The Role of Therapeutic Modalities

Clinical applications for low back pain

What Modalities Do

- Create Optimal environment for injury repair by limiting the inflammatory processes
- Breaking the pain-spasm cycle
- Aids in healing cycle
- Increases localized circulation and transfer nutrients

What is a Modality?

- Application of some form of stress to the body for the purpose of eliciting and adaptive response
- To be deemed "Therapeutic"
  - Stress applied must be conducive to the healing process of the injury in its current state.
    - Requires a BALANCE:
      - Protecting the area
      - Returning the body to normal function
        - Improper use of the modality will hinder the healing process
- Indication vs. Contraindication
  - Heat vs. Cold / US: 100% vs. 50%

Thermal Agents

- Cold Modalities (Cryotherapy)
  - Heat is removed from the body and absorbed by the cold modality
  - The more the skin is cooled, the greater the cooling of underlying tissues
    - Application for 15-20 minutes or less
  - Most rapid and significant temperature changes occur in the skin and synovium
  - Cold application leads to vasoconstriction at the cellular level decreasing the need for oxygen.
    - Decreases # of cells destroyed.

Types of Cryotherapy

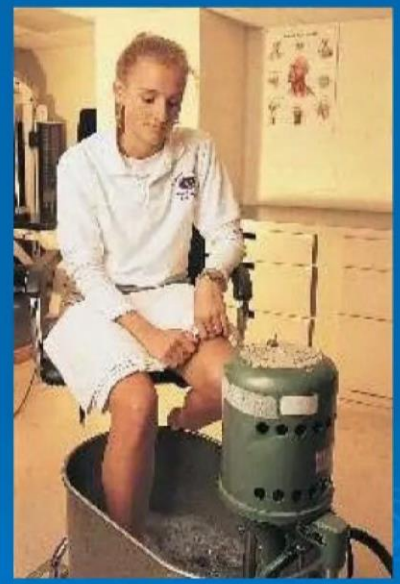
- Ice Massage
  - Produces significant cooling of the skin
  - Increase of blood flow once treatment has ended
  - Useful prior to ROM exercises/activity
  - Rubbed over skin in small circular motions for 7-10 min.
- Ice Packs/ Contoured Cryo Cuffs
  - Can be molded to body's contours
  - Applied for 15-20 minutes (Ice will reverse its effect and start heating)
  - Cryo Cuffs combine ice and compression

Types of Cryotherapy

- Ice Immersion / Cold Whirlpools
  - Quickly reduce over entire surface of DISTAL extremity
  - During inflammatory phase of rehab: OK to combine with ROM exercises
  - Temperatures range from 13-18' C (55-65' F)
- Commercial Gel / Chemical Packs
  - Vapocoolant Sprays
  - Chemical reaction is at an alkaline pH - may cause skin burns
    - Fluori-Methane spray uses rapid evaporation of chemicals on the skin area to freeze the skin prior to stretching muscle


Making an Ice Cup


torex
torex
torex
torex



Thermotherapy

- Heat Application
  - USUALLY used in phase two to increase blood flow and promote healing
  - Increases circulation
  - Increases cellular metabolism
  - Decreases muscle spasm and pain
- Contraindicated if swelling/pain has not subsided

Types of Thermotherapy

- Whirlpool and Immersion Bath
  - Combine hot/warm water with a hydro-massaging effect
    - Increases superficial skin temperature
  - Used for relaxation; muscle spasm/pain
  - Facilitates ROM after prolonged immobilization
  - 20-30 minutes with temperatures @ 36.67-43.33’ C
  - NEVER put injured body part directly on jets
- Hydrocollator Packs/Hot Pack
  - Provides superficial moist heat to slightly deeper tissue
  - Packs consist of silicone gel compartments encased in a canvas fabric
  - Stored in hot water (71.11’c)
  - Wrapped in layers of toweling for approx. 20 min.

Types of Thermotherapy

- Paraffin Bath
  - Hot wax and mineral oil
  - Temperatures are approx. 125-130'F
  - Great for contoured bony areas of the body (feet, hands, wrists)

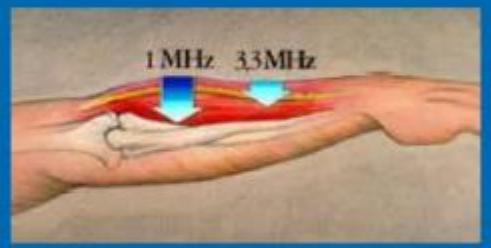
Types of Thermotherapy

- Contrast Bath
  - Cryo- and Thermo-Therapy combined
  - Works well for Subacute and Chronic injuries
    - Two whirlpools or containers placed side by side
    - One filled with cold water (10.0-18.3’c) Once filled with hot water (37.0-43.89 ‘C)
  - Injured extremity is alternated between tubs at a 3:1 ratio or 4: 1
  - Treatments begins and ends with ice unless injury is chronic
- Fluidotherapy
  - Hot air blows into a box creating a massaging effect
- Diathermy
  - Uses electromagnetic energy to elicit deep penetrating thermal effects

Ultrasound

- Uses high frequency sound waves to elicit deep thermal and Non-thermal effects in deep tissue
  - Alternating current flowing through a "piezoelectric crystal" (produce+ and - charge)
  - Two effects from ultrasound
    - Thermal
      - Elevate tissue temperature
      - Increase blood flow
      - Reduce muscle spasm and pain
    - Pulsed
      - Lower intensity
      - Non thermal
      - Facilitate repair and healing
      - Reduce edema
  - Phonophoresis
    - Used to drive anti-inflammatory drugs through the skin
      - Hydrocortisone, anesthetics

Thermotherapy Agents



ELECTRICAL STIMULATION

- Application of suitably modified electric current to produce therapeutic benefits
  - With stimulation of excitable tissues (nerves and muscles)
- Neuromuscular Electrical Stimulation (NMES)
  - Evokes a muscle contraction
    - Muscles with Normal nerve
    - Denervated muscles
- Transcutaneous electrical nerve stimulation (TENS)
  - Pain modulation

Neuromuscular Electrical Stimulation (NMES)/Faradic/(Neo) Faradic

- Electrical energy flows between two points
- Applied to injured or immobilized muscles in early stages of exercise when muscle is at its weakest
- Used to:
  - Reduce swelling
  - Muscle spasm and atrophy
  - Increase blood flow/ ROM (range of motion) and muscle strength
  - Enhance wound healing
  - Reeducate muscles

Electric Stimulation

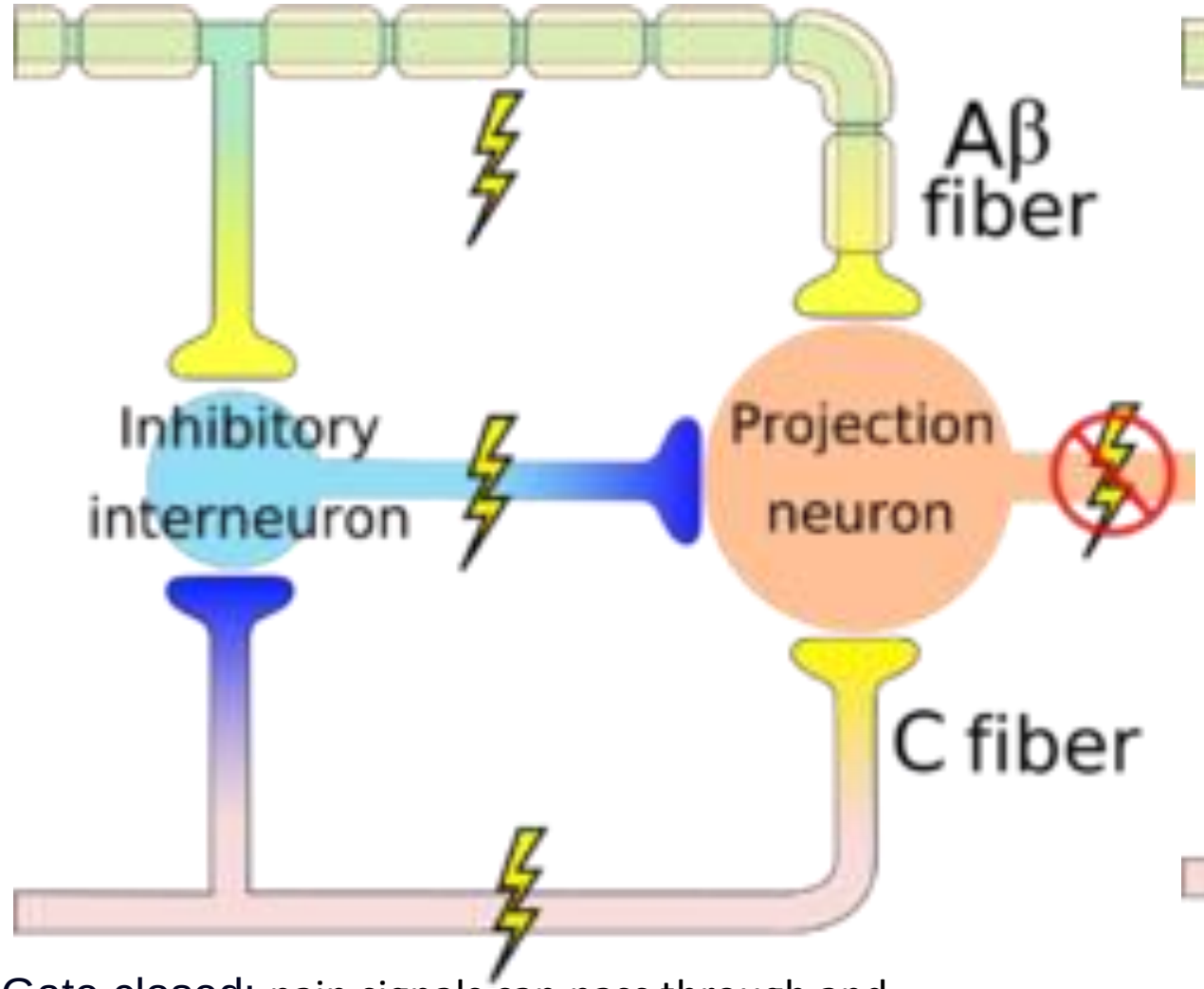
- Interferential Current
  - Utilizes two separate channels
  - Quadripolar electrode to produce 2 simultaneous electrical currents acting on the tissue (4 electrodes)
  - Treatment time is 20 min
    - Covers a larger area
  - Pre-Mod Current
    - Utilizes one1 channel & 2 electrodes
      - Covers a smaller area
    - Treatment time is 20 min.

Electric Stimulation

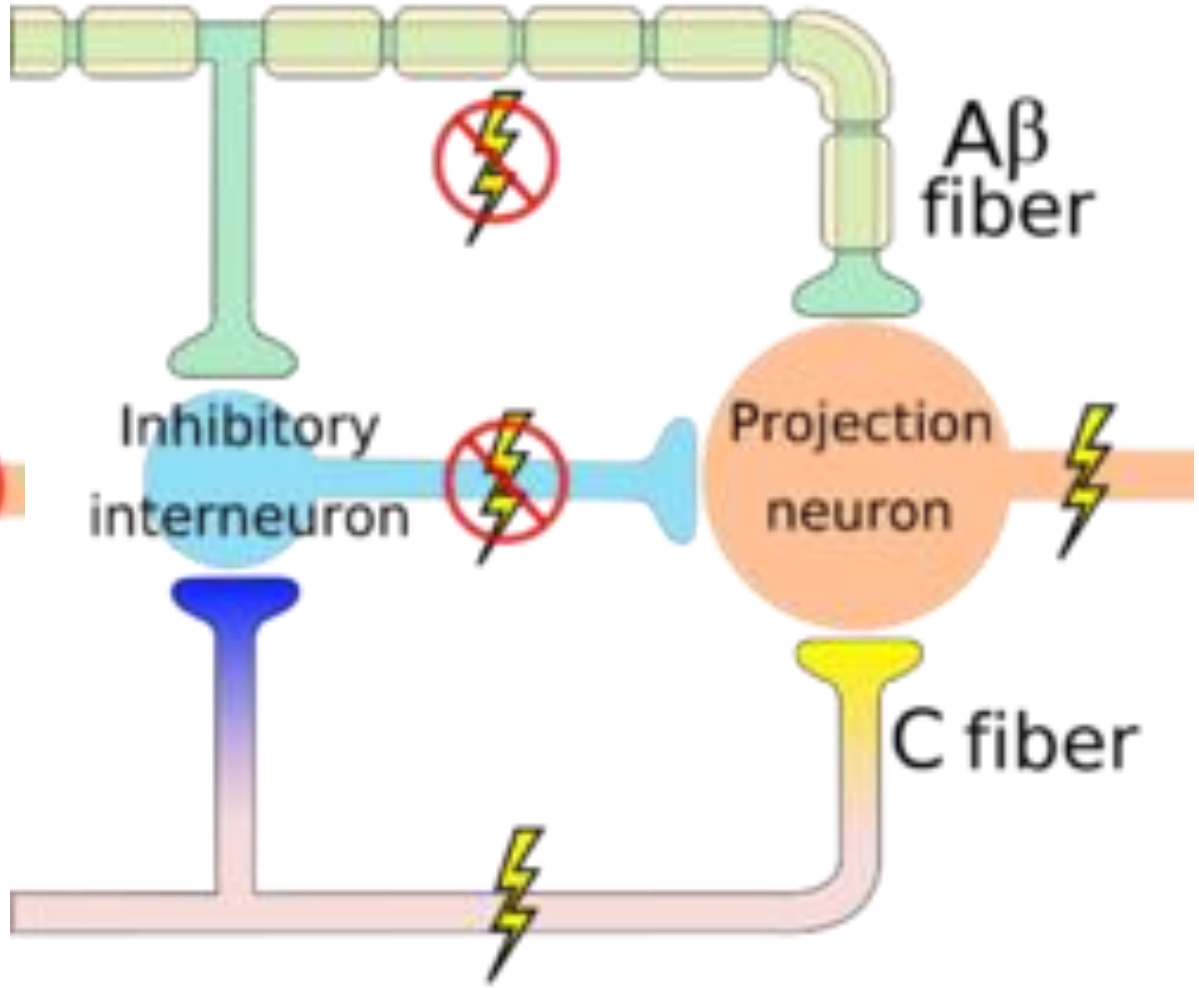
- Biphasic Current
  - Utilizes 1 or 2 channels
  - Less intense contraction
  - Great for muscle re-education
    - Intermittent contractions Co-contractions
- Russian
  - Identical to Biphasic
    - but more massaging with muscle contraction

Transcutaneous Electrical Nerve Stimulation(TENS)

- Produces analgesia
- Decreases acute and chronic pain
- Used continuously after surgery (30-60 min. sessions)
- Works to override the body's internal signals of pain:
  - Gait control theory
  - Endorphin release
  - Post-excitation depression of the sympathetic nervous system



Gate closed: pain signals can pass through and will be sent to the brain to perceive the pain



Gate open: pain signals will be restricted from travelling up to the brain

High Volt (Old School)

- Utilizes 1 channel 2 electrodes
- Reduces edema, pain, and muscle spasm during acute phase.
- Maintains muscle size during immobilization
- Muscle re-education
- Increases blood flow to tissues

Interferential therapy (IF)

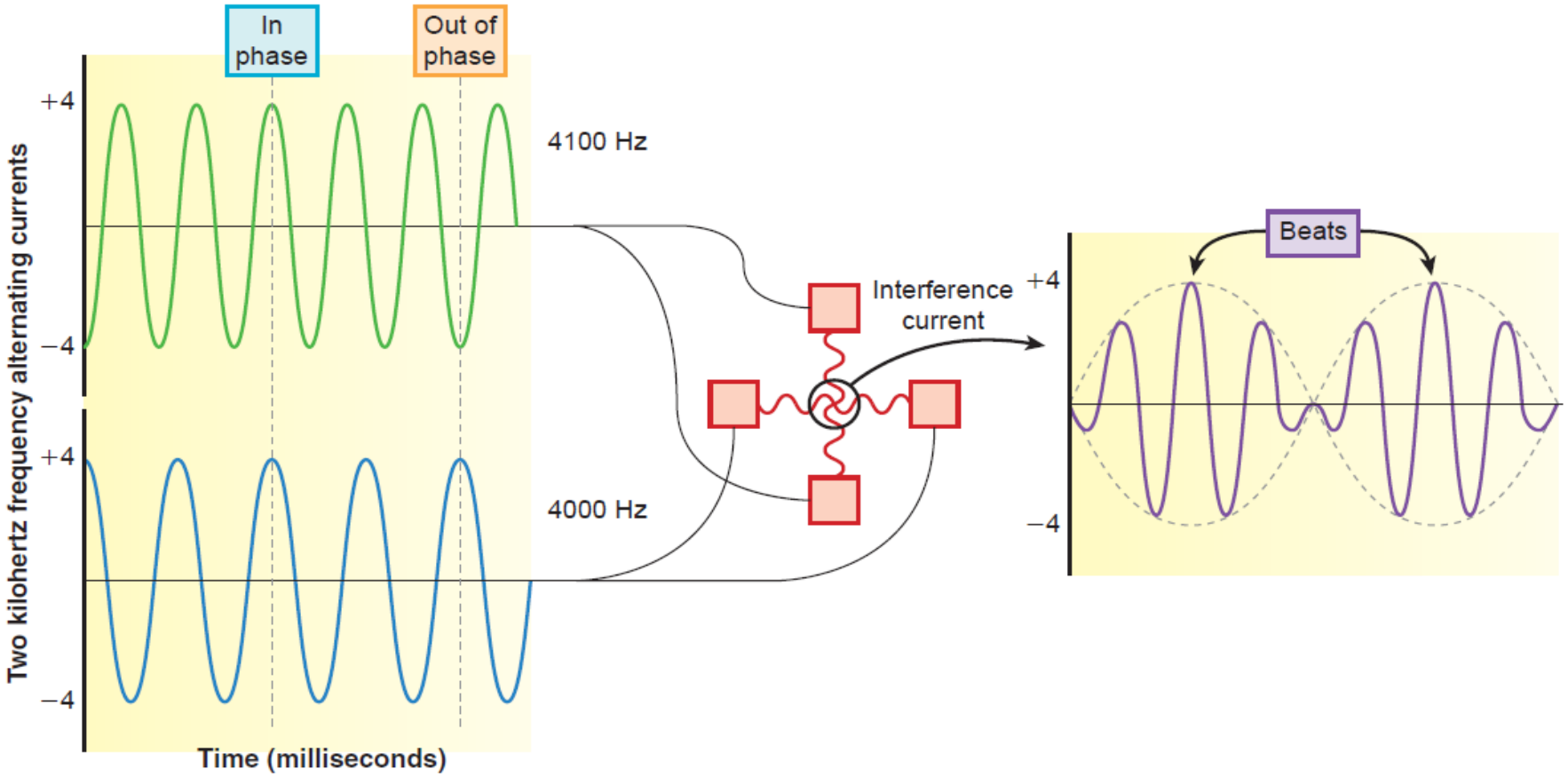


Fig 9 ■ 28 Interferential current is the interference of two asynchronous kilohertz frequency currents to form a current with amplitude modulation.

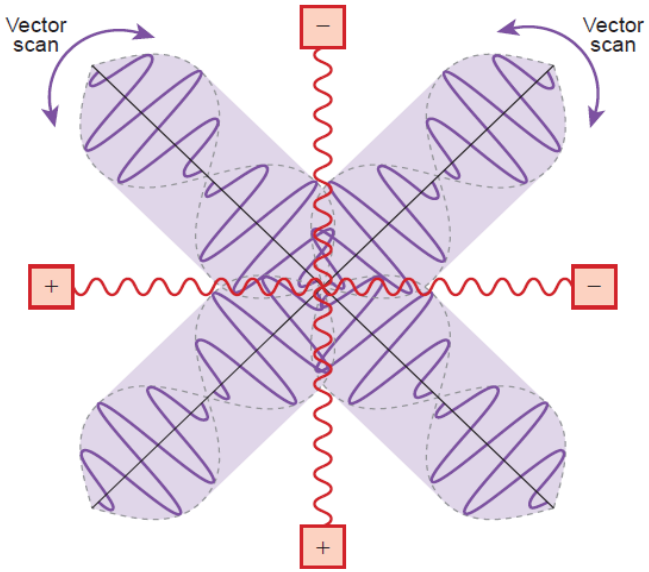
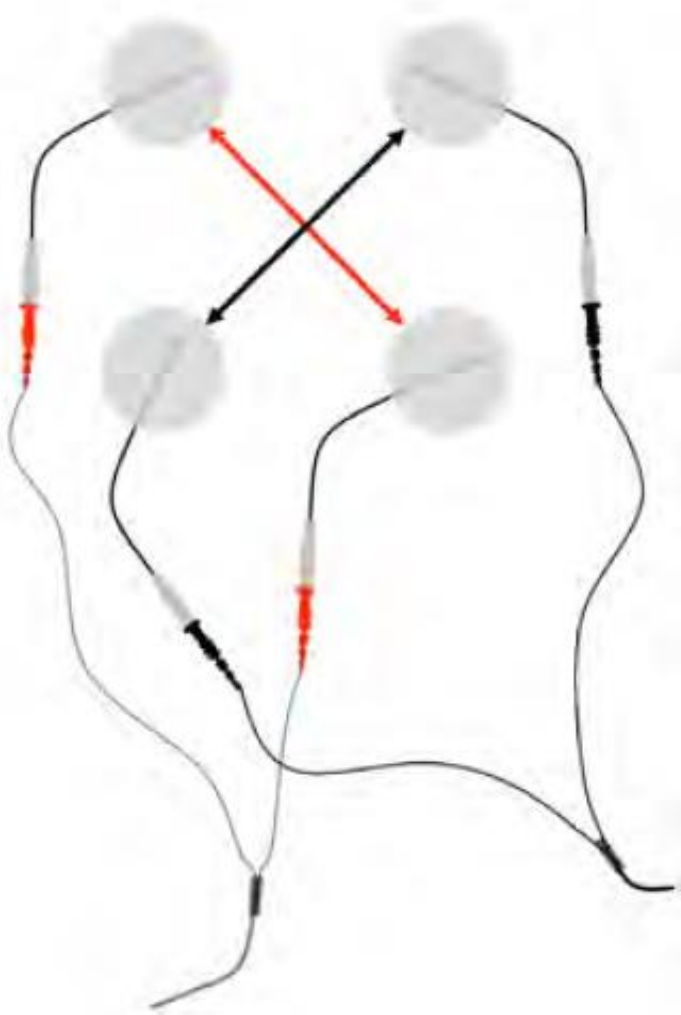
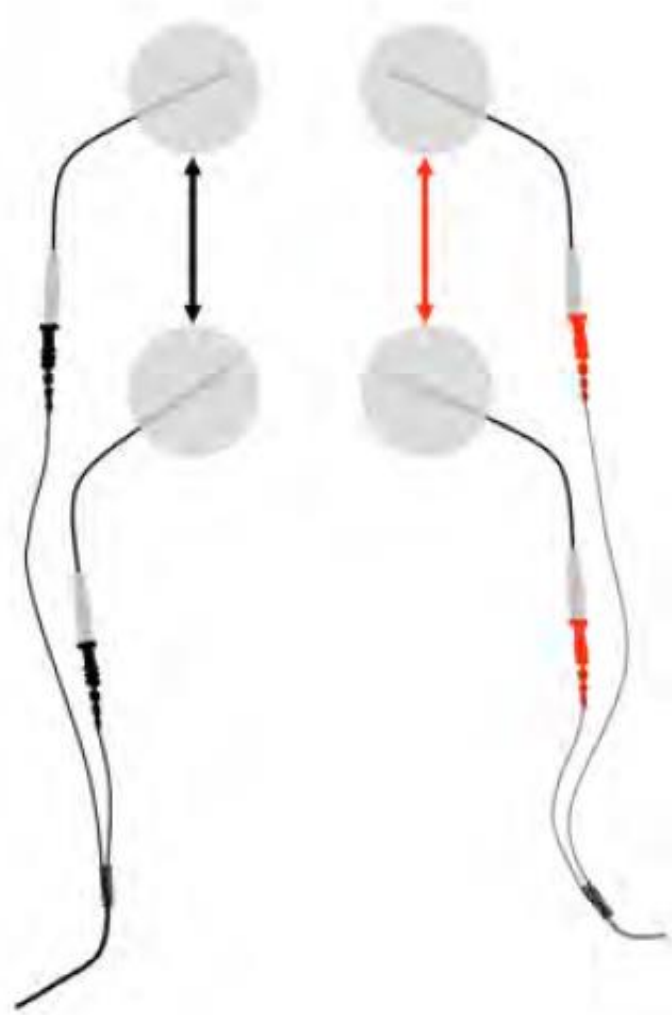


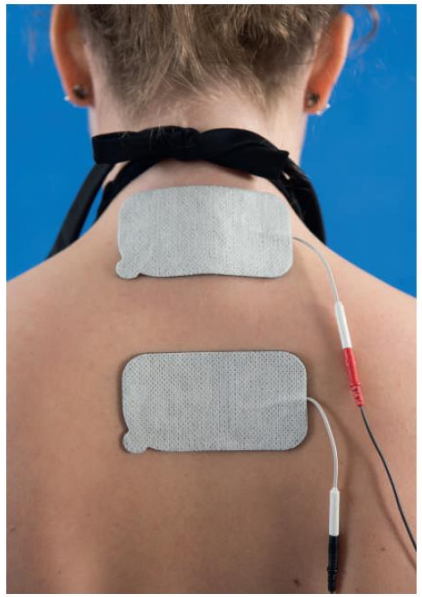
Fig 9 ■ 31 With the perpendicular interference of currents, a cloverleaf-shaped field of current is created. Vector scan is amplitude modulation resulting in expansion of the cloverleaf field.

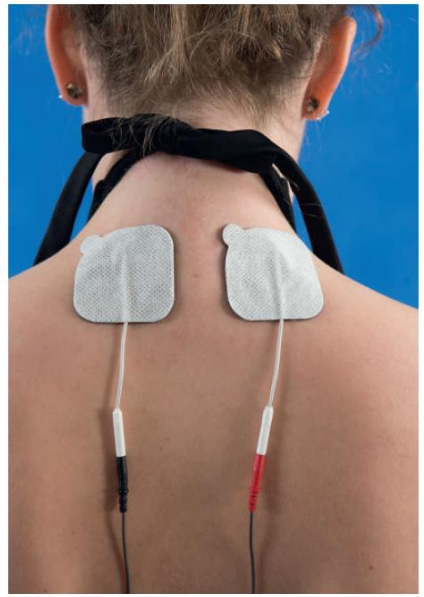
IFC
Crisscrossed Pattern



TENS or NMES
Up and Down Pattern







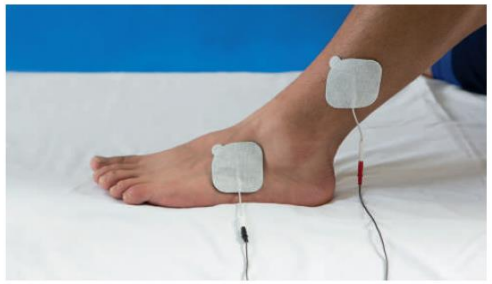
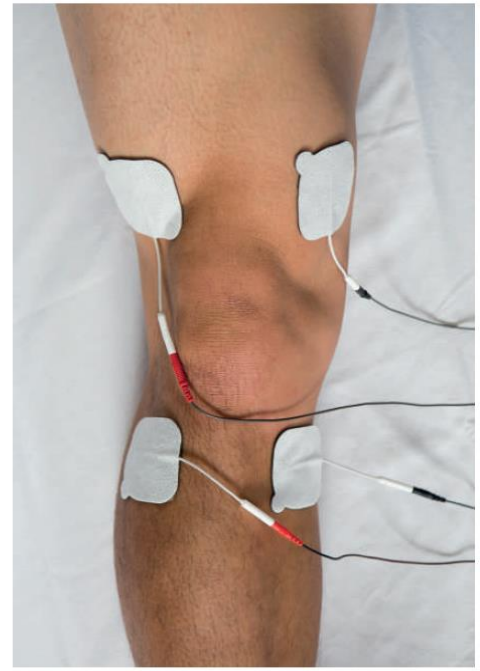


Fig 11 ■ 7 Common electrode configurations for TENS.

Continued



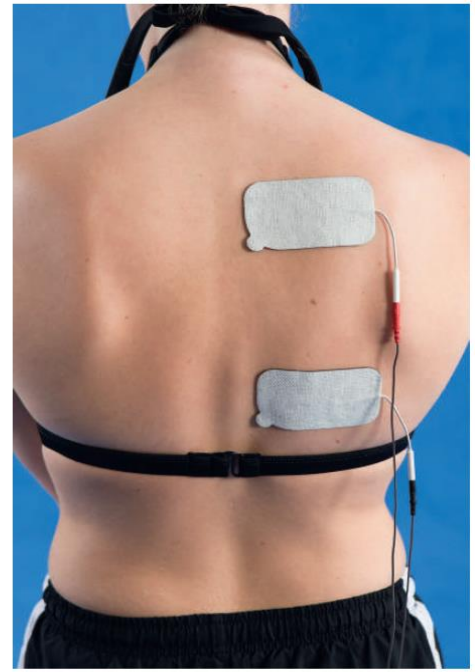


Fig 11 ■ 7—cont'd

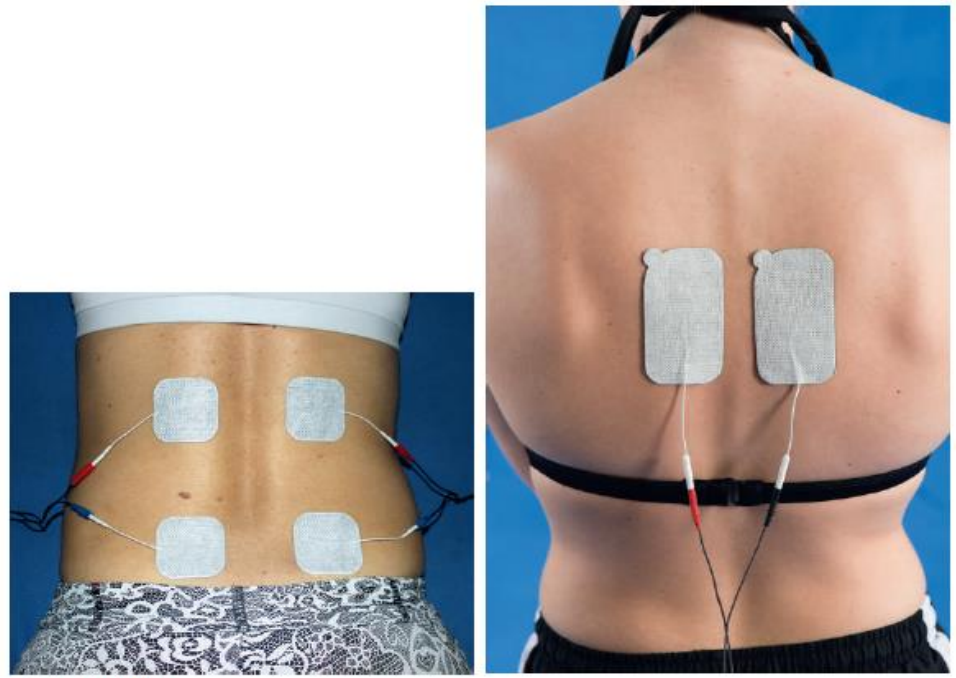


Fig 11 ■ 7–cont'd

Radicular Back Pain-Sciatica

PAIN CONTROL

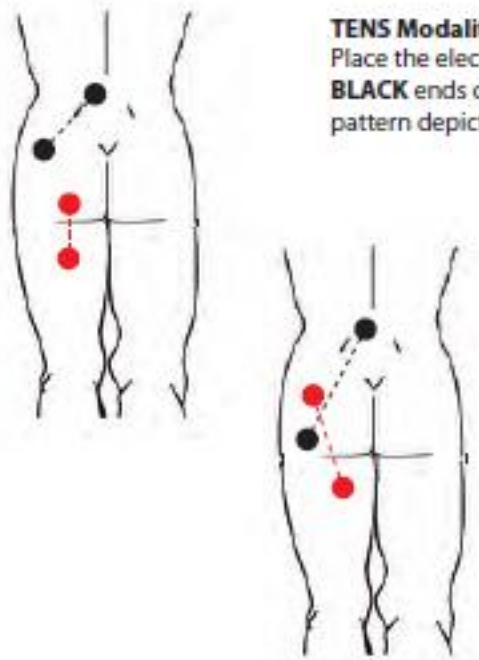
INTENSITY LEVEL:
The stimulation level should be set to a strong, but comfortable strength.

DEVICE SET-UP:

Modality	Mode	Treatment Time
TENS	Swp, Lmd, Hmd	As needed

ELECTRODE PLACEMENT *Option 1*

Electrodes should follow the dermatomal pattern related to the affected nerve root within the spinal segments involved.



TENS Modality
Place the electrodes with the **RED** and **BLACK** ends of the leadwires according to pattern depicted on figure to the left.

ELECTRODE PLACEMENT *Option 2*

Electrodes should follow the dermatomal pattern related to the affected nerve root within the spinal segments involved. **OVERLAPPING Techniques may vary.**

Lumbar Back

PAIN CONTROL

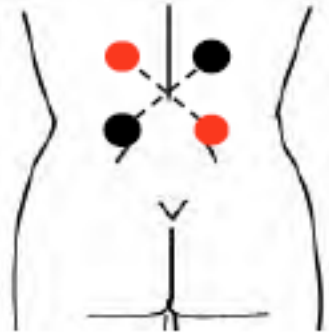
INTENSITY LEVEL:
The stimulation level should be set to a strong, but comfortable strength.

DEVICE SET-UP:

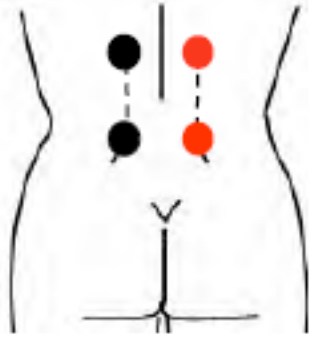
Modality	Mode	Treatment Time
IFC	LoHi, Low, Cmb	40 minutes 4 times/day
TENS	Swp, Lmd, Hmd	As needed
NMES	30:10, 20:10, 10:10 off:on time	As needed

ELECTRODE PLACEMENT

Electrodes should surround the targeted treatment site with area of pain located in the center of the electrode area.

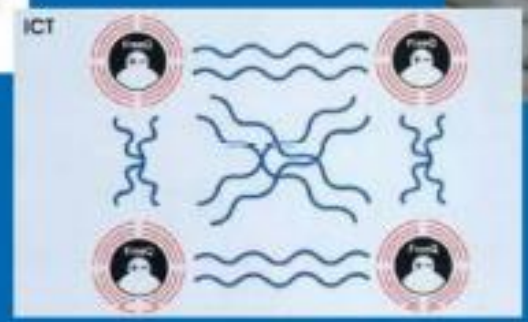


IFC Modality
Place the electrodes with the **RED** and **BLACK** ends of the leadwires according to pattern depicted on figure to the left.



TENS / NMES Modality
Place the electrodes with the **RED** and **BLACK** ends of the leadwires according to pattern depicted on figure to the left.

Using both channels and crisscrossing the electrodes is optional when using the TENS or NMES modality.


ICT

Intensity of the current

- A. the sensitivity threshold;
- B. the motor;
- C. the pain threshold; the patient experiences contractions and pain

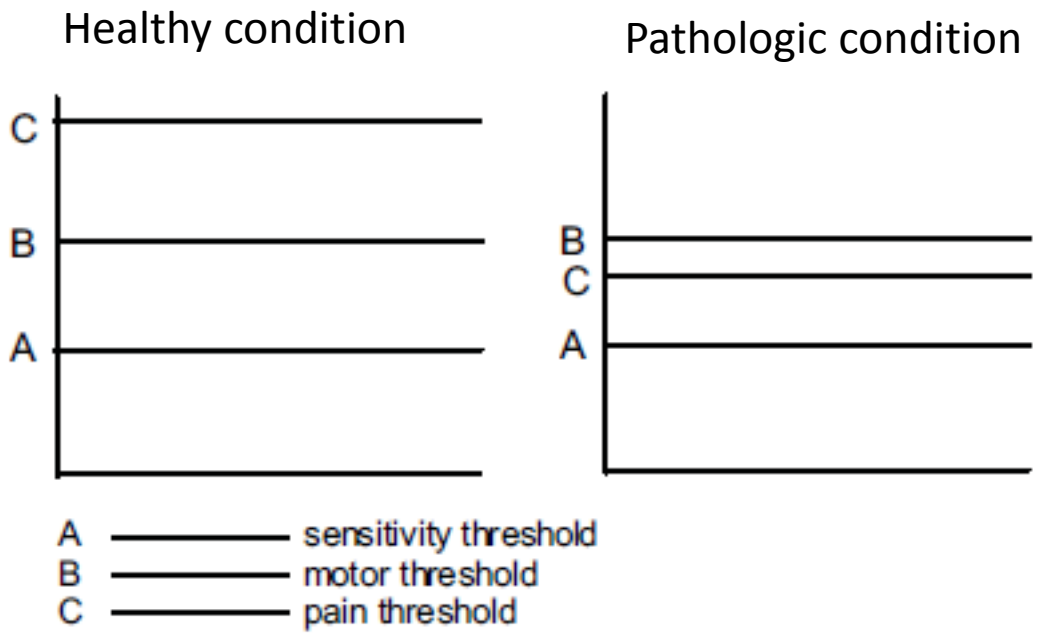


Fig. 6.
Coherence of stimulation level and amplitude.

Thank you