Robot-assisted gait training in individuals with incomplete spinal cord injury: A case report

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Introduction
Spinal cord injury (SCI) often results in physical impairments that affect one’s ability to walk. Based on the theory of neuroplasticity, using a task-specific, high-intensity training approach in gait training provides the most promising result. Traditionally, repeated practice for gait retraining is done by manually assisted overground or treadmill training, with or without body weight support. However, the techniques are cumbersome and have large physical demands from therapist. It also imposes considerable risk of injury to therapist and patient. Robot-assisted gait training (RAGT) has developed in recent years to improve rehabilitation outcome. With the new opening of Jockey Club Integrated Neurological Rehabilitation Centre in Princess Margaret Hospital (Kowloon West Cluster), an automated electromechanical device consist of robot-driven exoskeleton orthosis called “Lokomat” is recently available in the hospital.

Objectives
The purpose of this case report is to describe the use of RAGT in clinical setting to enhance motor recovery in 3 patients following motor incomplete SCI.

Methodology
Three patients (2 male, 1 female) with SCI of non-traumatic etiology were enrolled. In addition to individual rehabilitation program, all 3 patients participated in RAGT program using the Lokomat. RAGT was scheduled 2 times per week. Patients’ progress was assessed with the following instruments: Modified Functional Ambulation Category MFAC (walking ability), 10-metre walk test (gait velocity), Rate of Perceived Exertion RPE (subjective perception), Modified Rivermead Mobility Index MRMI (activity level) and Berg Balance Scale BBS (postural control). One
patient was also assessed using the built-in program in Lokomat to measure the lower limbs spasticity and isometric muscle force.

**Result**

After training, all 3 patients demonstrated improvements in their walking ability (MFAC) and activity level (MRMI). They also perceived much easier when performing overground walking (RPE). Improvements in gait speed (increased 57-143%), level of assistance needed (decrease number of assistants), postural control (transfer, unsupported sitting and standing balance), spasticity (decreased up to 67%) and muscle strength (increased up to 4-fold) in bilateral lower limbs were evident. Conclusions: All 3 patients with motor incomplete SCI improved their walking ability significantly after RAGT. The absence of controlled conditions in current study may limit the identification of a causal relationship between the observed clinical changes in rehabilitation outcome and the use of RAGT. A large scale longitudinal study, probably with an extended follow-up period, would be essential to further investigate the effect of RAGT in rehabilitation outcome of different neurological patients.