Stony Brook University  
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Abstract  
External Urethral Sphincter Activity during Micturition in the Adult Female Rat before and after Spinal Cord Injury  
By  
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The process of micturition is fundamental to life and one of the major ways by which organisms excrete toxic byproducts of metabolism. To function efficiently, micturition requires reciprocal bladder contraction and urethral relaxation that is coordinated by the brainstem. Spinal cord injury (SCI) above the level of the lumbosacral spinal cord results in dysfunction of the lower urinary tract (LUT). One of the most common forms of LUT derangement is detrusor-sphincter dyssynergia (DSD), which is characterized by simultaneous contraction of the bladder and the external urethral sphincter (EUS) muscle due to the impairment of reflex and voluntary sphincter control. SCI patients suffering from this condition exhibit inefficient voiding, urine retention and are prone to developing bladder and urinary tract infections. Proper bladder maintenance has a negative impact on the quality of life of the individual, thus the mechanisms underlying DSD are the subject of intense scientific research. Studies from animals with mid-thoracic SCI show increased tonic EUS activity, inefficient voiding, urine retention, and bladder contractions exhibiting long durations and large intravesical pressures. These observations are qualitatively similar to the pathological state of the human. A popular and robust in vivo animal model for studying micturition function is continuous flow bladder cystometry and whole muscle EUS EMG recordings in the urethane-anesthetized adult female rat. This dissertation describes the implementation of this experimental setup for studying bladder and EUS activity in the spinally intact and transected adult rat during repeated micturition events. The specific goals of this thesis work were to (1) quantify the major changes in bladder and whole muscle EUS activity following chronic spinal cord transection, (2) identify the activity of single EUS motor units and categorize different EUS motor unit recruitment patterns using extracellular ventral root and muscle recordings, and (3) study the effects of intrathecal baclofen, a potent GABA<sub>b</sub> agonist and clinically relevant antispasmodic, on EUS activity.

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