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Efficacy of transcutaneous electrical nerve stimulation combined with therapeutic exercise on hand function in children with cerebral palsy

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Background: TENS major function in physiotherapy field is to scale back pain but recent studies reported that TENS can reduce spasticity improve ADL and increase muscle strength. The purpose of this study is to research the effect of TENS on upper limb hand function and grip strength in children with hemiplegic spastic paralysis . Transcutaneous electrical nerve stimulation (TENS) may be a nonpharmacologic treatment for pain relief. TENS has been wont to treat a spread of painful conditions. This review updates the essential and clinical science regarding the utilization of TENS that has been published within the past 3 years (ie, 2005−2008). Basic science studies using animal models of inflammation show changes within the peripheral systema nervosum , also as within the medulla spinalis and descending inhibitory pathways, in response to TENS. Translational studies show mechanisms to stop analgesic tolerance to repeated application of TENS. This review also highlights data from recent randomized, placebo-controlled trials and current systematic reviews. Clinical trials suggest that adequate dosing, particularly intensity, is critical to obtaining pain relief with TENS. Thus, evidence continues to emerge from both basic science and clinical trials supporting the utilization of TENS for the treatment of a spread of painful conditions while identifying strategies to increase TENS effectiveness.

Introduction-

Transcutaneous electrical nerve stimulation (TENS) may be a commonly used nonpharmacologic and noninvasive treatment for pain. Although variety of clinical studies show the effectiveness of TENS for pain, there's still much controversy over which conditions to treat with TENS and therefore the adequate parameters to use. Prior reports show that TENS reduces pain through both peripheral and central mechanisms. Centrally, sites within the medulla spinalis and brainstem that utilize opioid, serotonin, and muscarinic receptors are activated by TENS. Peripherally, at the location of TENS application, opioid and α-2 noradrenergic receptors are involved in TENS-induced analgesia [1•]. The purpose of this review is to update the reader on the newest literature concerning TENS: basic science, experimental pain, clinical trials, and systematic reviews.

TENS is that the application of electrical current through electrodes placed on the skin for pain control. It can be applied with varying frequencies, from low (< 10 Hz) to high (> 50 Hz). Intensity can also be varied from sensory to motor intensities. Sensory intensity is when the patient feels a robust but comfortable sensation without motor contraction. High intensity usually involves a motor contraction but isn't painful. In general, higher-frequency stimulation is delivered at sensory intensity, and low-frequency stimulation is delivered at motor intensity. Prior literature from our laboratory shows that, no matter intensity, different frequencies activate central mechanisms to supply analgesia. Specifically, we show that low-frequency TENS activates μ-opioid receptors in the spinal cord and the brainstem, whereas high-frequency TENS activates δ-opioid receptors in the spinal cord and the brainstem [2–4]. Subsequent studies have investigated the role of serotoninergic, noradrenergic, muscarinic, and γ-aminobutyric acid (GABA)-ergic systems on the analgesia produced by both low-frequency and high-frequency TENS.

The terms “hyperalgesia” and “allodynia” are widely used in the following text. Hyperalgesia is an increased pain sensitivity to a peripherally applied stimulus [5]. Primary hyperalgesia is an increased pain sensitivity at the site of injury, which is thought to mirror changes in the peripheral nervous system. Secondary hyperalgesia occurs outside the site of injury, and it is thought to be mediated by changes in the central nervous system. We and others have tested the effectiveness of TENS on a variety of measures of both primary and secondary hyperalgesia. Allodynia is defined as pain in response to a normally innocuous (nonpainful) stimuli or activities that are thought to be mediated by changes within the central systema nervosum , where activation of a peripherally located nonnociceptor is perceived as painful.

Subjects: 29 children with hemiparetic CP were recruited in randomized control trial for 8 weeks, age between 6-12 years. Then, they were divided into two groups, TENS group (n=15) and control group (n=14).

Method: In TENS group the child received TENS on wrist extensor (once a day/3 day per week for eight weeks for 30 minute with pulse duration of 250 μs, 100 Hz), on top of things group the kid received placebo TENS both groups receive therapeutic exercise.

Outcome Measures: the first outcome measurements include modified Jebsen Taylor Hand Function Test (JTHFT) and hand grip strength via Jamar dynamometer, the secondary outcome measurement include ABILHAND-KID questionnaire.

Results: After using TENS for 8 weeks, the results show significant increase in HAND GRIP strength of TENS group (p=0.015) p0.05.

Conclusion: The finding of this study support that applying TENS together with therapeutic exercise give far better improvement of strength and hand function.Basic scientific evidence suggests that there are peripheral and central nervous system mechanisms underlying the analgesic action of TENS. Studies also show that tolerance to repeated application of TENS are often prevented by multiple strategies, both pharmacologic and nonpharmacologic. Experimental pain studies and clinical trials are starting to refine parameters of stimulation to get the simplest pain relief. It seems that

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stimulation intensity may be a critical factor for the effectiveness of TENS.

One meta-analysis was ready to show the positive treatment effects of electrical stimulation for relief of chronic musculoskeletal pain, and randomized controlled trials consistently demonstrate the effectiveness of TENS for acute, emergent, and postoperative pain conditions. However, the effectiveness of TENS on individual pain conditions, like low back pain, remains controversial, likely due to poor study designs and little sample size. Thus, continued research of TENS mechanisms and stimulation parameters in adequately characterized patient populations is critical .