Keck Medical Center of USC

TORONTO

#404: Transcutaneous Spinal Cord Stimulation Enhances Cortical Activity and Improves Lower Urinary Tract Symptoms in Stroke Survivors.

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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:

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 VPFC.

Insula (RIGHT)

20

10

-10

-20

- 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%)	
-20	-30	





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

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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.



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.

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.

Funding Acknowledgment: The Urology Care Foundation



