

Hypothesis

Stroke survivors often develop lower urinary tract symptoms (LUTS)

Stroke can change **Micturition-associated brain activity (MABA)** and relies on the activation of primitive brain regions, with **less activation of cortical regions**.

Transcutaneous Spinal Cord Stimulation (TSCS) is emerging as a novel electrical **neuromodulation technique** with neuro-restoration potential.

Objective:

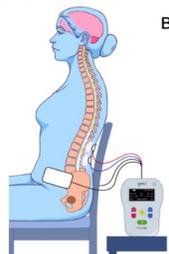
- Determine the clinical effect of **TSCS** using **patient reported outcome measurements**
- Determine the changes on **MABA** using fMRI after TSCS

Methods and Materials

12 patients with newly developed **LUTS** following a stroke underwent **TSCS for 24 sessions**.

Pre- and Post- Treatment:

- Bladder diary
- ICIQ-OAB questionnaire
- Simultaneous fMRI+ Urodynamic studies (UDS)



BOLD signal intensity was detected during the **maximum urgency period** and compared between groups using Statistical Parametric mapping with a **p < 0.01** and **cluster size of 25 voxels**.

Results

Patient Demographics	n=12
Male	5 (41.7%)
Mean age (SD)	52.8 ± 9.8 years
Mean time from stroke (SD)	3.61 ± 2.71 years
Stroke location	
Pons	4 (33.3%)
Basal ganglia	6 (50%)
Cortex	2 (16.7%)

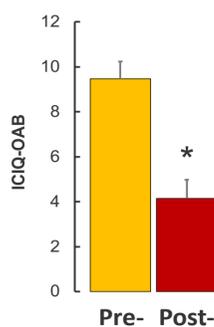


Figure 1: ICIQ-OAB results, demonstrating a clinical improvement.

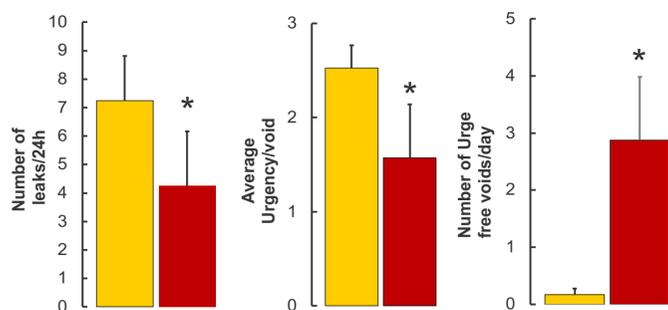


Figure 2: Voiding diary demonstrated a significant reduction in number of incontinence episodes per day, the average urgency per void, and an increase in urge-free voids in 24 hours.

Functional Imaging

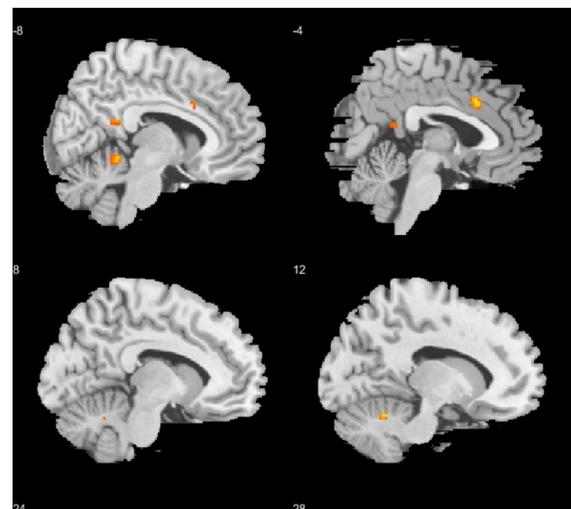
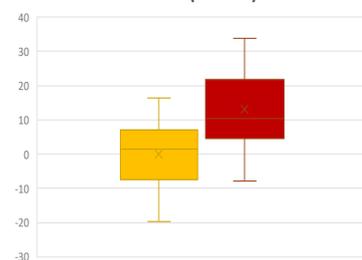
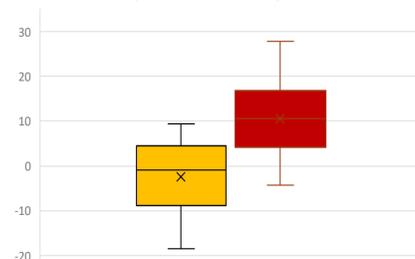


Figure 3. Left – Relative BOLD signal acquisition at point of maximal urgency (Pdet=0) between pre-TSCS and post-TSCS demonstrating increased activation in regions of the brain involved in the storage of urine. Right- BOLD signal acquisition in PAG, Insula, and VPPFC.

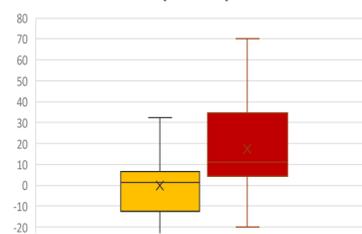
Insula (RIGHT)



Periaqueductal Grey (RIGHT)



Ventrolateral Prefrontal Cortex (RIGHT)



Interpretation of Results

Patients reported a significant improvements in

- Urgency**
- Number of urge incontinence episodes**
- Number of urge-free voids**

Clinically significant improvements in total **ICIQ-OAB scores**, which could be explained by the changes in cortical regions.

Conclusions

•TSCS shows **promising results** as a potential treatment for LUTD in stroke survivors.

•Changes in **cortical activation** may be the mechanism by which TSCS improves LUT symptomatology in this patient population.