Investigation of Morphological and Functional Changes in the Retina in Idiopathic Macular Hole

Vitreoretinal Surgery

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Purpose

The idiopathic macular hole (IMH) is a defect in all layers of the retina from the internal limited membrane to photoreceptors. It is accompanied by significant functional changes and morphological changes not only in the retina, but also in underlying tissues.
The aim to study is to investigate the morphological and functional changes in the retina and choroid in the eyes with the idiopathic macular hole.

Setting/Venue

The study was carried out at the department of vitreoretinal surgery in collaboration with the laboratory of electrophysiology at Filatov Institute of Eye Diseases and Tissue Therapy (Odesa, Ukraine) from January 2021 to December 2022.

Methods

71 eyes were operated on (70 patients: 15 men, 55 women, the average age 65,7 ± 6,8 years (M ± SD), best corrected visual acuity (BCVA) 0,19 ± 0,16, the disease duration was 3,0 (1,0-6,0) (Median (Q low -Q Up) months. In every eye was measured the minimal and maximal diameter of the IMH by OCT, the foveolar avascular zone (FAZ) area in deep retinal capillary plexus and choriocapillaries perfusion density (CPD) by OCT-angio (which was calculated as the ratio of the area of choriocapillary perfusion to the measurement area), central perimetry within 10 degree, and multifocal electroretinography (mERG). The mERG stimulus matrix consisted of 68 hexagons and covered the central 20 degree of the fundus area. The data was compared with the fellow eye (FE).

Results

The minimal diameter of IMH 377,0 (281,0-530,0) µm, maximal diameter of IMH - 673,5 (549,5-1010,5) µm. BCVA reduced significantly 0,19±0,16 compared to FE - 0,92±0,03 (p = 0,0001). The FAZ area did not differ from FE. The CPD was significantly lower - 0,11±0,06 versus 0,29±0,13 (p = 0,0001) than on the FE. The light sensitivity of the foveola in the eyes with IMH was significantly reduced – 22,6±9,6 dB and 34,5±2,92 dB (p = 0.0001) on FE.
The density of the retinal peak P1 mREG was reduced in the first ring: 56,7±24,0 nV/degree2 versus 92,7±29,0 nV/degree2 (p = 0,0001) and 37,5±11,4 nV/degree2 versus 47,4±13,6 nV/degree2 (p = 0,05) in the second ring compared to the FE.
A strong correlation was revealed between the perfusion density of choriocapillaries and the minimum diameter of the IMH r = 0,63 (p <0,05), BCVA r = 0,41 (p <0,05) and the density of the retinal peak P 1 in the first ring mERG r = 0,39 (p <0,05). The density of the retinal peak P 1 mERG in the first ring is strongly correlated with light sensitivity in the foveola zone r = 0,6 (p <0,05).

Conclusions

Changes in the central field of vision and mERG in the first (central) ring correspond to the presence of a retinal defect in case of macular hole and testify a dysfunction of photoreceptors. The presence of an idiopathic macular hole is also accompanied by depressed blood flow in a choriocapillaries.

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