Use of polymer track membranes with nanostructured surface as drainage in antiglaucomatous operations

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Interest in the treatment of refractory glaucoma by implantation of drainages on the basis of various materials is largely due to a high degree of incidence of this pathology and its serious complications. The refractory glaucoma accounts about 40% of all glaucoma pathology. Unsuccessful antiglaucomatous operations result, as a rule, from proliferation of connective tissue and obstruction of surgically formed outflow tracts. Therefore search of new drainage materials for antiglaucomatous operations is rather an actual problem. In the present paper we report on experience of using of the polymer track membranes with nanostructured surface as a drainage material for antiglaucomatous operations. For experiments poly(ethylene terephthalate) and polycarbonate track membranes with a thickness of 10.0 μm and a pore diameter of 400 nm were used (pore density of 5·10⁷ cm⁻²). By preliminary tests it was established that membranes of this type are stable to biodestruction and can remain in the intrascleral space for several years. For nanostructuring of the membrane surface a treatment by air plasma was applied. For this purpose a plasma-chemical reactor using a RF-discharge (13.56 MHz) was used. Experimental research of the drainage material was held by implanting its in anterior chamber and sclera layers of the rabbits and patients eyes. The clinical analyses after glaucoma surgical treatment were made during six months after the operation. It was found that no signs of either inflammation, cell infiltration, neovascularization of cornea and iris or anterior and posterior synechia were found in eyes during six months after operation. Histological research data demonstrate that the reaction of the inflammatory cells to drainage is minimal. The implant doesn’t resolve and keeps its porous structure up to six months. Fibrosis capsule around the drainage is not exposed. There was not a single case of reaction to drainage. After operations with nanostructured track membranes in all cases filtering blebs were split and plane. In all cases stable hypotensive result was achieved. Thus, the morphological and clinical researches of nanostructured track membranes as drainage clearly demonstrate its compatibility with eye tissues. Moreover, a new drainage has good lasting hypotensive effect and can be used as operation for refractory glaucoma surgery.

Keywords
polymer track membranes
nanostructured surface
drainage material for antiglaucomatous operations