Electrotherapy for Chronic Pain: Combining Active and Passive Modalities

Rose L. Smith PT, DPT, SCS, ATC
Amy Banks PT, DPT, NCS

Electrotherapy for Chronic Pain

TENS Parameters

- **High Frequency TENS**
  - Pulse rate: above 50 pps usually greater (80-100)
  - Pulse width: lower (100-200 usec)
  - Intensity: strong nonpainful

- **Low Frequency TENS**
  - Pulse rate: 2-10 pps
  - Pulse width: higher (200-400 usec)
  - Intensity: muscle contraction or strong nonpainful

Mechanism of TENS reduction on analgesia

- **Peripheral mechanisms**
  - HF reduces substance P
  - LF blockade of peripheral opioid receptors
  - LF with muscle contraction has increased blood flow: peripheral adrenergic receptors

- **Central mechanisms**
  - HF and LF reduce dorsal horn activity
  - HF reduce central neuron sensitization

Strength duration curves

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Elements that effect analgesic effect of TENS

- **Interaction with pharmacological agents**
  - High frequency TENS
    - Analgesia by activating endogenous inhibitory mechanisms in CNS
    - Opioids
    - Clonidine (Catapres, Kapvay, Nexiclon)
    - Treat high blood pressure
  - Low frequency TENS
    - Uses classic descending inhibitory pathways activating opioid receptors
    - Serotonin to produce analgesic effects
    - Do not produce analgesia to opioid and muscimol tolerant clients
    - Uptake inhibitors improve effectiveness (SSRIs) (Lexapro, Zoloft, Prozac)
Elements that effect analgesic effect of TENS

- Caffeine consumption
  - Marchand 1995
  - Block the analgesic effect of high frequency TENS
  - Half life of caffeine 4-6 hours; delay TENS usage

- Electrode placement
  - Sluka 2003
  - Adapted individually based on location
  - Entire area addressed with high frequency
  - Spinal originated site
  - Referred site

- Tolerance to repeated TENS
  - DeSantana 2008
  - Accommodation

- Intensity of TENS
  - Leonard 2010
  - Lower intensities ineffective

- Pain intensity
  - Benedetti 1997
  - Less positive response if pain rated severe

Integrating Exercise

- Education provided on Biomedical Model vs Biopsychosocial Model within an interprofessional pain team consisting of a PT, Chiropractor, Psychologist and Pharmacist

- TENS unit provided as part of larger “pain flare kit” to encourage self management

- Veterans seen individually by pain physical therapist are given pedometer and log sheet for daily step count tracking
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Mr. H is a 63 year old Vietnam Veteran with a 12 year history of chronic low back pain. No red flags. Referred to the chronic pain clinic where he was evaluated by the interprofessional pain team which included the PT, Psychologist, Pharmacist, and Chiropractor. The team recommended the Veteran engage in the 7 week outpatient PSME program (Pain Self Management and Education) which includes the ACT model of psychoeducation and individualized pain rehab physical therapy.

<table>
<thead>
<tr>
<th>Outpatient Medications</th>
<th>Status</th>
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</thead>
<tbody>
<tr>
<td>ACETAMINOPHEN 500MG CAP/TAB TAKE 1 OR 2 TABLETS BY MOUTH TWICE A DAY FOR PAIN (MAX 3000MG/DAY ACETAMINOPHEN FROM ALL SOURCES)</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>ARIPIPRAZOLE 10MG TAB TAKE ONE TABLET BY MOUTH AT BEDTIME <strong>NOTE STRENGTH &amp; DIRECTIONS</strong></td>
<td>ACTIVE</td>
</tr>
<tr>
<td>CHOLECALCIFEROL 1000UNIT TAB TAKE TWO TABLETS BY MOUTH ONCE DAILY - BEGIN WHEN ERGOCALCIFEROL IS COMPLETED</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>CYCLOBENZAPRINE HCL 10MG TAB TAKE ONE TABLET BY MOUTH THREE TIMES A DAY AS NEEDED FOR MUSCLE SPASMS</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>DICLOFENAC NA 75MG EC TAB TAKE ONE TABLET BY MOUTH TWICE A DAY AS NEEDED FOR MUSCLE SPASMS</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>GABAPEPTIN 300MG CAP TAKE TWO CAPSULES BY MOUTH EVERY MORNING AND TAKE THREE CAPSULES EVERY AFTERNOON AND TAKE THREE CAPSULES AT BEDTIME</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>HYDROXYZINE PAMOXATE 50MG CAP TAKE ONE CAPSULE BY MOUTH TWICE A DAY AS NEEDED FOR ANXIETY OR SLEEP</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>OMEPRAZOLE 20MG EC CAP TAKE ONE CAPSULE BY MOUTH ONCE DAILY TO TWICE A DAY -- START TAKING ONE CAPSULE ONCE DAILY -- MAY INCREASE TO TAKE ONE CAPSULE TWICE A DAY IF NEEDED</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>SIMVASTATIN 40MG TAB TAKE ONE-HALF TABLET BY MOUTH AT BEDTIME FOR CHOLESTEROL</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>TOPIRAMATE 25MG TAB TAKE ONE TABLET BY MOUTH TWICE A DAY</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>TRAZODONE HCL 100MG TAB TAKE ONE TABLET BY MOUTH AT BEDTIME FOR SLEEP</td>
<td>ACTIVE</td>
</tr>
<tr>
<td>ZOLPIDEM TARTRATE 10MG TAB TAKE ONE TABLET BY MOUTH AT BEDTIME FOR SLEEP</td>
<td>ACTIVE</td>
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</table>

-Sleep: Reported 3-4 hours per night, as he has difficulty getting to sleep and staying asleep.

-Substances:
Nicotine: Smokes 2 cigars per day
Alcohol: Veteran reported being clean from alcohol and other drugs for last 10 years (8 of which were in prison).

Illicit drugs: Denied any current use. Prior to his incarceration, Veteran reported frequent use of many substances, including cocaine, heroin, and methamphetamines. He stated, "The only thing I haven't abused is prescription medications."

Caffeine: Veteran reported drinking about 5 cups (60 oz.) of coffee each morning and 2-3 Monster energy drinks per day.

PMH: Depressive disorder, Mood disorder, Degeneration of lumbar intervertebral disc, Insomnia, Chronic back pain, Tobacco dependence

30 second chair rise: 6/14

Patient goals: "Hoping to find a way to make the pain tolerable."

Functional goal: return to social activities such as bowling

Physical Therapy Plan: Pt engaged in the PSME program with individual pain rehab PT where he was issued a TENS unit, pedometer with log sheet, given a home program and encouraged to wean from lumbar brace
References


