

MetroHealth Medical Center

RESEARCH DAY 2023

Abstract Submission Form

Poster Title: **Implanted Neuroprosthesis for Hand and Trunk Function in Cervical Spinal Cord Injury**

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Location of Laboratory: **OBC-MCRR**

Category: **Physical Medicine and Rehabilitation**

Objective: Provide increased functional ability and independence for individuals with cervical level spinal cord injury (SCI) through the implantation of a modular networked neuroprosthesis that provides hand grasp opening and closing, overhead reach, postural stability, and, for some individuals, stand and transfer capability.

Methods: Individuals with C5 or C6 motor function, AIS A, B, or C are candidates to receive the NNP system and undergo assessment focused on the electrical excitability of all target muscles. The NNP system is implanted in a two-stage surgical procedure. The recipient undergoes a 3-week period of immobilization followed by 4 weeks of muscle conditioning prior to initiating functional training and evaluation.

Results: The NNP System has been implanted in seven individuals with SCI to date. The implementation of the NNP is customized with each individual according to their retained motor function and their independence goals. We implant 20-24 stimulating electrodes in the trunk and upper extremity. Control is provided by 2-4 myoelectric signal recording electrodes in voluntary muscles in the forearm, shoulder, and neck. An implanted power module is placed in the abdomen. The results have been positive, and all subjects have demonstrated improved functional use of their hands, arms and trunk. Demonstrated activities include eating with a fork, writing, getting items out of the refrigerator, improved manual wheelchair propulsion, and successful standing pivot transfers from chair to bed.

Conclusion: The NNP is the first modular neuroprosthesis designed to provide multiple coordinated functions for individuals with SCI. This system provides increased functional ability of the hand, arm, and trunk. This project is supported by NIH UH3-NS103863; NIH U41-NS129436; FDA Orphan Products R01-FD-005409.