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MORPHOLOGICAL EXAMINATION OF RABBIT EYES PERFORMING SCLEROTRECTION OPERATIONS WITH SCLEROMAGLATION OF THE EYES

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Annotation. In this article, the results of the study of the morphological status of scleromalacia in the sclera of the eyeball of rabbits with developing myopia were a comparative assessment of the morphological characteristics of connective tissue, that is, the reaction of the sclera, the latter after the introduction of an experimental xenograft.

Key words: myopia, experiment, xenograft, LLC.

Scleromalacia is a rare bilateral disease that occurs mainly in elderly women with a history of severe, progressive, prolonged rheumatoid arthritis with extra-articular manifestations. Recent data indicate progressive disorders in the structure of elastic fibers of the sclera, mainly in adolescents, as well as in the development of the myopic process.

V.V. Serov and co-authors have shown that the collagen of the sclera's own substance belongs to types I, VI, VIII with the predominance of type I collagen in it. Type III collagen is mainly present in the episclere. An interesting fact is that the distribution of collagen in the thickness of the sclera of myopic eyes, especially in the progressive stages, has features that cannot be ignored in the development of surgical techniques. For example, researchers Andreeva L.D. and co-authors recorded the facts of accumulation of type III collagen in the sclera, which is normally not characteristic of its structure. The specificity of immunomorphological changes in the connective tissue of the sclera is also expressed in the fact that intense focal accumulation of type III collagen, as well as fibronectin and glycosoaminoglycans, occurs in its middle and deep layers.According to Keeley F. and co-authors, there is no difference between the anterior and posterior parts of the eyeball according to the typical composition of the collagen of the sclera.In the literature there is various information concerning the parameters of the thickness of the sclera in its different departments. In the optic nerve, according to various authors, its thickness ranges from 0.8 to 1.2 mm, and its thinnest part is fixed in the area of attachment of the external muscles of the eye – 0.3-0.5 mm.Thus, Richarrd E. Normann and co-authors (2009) examined 11 human cadaveric eyes, 4 of which were obtained from deceased who suffered from glaucoma during their lifetime. The average thickness of the entire sclera according to their observations was 670.8 microns (with a range from 564 microns to 832 microns), and the thickness in the region of the limb and the posterior pole was, on average, 588.6 microns and 996.18 microns, respectively.According to Olsen T. and co–authors, the thickness of the sclera on average in the limb region is about 0.53 ± 0.14 mm, in the equator region – 0.39 ± 0.17 mm, and in the posterior pole of the eye near the optic nerve - from 0.9 to 1.0 mm.

Shevchenko M.V. and co-authors in 2009 also conducted studies of pieces of sclera taken in vivo from patients who underwent posterior trepanation of the sclera during anti-glaucoma surgery, 10-13 mm from the limb. The thickness of the sclera in this zone ranged from 1.2 to 2.2 mm.Egorova E.V. and co-authors in 2015 published the results of acoustic measurements of the sclera in the limbic region and 4 mm from the scleral spur, conducted in patients suffering from high myopia. It turned out that in the equatorial zone the thickness of the sclera ranged from 0.21 to 0.23 mm, and in the limb region – from 0.42 to 0.63 mm.The studies of Strakhov V.V. and co-authors confirmed a

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decrease in the thickness of the sclera with the progression of the myopic process. The thickness of the sclera in the area of the ora serrata in normal eyes averaged 1.32 mm, whereas in patients with myopia – 1.14 mm.Such a large difference in the data concerning the thickness of the sclera in its various departments, apparently, depends on many factors. The final results directly depend on measurement methods, methods of sampling and processing of the material, as well as on concomitant pathologies of the organ of vision and lifetime refraction.The sclera is directly involved in the outflow of watery moisture both along the main and additional pathways. So the main element of the drainage zone of the eye – the helmet canal – is located in the thickness of the sclera, in the posterior part of the inner scleral groove. It is connected to intra- and episcleral veins by means of collector tubules, the number of which varies from 37 to 49, and the diameter from 20 to 45 microns. Collector tubules, or graduates, vary in size and direction. These conductors of watery moisture can flow into the vessels of the intra- and episcleral venous plexus, into the vessels of the venous network of the ciliary body or, moving away from the sinus in a parallel direction, flow back into it. Connecting with each other, the collector tubules of the first type form water veins. They contain watery moisture, pure or with an admixture of blood.

The sclera is also involved in the outflow of watery moisture along an additional path. The first experiments proving the permeability of the sclera to intraocular fluid were conducted by scientists in the 60-70s of the last century. The well-known term "uveoscleral outflow" arose after describing the movement of radioactive particles from the anterior chamber of the eyeball through the ciliary muscle into the suprachoroidal space, and then through the emissaries into the sclera, Researchers injected various substances such as coalin, ferritin and Indian ink, labeled proteins into the anterior chamber, which then as a result of radiological, histological and autoradiographic methods it was found not only in the drainage system of the eye, but also in the ciliary muscle, suprachoriodal space, sclera, epibulbar tissues and in the anterior parts of the vitreous body.

Objective: to conduct a comparative morphological assessment of the reaction of rabbit eye tissues after experimental use of xenografts.

Material and methods. The tissue reaction after experimental scleroplasty was studied on histological sections of the eyes of 8 rabbits (16 eyes). The animals were divided into 2 groups. In group 1, scleroconstrictive operations were performed using xenografts pretreated at a wavelength of 370 nm and a power of 5 MW/cm2 for 20 minutes on one side and after a 30-minute exposure in 0.5% aqueous riboflavin solution (right eyes of 4 rabbits). The remaining animals (group 2) were operated on

the same technique using xenografts. The rabbits' left eyes were left intact and taken over for control.Enucleated animal eyes were subjected to macroscopic and histological examination 2 weeks later (2 rabbits from each group) and 1 month after surgery.

Results. Morphological examination of enucleated eyes 2 weeks after surgery revealed a weakly expressed aseptic inflammatory reaction in the form of a scanty rim of lymphocytic cells in the thickness of the sclera. Histological studies conducted after 1 month revealed signs of the formation of a connective tissue capsule. In sections of the sclera of enucleated rabbit eyes using a xenograft, pronounced aseptic inflammation with massive lymphomacrophagal infiltration and the presence of a large number of fibroblasts was visualized 2 weeks after surgery at the border with the graft, and after 1 month – the appearance of only individual sections of granulation tissue.

Comparative characteristics of the studied morphometric indicators between groups

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Group

Number of eyes

Age, years

Morphometric indicators of the anterior segment of the eye

biometrics

haimpulg camera (Pentacam)

PZO, mm

TH, mm

PC depth, mm

pc depth on the periphery, mm

pc volume, mm3

1st (pandions from Hmm to 40 years old)

54

35 [30; 38]*

21,71 [20,99; 21,92]

4,15 [4,0; 4,32]*

2,68 [2,55; 3,15]*

1,00 [0,92; 1,24]

131 [98; 155]

2nd (antlers with Hm 41-50 years old)

54

47 [44; 48]

21,73 [21,44; 22,14]

4,32 [4,09; 4,52]

2,56 [2,34; 2,69]

0,99 [0,86; 1,19]

131 [101; 143]

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Comparison group (patients with ROM)

52

47 [45; 49]

21,79 [21,51; 22,22]

4,71 [4,55; 4,91]*

2,43 [2,35; 2,59]

0,37 [0,24; 0,74]*

98 [71; 110]*

Note. * — significant differences with the 2nd group ($p<0.05$).

Conclusions.

Histological examination of enucleated eyes 2 weeks after experimental scleroplasty revealed a less pronounced tissue reaction to the introduction of a xenotransplant. 1 month after the operation performed using xenografts, histological signs of the formation of a connective tissue framework were found against the background of a weakly expressed inflammatory reaction of the eye tissues.

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