Therapy of urinary incontinence by way of the cell-based regeneration of the urethral sphincter

DFG-funded clinical research unit KFO 273

Urinary incontinence is defined as the involuntary loss of urine. While minor incontinence can already affect a person's day-to-day activities, the leaking of large amounts of urine can also lead to health problems. In Germany, the costs arising from the treatment and resources used for bladder control problems amount to over 500 million euros. The most frequent type of urinary continence, stress urinary incontinence (SUI), mainly results from insufficient strength or dysfunction of the urethral sphincter. So far, no curative treatment is available.
The clinical research unit KFO 273 is investigating different aspects of cell-based treatment with the potential to strengthen the weakened urethral sphincter.

The project focuses specifically on finding answers to the following questions:

1. Is it possible to precisely apply cells or implants into the sphincter muscle and monitor the procedure as the intervention is being carried out?
2. Do the applied cells physiologically integrate into the muscle and do they connect with the nerval control mechanism?
3. Do the applied cells remain vital in the area of injection and which regenerative role do they play over time?

Different subprojects deal with the investigation of new stem cell sources and their characteristics as well as their behaviour in vitro and in vivo with regard to cellular changes, neuromuscular connection, functional impact and non-invasive verification of the outcome using imaging methods. One project focuses on the endoscopic, target-specific and dosed application of the cells into the sphincter using imaging modalities that are specifically adapted to the sphincter area. These aspects will be validated on large animal models and prepared for clinical application.

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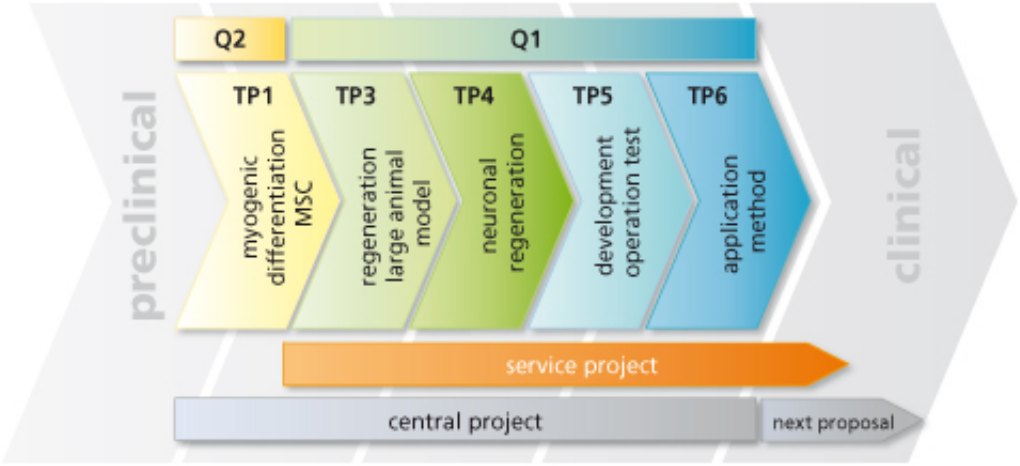
Projects of the 2012 – 2015 funding phase:



Subproject 1:
Differentiation of mesenchymal stromal cells and defined subpopulations into muscle cells by way of biochemical and biochemical stimulation

Subproject 3:
Comparative investigation of the regeneration capacity of damaged or degenerated sphincter muscles in animal models and human mesenchymal stem cells of the bone marrow, fat and placenta

Subproject 4:
Molecular strategies involving the transcription factor p53 to support the functional reinnervation of dysfunctional urethral sphincters

Subproject 5:
Assessment of regeneration state using signal processing and modelling for the objective determination of the occlusive force of the urethral sphincter

Subproject:
Target-specific application of cellular therapy

Cross-sectional project 1:
In vivo imaging of injected differentiated cells and stem cells in a pig sphincter and establishment of an in vivo small animal model to determine cell mobility and retention time

Cross-sectional project 2:
Functional analysis of myocytes differentiated in vitro

Service project – (financed with own resources)

Investigations relating to the optimal injection of regeneration-competent mesenchymal stem cells and the role of local inflammation in the cell-based treatment of sphincter defects

For more information: