

ET-1 plasma levels and vascular endothelial dysfunction in primary open angle glaucoma

Mauro Cellini, Ernesto Strobbe, Corrado Gizzi, Nicole Balducci, Pier Giorgio Toschi, Emilio Campos. University of Bologna, Department of Specialistic Surgery and Anesthesiology Science, Italy.

Glaucomatous optic neuropathy (GON) is related not only to elevated intraocular pressure (IOP) but also to an insufficient ocular blood supply related to a vascular dysfunction. We studied 40 patients with primary open angle glaucoma (POAG) aged from 34 to 64 (mean 72.4 yrs). The diagnostic criteria for POAG was an IOP exceeded 22 mm/hg before treatment, open anterior chamber angle, cup/disc ratio >0.7 and optic nerve related visual field loss (MD>6 dB, SF>2.5 dB and CPSD>3 dB). Patients with systemic diseases such hypertension, heart failure and diabetes mellitus were excluded. An increase in plasma levels of endothelin-1 (ET-1) was found as compared with healthy controls: 2.84 ± 0.27 pg/ml vs. 1.77 ± 0.19 pg/ml ($p < 0.001$). All patients also underwent measurement of FMD with high-resolution 2-dimensional ultrasonographic imaging of the brachial artery by a Philips EnVisor G HD (Philips, Eindhoven, The Netherlands) with a 4-7Hz linear probe. To induce iperemia a sphygmomanometer cuff was inflated to 250 mm/hg for 5 minutes. The cuff then was deflated rapidly and at 60 seconds after cuff deflation 2-D images of the brachial artery were recorded for 5 seconds. Patients affected by POAG exhibit lower values of FMD compared with healthy people. In POAG patients we found an FMD $4.46 \pm 1.28\%$ vs. $13.18 \pm 2.80\%$ ($p < 0.001$). Furthermore we studied the intraocular inflammation by a laser-cell flare meter Kowa FM-500 (Kowa Company Ltd., Tokio, Japan). The instrument is comprised of a He-Ne laser beam system, a photomultiplier mounted on a slit-lamp microscope and a computer. This flare-meter permits the objective determination of the flare and the number of cells in the aqueous of the anterior chamber. Patients affected by POAG exhibit an increase values of flare compared with healthy subjects 9.99 ± 0.95 photons/ms vs. 5.88 ± 0.63 photons/ms ($p < 0.001$).

Statistical Spearman's correlation test showed that the increase of ET-1 in POAG is related to vascular dysfunction ($r = -0.479$; $p > 0.028$) and that vascular dysfunction is related to sub clinical intraocular inflammation ($r = -0.679$; $p < 0.007$). Furthermore the increase of IOP is correlated to increase of ET-1 ($r = 0.884$; $p > 0.001$). These data show the importance of vascular endothelial dysfunction and increased ET-1 in the onset of glaucomatous optic neuropathy.