

Combination of Lokomat Therapy and FES on SCI person - Case Study

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- × **Services: PT, OT, SLT, PSC, MD, SW, ATT**
- × **Main categories of health conditions: Stroke, Spinal Cord Injury, Brain Injury, Cerebral Palsy, Spina Bifida, Muscle dystrophies**
- × **Cooperation among specialists and customers**
- × **Evidence based therapy and common surveys with university**

Aim of the Study

- **To evaluate the effectiveness of robot-assisted gait therapy and Functional Electrical Stimulation**
- **Hypothesis: intervention will increase muscle strength and functioning level of the gait midstance with chronic incomplete spinal cord injury patient**

Case Study Subject

- **34 year male**
- **4 years Post-traumatic SCI client**
- **Luxation on Th 12 and fracture of L1**
- **Paraparesis of lower extremities**

METHODS

- **Locomat robot-assisted gait therapy**
10 time per months ´a 45 minutes, during 7 months.
- **FES stimulation to**
M.Quadriceps, M. Gluteus Maximus, M. Semimembranosus.
3 times per week, ´a 30 minutes, during 3 months
- **Alternatively performed therapeutic exercising for**
improving patient´s trunk balance reactions and muscle strength

timescale

Case study performed from May 2009 to May 2010

Lokomat System



- The orthosis is position controlled
- The patient's legs are guided according to a pre-programmed physiological gait pattern.
- The computer controlled guidance allows individual adjustments of different gait parameters.
- Computer controlled drive are integrated in the gait orthosis at each hip and knee joint.

Lokomat System

- Force transducers at the joints measure the interaction between the patient and the Lokomat-Robotics
- The drives are precisely synchronized with the speed of the treadmill
- Hip and knee joint angles are controlled by software to achieve a physiologically meaningful gait pattern

FES

Functional Electric Stimulation

- is a method of transcutaneous (skin surface placed electrodes) low-level electrical currents to restore or improve functions
- FES is portable device that patient can use by himself during everyday activities inside and outside for restoring gait pattern (DF)
- **Emphasise on the word “functional”!**

FES

Functional Electric Stimulation

- FES stimulation to M. Gluteus Maximus, M. Semimebranosus and M. Quadriceps for stimulation midstance and terminal stance of gait

FES is a method of applying low-level electrical currents to the body to restore or gain muscle activity and contractions

FES

Functional Electric Stimulation



- Stimulation to M. Quadriceps

FES is a method of applying low-level electrical currents to the body to restore or gain muscle activity and contractions

RESULTS

- Muscle strength showed improvement 19.74 % (left) and 13.88 % (right) on M. Quadriceps.
- Accordingly maintained time for full extension of hip in midstance was from 0 to 21 seconds.

RESULTS



- Domain by International Classification of Functioning Disability and Health (ICF)

- Body transfers (ICF, b730-b749) from sitting to standing position were performed without assistance vs constant assistance before intervention

RESULTS

- In urinary functions (ICF, b610-b639) domain there was demonstrated improvement in sensation about urine genesis.
- Change in Activity/Participation from severe difficulty 95 % to average difficulty 50 %.

RESULTS

- Pressure sore risk on the tuberositas area decreased bilaterally during research by Braden Scale from „High risk“ (6-10 points) level to „Low risk“ (20-23 points) level.

RESULTS



Muscle strength showed improvement , considerably in eccentric and on average in contcentric muscle activities

CONCLUSION

- Combination of Robot-assisted gait and FES stimulated intervention has effective influence on patient`s ability to gain more functional gait pattern even after 4 years post-traumatic SCI stage.

CONCLUSION

Robot-assisted and FES combined gait therapy:

- increases trunk muscles activity
- increases reciprocal contractions
- improves general ability for better functioning during gait midstance and terminal stances

CONCLUSION

- **Combination of Lokomat Therapy and FES**
improves SCI patients life quality
improves Activity / Participation and
Activity Daily Life (ADL) skills.

Thank You for Your Attention

