Electrical Stimulation Duration is Not Associated with Upper Extremity Motor Outcomes in Subacute Stroke

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BACKGROUND

• Upper extremity (UE) hemiparesis is common among stroke survivors and often leads to decreased function and difficulties with valued activities.1,2,3
• Rehabilitative efforts frequently focus on increasing paretic UE use and movement.1,2,4
• Neuromuscular electrical stimulation (NMES) has been used in clinical and research environments to increase post-stroke UE active range of function.1,5,6,7
• Electromyography-triggered neuromuscular stimulation (ETMS), a form of NMES, encourages paretic UE muscle activation using visual biofeedback.
• The optimal duration of any NMES regimen in subacute stroke (< 3 months post ictus) remains unknown.
• Some evidence suggests that longer NMES durations convey greater paretic UE motor changes in chronic stroke.8
• To our knowledge, this was the first study examining the impact of NMES duration in subacute stroke.

Objective: To determine the association between electromyography-triggered neuromuscular stimulation (ETMS) duration with: (a) UE impairment; and (b) UE functional limitation.

Hypothesis: FM and AMAT scores would be positively, significantly, associated with duration of use.

Study significance: The optimal duration of neuromuscular electrical stimulation (NMES) at which the impact of upper extremity (UE) paresis is significantly reduced remains unknown in the rapidly growing stroke survivor population.

METHOD

Design: Secondary analyses of data obtained from a multicenter randomized control trial.

Participants: 41 subjects in the subacute stage of stroke (24 males; mean age = 65 ± 12 years; mean time post stroke onset = 92 ± 52.3 days) exhibiting mild, stable UE hemiparesis.

RESULTS

• subjects used ETMS for a mean duration of 2346.7 ± 987.9 minutes (range = 173 - 3773 minutes)
• Following intervention, both FM and AMAT scores increased significantly from baseline to end of intervention (28.4 ± T3.3 points at baseline to 35.8 ± 16.1 at final testing on the FM (Z = -4.58, p<0.001); 1.85 ± 1.21 points at baseline to 2.45 ± 1.47 points at final visit on the AMAT (Z = -4.41, p<0.001)).

• no association was found between total ETMS use and changes in scores at end of intervention (FM (p = -0.072; p = 0.65); AMAT (p = 0.079; p = 0.62)).
• Time post stroke was significantly correlated with changes scores on both the FM (F = 9.65; p<0.01) and the AMAT (F = 10.74; p<0.05).

DISCUSSION

• Possible explanations for outcomes
  • Spontaneous neurological recovery
  • ETMS exposure in subacute phase has impact regardless of duration
• Data in this study strongly indicated that people with more recent strokes (measured in days) exhibit larger score changes on the FM and AMAT.
• May be an optimal window during which ETMS should be administered.
• Choose with greater level of impairment may benefit more from ETMS.

REFERENCES