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Insights into the progression of primary open-angle glaucoma and myopia: comparative evaluation of OCT with OCTA changes

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Objectives: To determine changes in the optic nerve head (ONH) as biomarkers of primary open-angle glaucoma (POAG) and myopia progression using spectral optical coherence tomography (SOCT) and OCT angiography (OCTA).
Methods: 172 patients underwent OCTA and SOCT were divided into 3 groups: I–axial myopia (77), II–POAG II-III stages (58), III–control (37). The radial peripapillary capillary (RPC) and choriocapillaris density, the choroidal peripapillary atrophy (PPA) and choriocapillaris microvascular dropouts (MvDs) were determined. The lamina cribrosa (LC) depth, its structure; the LC, prelaminar (PL) zone, retinal nerve fibre layer (RNFL) and peripapillary choroidoidal thickness (PCT) were evaluated. The data was statistically approved using Statistica 10.0 for Windows. Pearson, Spearman correlation coefficients, when comparing groups the Kruskal-Wallis and Mann-Whitney tests were used.
Results: A significant decrease in the PCT (Me = 149.25 [132.38–178.75] mcm) in group I compared to control and PL zone reduction were established as the choroidal perfusion disorder in response to stretching sclera ($r = 0.398$, $p < 0.05$). A gamma zone of PPA predominated in 70.8 % in myopia, in 50 % in POAG groups and correlated with the decrease in choriocapillaris density and MvDs ($r = 0.657$; $p = 0.02661$). In patients with POAG a reduction in the LC thickness, an increase in its depth and a decrease in the PCT, PL zone, RNFL and RPC density were found. A reduction in the LC thickness correlated with the RPC density and indicated ONH perfusion disorder. A significant relationship between impaired perfusion in the RPC and choriocapillaris proved the systemic haemoperfusion disorders in POAG.
Conclusions: The following ONH changes were considered biomarkers of POAG and myopia progression: a decrease in the PCT and PL zone thickness, the formation of a PPA gamma zone in the patients with myopia; a LC thickness reduction, an increase in its depth and deformation in its structure along with a decrease in the RNFL thickness and PCT in patients with POAG. OCTA disorders of RPC in POAG, choriocapillaris with MvDs–in myopia group were considered predictors of their progression and correlated with OCT signs of scleral remodelling through the predominance of collagen tissue. This preceded RNFL losses, reflected risk factors for ischemia and ON axonal transport blockade and substantiated the prevention of POAG progression through the influence on the connective tissue remodelling.
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