Electrical Stimulation and Pain Modulation

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Purpose
Does the literature support the use of electrical stimulation for modulating pain in patients?

What is Electrical Stimulation?

Electrical Nerve Stimulation is a modality that uses electrical current delivered at various frequencies to influence in many musculoskeletal disorders. One use for this intervention is to modulate pain. Pain is modulated through the use of electrical nerve stimulation by activating non-nociceptor sensory afferents and inhibiting T cell activation in the spinal cord. Nerve impulses are blocked and spinal gates are closed, leading to a decreased perception of pain by the cerebral cortex centers.

Literature

**Author and Purpose**

He, R., Zhang, A., Sun, F.
To determine if percutaneous electrical nerve stimulation (PENS) was a safe and feasible option for patients with chronic knee pain.

**Design**

1. Participants: 40 participants
   - Mean age: 65 years

**Subjects**

**Results**

Group 1: Real PENS with electrostimulation (ES) once per day for 8 weeks.
- Real PENS treatment 3x/week for 8 weeks
- Patients had clinically meaningful increase in drop-out rate (pain >50%) in group 1 vs group 2 at 8 weeks.
- Real PENS treatment 3x/week for 8 weeks
- Treatment: over 30 minutes

Group 2: sham PENS treatment with electrostimulation (ES) once per day for 8 weeks
- Treatment: over 30 minutes
- Patients received no electrical power
- Future research

**Exclusion Criteria:**
- Subjective pain rating scale
- VAS: Post treatment there were significant decreases in VAS scores for both groups; however, group one decreased significantly more in pain:
- Neuropathic pain: (P<0.04 scores) Both groups had a decrease in VAS score after treatment, but they didn’t significantly differ from each other.
- Lamis scores: Both groups had significant decreases in post treatment Group one decreases were significantly greater in comparison to group two.
- There were no significant differences between groups in pretreatment measurements for any of the tests.

**Fiber Type**

A-Delta: Touch, temperature
- Thin, myelinated, slow

C-fibers: Pain, touch, temperature
- Thin, unmyelinated, slow

A-beta: Touch, vibration
- Thick, myelinated, fast

**Electrical Stimulation Parameters for Desired Effect**

**Parameter**

- Acute Sensory TENS
  - Motor TENS
  - Brief-Intense TENS
- Pulse Duration <100µsec 150-250µsec >250µsec
- Pulse Rate 60-200Hz 1-5Hz Variable
- Electrode Placement Directly on painful areas, nerve root and dermertome
- Electrosensor Modulated rate, amplitude
- Treatment Sequence 15-30 min/1x/day 30 min/1x/day 60 min/1x/day
- Onset of Relief <10 min 20-40 min <15 min
- Duration of Relief 30 mins to 2hrs 7-8 hrs <30 min
- Mechanism of Pain Modulation Dyorphin B Endorphin Enkephalin
- Fiber Activation A-beta A-delta and C A-beta, A-delta and C

**Future Research**

Future research should aim to take objective measures in addition to subjective data in order to make results more standardized and easier to compare between studies. Future research should also compare electrical stimulation to other modalities to determine its efficacy in relation to other treatment options. Studies should also impart a post-treatment intervention to see if electrical stimulation for pain modulation is effective in post application strengthening and stretching.

**References**

6. Tong KC et al. “To investigate whether of transcutaneous electrical nerve stimulation (TENS) 21(0)% Hz would produce greater analgesic effects than a fixed frequency of 12 (0)% Hz delivered at 21(0)% Hz in healthy subjects.” J R Coll Phys Surg Edinb. 2007;88:1344–1346.
7. Tong KC et al. “To investigate whether of transcutaneous electrical nerve stimulation (TENS) 21(0)% Hz would produce greater analgesic effects than a fixed frequency of 12 (0)% Hz delivered at 21(0)% Hz in healthy subjects.” J R Coll Phys Surg Edinb. 2007;88:1344–1346.
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