseases

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Abstract

Purpose: to evaluate variations on retinal sensitivity and visual acuity with the evolution of macular edema features using OCT instrument and OCT-MAT (OCT-Macular Analysis Tool) software after surgical treatment for macular pathologies. **Materials and**


Methods: 40 eyes of 25 consecutive patients were included in this observational prospective study (mean follow up 4.6 months) and divided in 3 Groups according to the macular pathology: Group 1 of 18 macular pucker, Group 2 of 12 macular hole, Group 3 of 20 diabetic macular edema. All eyes underwent functional and morphologic examination before and after the surgical treatment at months 1-3. Macular edema was classified on OCT examination (diffuse edema, cystoid edema involving outer retinal layers, cystoid edema involving inner retinal layers, serous foveal detachment) and subsequently studied on OCT-MAT software (ARVO 2006, ARVO 2007) to quantify in μm^2 different edema patterns.

Results: pretreatment mean retinal sensitivity measured in all eyes was 9.8 dB and mean VA 0.32. At 3 months post surgical treatment mean retinal sensitivity was 14.6 dB and mean VA 0.6. Intragroups data analysis showed that microperimetry sensitivity and visual acuity recovery significantly correlated with macular edema patterns.

Conclusions: the correlation between VA and retinal sensitivity parameters was significative in diffuse macular edema rather than in other intraretinal edema patterns. Moreover, on the considered pathologies, intraretinal cysts number and dimension in μm^2 are related to different results in retinal sensitivity and VA recovery.

Key Words: perimetry • macula/fovea • edema

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OCT Imaging Measurement Analysis Tool: First Results on Clinical Application

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Abstract

Purpose: To evaluate the clinical use and worth of a new measurement tool for quantitative study of macular edema in macular pathologies.

Methods: Starting from B-scan images from OCT/SLO, a quantitative study was performed using an improved measurement software from a prototype implementation of image enhancement, binarization of the grey levels, application of median filtering, blob analysis (ARVO 2006, Azzolini et al.). We investigate the extension and variability of macular oedema on selected patients during medical and surgical follow up. Special care has been applied to ensure the repeatability and reproducibility of the clinical data. 30 eyes of 25 patients affected by macular pucker, macular hole and diabetic macular edema were included in the study as early investigation.


Results: In all examined cases, our clinical data showed that the measurement tool can recognize all iporeflexive dark area on pixel basis, by edge detection, elimination of outlayers and point to point distances evaluation. Minimal measured changes on extension and entity of pathologic oedema, not subjectively appreciated by the examiner, were always precisely measured, enhancing intraretinal abnormalities.

Conclusions: The diagnostic measurement software tool showed its important clinical role for a medical and surgical follow up. On standard OCT/SLO B-scans, the accurate measurements of dark areas (coherent light iporeflexive areas) recognized as macular edema are useful for clinical purposes. The identification and evaluation of these pathologic areas should ameliorate our clinical knowledge to study clinical aspects at different stages, both pre and post operative.

Key Words: imaging/image analysis: clinical • imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound) • macula/fovea

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Quantitative Analysis of OCT Images as Means to Improve its Diagnostic Power

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None

Abstract

Purpose: Aim of the study is to increase quantitative informations on optical coherence tomography concerning tissues reflectivity, geometrical dimension of the retinal scanned area and its details.

Methods: We applied a number of image processing techniques (well known in industrial image processing) to selected OCT retinal scans. We have created a simple software tool, which implements different elaboration tasks: image enhancement on a logarithmic scale, binarization of the grey levels, detections and elimination of outlayers, application of median filtering, blob analysis to measure the areas of the low signal and edge detection to measure point to point distances.

Results: The experiments carried out highlighted the ability of the process to detect small retinal alterations like superficial epiretinal tractions and holes (5 pixels) and distances between very close points (3 pixels) to evaluate intraretinal edema or pathologic lesions. The elaboration of the images with a 1300 by 1030 pixels resolution permit to enhance intraretinal abnormalities of 6 pixels.

Conclusions: The results showed the possibility to obtain in a user friendly and interactive way geometrical dimension of any region of interest in the scan, to help the surgeon to most effectively perform quantitative analysis and patient follow up. The user can interactively chose the level of enhancement, perform the measurement of areas and perimeters within suitable regions and detect distances along suitable profiles down to few tens of pixel. The work performed so far demonstrate the flexibility and the accuracy of the overall process, to study clinical aspects at different stages, both pre and post operative.

Key Words: imaging/image analysis: clinical • imaging methods (CT, FA, ICG, MRI, OCT, RTA, SLO, ultrasound) • macula/fovea

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