

Comprehensive evaluation of spinal cord function accompanying Lokomat rehabilitation in patients with incomplete spinal cord injury.

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In this study, patients are recruited to a gait rehabilitation programme based on the use of a computer controlled robot (Lokomat) and any subsequent changes in status during the rehabilitation programme are charted through the application of a comprehensive battery of functional and physiological assessments. The goal of this testing procedure is to identify tests of sensory and motor function that are sensitive to the changes that occur in response to rehabilitation/ natural recovery in incomplete spinal cord injured patients. All protocols were conducted with ethical approval and all volunteers provided informed consent.

Lokomat Training & Assessment: The Lokomat rehabilitation programme we have adopted requires patients to attend for 1 hour of daily (Monday – Friday) Lokomat walking over a 6 week period. In addition, sensory and motor function is assessed longitudinally prior to the onset of Lokomat training, at the mid-point of training and following the cessation of training. For all recruits the level of body weight support and the treadmill speed is adjusted over the 6 week training period in relation to the rate of change in an individual's walking capability. Assessment protocols include a battery of standard clinical measures such as the Standard Neurological Classification of Spinal Cord Injury (ASIA), a range of functional tests of walking capability and a variety of quantitative measures of sensory and motor function.

Patient Recruitment & Compliance: At the time of writing 14 patients have completed the study, and a further 2 are currently undertaking Lokomat training. Compliance to the training regime (30 sessions) for the 14 subjects who have completed the study was high and averaged 94% with the majority of subjects missing fewer than 3 sessions over the 6 week training period. The reasons for missing a session were all unrelated to the use of the Lokomat. Subjects recruited to the study were allocated to an acute (<6 months post injury) or chronic (>6 months post injury) group and were ASIA C or D. Within the acute group 4 subjects were non-ambulatory prior to Lokomat training while all chronic patients showed some level of locomotor capability.

Training Outcomes: Preliminary group analysis of overground walking judged from gait analysis parameters together with WSCII demonstrate that both acute and chronic subjects show significant improvements in overground walking capability over the period of Lokomat training. Importantly, the degree of improvement appears greater within the acute group. Furthermore, the rate of gait improvements in the acute group is greatest within the first 3 weeks of training with patients who show the fastest improvements being those who can sustain the fastest daily reductions in percentage body weight support. These observations in themselves have implications for the design and usage of rehabilitation programmes based on devices like the Lokomat but also serve to show that it is an effective aid to improving gait performance in incomplete spinal cord injured patients and an appropriate platform to base investigations on adaptive changes in spinal cord function.

Sensory and Motor Assessments: Alterations have been observed in ASIA sensory and motor scores and in quantitative sensory testing of touch, vibration and electrical perceptual threshold in spinal segments above and below lesion sites. Electrophysiological measures of motor and sensory function also have shown changes over the course of the period of Lokomat changes and a summary of the results obtained will be presented within the poster. Of particular interest with respect to sensitivity in detecting changing function are the results of Somatosensory Evoked Potentials, Vibration thresholds and Motor Evoked Potentials testing in erector spinae muscles.

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