FEASIBILITY STUDY OF INFLATING PENILE PROTHESES, URETHRAL CUFFS AND ANAL CUFFS WITH MRI-COMPATIBLE, TRANSDERMALLY POWERED PUMP IN RESERVOIR IMPLANTS

Arthur L. Burnett, Marcel I. Horowitz, Howard S. Newman
MHN Biotech LLC

INTRODUCTION AND OBJECTIVES: Erectile dysfunction and urinary and fecal incontinence can be treated by inflatable medical implants operated by manual pumps which transfer fluid between reservoirs and penile cylinders or sphincteric cuffs. Some patients lack the strength and dexterity to operate such pumps, and they are not anatomically comfortable when placed in incontinent females. Replacing manual pumps with electric pumps solves these problems; however, implanted power sources not available to pump sufficient fluid in acceptable times.

This study's objective was to design a system to inflate penile cylinders from a nonferrous, reservoir-submerged package containing electronics, motor, pump and valves to replace the manual pump, see Figure 1. The package is transdermally powered and controlled from a TV remote like controller. A Physician's App programs the controller. Submerging the package in the reservoir provides heat transfer and allows abdominal implanting of only one component.

Initial system requirements include:
- Pump 60 ml of normal saline at 25 psi in 45 seconds
- MRI and SAR safety
- Minimum surgical impact
- 2-inches separation between controller and implant
- Treat any and all male and female conditions
- No internal energy storage.
- Pressure relief tube

METHODS: A survey of existing technology was conducted: conventional motors not compatible with MRIs; piezoelectric motor efficiency too low; innovative nonferrous motor and pump designs meet requirements; a baseline was selected; pump and motor performance was modeled; the motor stator was wound and tested; and a prototype transdermal power source, ferrous dc motor, and screw pump inflating penile cylinders was built and tested using commercially available parts.

RESULTS: Modeling shows that the baseline system meets requirements. An added piezoelectric valve manifold prevents pump backflow and provides multi-implant inflation with one pump. The prototype system inflated the penile cylinders in 23 seconds using 3.6 watts source power with a 1-inch sirloin steak gap between source and receiver.

CONCLUSIONS: A nonferrous pump in reservoir system is feasible. Implantation of this transdermally powered pump in reservoir system can treat male or female incontinence and erectile dysfunction while eliminating the need for manual pumps.

Patent US 10383715
Website: mhnbiotech.com
Contact: howard.newman@mhnbiotech.com