

Preserving Bone Health After Acute Spinal Cord Injury: Differential Response to a Neuromuscular Electrical Stimulation Intervention

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Objective: Determine factors associated with improved response of bone to an intensive neuromuscular electrical stimulation intervention (NMES) after acute spinal cord injury (SCI).

Design: Randomized-controlled trial.

Participants/methods: Individuals with C4 to T12 ASIA A or B SCI, less than 12 weeks post-injury. The control group received usual care and the exercise group received one hour electrical stimulation 5 days a week for six weeks. Outcome measures were collected at baseline, post-intervention, and 6 months post-injury, and included: DXA, CT, serum osteocalcin, alkaline phosphatase, serum calcium, N-telopeptide, and urine calcium. Bone density between groups was analyzed using a t-test and significance was determined a priori to be $p=.05$.

Results: 17 participants have completed the trial (7 exercise, 10 control). Participants 21 years of age and older who received NMES had 28% less bone loss than those receiving NMES who were younger than 21 ($P=.003$). Participants with a body mass index (BMI) less than 20 had significantly less BMD at baseline compared to those with higher BMI ($p=.001$). After intervention, the low BMI group who received NMES actually demonstrated no bone loss during the period of follow-up (Initial BMD 0.97 vs Post-intervention BMD 1.03; $p=0.19$). This is in contrast with the controls who had low BMI and did not receive NMES, BMD decreased from 0.95 to 0.65 ($p\text{-value}=.01$).

Conclusion: Interim DXA results demonstrate trends toward a larger effect of NMES in the population over the age of 20 and participants with a lower baseline BMI. These preliminary results indicate that subpopulations with acute SCI and baseline low BMD may preferentially benefit from an intervention such as this to preserve bone health.

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