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Fund “Nauka” Project № 17003 Resume – Competition-Based Session 2017:

“Creation of a structure for dynamic determination of peripheral visual acuity in patients with implanted intraocular lenses and socially significant diseases”

Project leader: Assoc. prof. Binna Nikolaeva Nencheva, MD, PhD

Project team:

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In relation to the project implementation:

1. A computer perimeter Humphrey Field Analyzer HFA 3 860 has been purchased which allowed connecting the device with a modern angio-OCT /from previous infrastructural project/
2. A training of the department members has been conducted and a specialist in optometry has been specifically prepared to carry out the tests
3. The first scientific projects have been developed

Topics:

1. **Impact of progressive intraocular lenses on the visual field**

   In the modern dynamic world, the visual requirements of patients constantly increase. The patients’ independence of glasses is extremely important to the majority of them. Multifocal intraocular lenses provide such freedom but their implantation is associated with some restrictions that should be specified and studied.

   The study has been carried out at the Department of Ophthalmology and Visual Sciences facility in Medical University – Varna. For a period of 2 years 30 patients (60 eyes) of median age of 72 years have been examined, who have undergone phacoemulsification with subsequent implantation of multifocal intraocular lenses of the same type and manufacturer.

   All patients have undergone a full ophthalmologic exam with testing of the visual acuity for farsightedness and nearsightedness at different illumination, contrast sensitivity and perimetry conditions through the SITA-Standard program of the Humphrey visual field analyzer perimeter, using 30-2 grid and stimulus size III. The central part of the visual field has also been tested with 10-2 grid and stimulus size III.

   The results of the visual field testing of eyes with multifocal implants are worse than those of eyes with monofocal lenses and a general reduction of photosensitivity is reported. The median MD difference between eyes with multifocal IOLs and such with

monofocal IOLs was -2.5 dB (P<0.001). The analysis of the results of testing within 10 degrees around the fixation point has demonstrated a median 2.1 dB (P<0.001) reduction of the average sensitivity in patients with multifocal IOL compared to patients with implanted monofocal IOLs. No significant difference in PSD between both groups (p=0.99) has been reported.

The conducted study has revealed a statistically significant reduction of the visual acuity in patients with multifocal IOLs at low illumination compared to such with implanted monofocal IOLs as well as low performance of the same group when carrying out standard program 30-2 and 10-2.

2. **Comparative analysis of the results of blue on yellow perimetry and standard perimetry with white stimulus in patients with intraocular lens blocking the blue light and patients with standard intraocular lens**

   Glaucoma is a degenerative disease of the optical nerve and one of the leading causes for preventable, irreversible vision loss worldwide. Although there is a number of developed methods for early diagnosis, one of the golden standards for defining the diagnosis is the computer automated perimetry. The standard computer perimetry using white stimulus on a white background detects defects in significant ganglion cells impairment (above 40%). With a view to that, the method of blue stimulus on yellow background has been developed as a more sensitive method. In relation to that a prospective, randomized study has been conducted including a comparative analysis of the computer perimetry results using a standard technique (white on white) and alternative programs (blue and yellow) in 14 patients.

   The results show a comparability of the data from the standard computer automated perimetry and short-wave automated blue on yellow perimetry (SWAP) in patients with advanced glaucoma taking anti-glaucoma medications (regardless if with these medications have one active substance or are a combined formula) and the patient after filtration procedure. In patients with suspected glaucoma and discrete changes of standard SWAP perimetry, the method shows higher sensitivity.

3. **Relation between functional and structural changes in patients with glaucoma**

   Glaucoma is a multifactorial optic neuropathy. It is expressed as changes of the retinal nerve fiber layer (RNFL), specific changes of the optic nerve disc and the visual field. Due to the chronic degenerative and irreversible nature of the disease the early definition of the diagnosis, the adequate follow-up and treatment of patients are extremely important. This is based on the evaluation of the structural and functional changes of the retinal ganglion cells. For years, the golden standard in monitoring glaucoma patients is the standard automated perimetry (SAP).

Despite of that the optical coherent tomography (OCT) provides excellent accuracy and precision in evaluating the structural changes.

The study enrolls 22 patients with established primary open-angle glaucoma.

The study describes the detection of the disease progression in glaucoma patients through GPA based analysis of the RNFL, GCIPL I and the visual field loss are examined with Humphrey VFA and Cirrus HD-OCT.

The computer perimeter is part of the first university centre for “Visual health” in Bulgaria which allows precise and fast diagnostics of a number of socially significant diseases like glaucoma. The modern technology of studying and storing the information allows introducing electronic healthcare.