Slide 1

PHYSICAL AGENT MODALITIES: WHY USE THEM?

Slide 2

Reasons not to use modalities:
- No strong research in the effectiveness of these modalities
- Reimbursement (combined with #1, why do things that are not as effective as other treatment interventions and reimbursed less or not at all by payers?)
- Limited time with patients and other things have higher ROI

Slide 3

The Reasons we use them:
- Focus on outcomes, the fact is and it is proved in the research; THEY WORK!!!
  - Whenever a modality is combined with therapeutic exercise or manual therapy techniques outcomes are improved
  - Better outcomes create a happier patient
- Physical agent modalities reduce pain
  - A less painful patient is more compliant with rehab
- Making what we do with our hands easier
  - They work with manual therapy to make it more successful
Slide 4

LASER – A versatile tool...

Slide 5

...to facilitate healing!

Slide 6

LASER or LLLT

- Light Amplification by Stimulated Emission of Radiation
- Low level laser therapy (LLLT) is the common term for the most commonly used type of Lasers in rehab
- Non-thermal modality
- Simply another form of energy that can be used to elicit physiologic changes
Slide 7

Low Level Laser Therapy

- One of the oldest modalities
- Laser light is concentrated light
- Greatest limitation is relatively shallow penetration
- Greatest asset is biostimulative effect
- Very brief application (seconds to few minutes)

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FDA cleared LLLT Indications

- Increase of localized circulation
- Relief of minor muscle and joint aches, pains and stiffness
- Relaxation of muscles
- Relief of muscle spasms
- Relief of minor pain and stiffness associated with arthritis

Slide 9

Non-FDA cleared LLLT Indications

- Inflammation
- Neuralgia
- Pain, acute and chronic
- Soft tissue injury, acute and chronic
- Tendinitis/Bursitis
- Triggerpoint
- Wounds, acute and chronic
- Joint disorders, chronic
Shortwave Diathermy

- Heat large areas efficiently and deeply (>2")
- Ultrasound is limited to a treatment area of approximately 2x's the size of the sound head
- SWD diathermy matches 1 MHz ultrasounds depth of penetration and heating rate (1)
- 27.12 MHz frequency stimulates ion acceleration – kinetic energy within tissue (molecular vibration)
- The electromagnetic radiation used for short wave diathermy does not require a coupling media to travel through; unlike ultrasound energy, electromagnetic radiation can travel through air – minimal/nocoustic application


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Ultrasound and Shortwave Diathermy Comparison

<table>
<thead>
<tr>
<th>Energy type:</th>
<th>Ultrasound</th>
<th>Shortwave Diathermy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acoustical</td>
<td>Electromagnetic</td>
</tr>
<tr>
<td>Tissue heated:</td>
<td>Collagen-rich</td>
<td>C: Skin, adipose tissue</td>
</tr>
<tr>
<td></td>
<td>I: Muscle, vessels</td>
<td></td>
</tr>
<tr>
<td>Tissue volume:</td>
<td>Small (20 cm³)</td>
<td>Large (200 cm³)</td>
</tr>
<tr>
<td>Temp increase:</td>
<td>1 MHz: &gt; 6.3°F</td>
<td>C: &gt; 7°F</td>
</tr>
<tr>
<td></td>
<td>3 MHz: &gt; 14.9°F</td>
<td>I: &gt; 18°F</td>
</tr>
<tr>
<td>Heat retention:</td>
<td>3 min</td>
<td>&gt; 9 min</td>
</tr>
</tbody>
</table>

C = Capacitive method
I = Induction method
Slide 13

Indications, Contraindications

**Indications**
- Decrease pain
- Decrease edema
- Promote tissue healing
- Increase circulation
- Decrease muscle tone
- Increase tissue flexibility

**Contraindications**
- Pregnancy
- Hemophilia
- Active infection, neoplasm
- Arterial disease
- Electronic implants

Examples of conditions
- Tendinopathies
- Contractures
- Wounds
- Arthritic conditions

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Slide 14

Thermal Effects

- Thermal effects listed in the literature include:
  - Increase in tissue temperature
  - Increased blood flow
  - Decreased joint stiffness
  - Cell membrane filtration and diffusion increases
  - Increase in metabolism
  - Decrease in pain
  - Muscle relaxation
  - Decrease in inflammation

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Non-Thermal Effects

- **Maximized by using pulsed mode SWD**
- Electromagnetic energy allows damaged cells to return to their normal function.
- Non-thermal effects will occur in both CSWD and PSWD.
- These non-thermal effects occur at the cell membrane as the electromagnetic energy affects ion attraction and cell function.
- Restoring the normal function of damaged cells through repolarization.
- Increase cell growth and division
- Increase microvascular circulation
Slide 16

**Non-Thermal Effects**

- Increases the activity of the sodium pump to remove excess sodium. Excess sodium creates an negatively charged environment and the magnetic field will re activates the pump to regain normal ionic balance in the cell.
- Increased local tissue oxygenation
- Increase phagocytosis
- Decreased pain
- Increased protein synthesis
- Increased ATP production

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**Advantages of Shortwave Diathermy**

- **Deep** penetration, up to 5cm
- **Hands-free** Application - You can use it while attending to another patient, which allows you to manage your time in the clinic
- It covers large areas
- It can heat the deeper tissue **without heating the superficial tissue**
- **Non-contact** application possible - e.g. sensitive tissues / lesions etc...

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**Electrotherapy**
Slide 19

Why Use Electrotherapy?

Studies show that 85 to 90 percent of electrotherapy treatments are for:

PAIN

Slide 20

Why Use Electrotherapy?

- Muscle Re-education/Strengthening
- Increase in Circulation
- Decrease Spasm
- Decrease Edema
- Decrease Inflammation
- Increase Range of Motion

Slide 21

Controlling Acute and Chronic Pain

- Two ways:
  - Gate Theory Control
    - Melzack and Wall
  - Opiate Release Control
    - Endorphins, Dynorphins, Enkephalins
**Slide 22**

Controlling Acute and Chronic Pain

What waveform do I use?
You can use any waveform, the key is to set the parameters correctly.

The most common waveforms used for pain are:
- IFC – for larger areas
- Premod – smaller areas, especially joints
- Asymmetrical Biphasic - TENS

**Slide 23**

Controlling Acute and Chronic Pain: Guidelines for Parameter Control

- Modulation
  - Modulate parameters whenever possible “IT IS SAFER”
- Amplitude (Hot Sauce)
  - Should be set to get a physiological response
- Treatment Time
  - 15-20 minutes is not always the answer
- Electrode Placement: Sufficient Spacing
  - Above and below
  - Around the area
  - Over the area
- Do something with the current
  - ROM exercises

**Slide 24**

Acute/Chronic Pain

Gate Mechanism Protocol

- Waveform: ?
- Phase Duration: 200 µsec or lower
- Frequency: 80 – 150 Sweep; 100 Fixed
- Amplitude: Strong Sensory
- Cycle Time: Continuous
- Treatment Time: 20 minutes
Slide 25

**Acute/Chronic Pain**

**Opiate Release Mechanism Protocol**

- Waveform: ?
- Phase Duration: 200 µsec
- Frequency: 1 – 10 Sweep; 5 Fixed
- Amplitude: Motor
- Cycle Time: Continuous
- Treatment Time: 30 to 60 Minutes

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**Muscle Strengthening/ Muscle Re-Education**

Research shows:
- Therapeutic exercise increases strength,
- Electrotherapy increases strength,
- But when combining exercise with electrotherapy the effects are compounded.

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Slide 27

**Keys to Obtaining a Muscle Contraction with E-Stim**

- Amplitude: must be sufficient to obtain a contraction but also must be comfortable (Waveform is a factor; Russian)

- Phase Duration:
  - Measured in microseconds (µsec)
  - Longer phase durations increase the depth of penetration
  - Longer phase durations recruit more motor units
  - Longer phase durations elicit stronger muscle contractions

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Keys to Obtaining a Muscle Contraction with E-Stim

- **Electrode Placement**
  - One on the motor point at the muscle origin
  - The second on the motor point near the musculotendinous junction or muscle belly
- **Electrode spacing**
  - Electrodes should be placed so the flow of current can reach the target tissue
  - Increasing the distance between the electrodes increases the depth of penetration
  - Placed too close the potential exists for greater concentration superficially, this can result in discomfort
  - Larger Electrodes: larger electrodes expose more surface area to the current

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Muscle Strengthening/Re-Education

- **Waveform**: Symmetrical Square Biphasic
- **Phase Duration**: 200 µsec or greater
- **Frequency**: 35 or 50
- **Amplitude**: Strong Motor
- **Cycle Time**: Early Stage 10/50 progress to 4/12 or 5/5 in latter stages
- **Treatment Time**: 10-20 minutes; determined by patient fatigue. Longer treatment times are indicated for disuse atrophy

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Electrotherapy Contraindications

- *Cardiac pacemaker*
- *Cardioverter defibrillator*
- Over the carotid sinus/anterior transcervical area
- Over heart transthoracic area
- Over the abdominal, lowback and pelvic area during pregnancy
- **Areas of venous or arterial thrombosis**
- Thrombophlebitis

*See Belanger Evidence Based Guide to Ther Phys Agents. Lippincott Williams & Wilkins, 2003.*
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Contraindications cont..
- Phrenic nerve or urinary bladder stimulator
- Cancerous lesions
- Neoplasms
- Superficial metal (e.g. staples, pins, external fixators)
- Patients prone to seizures
- Transcerebral stimulation
- Stimulation over the eyes
- Pain of unknown etiology

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THANKYOU