A NOVEL MODEL OF OUTPATIENT REHABILITATION INCORPORATING ADVANCED REHABILITIATION TECHNOLOGY INTO A NON-PROFIT CLINICAL ENVIRONMENT: A CASE REPORT

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Introduction / Background

One of the greatest challenges facing individuals recovering from a spinal cord injury (SCI) upon discharge from rehabilitation is access to resources that will promote continued recovery. These resources can include clinical expertise, advanced rehabilitation technologies and the financial constraints often associated with both.

A unique clinical program was developed to overcome these potential barriers to recovery. This program provides free or low-cost ongoing therapy utilizing typically cost-prohibitive rehabilitation technology such as whole-body vibration and robotic exoskeletons.

This case report describes the therapeutic program of an individual with incomplete SCI that integrated traditional physical therapy interventions with use of advanced rehabilitation technologies.

Case Presentation and Timeline

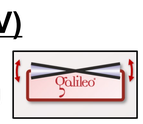
The patient described in this case report is a 34 year old man who he was very active with outdoor activities such as hiking, skiing, and kayaking. He sustained an L2 fracture from a kayaking accident with subsequent incomplete SCI (NLI: L1; AIS-C).

The patient received spinal stabilization surgery and participated in approximately 6-week of rehabilitation. Approximately 10-weeks after SCI, the patient entered the non-profit outpatient therapy program with a goal of returning to walking. The patient received therapy 1-3 times per week for 18 months.

Rehabilitation Technology

Whole-body vibration (WBV)

- Galileo® Delta A tilt table
- Side-alternating vibration training
- Vibration frequency 5 – 27Hz
- Variable amplitude based on foot placement

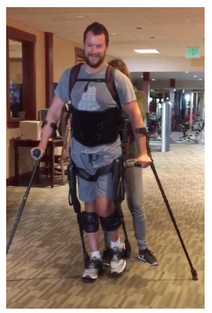


Wearable robotic exoskeleton

- Ekso Bionics Ekso®
- Fully powered motors at bilateral hips and knees
- Adaptive-assist mode adjusts motor output based on user capacity
- Requires PT supervision

Treatment Focus and Assessment

At the start of the program, the patient required a manual wheelchair for all mobility (WISCI-II = 0). Lower extremity motor score was 13/50. Initial strength for right (R) and left (L) lower extremity musculature was as follows: hip flexion 2/5 (R), 1/5 (L); hip extension 1/5 bilaterally; knee extension 3/5 (R), 0/5 (L); plantar flexion 2/5 bilaterally; and dorsiflexion 2/5 (R), 0/5 (L).



Therapy sessions consisted of lower body and core strengthening, flexibility, and functional training. Additionally, WBV was utilized to enhance muscle recruitment and range of motion. This was initially performed on a tilt table and progressed to a platform which developed balance function. Gait training was initiated using the Ekso 1.1 robotic exoskeleton. As the patient regained walking function, overground gait training was added with appropriate assistive device.

Follow-up and Results

At the conclusion of the therapeutic program, the patient had significant improvements in lower extremity strength, gait and functional activities. All lower extremity strength improved to 4/5 with the exception of left knee extension (3+/5) and left dorsiflexion (1/5).

Walking function progressed to a current function of independent walking without assistive device or orthosis (WISCI-II = 20) at a speed of 0.8m/s for 800meters. Additionally, the patient is able to negotiate stairs with reciprocal pattern with use of 1 handrail and has returned to recreational activities including downhill skiing.

Discussion and Significance

Providing access to the resources of clinical expertise and advance rehabilitation technology resulted in dramatic improvements in functional recovery for the patient presented in this case report. Gains in lower extremity strength and gait function were greater than anticipated based on current literature. Use of whole body vibration combined with gait training with a wearable robotic device offers a unique training paradigm with potential for improving recovery during the subacute period following incomplete SCI.

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