Robotic-assisted treadmill therapy in adolescents with cerebral palsy: cases review

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Keywords:
Robotic
Robotic-assisted treadmill therapy
cerebral palsy

Introduction
Recent studies demonstrated that robotic-assisted treadmill therapy improves walking or locomotor performance in children and adolescents with central gait impairment, including those suffering from cerebral palsy, brain or spine arteriovenous malformation (AVM), Guillain-Barre Syndrome and traumatic brain injury. Current concepts of motor learning assume that repetitive task-specific practice can significantly improve motor function, based on the principle of enhancing neuroplasticity. With the opening of Integrated Neurological Rehabilitation Center (INRC) in Princess Margaret Hospital (PMH) in 2014, a DGO (driven gait orthosis) Lokomat was installed for the gait rehabilitation of patients.

Objectives
To study the effectiveness of robotic-assisted treadmill therapy on the locomotor function of adolescents with central gait impairment.

Methodology
Three adolescent participants (aged 13 to 18), two with cerebral palsy (Gross Motor Function Classification Levels, GMFCS, I and III) and one with AVM spine (GMFCS IV), completed 18 sessions (30 minutes each, twice per week) of robotic-assisted treadmill therapy using the DGO Lokomat. Outcome measures were the Gross Motor Function Measure (GMFM) dimensions D (standing) and E (walking), walking speed (10 meter walk), walking endurance (6 minutes’ walk), lower limb (LL) muscle tone (Ashworth Scale), LL passive range of motion, anti-gravity LL strength and clinical gait analysis (observational gait score).

 Result
Results All cases showed progress in walking endurance, reduction in LL spasticity
and increase in LL passive range of motion; in addition to these, the standing function, LL strength and gait pattern for diplegic GMFCS I case; the LL strength for diplegic GMFCS III case; and the standing function, walking speed and GMFCS level for the AVM case; also showed improvements. Conclusion & Outcomes It concluded that robotic-assisted treadmill therapy is effective in enhancing the locomotor function of adolescents with cerebral palsy or AVM spine. The therapy is suggested to supplement other spasticity management methods, such as Botox injection and intrathecal Baclofen. It may also help strengthen the LL strength for the post-selective dorsal rhizotomy cases. Up till now, there is no standardized protocol of this therapy. It is worthwhile to study further on the therapy's effectiveness with increased training frequency and/or longer session duration. Moreover, future investigations are suggested to assess the usefulness of this therapy on the gait rehabilitation of pediatric patients with a wider range of ages and with more different varieties of diagnosis.