

HIGHER NEURAL CORRELATES AT INITIATION OF VOIDING IN PATIENTS WITH MULTIPLE SCLEROSIS WITH NEUROGENIC BLADDER DYSFUNCTION VIA CONCURRENT FUNCTIONAL MAGNETIC RESONANCE IMAGING (fMRI) AND URODYNAMIC STUDIES

Hypothesis / aims of study

Normal voiding is triggered by release of tonic inhibition from suprapontine centres, allowing the pontine micturition centre to trigger the voiding reflex. Exploring brain areas in neurologic diseases is important to discern any altered control over the micturition cycle. Neurogenic bladder dysfunction is seen in 95% of multiple sclerosis (MS) patients and has a significant impact on their quality of life. In this preliminary study, we seek to discover brain activity processes during initiation of voiding via fMRI in female subjects with MS and neurogenic bladder overactivity (NDO) and compare it to healthy normal controls.

Study design, materials and methods

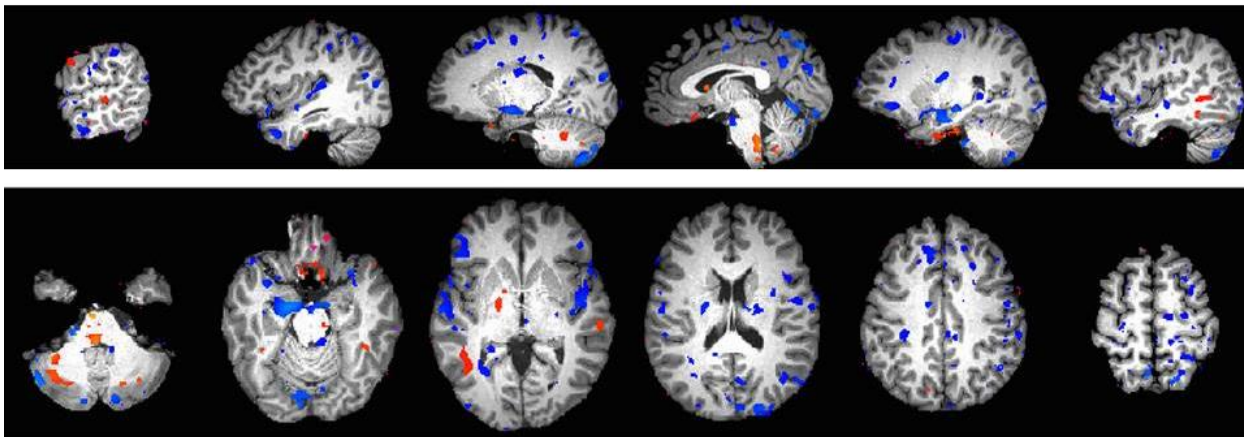
Ten ambulatory female patients with MS and NDO were recruited for this IRB approved study. We recorded brain activity via fMRI with simultaneous UDS. After motion correction, the Generalized Linear Model created individual fMRI activation maps at initiation of voiding. A high-resolution structural scan of the brain transformed the individual fMRI activation maps into Talairach space. From these transformed datasets, an average fMRI activation map (student t-test) was created, from which areas of significant activation were identified ($p < 0.05$).

Results

All 10 patients were able to void while supine. Group analyses of the patients yielded consistent areas of activation at the initiation of micturition in regions for motor control (cerebellum and thalamus), emotion (cingulate gyrus), recognition (middle temporal and fusiform gyrus), the occipital lobe (cuneus and lingual gyrus), and the cerebellum (culmen). Comparison in average change of activations between healthy subjects and MS patients shows predominantly larger activation in normal controls.

Concluding message

Our preliminary group and network analyses demonstrate for the first time the activation of a brain network consisting of regions for motor control, executive function, and emotion processing, as well as structures such as cerebellum during micturition in patients with neurogenic detrusor overactivity caused by Multiple Sclerosis. Further investigations are needed to define the optimal approach for the care of these patients.



Average change of activations comparing healthy subjects (HS) and multiple sclerosis (MS) during initiation of voiding. It is interesting to see that there is predominantly larger activation in normal controls.

blue: larger activation for HS

red: larger activation for MS

Disclosures

Funding: none **Clinical Trial:** Yes **Public Registry:** No **RCT:** No **Subjects:** HUMAN **Ethics Committee:** Methodist IRB **Helsinki:** Yes **Informed Consent:** Yes