Spinal Cord Injury’s bladder problem

Spinal cord injury (SCI) seriously disrupts the function of the lower urinary tract, affecting storage and voiding of urine. SCI can result in overactivity of the bladder (NDO), which often leads to chronic issues with urinary incontinence [1].

Urodynamic assessment of bladder overactivity

Measuring bladder pressures whilst filling the bladder enables us to quantify bladder activity. The figure below shows an uncontrolled detrusor contraction resulting in leakage.

Assessing acute effect and comparing stimulation sites

Stimulation of several anatomical sites is reported to reduce bladder overactivity in neurogenic cases [3]. However, validity in SCI and agreement on the acute effect of stimulating each site have not been achieved. We conducted a urodynamic investigation of n=8 people with SCI and bladder overactivity, comparing stimulation at each of the sites in figure 2, to assess the acute effects.

• Only DGNS produced a significant change in bladder capacity (+118ml±124).
• Stimulation of the genital nerve was seen to suppress detrusor contractions when applied at sufficient amplitude.
• For clinical implementation patient selection will be key to effective use, intact reflexes are necessary.
• No significant changes in capacity or visual suppression of NDO seen during stimulation of other sites.

A wearable neuromodulation device?

The ability to switch off or delay a detrusor contraction presents an opportunity to develop a wearable device that may be used to reduce incontinence events.

Problems

There have been several issues identified in previous short trials of surface DGNS for management of incontinence. Variable levels of sensation to trigger stimulation, abundance of wires, lack of easy access to stimulation triggers, unknown best regimes and surface electrode design all present problems. We have recently begun a pilot study using DGNS over a week with SCI participants. Outcome measures are a digital bladder diary, ICIQ and ambulatory urodynamics compared to baseline values generated in a preceding week.

Conclusions

• Potential for an effective wearable device exists, we are investigating further.

References