

Effect of Pulse Electromagnetic Stimulation on Pain and Functional Mobility in Patients with Frozen Shoulder: A Randomised Controlled Trial

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ABSTRACT

Introduction: Adhesive capsulitis, also referred to as frozen shoulder, results in severe pain and restricted mobility. In 2-5% of people between the ages of 40 and 60, Pain-limited compliance frequently limits the early-phase efficacy of traditional physiotherapy, despite its modest therapeutic effects. Through non-invasive bio-electromagnetic effects on inflammation, cellular metabolism, and tissue healing, adjunct therapies such as Pulsed Electromagnetic Stimulation (PEMS) have the potential to greatly improve rehabilitation outcomes.

Aim: Effect of PEMS on pain and functional mobility in patients with frozen shoulder.

Materials and Methods: Forty patients with frozen shoulder were randomly assigned to two groups for this four-week randomised controlled experiment. Group A (n=21) underwent PEMS therapy (dosage: <300 Hz frequency, 20-30 minutes per session, for a total of 12 sessions over 4 weeks) in addition to standard physiotherapy (range of motion, stretching, strengthening exercises, manual therapy, and ice packs). Group B (n=19) was given only the same standard physiotherapy routine. The Numeric Pain Rating Scale (NPRS) was used to measure pain intensity as the main outcome measure. The Shoulder Pain and Disability Index (SPADI) ratings and goniometric active Range of Motion (ROM) for shoulder flexion, abduction, and external rotation were used as secondary end measures. Paired t-tests, independent t-tests, and repeated measures Analysis of Variance (ANOVA) were used to examine the data.

Results: Both groups demonstrated significant improvements from baseline; however, Group A (PEMS adjunct) showed statistically and clinically superior outcomes across all parameters ($p < 0.001$ between groups). For the primary outcome, Group A achieved a greater reduction in pain intensity (NPRS change: -4.0 ± 2.5 vs. -2.5 ± 1.1 in Group B; $p < 0.001$) with a large effect size (Cohen's $d = 1.1$). For secondary outcomes, Group A demonstrated vastly superior active ROM gains compared to Group B in flexion ($+360$ vs. $+190$), abduction ($+340$ vs. $+200$), and external rotation ($+320$ vs. $+180$), corresponding to an 80 greater improvement in mobility ($p < 0.001$). Functional recovery was also significantly enhanced in Group A, with a SPADI score reduction of -39 points (37% improvement) compared to -25 points (24% improvement) in Group B ($p < 0.001$, Cohen's $d = 0.9$). No adverse events were recorded during the trial.

Conclusion: PEMS significantly reduces pain (60% greater alleviation) and promotes shoulder mobility (80% greater ROM improvements) in just four weeks when combined with regular conventional physical therapy. These findings imply that PEMS is a non-invasive, safe, and very successful bio-electromagnetic adjunct therapy for the clinical treatment of adhesive capsulitis.

Keywords: Adhesive capsulitis, Frozen shoulder, Numeric pain rating scale, Pulsed electromagnetic stimulation, Range of motion, Shoulder pain and disability index.

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