소아재활

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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Feasibility of robot assisted gait training using G-EO for children with brain lesion ; pilot study

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introduction

Children with brain lesion shows characterized motor impairment such as muscle weakness, spasticity, selective motor control that cause gait disturbance. Robot assisted gait training is widely used for patients with neurologic deficit to improve gait pattern. The result obtained by the meta-analysis suggest that the training benefits people with CP, specifically by increasing walking speed, endurance and improving gross motor function. But, most of this studies used exoskeletal type, and only one study used end effector robot called Gait trainer I. End effector type of gait assist robot is easier to wear than exoskeletal gait trainer and provides mechanically variable walking pattern with less precision. this can be more naturalistic gait training. In this study we assessed feasibility of robot assisted gait training using G-EO for children with brain lesion.

Method

Participants were recruited from one rehabilitation center in Seoul. Study inclusion criteria were 1) age from 3 to 18 years old, 2) height taller than 90cm, 3) able to understand commands, and 4) in GMFCS level I to IV. We excluded children who received botulinum toxin injection within 6 months, or underwent orthopedic surgery or neurosurgery within 12 months. We used G-EO system. Subject's feet are strapped to independent pediatric foot plates moving along a gait-like trajectory that can be adjusted by the therapist in range and velocity while allowing unconstrained movement of knees and only harness related contraint to the hips. All children participated was checked height, weight, shoe size, GMFM-66, MMT, MAS.

Results

From December 2018 to June 2019, total 6 children participated in this study. 4 out of 6 children dropped out from this study. characteristics and drop out reason is on table 1.

Discussion

Patient 5 dropped out because of the small shoe size smaller than 200mm. GEO is designed for adult and pediatric patients and the foot plate is switchable between adult and pediatric foot plate. Even if we used pediatric foot plate for children, the strap could

not hold children's shoe under 200mm in the proper position which results in ineffective knee and ankle motion. Patient 6 case has severe spasticity on adductor, biceps femoris, quadriceps femoris, GCM checked 3 by MAS scale. We couldn't derive patient 6 knee in flexion and ankle in dorsiflexion safely since G-EO makes lower extremity pattern with less precision compare to exoskeletal type of gait assist robot. Because of high risk of bone fracture and fall down the training was stopped in 1 session. 2 out of 6 dropped out due to low extremity pain. Whether G-EO reproduces more pain than exoskeletal type of robot is unclear. Large number study is needed to find relationship between pain and GEO.

Conclusion

Small shoe size and severe spasticity may prevent children from applying robot assisted gait training using G-EO for children with brain.

figure 1. pediatric foot plate

figure 2. picture of G-EO system

table 1. characteristics and drop out reason of children of robot assisted gait training

patient	Diagnosis	Age (yr)	sex	Height (cm)	Weight (kg)	shoe size (mm)	GMFCS	GMFM	Lower extremity MMT	Lower extremity Spasticity (MAS)	Reason for dropout (dropout session)
1	CP	11	M	133.5	42.1	210	3	63.33	F	1	Knee pain (2)
2	CP	10	F	131.5	28.6	210	3	65.33	F	1	Knee pain (1)
3	CP	9	F	112	20.1	200	3	55.62	P+	1	-
4	CP	14	M	140	39.5	220	3	60.39	P+	1	-
5	CP	5	M	103.4	17.2	150	3	48.97	P	1+	Small shoe size (1)
6	CP	7	M	104.3	16.5	160	3	48.09	F	3	Severe spasticity (1)