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

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 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%.
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 concentric 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 gate 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