The effect of neuromuscular electrical stimulation on bowel management in people with chronic spinal cord injury

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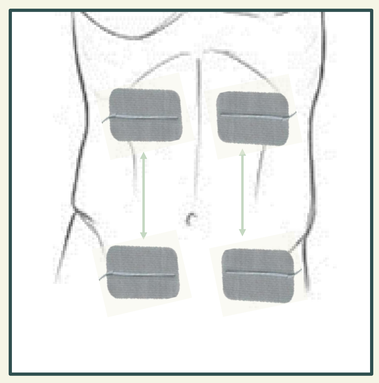
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Introduction

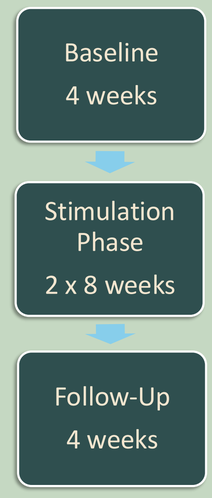
- Spinal cord injury leads to a disruption of the autonomic nervous system
- 14% spend > 1h on bowel management
  → consequences: restriction in social life activities[1] and reduction in quality of life
- Aim of this pilot study: to investigate the effect of 16 weeks of home-based neuromuscular electrical stimulation (NMES) on the defecation time, bowel transit time, neurogenic bowel dysfunction and satisfaction with bowel management in people with chronic SCI (> 2 years)



Methods

- 20 participants with SCI (AIS A-D, neurological level of injury: C5-L3)
- Home-based NMES over the abdominal wall: 40Hz, 300µs, 8s on-4s off, 2s ramps
- Stimulation intensity set above motor threshold
- Duration: 16 weeks for 30 minutes prior to their regularly scheduled defaecation times
- Bowel management protocol & study visits to assess:
  - Defecation time and frequency
  - Bowel transit time
  - Neurogenic bowel dysfunction score (NBDS)
  - Satisfaction with bowel management

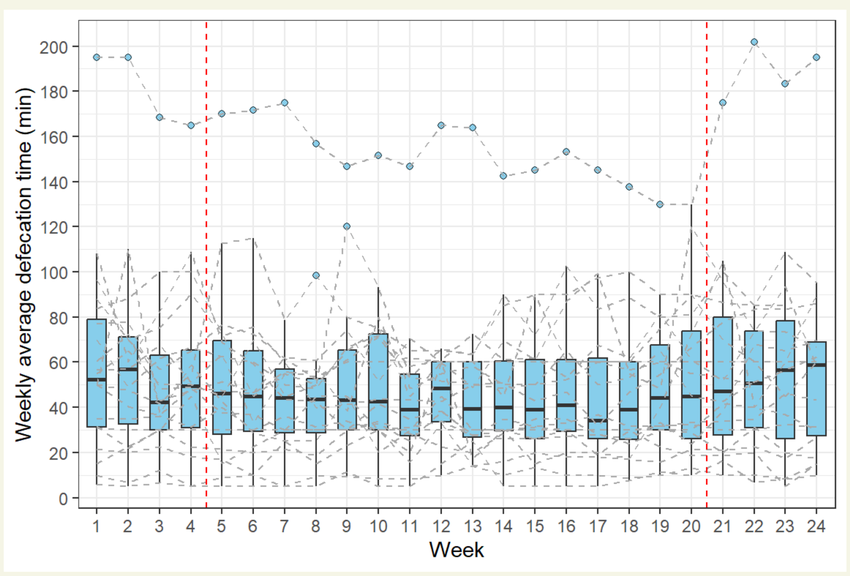




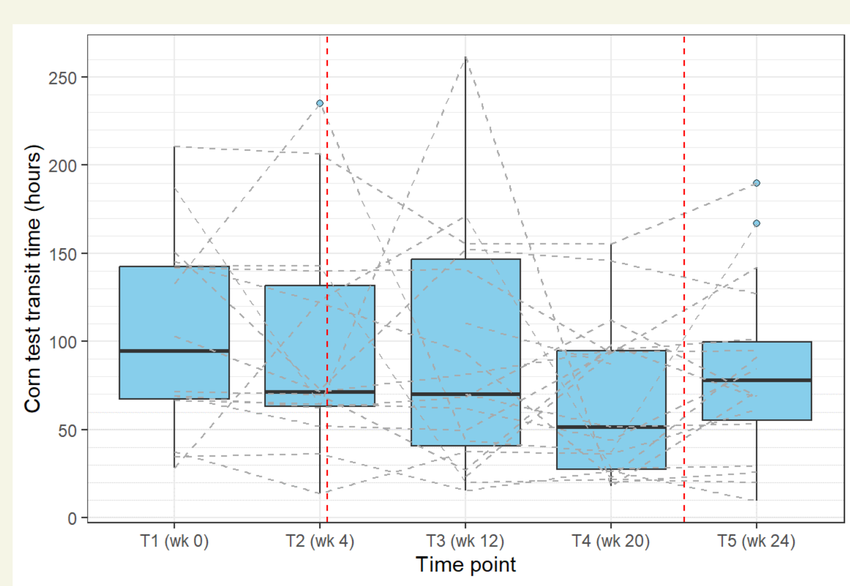
Results

- Mean defecation time decreased by 7.4 min after 8 weeks (95%-CI -11.2 to -3.5, p<0.001) and by 8 min (95%-CI -11.9 to -4.2, p < 0.001) after 16 weeks of NMES
  → afterwards: return to baseline
- Defecation frequency and stool form remained unchanged
- Significant reduction in total bowel transit time: -32.51 hours (p=0.031) after 16 weeks of stimulation
- Level of neurogenic bowel dysfunction remained moderate - severe (14+) while satisfaction increased

Study visit	Mean NBDS (SD)	Mean satisfaction (SD)
T1 (wk 0)	14.37 (6.98)	4.32 (2.16)
T2 (wk 4)	14.84 (5.73)	4.32 (2.47)
T3 (wk 12)	13.55 (5.04)	5.50 (2.31)
T4 (wk 20)	14.40 (6.32)	5.75 (1.94)
T5 (wk 24)	14.55 (6.68)	4.30 (2.36)



Box plot of defecation time averaged per week and patient with individual lines per patient; red dashed lines = start and stop of stimulation.



Box plot of corn test transit time per study time point with individual lines per patient; red dashed lines = start and stop of stimulation.

Discussion & Conclusion

- NMES led to a reduction in total bowel transit and defecation time
- Wide inclusion criteria ➔ large standard deviations
- Many study participants continued NMES after study termination
  → patient satisfaction high despite severe NBD
- Optimal dose of NMES should be investigated in future research projects

References and acknowledgements

[1] Coggrave, M., Norton, C. et al.: Management of neurogenic bowel dysfunction in the community after spinal cord injury: A postal survey in the United Kingdom, *Spinal Cord*, vol. 47, pp.323-333, April 2009.

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