

Workshop:

Functional Electrical Stimulation of Denervated Muscles

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Functional Electrical Stimulation (FES) of denervated muscles has long been regarded as generally insufficient, only some limited capability of slowing down degenerative processes in muscle tissue with lost nerve supply has been attributed to application of sequences of long-duration triangular stimuli (known as "Exponential Current") via skin attached electrodes. After growing evidences that more effective direct muscle stimulation is possible with appropriate stimulation patterns, this question was addressed on a broader basis in the European Research and Development Project "RISE", that was focused to individuals with flaccid paraplegia with clinically complete denervation of both lower extremities, but also included basic research in animal studies. Deliverables of RISE were validated clinical guidelines for maintaining intact or retraining degenerated denervated muscles and equipment for stimulation and assessment of muscle status for intervention planning and monitoring. The method provides effective prophylaxis against pressure sores and osteoporosis, and opens new exercising means for effective cardiovascular fitness for persons with flaccid paraplegia.

The developed methods for maintaining denervated muscles after peripheral nerve damage can also serve as an important tool for supporting long-lasting nerve recovery processes or reconstructive nerve surgery, e.g. in case of plexus brachialis, facialis or recurrent nerve lesion. The method is capable of maintaining muscle in the preparation phase for nerve surgery and for post-surgical maintenance of the muscle as reinnervation targeted.

The workshop will provide a summary on the outcome of RISE with introduction in the methodology, clinical and muscle physiological validation, risks and their management. It will give insight in degenerative developments after muscle denervation, how those can be reversed to a high extend by electrical stimulation and how individual setups and parameters can be configured effectively. In the hands-on part handling of the equipment and application of clinical protocols will be demonstrated in volunteers with spinal cord injury and can be experienced at first hand.