

## Upper and Lower Motoneuron Lesions in Tetraplegia - Diagnostic and Therapeutic Implications of Electrical Stimulation

The application of electrical stimulation has a long tradition in the treatment of people with spinal cord injury to support and improve function and muscle strength and is nowadays an established part of rehabilitation. The technical developments and improvements of the last decades enable to apply electrical stimulation even to tetraplegic patients with lower motoneuron lesions of the upper limbs. This provides new diagnostic and therapeutic options and scientific challenges.

The thesis illustrates in five complementary studies how electrical stimulation can supplement reconstructive tetraplegia hand and arm surgery, particularly nerve transfers. It is demonstrated how electrical stimulation can be used as a diagnostic tool to differentiate upper from lower motoneuron lesions and how a direct muscle stimulation of forearm muscles effects the muscle properties in patients with a lower motoneuron damage. In addition, the effect of electrical stimulation in combination with robotics on the neuromodulation in the lower limbs is theoretically transferred to the upper limbs.

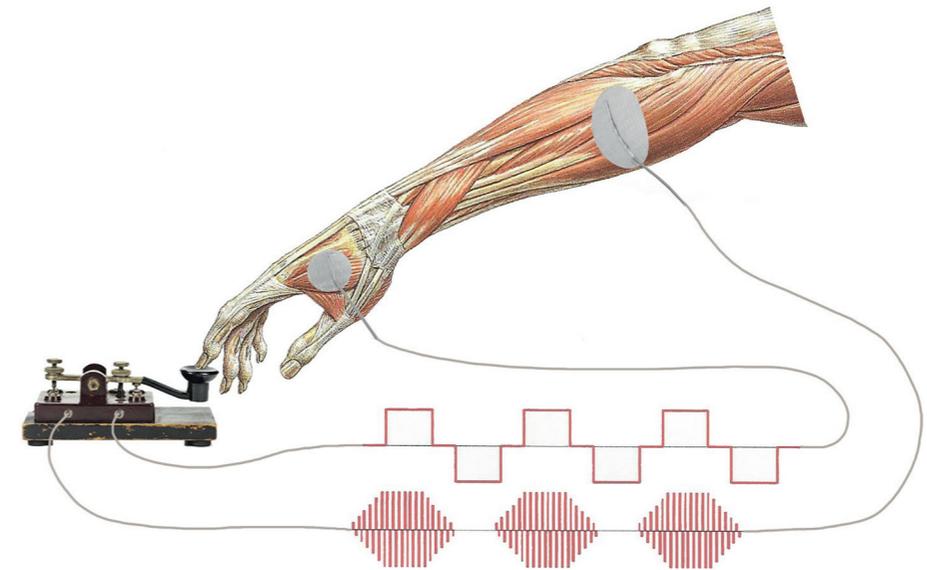


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