Beneficial effects of robotic exoskeleton-assisted gait training in a hemiplegic cervical cord injury patient

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Objective: Spinal cord injury (SCI) results in various problems such as standing or walking issues, cardiovascular diseases and respiratory problems. There have been few studies on the gait pattern and cardiopulmonary function in chronic SCI patients trained with powered robotic exoskeleton. We report the changes of gait pattern and cardiopulmonary function in a chronic incomplete cervical SCI patient who was trained using the new powered robotic exoskeleton. Case description: A 57-year-old male chronic incomplete cervical SCI patient participated in the study. He was able to walk about 10 m using Q-cane. His gait pattern was more like that of hemiplegic patient. Muscle strength of the right upper and lower limbs was good and that of the left upper and lower limbs was poor. We put him through conventional rehabilitation and robotic exoskeleton-assisted gait training program (REP). REP was done five times a week, for 30 minutes per session, for 6 weeks. REP consisted of sit to stand, stand to sit and overground walking on the flat aisle, while wearing Angelegs (SG-Robotics, Seoul, Korea). The gait speed was fit to the patient`s pace. Functional changes were assessed by Manual Muscle Test, Korean-Modified Barthel Index, Functional Ambulatory Category, 3D dynamic posturography, 10-meter walking test, Timed up and go test, and 3D gait analysis before and after training. At the time of gait analysis, the patient walked wearing portable gas analyzer to measure VO_2 and MET. After 6 weeks of treatment, balance function somewhat improved and gait speed was slightly faster than before. Peak MET and peak VO_2 decreased during the test. Conclusion: Robotic exoskeleton would be a useful gait assistive device in incomplete SCI patients. Decreased peak VO_2 and peak MET during the test mean that the patient performed the same activity with less effort and cardiopulmonary function was improved.