

Optimal neurophysiological parameters in neuromuscular electrical stimulation in the treatment of dysphagia in multiple sclerosis – a pilot study

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Treatment of dysphagia in MS



- Langmore & Pisegna (2015):
 - Evidence for support of swallowing exercises is lacking
- Systematic review of Alali, Ballard & Bogaardt (2016):
 - Limited evidence of dysphagia treatment in MS
 - Some positive results for neuromuscular electrical stimulation and botuline toxin in MS
- tDCS of pharyngeal motor cortex (Restivo et al., 2019)
 - Significant improvement in penetration/aspiration
- Pilot RCT traditional dysphagia therapy in MS (Tarameshlu et al., 2019)
 - Both traditional therapy and posture/diet modifications positive short term effect
 - In traditional therapy group improvement maintained after 6 weeks

Neuromuscular electrical stimulation



Goal is optimal hyoid displacement

Explorative study

- Aim:

To determine the optimal electrode placement and stimulation characteristics of NMES in the treatment of dysphagia in MS



Explorative study



- Inclusion criteria:
 - >18 years of age
 - Diagnosis MS
 - Dysphagia including reduced laryngeal elevation (diagnosed with FEES)
- Exclusion criteria:
 - Other neurological disorder
 - Significant cognitive deficits leading to not being able to give feedback on sensing stimulation or pain

Explorative study

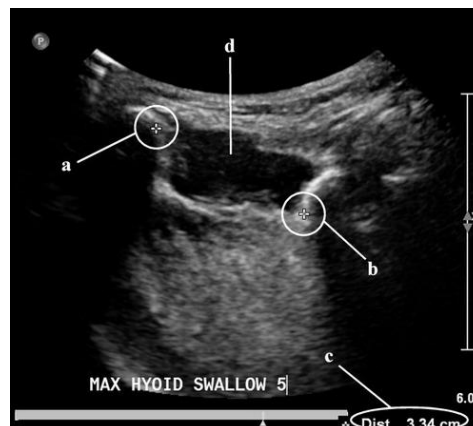
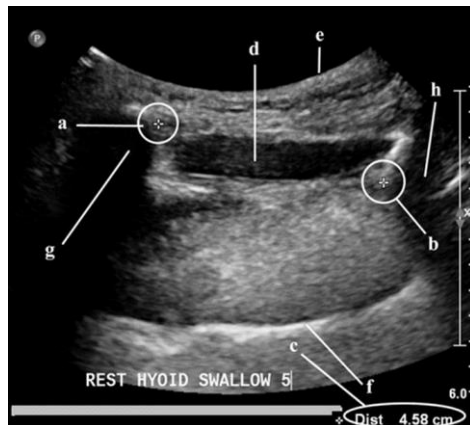
- Clinical data:
 - Type of MS
 - Disease duration
 - EDSS
 - BMI
 - Ultrasonographic measurements



Explorative study



- Parameters:
 - Wave form (Vital Stim vs Tense Current)
 - Electrode placement (suprahyoid vs supra + infrahyoid)
 - Flow direction of the current (cross-section vs longitudinal)
 - Intensity (contraction threshold vs maximal tolerable)
 - Consistency (water vs yoghurt)
- Measured with ultrasonography
 - Distance between mental spine of mandibula and hyoid bone



Source: Macrae et al (2012)

Explorative study



Preliminary results

- Demographic data:

	Patients (n = 27)
Gender (male)	15 (55.6%)
Age (years) – mean; range	58.81; 36-74
MS type <ul style="list-style-type: none">• PP MS• SP MS• Unknown	12 (44.4%) 12 (44.4%) 3 (11.1%)
Disease duration (years) – mean; range	24.15; 3-74
EDSS – median; range	7.5; 5.0-8.5 (n = 25)
BMI – mean; range	26.08; 17.7-36.9



Explorative study

Preliminary results

- Ultrasound measurements:



No stimulation



Stimulation

Explorative study



Preliminary results

- Ultrasound measurements:

		Mean	Std. Deviation	Std. Error Mean
	Hyoid Mandibula rest	54.056	6.6455	.3474
	NMES Hyoid Mandibula rest	50.617	7.1110	.3717

- Paired samples t-test: $p = 0.00$



Explorative study

Preliminary results:

- Ultrasound measurements:
 - Mixed model analysis

Parameter	Estimate	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	3.126893	.824532	3.792	.001	1.448127	4.805658
[NMES_placement=1]	.323057	.303737	1.064	.288	-.274395	.920509
[NMES_placement=2]	0 ^b	0	.	.	.	.
[NMES_flow_direction=1]	2.049834	.300492	6.822	.000	1.458759	2.640908
[NMES_flow_direction=2]	0 ^b	0	.	.	.	.
[NMES_type=1]	-.086235	.299990	-.287	.774	-.676321	.503852
[NMES_type=2]	0 ^b	0	.	.	.	.
[NMES_intensity_point=1]	-1.519405	.301036	-5.047	.000	-2.111550	-.927260
[NMES_intensity_point=2]	0 ^b	0	.	.	.	.

Explorative study



Conclusion

- Stimulation protocol:
 - Suprahyoidal electrode placement;
 - Cross-sectional flow direction;
 - TENS current (30 Hz and 200 μ s) at maximum tolerated level.
- Guidelines of American College of Sports Medicine for prescription of strengthening exercises
- Effect of NMES in treatment of dysphagia in MS should be investigated in RCT study

Future research

- RCT into effectiveness of neuromuscular electrical stimulation in dysphagia in MS
 - Multicenter!!

