P-57

Application of Gait Training Robots According to the Functional Level of Guillain-Barré Syndrome

Tae Soo Lee[1], June Sung Lee[2], Dong Yeong Kim[2], Hyeok Jun Seo[2] , Ha Ra Jeon[1*]

[1]Department of Physical Medicine and Rehabilitation, National Health Insurance Service Ilsan Hospital

[2]Department of Rehabilitation Center, National Health Insurance Service Ilsan Hospital

Introduction

Gait training robots can be categorized into exoskeleton-type, end-effector-type, and wearable-type devices. Robot-assisted gait training (RAGT) has been increasingly used in neurological rehabilitation and is known to be beneficial for patients with Guillain-Barré syndrome (GBS) who experience gait impairment. In clinical practice, however, the therapeutic role and physical demands of each robotic system differ according to the patient's gait ability, trunk control, and balance function. Therefore, selecting an appropriate gait training robot according to the patient's functional level is an important part of effective rehabilitation. Despite this clinical need, there is still no practical framework for determining which type of gait training robot is most appropriate for patients with GBS at different stages of gait recovery. This study aimed to suggest the appropriate application of gait training robots according to the functional gait level of patients with GBS.

Methods

Three types of gait training robots were used according to the patients' functional level: the exoskeleton-type Walkbot, the end-effector-type Morning Walk, and the wearable-type Angel Legs (Fig. 1). Each device has different characteristics in terms of fixation, body-weight support, and balance demand during gait training. The patients' functional level was classified using the Functional Ambulation Categories (FAC) and the Berg Balance Scale (BBS). These measures were used to estimate ambulatory dependency, postural control, and the degree of support required during RAGT. A total of 24 patients with GBS who received RAGT were reviewed, and the applicable gait training robots were summarized according to their functional level. Rather than focusing on a single robotic device, we examined how different robotic systems could be applied across the rehabilitation process depending on gait recovery.

Fig. 1. The gait training robots. (a) Exoskeleton-type Walkbot, (b) End-effector type Morning Walk, (c) Wearable type Angel Legs

Results

A total of 10 patients used Walkbot, 12 used Morning Walk, and 2 used Angel Legs. Patients who used Walkbot showed FAC levels of 0 to 1, with a mean BBS of 4.5. Patients who used Morning Walk showed FAC levels of 1 to 3, with a mean BBS of 7.9. Patients who used Angel Legs showed FAC levels of 2 to 3, with a mean BBS of 22.5. Walkbot was considered suitable for patients with FAC 0 to 1. If the patient was able to control the trunk to some extent, Walkbot could provide gait experience even when lower-limb strength was nearly absent. Morning Walk and Angel Legs were applicable mainly in patients with FAC 1 to 3. In particular, when body-weight support during Morning Walk training was consistently less than 10%, the gait training robot could be transitioned to Angel Legs. However, because Angel Legs is a mobile wearable robot, it required a higher level of balance ability than fixed robotic systems such as Walkbot or Morning Walk.

Conclusion

This study suggests that the applicable range of gait training robots in patients with GBS differs according to functional gait level. Exoskeleton, end-effector, and wearable-type robots may be used continuously across the rehabilitation process. Selecting the gait training robot according to FAC, BBS, trunk control, and body-weight support requirement may help provide more appropriate and progressive gait training for patients with GBS. These findings may be useful in guiding practical robot selection during different stages of recovery. Further studies are needed to establish more precise functional criteria and practical training protocols for selecting gait training robots in patients with GBS.