

# O4

## OPTIMISATION OF TRANSCUTANEOUS SPINAL CORD STIMULATION IN MODULATION OF MICTURITION REFLEXES FOLLOWING SPINAL CORD INJURY

*H. Houlston, R. Nobrega, S. Knight, N. Vasquez, F. Lee*

### **Introduction**

Spinal cord injury (SCI) can result in neurogenic lower urinary tract dysfunction including neurogenic detrusor over-activity (NDO) and detrusor-sphincter dyssynergia (DSD). There is preliminary evidence to suggest transcutaneous Spinal Cord Stimulation (tSCS) can modulate spinal networks involved in micturition. However, there is ambiguity regarding optimal electrode sites and stimulation parameters. The aim was to investigate optimisation of electrode site and tSCS parameters during bladder filling and voiding.

### **Materials and Methods**

Ethical approval was obtained from the Research Ethics Committee. Participants had a supra-sacral SCI and proven NDO from urodynamics. During visit 1, 1ms tSCS pulses of increasing amplitude were administered at three randomised electrode sites; cathode at T11-12, or L1-2, anodes at iliac crests or abdomen. External anal sphincter and bilateral tibialis anterior EMG was recorded throughout. Optimal electrode site was selected based on motor-evoked potential response, and tolerance to stimulation. At optimal electrode site, tSCS was applied in 5 s bursts at either 1, 15 or 30 Hz during voluntary pelvic floor contraction, relaxation and control. During visit 2, participants completed 6 cycles of urodynamics, control cycles at the start and end, two cycles applying either 30 or 15Hz tSCS during bladder filling, and two cycles applying either 1 or 15Hz tSCS during voiding.

### **Results & Conclusions**

Six participants were recruited (4 male, 2 female), mean age 50 +/- 20 years, incomplete cervical (n=4) and incomplete thoracic (n=2) SCI. Optimal electrode sites were cathode L1-2, anode abdomen (n=2), cathode T11-12, anode iliac crest (n=2), cathode L1-2, anode iliac crest (n=1) and cathode T11-12, anode abdomen (n=1). Preliminary analysis of EMG data indicates that tSCS may enhance voluntary contraction of EAS. In addition, tSCS during the filling phase may increase bladder capacity. Further analysis is on-going. tSCS is an exciting new development which may improve bladder function following SCI.