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Implantable Device for Wireless Regulation of the Bladder through Pelvic Nerve Stimulation

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ABSTRACT

Urinary incontinence (UI) is the involuntarily urination that usually effects older people or is the result of an injury. UI affects more than eleven million people and the cost of incontinence management in the United States in 2000 was \$19.5 billion. Where conventional physical therapies have failed, pelvic nerve stimulation is a promising form of regulating the bladder long term. Piezoresistive pressure sensors consist of two variable resistance values and two known resistance values that are represented on a daughterboard. This unknown resistance represents the change in pressure. The filling and voiding of the bladder was characterized through acute surgeries. It was found that the pressure sensor successfully detects changes in the bladder. Based on the collected data an implantable package can be assembled for chronic surgeries. The package consists of a bionode to record and stimulate the pelvic nerve, a powernode to apply a voltage, and a daughterboard. The next phase of the research is to thoroughly test the implantable package by placing the rat inside a cavity that will wirelessly power the device to regulate the bladder. Future applications of this will be long term use in humans with the ability to control the stimulus through a smart phone application. This research can improve the overall health and quality of life of patients by giving them back control of their bodies.

KEYWORDS

Pelvic nerve, stimulation, bladder, incontinence, pressure, sensors, piezoresistive