**59**

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## DOES SACRAL AFFERENT NERVE STIMULATION INFLUENCE BOWEL COMPLIANCE?

Hypothesis / aims of study

Constipation and faecal incontinence are prevalent amongst spinal cord injured (SCI) patients. Electrical sacral nerve stimulators (Sacral Anterior Root Stimulator Implants, *Finetech-Brindley*), designed for bladder control, improve bowel function through unknown mechanisms[1]. Similar devices are also effective in faecal incontinence and constipation in nerve-intact functional disorder patients (Sacral Nerve Stimulator, *Medtronic*)[2]. It is thought that a possible mechanism for this improvement may be by altering bowel compliance. Increased rectal compliance has been shown to improve symptoms in patients with functional bowel disorders[3]. We hypothesized that sacral afferent stimulation, by altering the aberrant sacral reflexes in SCI patients, may influence rectal compliance, thus improving bowel function.

Study design, materials and methods

Full local ethical approval was obtained. 5 male subjects with established SCI between C4-T5 were studied. Rectal distension was performed in 50ml steps using a barostat machine (Distender Series II, *G&J Electronics*). The barostat machine inflates an infinitely compliant bag with set volumes whilst simultaneously recording pressure. From these measurements rectal wall compliance can be calculated. Maximal rectal distension volume was set at 300ml and the barostat was set to stop inflating if the balloon pressure reached or exceeded 40mmHg, or a reflex balloon expulsion was triggered. Sacral afferent nerve stimulation was conducted using dorsal penile nerve (DPN) stimulation. Pre-gelled surface electrodes placed on the dorsal aspect of the penis, were connected to an impulse generator. Stimulation amplitude was set at twice the level of the pudendo-anal reflex motor threshold and neuromodulation frequency altered at 0.2, 2 and 20Hz.

Results

Afferent neuromodulation resulted in significant increased rectal compliance with increasing distension at 0.2, 2 and 20Hz ($p < 0.05$, $p < 0.01$ and $< 0.001$ respectively), compared to compliance at baseline fill. Increases in compliance curves appeared to follow a stimulation frequency dependent response *(fig 1)* although this was not statistically significant (0.2Hz vs 20Hz stimulation frequency compliance curves were not quite statistically different, $p = 0.08$, 2 way ANOVA).

Interpretation of results

Sacral afferent neuromodulation results in increased rectal compliance. The response of this phenomenon *appears* to be dependent on frequency magnitude, although we have not quite shown this to be a statistically significant finding. The efficiency of the rectal wall seems to be maximal at a volume of 200ml, as the compliance is optimal at this volume.

Concluding message

For the first time we have demonstrated an *objective* measure to explain why sacral nerve modulation may improve bowel function in spinal cord injured individuals. These same changes may explain the improvement observed in non-spinal injury patients with functional bowel disorders who have sacral nerve stimulator implants. Using these techniques, optimisation of current therapies may be achieved, together with the possibility of developing novel therapeutic therapies.

*Figure 1*

**Changes in rectal compliance during stepwise filling with afferent nerve stimulation at different frequencies**
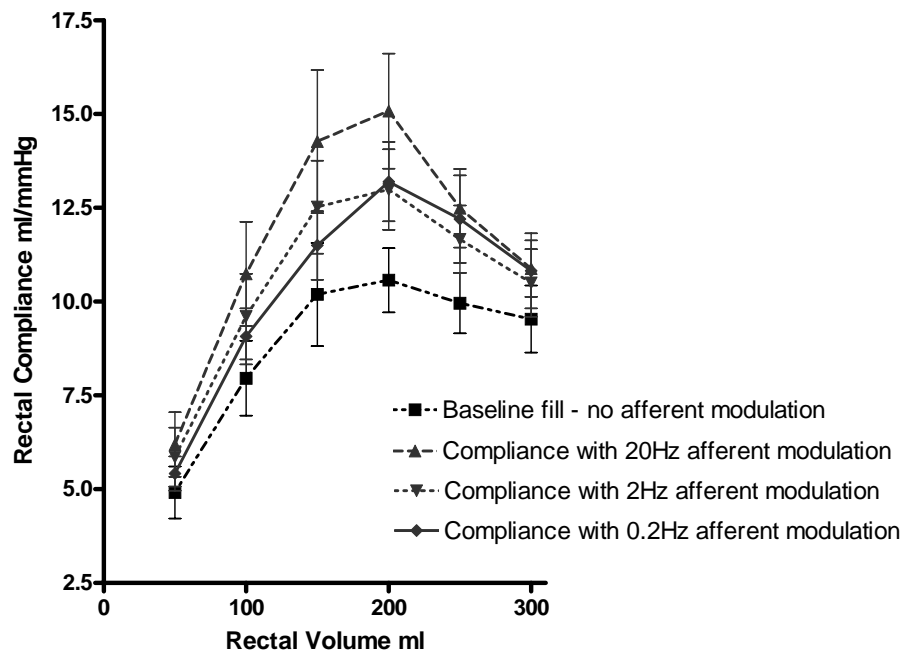
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