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# A NEW COLLAGEN-BASED UROTHELIAL TRANSPLANT FOR RECONSTRUCTIVE SURGERY OF THE LOWER URINARY TRACT

Hypothesis / aims of study

Reconstructive surgery of the lower urinary tract often requires suitable grafts. Implantation of engineered tissue equivalents might be an option for urethral and ureteral reconstruction especially in patients for whom autologous grafts are not available. Urothelial implants might require biomaterials as cell carriers (1). Matrices have to be biocompatible, induce tissue regeneration, and must be subject to rapid degradation in vivo. Aim of the study was to prove adherence, viability, and growth pattern of human urothelial cells seeded on a new factory-made bovine collagen I-based matrix.

Study design, materials and methods

Ureter tissue specimens were obtained from adult patients undergoing open tumour surgery following informed consent according to the ethics committee approval. Urothelial cells were isolated and cultivated in complete keratinocyte serum-free medium (KSFMc). Subconfluent monolayers were detached with trypsin/EDTA, labelled with the red fluorescent cell linker PKH26, seeded onto the collagen matrix, and cultivated in KSFMc. Cell adherence was indirectly ascertained by counting non-adherent cells in the culture supernatant. Growth behaviour was studied by phase contrast microscopy and cryosections of the populated matrix. Viability of human urothelial cells seeded onto the collagen matrix was analyzed with the WST-1 assay.

Results

Human urothelial cells grown on the collagen matrix were as homogeneously spread as cells seeded onto standard plastic surface. At day 1 after seeding the fraction of non-adherent human urothelial cells was slightly increased (2.2%) compared to the controls (0.3%), whereas at day 3 both groups revealed similar rates (0.4% and 0.3%, respectively). Viability of human urothelial cells growing on the matrix revealed 111% of the control group at day 3. The cell-matrix constructs could be easily detached from the culture dish and were manageable with surgical instruments.

Interpretation of results

Although surgical techniques for urological reconstruction have advanced considerably in recent years, the quest for the ideal substitute for sustained urothelial regeneration continues. Tissue-engineered autologous urothelial transplants might expand the reconstructive toolbox. Direct application of tissue-engineered autologous urothelial transplants could replace flaps in open urethral surgery and might be used in endoscopic urethroplasty.

Concluding message

As the data demonstrate a good in vitro biocompatibility of the new bovine collagen I-based matrix, we conclude that the matrix might be well suitable for construction of urothelial cell-matrix implants for reconstructive surgery of the lower urinary tract. Further experiments with urothelial multilayers established from bladder washings (2) and grown on the collagen-based matrix will be performed. Especially, tissue-engineered urothelial implants will be characterised by epithelial cell markers (3). The outcome of the implants will be investigated in an animal model.

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