

Effect of Capacitive and Resistive Energy Transfer on Pain, Quality of Life and Functional Limitation in Spinal Disorders: A Systematic Review

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ABSTRACT

Introduction: Chronic spinal pain and disc-related issues are disabling and prevalent conditions leading to reduced quality of life, functional limitations and persistent pain. Capacitive and Resistive Energy Transfer (CRET), also called TECAR or monopolar radiofrequency therapy, is a non-invasive physical modality that uses capacitive and resistive modes to deliver long-wave radiofrequency energy (roughly 440-600 kHz), enabling treatment of both superficial and deep tissues. Despite being used more frequently in clinical settings for neuromuscular optimisation, tissue repair, and pain modulation pain its therapeutic effectiveness in managing chronic spinal pain requires a comprehensive synthesis of existing evidence.

Aim: To systematically evaluate the effectiveness of capacitive and resistive energy transfer in reducing pain intensity and functional disability in individuals with chronic spinal pain associated with spinal disorders.

Materials and Methods: The databases PubMed, MEDLINE, Web of Knowledge, PEDro, ProQuest, and Cochrane Library were thoroughly searched for research published from 2020 to December 2025. Included studies were randomised controlled trials, controlled clinical trials, and meta-analyses assessing monopolar radiofrequency or CRET treatments for musculoskeletal spinal pain. Primary outcomes were pain severity {Visual Analogue Scale (VAS)/Numerical Pain Rating Scale (NPRS)} and impairment (Neck impairment Index or functional surveys) were the main results. Methodological quality and risk of bias were evaluated using standardised assessment tools.

Results: Thirteen studies met the inclusion criteria, primarily involving musculoskeletal spinal conditions, degenerative spinal disorders, mechanical spinal pain and osteoarthritis-related spinal pain reported significant short-term reductions in pain intensity and improvements in functional disability following CRET therapy compared with baseline measures or control interventions. While there was little evidence to suggest that neuromuscular performance would be improved, several studies found increases in cervical mobility and muscle function. Only two studies showed low risk of bias, and there was clear variation in treatment regimens and outcome measures despite encouraging results. When compared to a placebo or conventional therapy alone, the included trials showed that CRET therapy significantly reduces neck-related disability and pain intensity in participants aged 20 to 40 years. Reports of improved muscular function and cervical mobility were also common.

Conclusion: Capacitive and resistive energy transfer appears to be a beneficial adjunctive intervention for reducing pain and functional disability in individuals with chronic spinal pain due to spinal disorders. While short-term clinical improvements are consistently reported, the heterogeneity of protocols and methodological limitations highlight the need for high-quality randomised controlled trials to establish standardised treatment guidelines and determine long-term effectiveness.

Keywords: Capacitive and resistive energy transfer, Disability, Functional limitation, Spinal pain.

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