

## MetroHealth Medical Center

RESEARCH DAY 2023  
Abstract Submission Form

**Poster Title:** Restoration of Cough after Spinal Cord Injury (SCI)

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**Category:** Physical Medicine and Rehabilitation /Clinical Research

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**Introduction:** Due to expiratory muscle paralysis and lack of an effective cough, individuals with SCI often have difficulty clearing secretions and suffer from the recurrent development of atelectasis and pneumonia, which are major causes of morbidity and mortality. In recent clinical trials, we demonstrated that lower thoracic spinal cord stimulation (SCS) applied via the Cough Stimulation System (CSS) results in the generation of large airway pressures (P) and peak expiratory airflow rate (F) characteristic of a normal cough.

**Objective:** 1) To evaluate the capacity of SCS to activate the expiratory muscles and generate large P and high F characteristic of normal cough and 2) to determine participant quality of life before and after use of the CSS.

**Participants:** Participants (N=28) with SCI

**Interventions:** A fully implantable CSS was surgically placed in each participant

**Main Outcomes:** 1) P and F achieved with SCS and 2) Life quality assessment questionnaires

**Results:** Mean P and F during spontaneous efforts pre-implantation were  $26\pm 3$  cmH<sub>2</sub>O and  $2.4\pm 0.3$  L/s, respectively. While using the CSS, maximum P values were  $83\pm 8$ ,  $112\pm 10$ , and  $126\pm 9$  cmH<sub>2</sub>O while maximum F values were  $5.5\pm 0.5$ ,  $8.3\pm 0.9$  and  $9.7\pm 1$  L/s at FRC, TLC and at TLC with participant effort respectively ( $p < 0.05$ , for each when compared to spontaneous efforts). Moreover, use of the CSS resulted in a significant reduction in the incidence of acute respiratory tract infections which declined from  $1.39\pm 0.29$  to  $0.21\pm 0.08$  and  $0.07\pm 0.05$  events/year at the 1- and 2-year mark ( $p < 0.01$  compared to pre-implant values). The degree of difficulty in raising secretions improved markedly, and the need for alternative methods of secretion removal was virtually eliminated. Participant life quality related to respiratory care improved, with each participant reporting greater control of breathing problems and enhanced mobility. There was also a significant reduction in the need for trained caregiver support related to secretion management.

**Conclusion:** Use of the CSS by SCI participants results in restoration of an effective cough with significant clinical benefits.

**Support:** This work was supported by the National Institute of Neurological Disorders and Stroke (R01 NS049516 and U01 NS083696), Neilson Foundation (278855), NCRR (M01RR000080 and UL1RR024989). This project was supported by the Clinical and Translational Science Collaborative (CTSC) of Cleveland which is funded by the National Institutes of Health (NIH), National Center for Advancing Translational Science (NCATS), Clinical and Translational Science Award (CTSA) grant, UL1TR002548.

**Approved by the MetroHealth IRB as protocol number:** IRB98-00091: Spinal Cord Stimulation to Restore Cough (Initial approval: 10/26/1998) and IRB15-00014: SCS with Wire Leads to Restore Cough (Initial approval: 4/10/2015).