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COENZYME Q10 AND NEUROPROTECTION

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ABSTRACT

Purpose: This is an open, prospective study about the neuroprotective effect of oral administration Coenzyme Q10 in patients affected by open-angle glaucoma. **Patients and Methods:** We enrolled 20 patients (10 males, 10 females) affected by open-angle glaucoma under monotherapy. They received oral supplementation of Coenzyme Q10 two tablets per day. At baseline and time 3, 6, 9 and 12 months they had a complete ophthalmological assessment and visual field test by Humphrey 30-2. The statistical analysis was performed by Student t-test. The results were considered significant at p=0.05. **Results:** All the patients enrolled completed the study and they did not need any laser a/or surgery. The campimetric data changed from S1 to S0 according to Glaucoma Staging System (p=0.05). **Conclusion:** This is a pilot study about the neuroprotective effect of oral administration Coenzyme Q10.

KEYWORDS: Coenzyme Q10, neuroprotection, visual field test.

INTRODUCTION

The retina is the most metabolically active tissue in the body, with the highest consumption of energy per unit area of tissue.[1] Coenzyme Q10 (CoQ10) deficiency may cause retinopathy alone or as part of a syndrome. CoQ10 may play a role in the pathogenesis of retinal diseases. Age-related macular disease (AMD) is a major cause of visual impairement in elderly patients. They suffer from a loss of central vision. In AMD patients, CoQ10 plasma levels revealed lower than age-matched control subjects. These data suggest an association between oxidative stress and the pathogenesis of AMD.

Glaucoma is the second leading cause of blindness worldwide. The first and most important risk factor for retinal ganglion cell (RGC) death and optic nerve degeneration is elevated intraocular pressure (IOP). The acute IOP elevation alters mitochondrial proteins and induces mitochondrial apoptotic cell death in mouse and human being.[2] It is associated with mitochondrial apoptotic pathway in the retina. CoQ10 is an ubiquitous cofactor in the body. CoQ10 is a cofactor of the electron transport chain and acts by maintaining the mitochondrial membrane potential. It supports ATP synthesis and inhibits reactive oxygen species (ROS). CoQ10 scavenges reactive oxygen species and protects neuronal cells against oxidative stress in neurodegenerative diseases, suc as age-related macular disease (AMD), glaucoma, Alzheimer's disease (AD), Parkinson's disease (PD) and Leber hereditary optic neuropathy.[3]

Glaucoma is an optic neuropathy, characterized by a loss of retinal ganglion cells (RGC). Levels of CoQ10 decline with age and oxidative stress increases.[4,5,6] This is a therapeutic rationale to supplement older and ill patients with CoQ10. It may be useful also in the prevention of lens epithelial cells death and consecutive cataract formation in vivo.[7] A combination of crosslinked hyaluronic acid, CoQ10 and vitamin E is protective for ocular surface also in people attending swimming pools.[8] In glaucomatous patients it shows a beneficial effect on the inner retinal function (PERG improvement) with enhancement of the visual cortical responses (VEP improvement).[9]

PATIENTS AND METHODS

Since January 2020 till December 2020 in the Ophthalmological Department of the Catholic University of Rome (Italy), after approval of our Ethical Committee, we selected 20 patients affected by open-angle glaucoma. It was a prospective single center open study. Their demographic data were: 10 males and 10 females mean age 59.5 years, standard deviation 11.24 years (Table I). The inclusion criteria were: of age, affected by open-angle glaucoma, pachymetry 550 µm ± 30 µm, best corrected visual acuity 20/20, hyperopia, myopia a/or astigmatism ± 1 diopter. Exclusion criteria were: anterior a/or posterior segment diseases interfering with visual field and IOP assessment, pharmacologic therapy including neuroprotective drugs, ametropia > 1 diopter. All of them were under monotherapy (Table II). They were enrolled in this study and received a complete

ophthalmological assessment including visual field test (Humphrey 30-2) at baseline, 3, 6, 9 and 12 months. We used the Glaucoma Staging System 2 to plot data from visual field test.[10] They received oral administration of Coenzyme Q10 (two tablets daily) up to the end of the study. The statistical analysis was performed using t-Student test. The statistical significance was fixed at p=0.05.

RESULTS

All patients enrolled in this study completed it. The IOP was always well controlled in all patients. None of them changed its therapy a/or needed laser therapy or surgery. From campimetric point of view there was a shift from S1 to stage 0[10] as long as 12 months of follow-up (p=0.05) (Fig. 1). There was no difference as for sex a/or glaucoma therapy (p=0.9).

DISCUSSION

This clinical study may suggest a neuroprotective role of Coenzyme Q10 also in oral administration. It is only a campimetric study and it lasted after only one year. We need further and longer studies including electrophysiological data. As the subgroups of different glaucoma therapy were too small we need more data from different molecules to prove a different neuroprotective effect according to a glaucoma therapy.

Table I: Demographics.

10 M; 10 F MEAN AGE 59.5 y SD 11.24 y.

Legenda: F = female; M = male; SD = standard deviation; y = years.

Table II: Glaucoma Medical Therapy.

BRIMONIDINE	**2P**
BIMATOPROST	**4P**
LATANOPROST	**4P**
TAFLUPROST	**10P**

Legenda: P: patients.

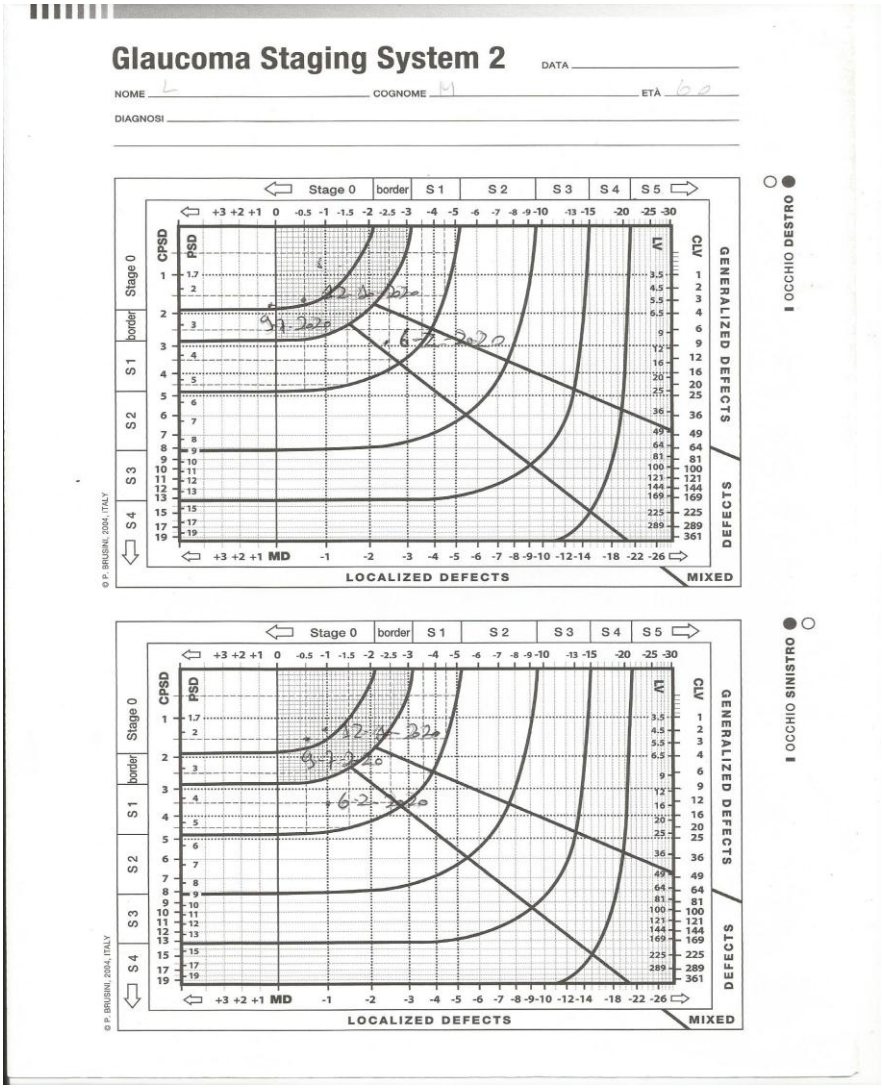

Fig. 1: Campimetric results of patient # 2 L.M., age 60, at each check, plotted on a Glaucoma Staging System chart (10).

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