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A retrospective comparison study of training effects of Locomat and Walkbot in acquired brain injury

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Objective

Two robotic exoskeletons, Lokomat and Walkbot are designed to provide active-assistive gait training by guidance and actuation of the leg movement. Lokomat has two actuated joints for hip and knee flexion, whereas Walkbot system is modulated by three actuated joints for hip, knee and ankle joints, bilaterally. The aim of this study is to investigate whether there are comparative effects on the motor recovery, balance and gait between Lokomat and Walkbot.

Methods

The clinical data warehouse was used for a retrospective comparative analysis. We reviewed the electronic medical records and analyzed Manual Muscle Testing (MMT), Fugl-Meyer Assessment (FMA) of lower extremity, Postural Assessment Scale for Stroke Patients (PASS), Berg Balance Scale (BBS), 10-Meter Walk Test (10MWT), 6-Minute Walk Test (6MWT), Timed Up and Go test (TUG), Functional Ambulatory Category (FAC), Fuctional Gait Assessment (FGA), and the Korean Version of Modified Barthel Index (K-MBI)) of 85 patients with acquired brain injury who received robot-assisted gait training (RAGT) on the Lokomat (Hocoma AG, Volketswil, Switzerland) or Walkbot (P&S Mechanics, Seoul, Korea) for the period of about 2 years. Moreover, subjects were stratified using the FAC score into dependent ambulatory (FAC 0~2) and independent ambulator group (FAC 3, 4) for futher analysis.

Results

Onset age, sex, paralysis type, etiology, cognitive function, lag time to the intervention, baseline function were similar across groups. 44 and 41 patients received Lokomat and Walkbot assisted gait training, respectively, for 30 minutes, once a day, 2 to 3 times a week, for a total of 8 to 36 sessions. In total 85 subjects, both interventions showed beneficial effects in MMT on lower extremity, K-MBI scores on stair climbing, walking, transfer, and the total score, scores on BBS, PASS, FGA, and FAC in each group. Among them, only PASS showed significantly more beneficial effects in Walkbot group than Lokomat group ($p<0.05$). In the dependent ambulatory group, both Lokomat and Walkbot significantly improved MMT, MBI, PASS, BBS, FAC, FGA, and 6MWT ($p<0.05$). Walkbot group showed significantly more increase on PASS score than the Lokomat group ($p<0.05$). As to the independent ambulatory group, BBS, 10MWT, and total K-MBI scores showed significant improvement in both intervention groups ($p<0.05$). However, no comparative beneficial effectiveness was demonstrated between the exoskeletons.

Conclusion

In this study, both Lokomat and Walkbot have beneficial effects in the balance and gait recovery in patients with acquired brain injury. Our investigation demonstrate that, of two robotic exoskeletons, there is no superior locomotor training intervention for motor recovery, balance and gait, but for PASS. Elucidation of these even therapeutic benefits in the robotic exoskeletons provides new insights into the robot-assisted locomotor training.