Modalities: A Small Piece of PT

- Physical therapy means the art & science of...
- Use of the physical, chemical, & other properties of heat, light, water, electricity, sound
- Massage
- Active exercise
- Passive exercise
- Resistive exercise
  (California PT Practice Act)

Ultrasound (US)

- Frequency >20,000 cycles/second (Hz)
- Applying high frequency alternating electrical current to crystal in transducer
- Thermal & nonthermal effects

Contraindications for Ultrasound

- Malignant tumor
- Pregnancy
- Central nervous system tissue
- Joint cement
- Plastic components
- Pacemaker
- Thrombophlebitis
- Eyes
- Reproductive organs
The efficacy, safety, effectiveness, and cost-effectiveness of ultrasound and shock wave therapies for low back pain: a systematic review

Jesus Seco, MD, PhD, Francisco M. Kovacs, MD, PhD, and Gerard Urrutia, MD

- Inclusion criteria: RCT, compared US or shock wave with any kind of procedure
- At least 1: pain, disability, QOL, ADLs, work impact, pt satisfaction, med use, side effects, health resources employed, total costs
- 4 studies (242 patients), 3 of these on US

<table>
<thead>
<tr>
<th>Patients</th>
<th>Interventions</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlu 2008 60 acute patients</td>
<td>Traction, US, &amp; laser</td>
<td>Same results on pain &amp; disability at 1 &amp; 3 months</td>
</tr>
<tr>
<td>Ansari 2006 15 patients, chronic LBP (10 analyzed)</td>
<td>US versus sham US</td>
<td>10% improvement in disability at week 1 for US versus Sham US</td>
</tr>
<tr>
<td>Mohseni-Bandpei 2006 120 patients, chronic LBP</td>
<td>Spinal manipulation versus US</td>
<td>Manipulation better than US</td>
</tr>
</tbody>
</table>

- Conclusions: “do not demonstrate the efficacy or effectiveness for treating LBP, whether acute or chronic, with or without leg pain”

Electrical Stimulation: TENS

<table>
<thead>
<tr>
<th>Parameter Settings</th>
<th>Pulse Freq</th>
<th>Pulse Duration</th>
<th>Amplitude</th>
<th>Modulation</th>
<th>Rx Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional (high rate)</td>
<td>100-150 pps</td>
<td>50-80 µs</td>
<td>tingling</td>
<td>Use if available</td>
<td>Can be 24 hrs</td>
</tr>
<tr>
<td>Acupuncture-like (low rate)</td>
<td>2-10 pps</td>
<td>200-300 µs</td>
<td>Visible contraction</td>
<td>none</td>
<td>20-30 mins</td>
</tr>
</tbody>
</table>

- Measured before and after 3 week period
- Leg pain & disability score decreased in group 1 & 2, compared with control group
- No significant difference between group 1 & 2
- Analgesic consumption less in group 1 than 3
How does TENS work?

- Based on the Gate Control Theory
- Stimulation of large diameter A-beta sensory afferents activates inhibitory interneurons in substantia gelatinsosa of spinal cord dorsal horn and blocks transmission of nociceptive signals from small diameter A-delta and C-fibers
- Supraspinal mechanisms involving endogenous opioid system
- TENS is proposed to dampen perception of pain


Transcutaneous electrical nerve stimulation (TENS) versus placebo for chronic low-back pain (Review)

- RCTS up through July 2007
- Four high quality RCTs (585 patients)
- Outcomes:
  - Primary: pain, back-specific functional status, generic health status, work disability, pt satisfaction, treatment side effects
  - Secondary: ROM, SLR, strength

US Versus Estim (Durmus 2010)

- Conflicting evidence whether decr pain intensity
- Back-specific functional status not improved in 2 trials
- Moderate evidence work status and medical services did not change with treatment
- Conflicting results from 2 studies for generic health status
- Multiple physical outcome measures lacked statistical significance
- Patients treated with acupuncture-like TENS & conventional TENS responded similarly

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ES + exercise</td>
<td>US + exercise</td>
<td>Exercise</td>
</tr>
</tbody>
</table>

- All groups improved in pain, disability, strength, endurance, walking performance, mobility, QOL, & depression
- Intergroup comparison showed significant difference in physical function, SF36, pain & extensor muscle strength between Groups 1 and 2 when compared to 3
- No significant difference between 1 & 2
Laser Therapy

**Class Power Effect**

<table>
<thead>
<tr>
<th>Class</th>
<th>Power</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>&lt;0.5mW</td>
<td>No hazard</td>
</tr>
<tr>
<td>1M</td>
<td>&lt;0.5mW</td>
<td>No hazard because the beam has a large diameter or is divergent.</td>
</tr>
<tr>
<td>2</td>
<td>&lt;1mW</td>
<td>Safe for momentary viewing; provokes blink reflex.</td>
</tr>
<tr>
<td>3A</td>
<td>&lt;5mW</td>
<td>Laser pointers</td>
</tr>
<tr>
<td>3B</td>
<td>&lt;500mW</td>
<td>Used for therapy</td>
</tr>
<tr>
<td>4</td>
<td>&gt;500mW</td>
<td>Surgical &amp; cutting lasers</td>
</tr>
</tbody>
</table>

**Efficacy of Low Power Laser Therapy and Exercise on Pain and Functions in Chronic Low Back Pain**

- 75 patients, chronic LBP for > 1 year
- Outcome measures: VAS, Roland Disability Questionnaire, Modified Oswestry, Schobertest, flexion and lateral flexion
- Groups: Laser + exercise, Laser, Exercise
- Pain levels in all groups decreased after treatment
- Schober test improved in all groups after treatment
- Flexion improved after treatment in all groups

**Laser Therapy: A Randomized, Controlled Trial of the Effects of Low-Intensity Nd:YAG Laser Irradiation on Musculoskeletal Back Pain**

- 63 participants, nonradiating LBP > 30 days
- Laser versus sham laser
- 90 seconds, 8 symmetric points along lumbosacral spine, 3x/week × 4 weeks
- Outcome measures: perception of benefit, level of function (Oswestry), lumbar mobility
- Treatment group had time-dependent improvement in perception of benefit and level of function at midpoint and end of treatment
- Results lessened at 1 month follow-up

**Is low-level laser therapy effective in acute or chronic low back pain?**

- Randomized, double blind, placebo-controlled
- Statistically significant improvements in all groups in pain, global assessments, ROM, Roland Questionnaire, & Modified Oswestry
- No significant difference between groups
Conclusions

• Ultrasound, TENS, & laser are modalities that can be used in PT to treat low back pain
• Safe modalities
• Evidence limited for this patient population
  – US may help decrease analgesic consumption
  – Conflicting evidence whether TENS decreases pain
  – Adding US or electrical stimulation to exercise may improve physical function, SF36 & strength
  – Laser may improve short-term perception of benefit & level of function

References


References Continued


References Continued

References Continued