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Reconstruction of urinary organs using tissue engineering constructs with mesenchymal stem cells

In recent years the interest of urologists to use the methods of tissue engineering in the treatment of pathologies of the urinary tract has increased. This refers to diseases in which organ substitution is required, and the tissues of the gastrointestinal tract and various tissues of the body are used as substitutes. The disadvantages of this approach are postoperative complications, a shortage of tissues for plastics, and an increase in the time of surgery due to the need for a patient's flap. The aim of the study was to investigate the effectiveness of the tissue engineering graft (TEG) application for the repair of damaged urine bladder (UB) tissue and urethra. TEGs based on bilayer polymer scaffolds seeded with allogeneic mesenchymal stem cells (MSCs) of rabbit bone marrow were prepared for the reconstruction of UB and urethra. To specifically track the used cells *in vivo*, the later were labeled with superparamagnetic iron oxide nanoparticles (SPIONs). TEGs were implanted on the model of partial resection of the UB and defect of the dorsal surface of the urethra of rabbits. Evaluation of the results of the TEGs application and cell therapy was performed following 4, 8 and 12 weeks after the operation. After animal sacrifice, histological and immunohistochemical analyses were performed and tissue cryosections were prepared. The nanoparticle-labeled cells were detected in various layers of reconstructed tissues that convincingly demonstrate their active participation in the reconstruction process. The developed TEGs with allogenic MSCs facilitated to the effective reparation of damaged tissues of UB and urethra, which is especially important for treatment of pathologies without a possibility of using autologous tissue.

Biography

Yudintceva Natalia works in the field of the regenerative medicine. She studies the possibilities of using tissue engineering grafts based on polymeric scaffolds and stem cells to restore the structural integrity of the tissues of the genitourinary system (urine bladder, urethra) on experimental models, including on models of the tuberculosis bladder. Another direction of her investigations is a development of the polymeric small diameter vessels for cardiac surgery.

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