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**EVOLIUCINĖ MEDICINA:
ŽMOGAUS RAIDOS PERSPEKTYVOS IR SVEIKATA
BESIKEIČIANČIOJE APLINKOJE**

**EVOLUTIONARY MEDICINE:
PERSPECTIVES ON HUMAN DEVELOPMENT AND HEALTH
CONSEQUENCES IN A CHANGING ENVIRONMENT**

Rengėjas:

Vilniaus universiteto Medicinos ir sveikatos mokslų
Doktorantūros mokykla, VU Medicinos fakultetas

Organized by

the Doctoral School of Medicine and Health sciences
at Vilnius University, VU Faculty of Medicine

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3D PRINTED ADIPOSAL AND MUCOSAL STEM-CELLS ENRICHED VERSUS ACELLULAR SCAFFOLD FOR URETHRAL REPAIR IN A RABBIT EXPERIMENTAL MODEL

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Background and Aim: The study was conducted to develop and test an artificial biocompatible tissue that could later be used in urethral surgery. The need for synthetic material for replacement urethroplasty in adult and pediatric medicine for the treatment of congenital urethral deformities is well known and widely discussed in modern scientific literature.

Materials and Methods: Biocompatible materials, gelatin methacrylate (GelMA) and polycaprolactone (PCL), supplemented with silk fibroin and polylactic acid (PLA), were selected to form the scaffold. Using 3D printing technology, a multilayered scaffold was produced. Adult rabbit stem cells were isolated from biopsies, cultured, differentiated into epithelial and mesenchymal cells and inserted into the artificial scaffold. 16 New Zealand White rabbits were divided into three groups: stem-cells enriched scaffolds, acellular scaffolds and a control. 3 months postoperative follow-up included clinical observation, blood and urine tests, urethrograms, histological evaluation. Approved by the Regional Bioethics Committee.

Results: All 16 animals completed the study. Final urethrograms showed a significant advantage of the cell-enriched scaffold. Final urethrograms showed 4/6 (67%) completely patent urethras without strictures compared to 1/5 (20%) in group B. The results were complemented by histological findings. Acellular Group B showed significantly higher histological inflammation (50% vs. 17%), fibrosis (70% vs. 33%), and residual hydrogel (20% vs. 0%). Clinical signs and laboratory measurements showed a worse postoperative period in

group B. On average, animals in group B lost about 5.8% of their body weight, while animals in group A gained about +1% on average.

Conclusions: Rabbit perineal adipose-derived stem cells and rabbit oral mucosal stem cells are suitable for forming artificial urethral tissue. Urethrograms and final histology showed the superiority of the stem cell-enriched scaffolds. 3D printed multilayer cell-enriched artificial tissue has advantages over acellular scaffolds in a rabbit urethral reconstruction experimental model.

Keywords: artificial, bioengineered, rabbit, stricture, urethra