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Fund “Nauka” Project № 17004 Resume – Competition-Based Session 2017:

“Creation of a structure for precision topography of the anterior ocular segment for early diagnosis of corneal diseases, as well as in patients with cataract and glaucoma”

Project leader: Assoc. prof. Yana Manolova Manolova, MD, PhD

The creation of a modern infrastructure for the study of the geometry, biochemical parameters and dynamic changes of the anterior segment of the eye is an innovative area worldwide. The aim of the project is early screening and diagnosis of one of the most powerful refractive surfaces, such as the cornea and its difficult to diagnose and difficult to treat diseases.

The cornea is one of the most delicate tissues in the human body. It is the carrier of the most valuable sensory information – sight. Corneal topography is one of the mandatory examinations for every patient who has visited an eye clinic for early screening, diagnosis and timely treatment, which is not yet routine. The project will also allow for non-invasive three-dimensional reconstruction of anterior chamber and anterior chamber angle in glaucoma patients, and timely analysis will lead to early assessment of anterior chamber angles with high risk of closure and prevent the risk of acute glaucoma. Photographic analyzes of the Pentacam corneal topographer also provide an estimate of central corneal thickness, which is associated with the correct determination of intraocular pressure useful for stratification of glaucoma risk.

Implementation of the project has the following tasks set:

1. Purchase of the latest generation of corneal topograph PENTACAM HR;
2. Training of the members of the Department of Ophthalmology and Visual Sciences
3. Development of the first research projects of young scientists:
   3.1. Comparative characteristics of the biochemical parameters of the cornea, corneal dynamics and topographic analysis of the corneal geometry in normal and pathology;
   3.2. Performing early screening and monitoring of corneal changes in patients with keratoconus and other corneal ectasias;

3.3. Evaluation of corneal densitometry and comparative analysis of endothelial morphology of patients in normal and pathology using Pentacam corneal topograph and in vivo confocal microscopy;

3.4. Perform a comparative assessment of central corneal thickness, anterior chamber depth, and anterior chamber angle in glaucoma patients using a Pentacam corneal topograph and anterior segment optical coherence tomography.

Methods:

1. Analysis of different topographic, pachymetric and aberometric indicators of the cornea with corneal topograph Pentacam HR.
2. Performance of corneal densitometry and comparison of the results obtained by in vivo confocal microscopy.
3. Performance of a comparative assessment of central corneal thickness, anterior chamber depth, and anterior chamber angle in glaucoma patients using a Pentacam HR corneal topograph and presegmental optical coherence tomography (OCT).

To perform these tasks, it is necessary to purchase a Pentacam HR corneal topograph. The device uses a Scheimpflug rotating camera that allows real-time imaging of the entire anterior segment of the eye, including the cornea from limb to limb. The images are digitalized and allow additional evaluation by transferring to databases. There is a scan mode allowing 100 Scheimpflug scan images for each scan.

This equipment will provide a long-term opportunity for many research projects, as well as the defense of dissertations of doctoral students in the field of ophthalmology and optometry. It will provide excellent opportunities for educational and clinical work.