재활보조기구

게시일시 및 장소 : 10 월 19 일(토) 08:30-12:30 Room G(3F)

질의응답 일시 및 장소 : 10 월 19 일(토) 11:00-11:30 Room G(3F)

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Effectiveness of Robotic Exoskeleton Gait Training in Guillain-Barré Syndrome: A Case Report

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Objective

Guillain-Barré syndrome (GBS) is a peripheral neuropathy (PN) characterized by rapid progressive bilateral motor weakness. Some GBS patients have permanent disability. Motor weakness makes it difficult to live an independent daily life and worsens the quality of life. Thus, it is important to serve continuous rehabilitation for the patients with motor weakness. These days robot-assisted gait training is gaininig popularity because of easy accessibility. However, most studies on the robotic rehabilitation have been carried out in patients with central nervous system injuries such as stroke and spinal cord injury. Few studies have been conducted in PN patients. Especially, researches on robotic rehabilitation using powered robotic exoskeleton are very few in GBS patients. We report therapeutic outcome of robotic exoskeleton-assisted gait training (REGT) in a GBS patient.

Case description

An 80-year-old man who was diagnosed with GBS 6 years ago visited our clinic. He complained of gait disturbance with motor weakness and postural instability. Muscle strength of both lower limbs was good (MRC grade 4). He walked without any assistance under supervision, but walking a long distance was difficult. Contracture was not displayed in both lower limbs. He reported mild both knee pain due to early osteoarthritis. He was well informed of this clinical study and voluntarily participated in this REGT program. The training program was carried out 30 minutes a session, 3 sessions a week, total 24 sessions for 8 weeks on an outpatient basis. REGT program consisted of sit to stand (5 minutes), stand to sit (5 minutes), and over-ground walking on a flat hallway (20 minutes), while wearing Angelegs (SG-Robotics, Seoul, Korea), i.e., a kind of robotic exoskeleton. Gait speed was fit to the patient's pace. A physical therapist evaluated the functional outcomes of the patient before training, after training, and at 4 weeks after the end of REGT program. He did not tell any adverse events during the program. The standard forward-backward and medial-lateral deviations measured by 3D dynamic posturography system (TecnoBody, PRO-KIN system, TecnoBody Srl, Dalmine BG, Italy) decreased after training (Table 1). According to the kinematic data of gait analysis, angles of hip and knee extension were

increased during stance phase in both sides. Angle of ankle dorsiflexion was also increased during total gait cycle in both sides (Figure 1). The training effects lasted until 4 weeks after the end of the program. Mean VO2 calculated by portable gas analyzer (K4b2, COSMED Srl, Rome, Italy) and energy cost decreased after training.

Conclusion

After REGT program, the kinematic data of our patient approximated to normal gait pattern. Balance function and energy efficiency of gait were also improved. Training effect was maintained until 4 weeks after the end of training, however, long-term follow-up will be needed.

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Table 1. Changes of functional scales

	Before training	After training	4 weeks after training
MMT			
right hip/knee/ankle (MRC grade)	4/4/4	4/4/4	4/4/4
left hip/knee/ankle (MRC grade)	4/4/4	4/4/4	4/4/4
Balance			
opened eyes			
standard forward-backward deviation (mm)	7	2	2
standard medial-lateral deviation (mm)	6	1	1
closed eyes			
standard forward-backward deviation (mm)	13	7	7
standard medial-lateral deviation (mm)	14	6	7
10-meter walking test			
comfortable pace (sec)	11.33	11.31	11.29
fast pace (sec)	8.89	8.89	8.78
Timed up and go test (sec)	12.44	12.41	12.44
Energy expenditure			
mean VO_2 (mL/Kg/min)	12.36	12.00	14.06
energy cost (Kcal/min)	3.6	3.5	4.1

MMT: manual muscle test, MRC: medical research council, VO_2: Oxygen consumption

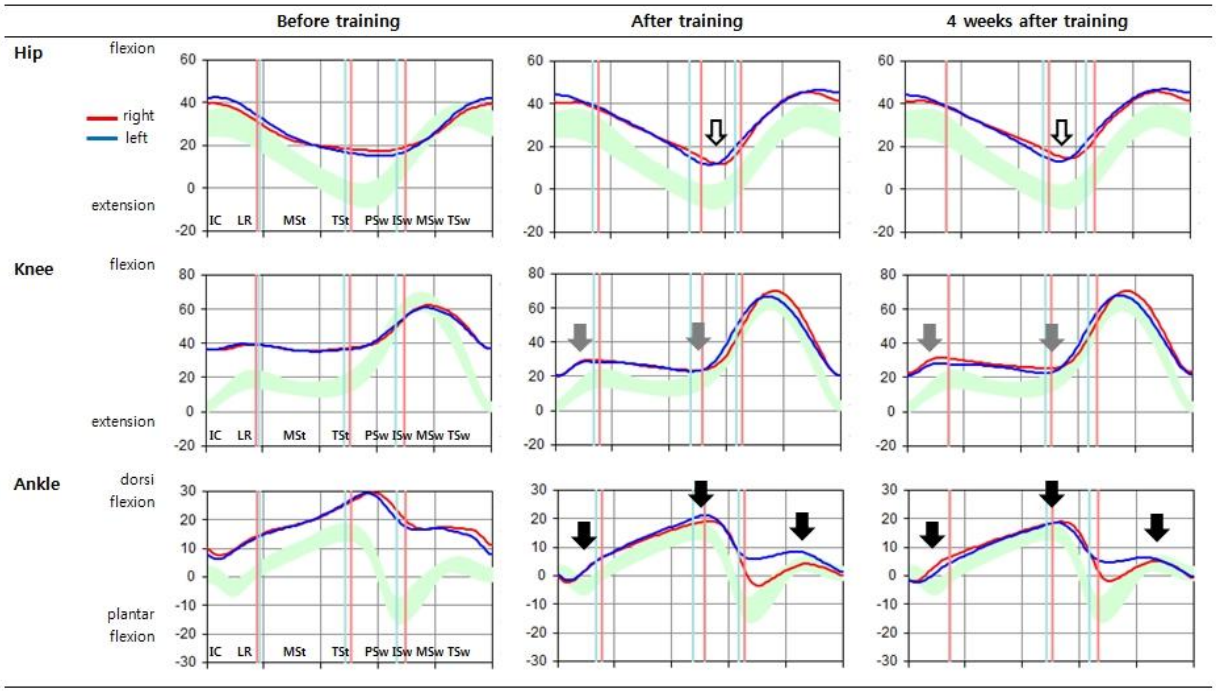

Figure 1. This figure shows the kinematic data of gait analysis. After 8 weeks of robotic exoskeleton-assisted gait training, angles of hip (white arrow) and knee (gray arrow) extension were increased during stance phase in both sides. Angle of ankle (black arrow) dorsiflexion was also increased during total gait cycle in both sides.