Department of
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Robot – assisted therapy integrated with virtual reality for rehabilitation of hand function after stroke: a clinical case study

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Case Diagnosis

The patient, F.M., was a 68-year-old female with left hemiparesis (mainly distal paresis of the left upper arm) secondary to a right hemispheric stroke occurred 8 months prior to examination.

Case Description (1)

- A customized rehabilitative intervention with *Gloreha*® hand rehabilitation glove in a chronic stroke patient
- Outpatient setting:
  - 5 sessions of 25 minutes each per week (4 weeks)
  - *mirror box therapy* [1] (daily)
  - physical therapy (2 sessions/week)

- No transcranial magnetic stimulation (EEG: irritative signs)
- No botulinum toxin injections
- Clinical outcomes measured by the same operator before and after 20 sessions of robotic therapy

1. Wu CY, Huang PC, Chen yT, Lin KC, Yang HW. Effects of Mirror Therapy on Motor and Sensory Recovery in Chronic Stroke: A Randomized Controlled Trial. Arch Phys Med Rehabil. 2013 Jun;94(6):1023-30

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Case Description (2)

Physical examination before treatment:

- mainly distal paresis of the left upper arm
- hypertonia of elbow, wrist and fingers flexors
- proprioceptive deficits
- mild cognitive impairment

Measures [2]		Before	After 4 wks
m-Ashworth	Wrist flexors	2/4	**1/4**
	Flexor digitorum superficialis	2/4	**1/4**
	Flexor digitorum profundus	1/4	**0/4**
MRC	Wrist flexors	3/5	**4/5**
	Flexor digitorum superficialis	3/5	**4/5**
	Flexor digitorum profundus	2/5	**4/5**
	Flexor pollicis longus and brevis	2/5	**3/5**
	Extensor digitorum communis	1/5	**3/5**
	Thumb to index pinch grip	1/5	**3/5**
Chedoke – McMaster Stroke Assessment Measure	Arm	5/7	**6/7**
	Hand	3/7	**4/7**
Motricity Index		49/100	**72/100**
Wolf Motor Function Test		30/85	**52/85**
Fugl – Meyer (Upper extremity motor function)		23/66	**43/66**
Action Research Arm Test		14/57	**25/57**
Barthel Index		80/100	**90/100**
Stroke Specific Quality of Life Scale		120/260	**180/260**
Mini Mental Status Examination		24/30	**24/30**

2. Kwakkel G, Kollen BJ, Krebs HI. Effects of robot-assisted therapy on upper limb recovery after stroke: a systematic review. Neurorehabil Neural Repair. 2008;22(2):111-121

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Discussion

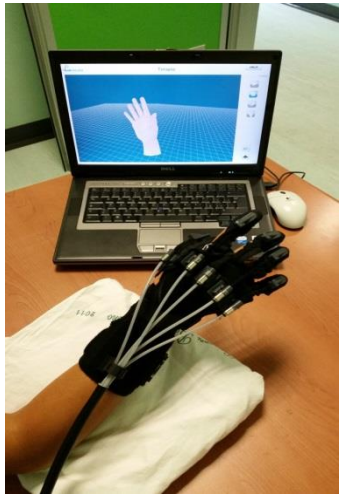
Gloreha® hand rehabilitation glove:

- exoskeleton device

- high intensity repetitive and customizable sensorimotor robotic training

- single and synchronous mobilization of the metacarpophalangeal and interphalangeal joints (counting, grasping, pinching, sequential exercises)

- movement of the hand associated with digitally enhanced visual and auditory feedback to deliver sensory reinforcement



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Conclusions

According to previous research[3], robotically-assisted integrated rehabilitation devices may affect short - term functional recovery after stroke with additive effects relative to conventional therapy in patients with chronic stroke.

Improving proprioception
motor planning
neuroplasticity

Reducing spasticity

Preventing damage due to immobilization

Robotically facilitated rehabilitation program for our chronic stroke patient: short-term improvements of upper extremity function

No complications

High patient compliance

➡ Further steps

Recruitment of acute and sub – acute stroke patients

Home therapy

Design of a new study

Thank you

3. Chang WH, Kim YH. Robot – assisted therapy in stroke rehabilitation. J Stroke 2013 Sep;15(3):174-81