German Artificial Sphincter Systems - GASS: The first generation of a remote-controlled sphincter prosthesis

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**Background**

We developed the first model of an automatically operated sphincter prosthesis for therapy of different incontinence disorders through microsystems technology.

**Methods**

The prototype integrates a fluid reservoir, a novel designed high-power micropump based on piezo-technology, an online pressure management and a microprocessor controls in a single unit. The four-membrane silicon micropump includes two active valves. Different sizes of inflatable bodies are suitable for connection. A transcutaneous energy- and data transfer system (TET) was integrated.

**Results**

The system fulfills the following requirements: high flow rate (2,39 ml/min at 25.3Hz), maximum possible backpressure of 430mbar, bidirectional operation, an absolutely bubble-tolerance, a small size for subcutaneously implantation and a low energy consumption (84-123mA/day). At present, the operation time is estimated at about 7-10 days without transcutaneously recharging of the battery. We could show that 330 million cycles of the silicon membrane actuators (corresponding a life-time of 10 years) did not result in fatigue or breakage of material. The integrated fluid reservoir contains a volume of 20 cc. Furthermore, the telemetric interface guarantees a freely application programming for different therapies and a comfortable remote control for the patient.

**Conclusion**

GASS is the first remote-controlled prosthesis which is designed either for therapy of major fecal incontinence or placement around the urethra in patients with urinary incontinence. Additional applications such as an automatically gastric banding or a pressure controlled cardia prosthesis are imaginable.