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:

<table>
<thead>
<tr>
<th></th>
<th>Patients (n = 27)</th>
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<tbody>
<tr>
<td>Gender (male)</td>
<td>15 (55.6%)</td>
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<tr>
<td>Age (years) – mean; range</td>
<td>58.81; 36-74</td>
</tr>
<tr>
<td>MS type</td>
<td></td>
</tr>
<tr>
<td>• PP MS</td>
<td>12 (44.4%)</td>
</tr>
<tr>
<td>• SP MS</td>
<td>12 (44.4%)</td>
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<tr>
<td>• Unknown</td>
<td>3 (11.1%)</td>
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<td>Disease duration (years) – mean; range</td>
<td>24.15; 3-74</td>
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<td>EDSS – median; range</td>
<td>7.5; 5.0-8.5</td>
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<tr>
<td>BMI – mean; range</td>
<td>26.08; 17.7-36.9</td>
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</tbody>
</table>
Explorative study

Preliminary results
• Ultrasound measurements:

No stimulation

Stimulation
Explorative study

Preliminary results

• Ultrasound measurements:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
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<tbody>
<tr>
<td>Hyoid Mandibula</td>
<td>54.056</td>
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<tr>
<td>rest</td>
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<td>NMES Hyoid</td>
<td>50.617</td>
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<td>Mandibula rest</td>
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• Paired samples t-test: p= 0.00
Explorative study

Preliminary results:

- Ultrasound measurements:

  - Mixed model analysis

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<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Std. Error</th>
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<th>Sig.</th>
<th>95% Confidence Interval</th>
<th>95% Confidence Interval</th>
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</table>
Explorative study

Conclusion

• Stimulation protocol:
  • Suprahyoidal electrode placement;
  • Cross-sectional flow direction;
  • TENS current (30 Hz and 200μs) 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!!