IS INTENSIVE NEUROREHABILITATION USEFUL IN CHRONIC SPINAL CORD INJURY: A COMBINED ROBOTIC-TMS APPROACH!

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Introduction. Spinal cord injury (SCI) affects more than 2.5 million people worldwide, often leading to severe disability. Thus, a proper management of individuals with SCI is required either in the acute or in the post-acute rehabilitative phase. Growing evidence is demonstrating the effectiveness of the robot-assisted gait therapy (RAGT) in improving the SCI rehabilitative functional outcomes. On the other hand, it has been shown as neuromodulation can reduce the motor impairment and promote spinal fiber functional restoration in SCI.

Case description. A 31-year-old man, affected by chronic SCI, underwent two different intensive rehabilitation treatments, including either Lokomat_Pro or a paired Lokomat_Pro-rTMS training, with a month of rest between the two sessions. We evaluated the clinical (ASIA, LEMS), kinetic, and electrophysiological (MEP, MUNE) parameters before and after each training session. In particular, the intensive robotic training was articulated in a total of 40 one-hour training sessions

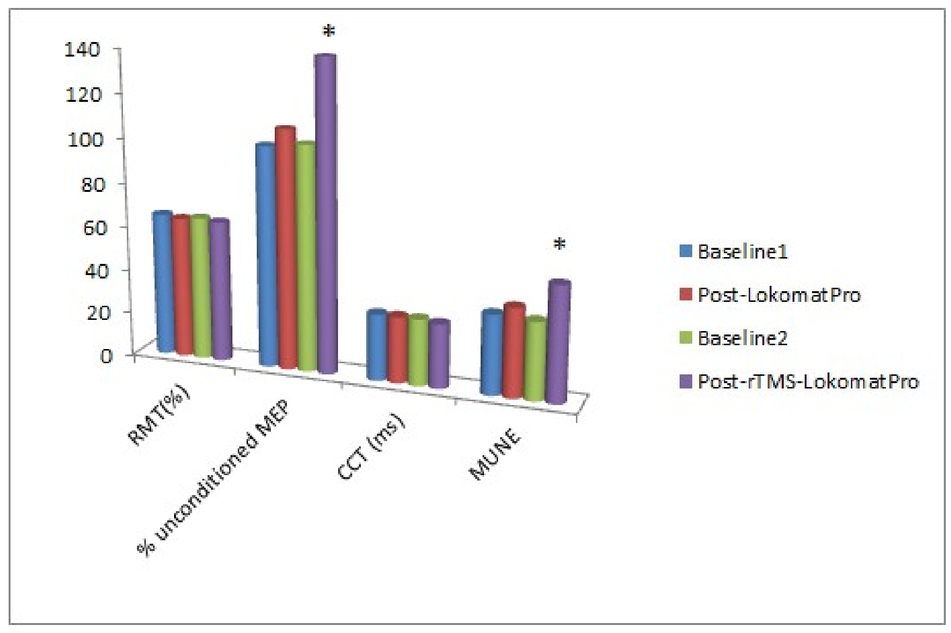
(i.e. 5 times a week for 8 weeks), whereas the rTMS sessions were delivered 3 days per week for 3 consecutive weeks, just before the Lokomat_Pro session. Only at the end of the experimental treatment, we observed an important improvement in nearly all parameters we investigated (table 1, fig. 1, 2, and 3).

Results and conclusions. the combination of rTMS with Lokomat-Pro training induced a significant improvement in nearly all clinical scale scores, MEP amplitude, MUNE, and the other kinetic parameters. The underlying neurophysiologic mechanism may include cell death limitation, cell regeneration, cell replacement, remyelination, and spinal plasticity modulation. We may hypothesize that our rTMS paradigm could have strengthened the RAGT's effects thanks to either direct cortico-spinal or trans-synaptic spinal effects, which could have induced compensatory plasticity mechanisms and recruited stunned or dysfunctional spinal motor-neurons, as suggested by the significant MUNE increase.

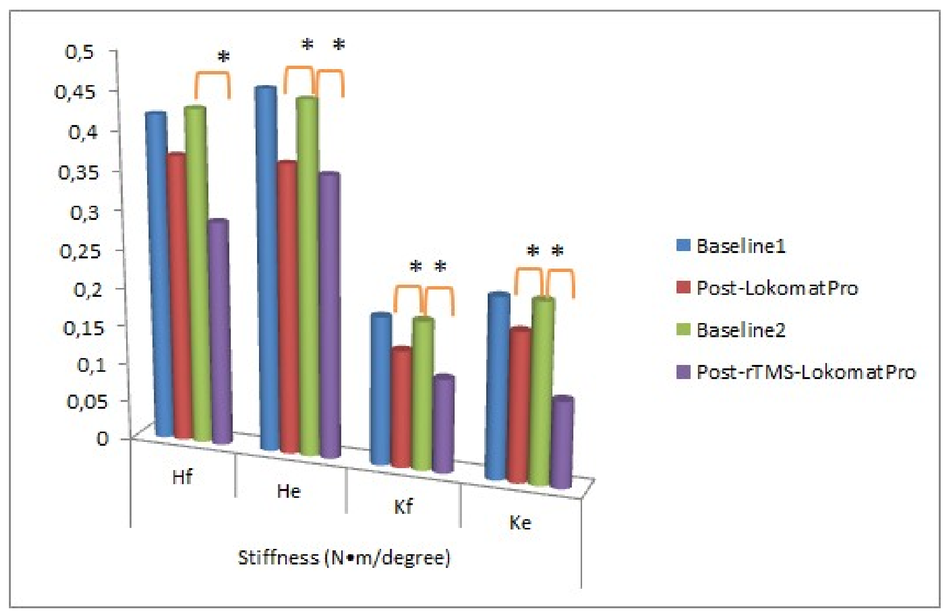
Table 1

Baseline1	**Post-LokomatPro**	**Baseline2**	**Post-rTMS-LokomatPro**
	40 daily sessions 5 times per week 8 weeks		40 daily sessions 5 times a week 8 weeks rTMS during the first 3 weeks at alternating days
C	C	C	D
1,1,1,0,0	2,2,1,0,0	1,1,1,0,0	3,3,3,0,0

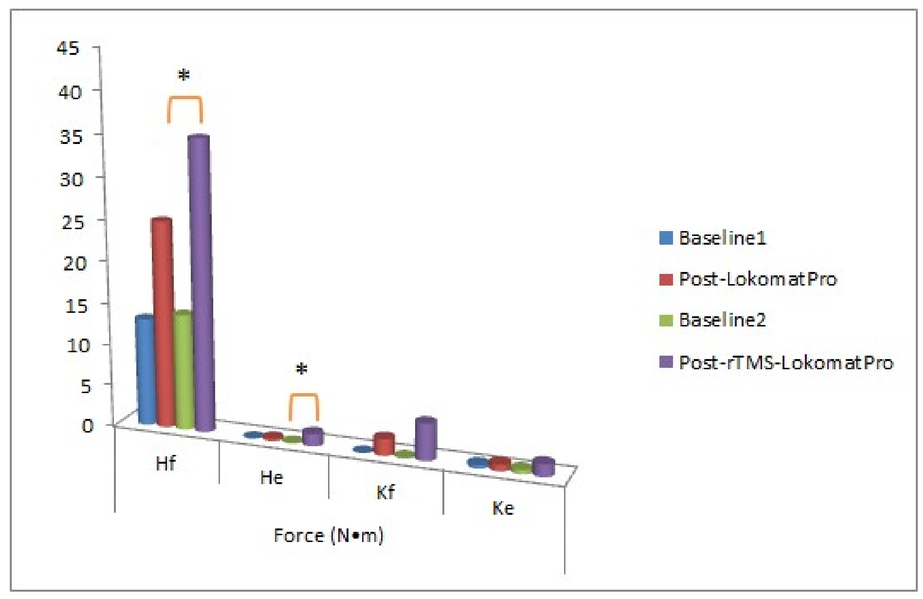
1. Electrophysiological effects



2. Stiffness modulation



3. Force variations



Clinical

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