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**MODERN APPROACH TO THE ASSESSMENT OF THE
ANTERIOR SEGMENT OF THE EYE BY ULTRASOUND
BIOMICROSCOPY IN CATARACT AND GLAUCOMA COMBINED
WITH PSEUDO-EXFOLIATIVE SYNDROME**

Resume: In recent years, new diagnostic possibilities have emerged not only from the point of view of establishing and clarifying the diagnosis, but to a greater extent for a more subtle examination of the optic nerve disc (optic disc) and the retina. Optical coherence tomography (OST) occupies a special place among high technologies in this series. The use of OS makes it possible to obtain information about the morphological state of the eyeball structures in normal and in pathology in vivo and noninvasively.

Key words: exfoliative syndrome, glaucoma, myopia, ultrasound biomicroscopy.

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**СОВРЕМЕННЫЙ ПОДХОД К ОЦЕНКЕ ПЕРЕДНЕГО
СЕКМЕНТА ГЛАЗА МЕТОДОМ УЛЬТРАЗВУКОВОЙ
БИОМИКРОСКОПИИ ПРИ КАТАРАКТАХ И ГЛАУКОМОЙ
СОЧЕТАННЫХ ПСЕВДО-ЭКСФОЛИАТИВНЫМ СИНДРОМОМ**

Резюме: В последние годы появились новые возможности диагностики не только с точки зрения установления и уточнения диагноза, но в бóльшей степени для более тонкого исследования диска зрительного нерва (ДЗН) и сетчатой оболочки. В этом ряду среди высоких технологий оптическая когерентная томография (ОСТ) занимает особое место. Использование ОСТ позволяет прижизненно и не инвазивно получить

сведения о морфологическом состоянии структур глазного яблока в норме и при патологии.

Ключевые слова: эксфолиатив синдром, глаукома, близорукость, ультразвуковая биомикроскопия.

Relevance. According to the World Health Organization, the number of glaucoma patients in the world ranges from 60.5 to 105 million people, while the number of cases is projected to increase by another 10 million over the next 10 years[1,6].

Progressive glaucoma neuroopticopathy leads to disability and disability in 15-20% in the structure of ophthalmopathy. Despite the variety of medical, laser and surgical methods of glaucoma treatment, early detection of the disease is recognized as the most effective, since timely treatment and adequate control of the course of the glaucoma process contribute to its stabilization with the preservation of visual functions [1,2].

In ultrasound biomicroscopy (UBM) of the anterior segment, high-frequency sensors (50 MHz) are used to obtain a high-resolution image (approximately 50 microns), allowing to see in vivo into the anterior segment of the eye (penetrating depth - 5 mm). In addition, anatomical relationships of structures surrounding the posterior chamber, which are hidden during clinical examination, can be visualized and evaluated[2,4].

Ultrasound biomicroscopy is used to study the normal structures of the eye and the pathophysiology of eye diseases, including cornea, lens, glaucoma, congenital anomalies, effects and complications of surgical operations of the anterior segment, trauma, cysts and tumors, as well as uveitis [1,5].

The method is important for understanding the mechanisms of development and pathophysiology of angle closure, malignant glaucoma, pigment dispersion syndrome and filtration pads. Studies using ultrasound biomicroscopy are qualitative. Quantitative and three-dimensional image analysis of ultrasound biomicroscopy is still at an early stage of development.

Ultrasound biomicroscopy is ideal for studying angle closure, since it is possible to simultaneously obtain images of the ciliary body, the posterior chamber, the iridocrystal relationship and angle structures[3,6].

It is important in the clinical assessment of the possible closure of a narrow corner of the eye to conduct gonioscopy in a completely darkened room using a very small light source for the slit lamp beam in order to avoid pupillary light reflex.

The effect of external light on the shape of the angle is well shown when performing ultrasound biomicroscopy in lighting and dimming conditions.

The purpose of the study. The study of anatomical and topographic features of the anterior segment of the eye by ultrasound biomicroscopy in cataracts in combination with glaucoma and pseudoexfoliative syndrome.

Materials and methods of research. A total of 50 patients with age-related cataract (63 eyes) participated in the study. 28 eyes of 25 patients with age-related cataract in combination with pseudoexfoliative syndrome, who made up the I clinical group, and 35 eyes of 25 patients with age-related cataract without pseudoexfoliative syndrome, who made up the second clinical group, were examined. The average age of patients of group I was 74.04 ± 1.37 years, patients of the second group - 70.00 ± 1.25 years ($P=0.02$), thus, patients of group I were statistically significantly older than patients of the second group, which corresponds to the data on the relationship between the frequency of development of PES and the age of patients.

The results of the study. The mathematically calculated values of linear parameters presented in the work: the distance "trabecula-iris", the distance "trabecula-ciliary processes", as well as angular parameters: the angle "sclera-iris", the angle "sclera-ciliary processes" in the UBM study are the most informative for assessing the anatomical and topographic relationships of the structures of the anterior segment of the eye with various types of refraction.

The UBM method proved the specificity of spatial relationships of the structures of the anterior segment of the eye for each type of refraction. The values of these parameters retain their significance in the normal functioning of the eye and the transparency of optical media.

Going beyond the indicated values makes it possible to diagnose various diseases at the preclinical level (pigment dispersion and pigment glaucoma, iris plateau syndrome).

The increase in the thickness of the lens with the progression of cataract opacities depends on the initial refraction. With hypermetropic refraction, its thickness at the age of more than 50 years significantly ($p < 0.001$) differs from other types of refraction and at the age of more than 60 years in 54% of cases exceeds the thickness of more than 5.0 mm, creating favorable conditions for the appearance of angular, relative pupillary, ciliochrestal or ciliovitrochrestal blocks induced by the cataract lens.

The formula for the prediction of intraocular blocks proposed on the basis of mathematical calculations has proved to be informative and can be recommended for clinical practice.

Depending on the intensity, acoustic density of exfoliative overlays, their localization, the state of the fibers of the zinc ligament and the presence of anatomical and topographic disorders of the structures of the anterior segment of the eye, according to UBM, 4 stages of PES were identified, which reflect the successive stages of disease progression against the background of cataract opacities of the lens, providing: preclinical diagnosis of PES in 40% of cases, detection of failure of the ligamentous apparatus of the lens - in 48.1%; diagnosis of rupture of the fibers of the zinc ligament - in 39.3 %; diagnostics of violations of spatial relations of the structures of the anterior segment of the eye, inaccessible to biomicroscopy.

Recommendations have been developed for the prevention of operational complications in cataract surgery, taking into account the stages of PES in UBM

research, which expand the indications for phacoemulsification during lysis of zinc ligament fibers up to 2/3 in circumference in patients with pseudoexfoliation syndrome.

Conclusion. Thus, the clinical and functional indicators of patients with age-related cataracts of both groups (visual acuity, intraocular pressure level) were the same regardless of the presence of PES. In contrast, with age-related cataracts against the background of PES, pathological changes were expressed in the anterior part of the eyes: atrophy of the iris stroma and its pupillary pigment border, pigment dispersion on the iris, PEM deposits on the anterior capsule of the lens.

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