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Thermal Therapy – Heat & Cold

Andrew Starsky, PhD, PT

Superficial (misleading) Heat

Hot packs
Paraffin
Fluidotherapy
Infrared lamp
Whirlpool

Thermotherapy

- Therapeutic range 104-113 degrees Fahrenheit (40-45 degrees Celsius)
- > 113 degrees Fahrenheit leads to catabolism (breakdown of macromolecules) and cell death

Energy Transfer

- Conduction: direct collision between molecules of two materials at different temperatures
- Convection: contact between circulating medium and another material at different temperatures
- Radiation: through the traveling of electromagnetic waves, across the air, from the warmer to the cooler substance or body
- Evaporation: transfer of heat from the body by conversion of a volatile liquid into a vapor when the liquid is applied to the skin (vapoocoolant)
- Conversion: changing from one form of energy to another (US)

Conduction

- Directly proportional to the following:
  - Temperature gradient between agent and skin surface
  - Duration of application
  - Thermal conductivity of the tissue
    - Skin > muscle > subcutaneous fat
    - Subcutaneous fat acts as a barrier- reduces transfer of heat to deeper tissues
  - Body weight- positioning
    - Body part resting on hot pack versus supporting hot pack
    - Resting creates higher pressure contact and decreases skin's ability to dissipate heat
  - Application method used (i.e. paraffin)

Conduction

- Inversely proportion to thickness of coupling medium
  - Add or remove towels with hot pack
  - Pre-warmed or moist towels compared with room-temp or dry towels will facilitate heat transfer

Hot Packs

- Introduced in 1950s
- Present in ~94% clinics
- Various sizes and shapes
- Hydrocollators
  - Water temp = 158°F- 168°F

Hot Packs

Hot Packs

- Heat transfer via conduction
- Stored in hot water (158-168 degrees Fahrenheit)
- Requires coupling medium to avoid tissue damage
- Requires ~ 2 ½ hours to reheat between uses
- Issues with weight and AROM

Box 4-2 Advantages and Disadvantages of Using Moist Heat Packs

Advantages
1. Ease of preparation and application
2. Variety of shapes and sizes available
3. Moist, comfortable heat
4. Relatively inexpensive to purchase and replace (assuming a tank already owned)

Disadvantages
1. No method of temperature control once applied to patient
2. Do not readily conform to all body parts
3. Sometimes awkward to secure in place on a patient
4. Do not retain heat for longer than about 20 minutes
5. Are a form of passive intervention, not requiring active patient participation
6. May leak and then must be discarded (hydrophilic or gel packs)

Michlovitz and Nolan, 2005

Whirlpool

Whirlpool

- Used in Greece from 500-300 BC
- Various sizes and shapes

Whirlpool

- Heat transfer via conduction and convection
- May adjust turbine to project water pressure toward or away from the involved area
- May perform therapeutic exercise
- Issues with contamination and costs associated with cleaning and heating water

Paraffin

- Introduce in early 1900s
- Present in ~60% of clinics



Paraffin

- Heat transfer via conduction
  - 1-2 centimeters
- Temperature 113°F- 122°F
  - Why is the temperature greater with paraffin than other thermal modalities?
    - Lower specific heat
    - Touch a steel and plastic surface on your chair
    - Steel feels colder- although both the plastic and steel are room temperature

Paraffin

- May be mixed with mineral oil to decrease melting point
  - from 129 to ~117 degrees Fahrenheit
- Good for contoured areas
- Issues with contamination if paraffin is reused- not recommended
  - May sterilize by setting heat to ~176 degrees Fahrenheit for a few hours/overnight

Methods for Applying Paraffin

- Continuous immersion with retention
  - 7 dip immersions
  - Continuous 30 min immersion in bath
  - 30 min period of retention outside the bath
- Continuous immersion
  - 7 dip immersions
  - Continuous 30 min immersion in bath

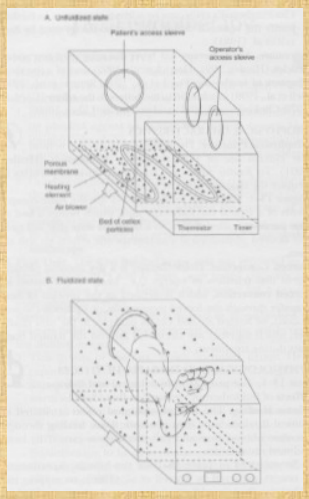
*** **Continuous immersion produces greatest increase in cutaneous, subcutaneous and muscular temperature**

Methods for Applying Paraffin

- Dip immersion with wrapping (transient increase in skin temp)
  - 6-12 dip immersions then wrapped in layers
  - 30 min period of retention outside the bath
- Brushing with wrapping
  - 7-10 coating are brushed over treated area then wrapped in layers

Fluidotherapy

- Contains natural cellulose (ground up corn cobs) circulating in dry warm air
- May control heat and air flow
- Heated to around 130 degrees F



Fluidotherapy

- Heat transfer via convection
- Stimulates thermo and mechanoreceptors (heat & movement)
- Thermal effects + desensitizes hypersensitive tissue
- May help prevent edema ????
  - Limb in horizontal position vs. vertical position

Box 4–6 Advantages and Disadvantages of Fluidotherapy

Advantages

1. Fluidotherapy is convenient and easy to administer.
2. Temperature of application can be controlled.
3. Agitation of dry particles can be controlled for comfort.
4. Variety of unit sizes allows for most body areas to be treated.
5. Allows for some active exercise to be carried out during intervention.
6. Fluidotherapy provides a dry, comfortable heat.
7. Fluidotherapy can be used for desensitization of hypersensitive hands/fingers or feet/toes.

Disadvantages

1. Fluidotherapy is a relatively expensive modality to purchase.
2. Some patients are intolerant to the enclosed container (claustrophobic feeling).
3. Some patients are intolerant to the dry materials used.

Fluidotherapy Disadvantages

- Expensive
- Cannot treat proximal joints
- Slippery due to spilling of particles
- Large unit

Infrared Lamp

- Present in 2-30% of clinics
- Emit electromagnetic radiation
  - Heat transfer occurs in electromagnetic spectrum (radiation)
- Wavelengths between 780-1500 nm with peak intensity at 1000 nm
- ** Two recently published texts indicated that Infrared therapy is rarely used and “will not be discussed further.”

Infrared Lamp

- Tissue temperature proportional to radiation that penetrates tissue
  - Related to distance from source, angle, and skin color
  - Limited depth of penetration (1-3 mm)
- Avoid irradiation of the eyes: wear IR opaque goggles
- Use tape measure to record distance from source

Thermotherapy Effects

Thermotherapy Effects

- Hemodynamic effects
- Neuromuscular effects
- Metabolic effects
- Altered tissue extensibility

Hemodynamic Effects

- Vasodilation
- Increases blood flow
  - Improves healing and repair
  - Removes inflammatory compound that activate nociceptors
  - Studies regarding deep heating are mixed
    - Studies showing heating effects on “deep” muscle and joints used hands for assessment

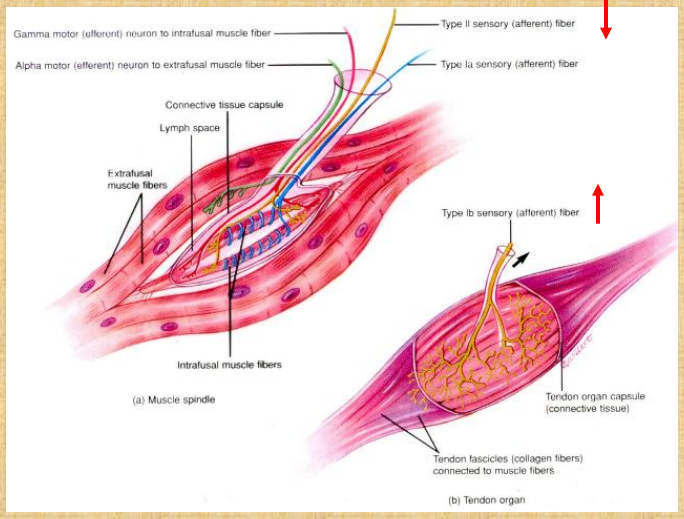
Hemodynamic Effects

- Reflex vasodilation
  - Heat may trigger reflex activation of sympathetic cholinergic nerve fibers
  - Affects deeper tissue (not just superficial)
    - Greatest change in tissue temperature 1-2 centimeters

Neuromuscular Effects Mense, 1978 (cat study)

- Increase in temperature
  - Decreases firing rate of type II muscle spindle
    - excitatory to agonist muscle and inhibitor to antagonist muscle
  - Increases firing rate of type Ib fiber from Golgi tendon organs
    - -inhibitory to agonist and excitatory to antagonist
  - Reduces alpha motor neurons
    - reduction in muscle spasm
    - reducing muscle spasm should reduce pain

Muscle spindle and Golgi tendon organ (GTOs)



Neuromuscular effects

- Changes nerve conduction velocity and firing rate
- Increases pain threshold
  - Decrease muscle spasm: decrease local ischemia and nociceptor activation
  - Inhibit gating effect on transmission of pain sensation at the spinal cord level via mechanical stimulation (gate control theory)
- Change in muscle strength
  - Muscle strength and endurance may decrease during the initial 30 minutes after heating
  - Changes in motor hand performance

Metabolic effects (increases metabolic rate)

- Increases enzymatic activity (102°F-109°F)
  - Begins to decrease at 111°F and stops completely at 122°F
- Increases oxygen uptake
- Increases cellular biochemical processes: accelerates healing
- May accelerate destruction of articular cartilage in patients with rheumatoid arthritis
  - Use caution in patients with acute inflammatory disorders; may contribute to inflammatory process

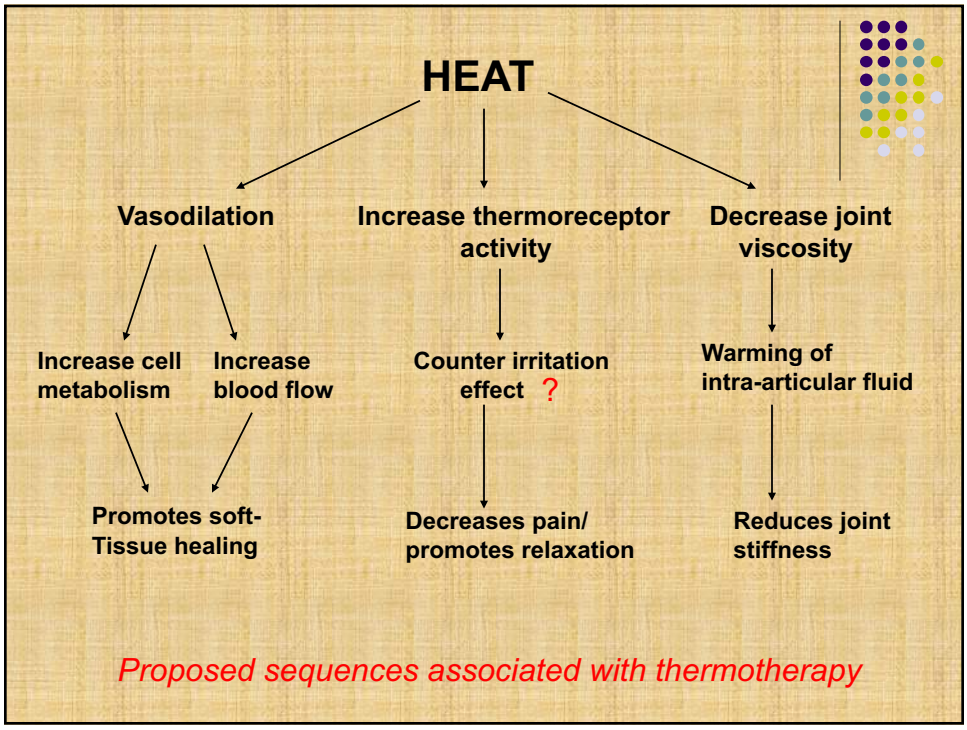
Altered tissue extensibility (increases collagen extensibility)

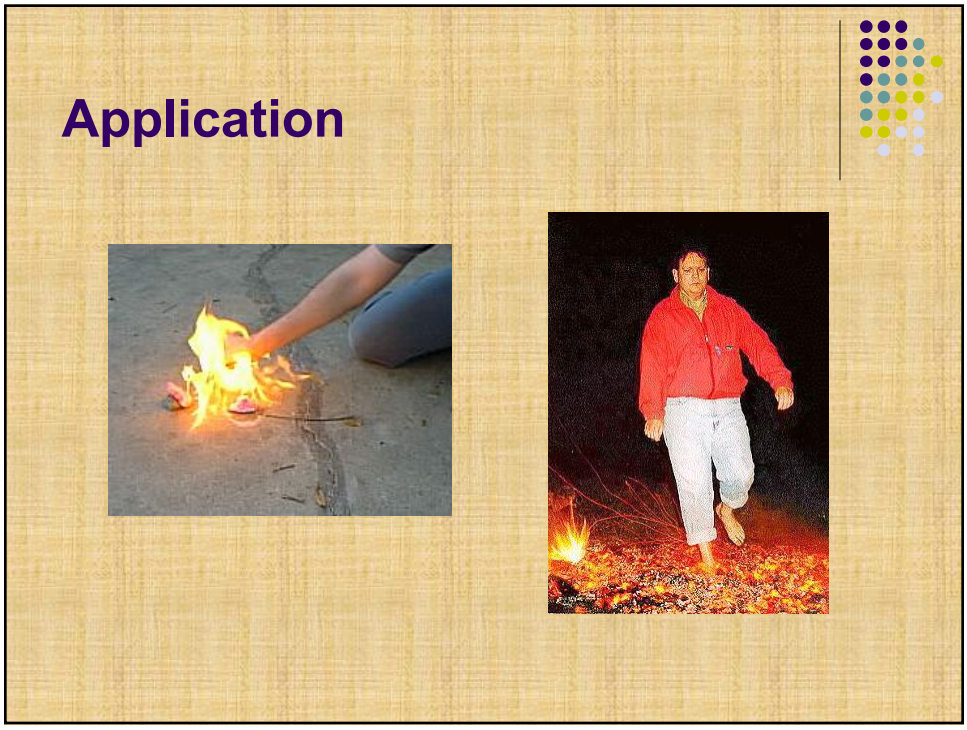
- Heated soft tissue
  - Maintains greater increase in length
  - Less force is required to increase length
  - Reduces risk of tissue tear
- May be difficult to achieve with superficial heat
  - Optimal at 104-113 degrees Fahrenheit for 5-10 minutes

When should you stretch when using heat?

Thermotherapy Treatment/Indications

- Pain control
  - Decreasing muscle spasm (by decreasing ischemia)
  - Increasing blood flow removes waste products/inflammatory compounds that activate nociceptors
  - Psychological aspects
- Increase ROM and decrease joint stiffness
- Tissue healing (not recommended during acute inflammatory stage)
- Psychological


HEAT
Vasodilation
Increase thermoreceptor activity
Decrease joint viscosity
Increase cell metabolism
Increase blood flow
Counter irritation effect ?
Warming of intra-articular fluid
Promotes soft-Tissue healing
Decreases pain/ promotes relaxation
Reduces joint stiffness
Proposed sequences associated with thermotherapy


Application

Application

- Check for contraindications/precautions
- Visually inspection tissue before and after application
- Test skin for sensory heat discrimination
- Educate patient on goals of thermotherapy, expected sensation (i.e. mild warmth) and to ask for assistance if too hot (bell)
- Wear timer!

Application

- Check patient periodially (5-10 min)
- ~20 min duration depending on patient (dx, history, tolerance…)
- Stop treatment if patient reports excessive heat or burning

- **#1 lawsuit in P.T. due to hotpacks**

Documenting Treatment

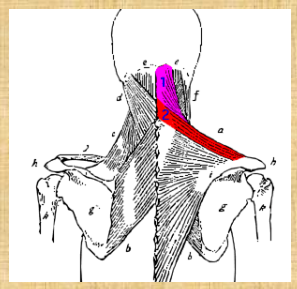
- Area
- Duration
- Position
- Co-treatments

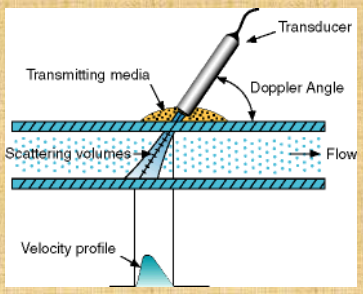
Thermotherapy effects

- Vasodilation
  - Direct effect
  - Reflex vasodilation
    - Activates sympathetic cholinergic fibers, AcH released and activates cholinergic receptors on smooth muscle on blood vessels

Evidence for vasodilation

Erasala GN et al. The effect of topical heat treatment on trapezius muscle blood flow using power doppler ultrasound. **Physical Therapy** 2001; 81(5):A5





Erasala 1

- Temperature controlled heating pad
  - 38° C (100° F)
  - 40° C (104° F)
  - 42° C (108° F)
- 30 minute treatment to upper traps
- Measured blood flow at 18 different sites pre and post

Erasala 2

- Results
  - Vascularity changes up to 3 cm below skin
  - 38° C → 27%
  - 40° C → 77%
  - 42° C → 104%

What will this vasodilation do?

- More Oxygen to the tissues
- More nutrients to the tissues
- More “troops” to the injured tissues
  - Macrophages
  - Neutrophils
  - Fibroblasts
- Overall potentially speed the healing process

Lawsuits

- Source: Court TV, "Suit: Heating pad injured man's ability to provide wife with love," December 20, 2004 .
- $450,000 in damages
- The mother of a 36-year-old man who died from a fentanyl overdose in 1994 won a verdit of $5 million against the manufacturer in an early Duragesic Patch lawsuit. The case was settled by a confidential agreement on appeal. Kurt Hophan had been prescribed a patch for pain from a back injury. He fell asleep with a heating pad and an electric blanket and never woke up. The heat of the pad and blanket were said to have caused the patch to release 100 times the prescribed dose of fentanyl.

Evidence of tissue extensibility

- Lentell et al, JOSPT 1992, 16(5): 200-7
- 92 healthy volunteers
- Measured upper trap flexibility
- 5 groups
  - Stretch only
  - Heat + stretch
  - Cold + stretch
  - Heat and cold + stretch
  - No intervention

Lentell #2

- 3 treatments of 40 minutes over 5 days
- Follow up measurement 3 days after
- Significant improvement with heat + stretch
- Heat in stretched position

Thermal wraps





Evidence on thermal wraps

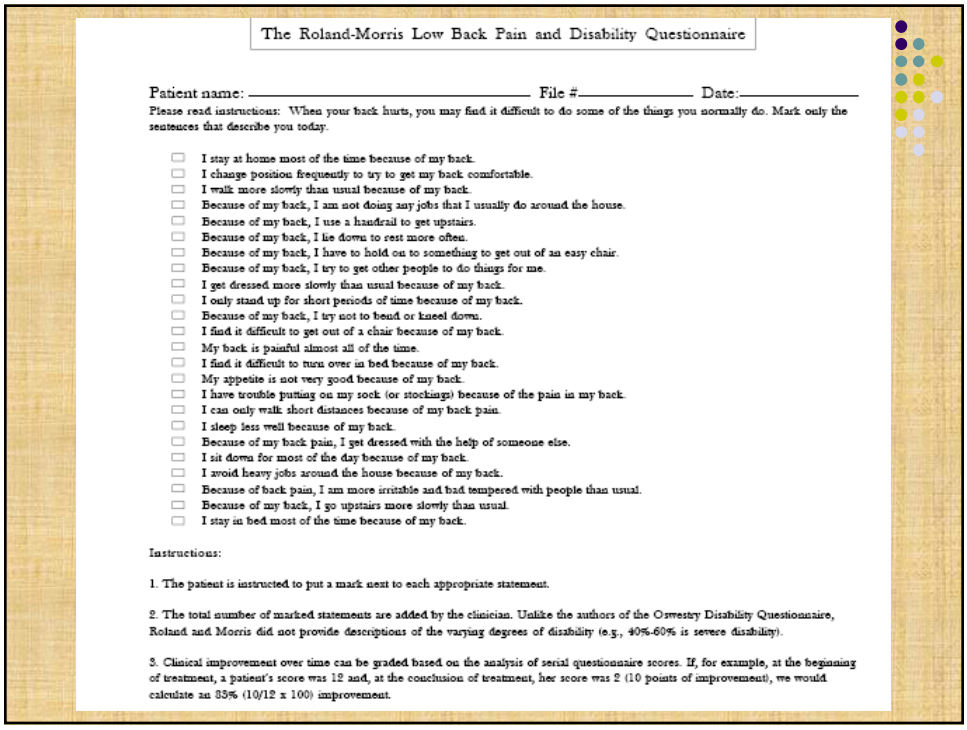
- Abeln SB, et al. Overnight treatment with continuous low level topical heat therapy provides effective relief of low back pain. **Journal of the American Pharmaceutical Association**. 2000; 41(2):307

Abeln #2

- 76 adults with acute muscular LBP
- 4 treatments
  - Thermal wrap
  - Placebo wrap
  - Ibuprofen (400mg)
  - Oral placebo
- Wraps worn 8 hrs/night

Abeln #3

- subjective measures
  - pain relief
  - muscle stiffness
- objective
  - trunk range of motion
  - Roland Morris disability
  - sleep onset difficulty and sleep quality



The Roland-Morris Low Back Pain and Disability Questionnaire

Patient name: _____ File #_____ Date:_____

Please read instructions: When your back hurts, you may find it difficult to do some of the things you normally do. Mark only the sentences that describe you today.

- ☐ I stay at home most of the time because of my back.
- ☐ I change position frequently to try to get my back comfortable.
- ☐ I walk more slowly than usual because of my back.
- ☐ Because of my back, I am not doing any jobs that I usually do around the house.
- ☐ Because of my back, I use a handrail to get upstairs.
- ☐ Because of my back, I lie down to rest more often.
- ☐ Because of my back, I have to hold on to something to get out of an easy chair.
- ☐ Because of my back, I try to get other people to do things for me.
- ☐ I get dressed more slowly than usual because of my back.
- ☐ I only stand up for short periods of time because of my back.
- ☐ Because of my back, I try not to bend or kneel down.
- ☐ I find it difficult to get out of a chair because of my back.
- ☐ My back is painful almost all of the time.
- ☐ I find it difficult to turn over in bed because of my back.
- ☐ My appetite is not very good because of my back.
- ☐ I have trouble putting on my sock (or stockings) because of the pain in my back.
- ☐ I can only walk short distances because of my back pain.
- ☐ I sleep less well because of my back.
- ☐ Because of my back pain, I get dressed with the help of someone else.
- ☐ I sit down for most of the day because of my back.
- ☐ I avoid heavy jobs around the house because of my back.
- ☐ Because of back pain, I am more irritable and bad tempered with people than usual.
- ☐ Because of my back, I go upstairs more slowly than usual.
- ☐ I stay in bed most of the time because of my back.

Instructions:

1. The patient is instructed to put a mark next to each appropriate statement.

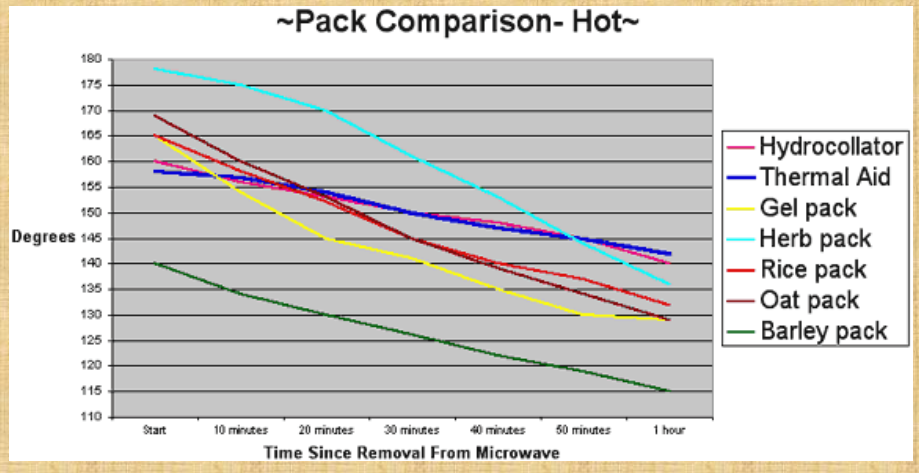
2. The total number of marked statements are added by the clinician. Unlike the authors of the Oswestry Disability Questionnaire, Roland and Morris did not provide descriptions of the varying degrees of disability (e.g., 40%-60% is severe disability).

3. Clinical improvement over time can be graded based on the analysis of serial questionnaire scores. If, for example, at the beginning of treatment, a patient's score was 12 and, at the conclusion of treatment, her score was 2 (10 points of improvement), we would calculate an 83% (10/12 x 100) improvement.

Abeln #4

- Heat therapy compared to placebo provided significant increases in:
  - mean 3 day morning pain relief (2.75 vs. 1.45; p = 0.00005)
  - trunk range of motion (20 vs. 17 cm ; p = 0.001) and decreases in muscle stiffness (36.3 vs. 47.9; p = 0.0008)
  - disability (15% vs. 24% ; p = 0.005).
- These therapeutic benefits were evident both during the 3 day treatment period as well as during the 2 day follow-up period

Keep it hot



Contrast therapy

- Repeated immersion into cold, then hot
- 1 minute cold, 3-4 minutes hot
- Effects
  - Counterirritant
  - “pumping” action from blood vessel dilation and constriction
  - Activation of descending pain modulation

Contrast therapy evidence

- Myrer et al, Journal of Athletic Training. 1997 Jul-Sep; 32(3): 238-41
- 16 healthy volunteers
- 20 minutes of contrast therapy
- Subcutaneous and intramuscular tissue temperatures were measured
- No significant temperature fluctuation in intramuscular region

Consensual heating

- Heat applied to regions of the spine will cause some reflex vasodilation at that myotomal level
- Examples
  - Hot pack to cervical region will cause vasodilation to UEs
  - Heat to lumbar region will cause vasodilation to Les
- Safer for people who cannot tolerate direct heating

Contraindications

Contraindications

- Acute injury or inflammation: edema, bleeding, may aggravate inflammatory reaction
- Open draining wound
- Thrombophlebitis: dislodge thrombus or blood clot
- Impaired sensation/mental cognition: burns
- Malignancy: may increase growth rate
- Pregnancy: avoid heating of the trunk or full body- may affect fetal development

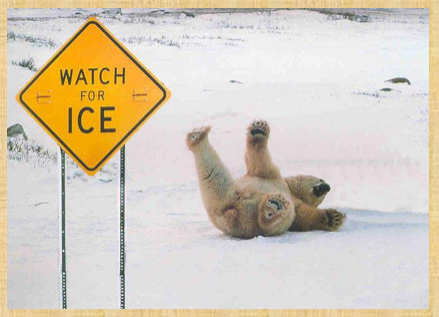
Precautions

- Chronically inflamed joints
- Impaired circulation/ poor thermal regulation: burns
- Edema
- Cardiac insufficiency: may not tolerate increase in cardiac demand
- Metal implants: internal bleeding
- Over an superficial-closed or open wound: contamination, burns, breakdown immature scars
- Over areas where topical counterirritants have recently been applied: further vasodilation may promote burns

Literature Review

- Hot packs and static stretching
  - Mixed results (+ shoulder, - hamstrings)
- Rheumatoid arthritis
  - Mixed results (50/50)
- Burn contracture (+, type II)
- Traumatic hand injury (+, type II)
- Adhesive capsulitis (+, type II)
- Low back pain (+, type II)
- Trigger-point pain (+, type II)
- Spasm (+, type II)
- Neck and shoulder pain (+, type II)

Cryotherapy



Cryotherapy

- Not putting cold into the body
- Removing heat from body

Energy Transfer

- Conduction: direct collision between molecules of two materials at different temperatures
- Convection: contact between circulating medium and another material at different temperatures
- Radiation: through the traveling of electromagnetic waves, across the air, from the warmer to the cooler substance or body
- Evaporation: transfer of heat from the body by conversion of a volatile liquid into a vapor when the liquid is applied to the skin (vapoocoolant)
- Conversion: changing from one form of energy to another (US)

Energy Transfer- Conduction

- Conduction: direct collision between molecules of two materials at different temperatures
  - Transfer of heat from the body by the direct interaction of molecules in the (warm) body with those in a cool (cold) medium, which is dependent on:
    - Temperature difference between the two objects
    - Time of exposure
    - Thermal conductivity of the substance being cooled

Energy Transfer- Conduction

- Rate of heat transfer by conduction:
  - [Area X K X (T1-T2)]/ thickness of tissue
    - Area= bigger area then fast rate of exchange
    - K= conductivity coefficient= depends on tissue
      - Bone > Muscle > Fat
        - Bone has greater thermal conductivity
      - Want material between ice and person to be as conductive as possible
      - Use wet towel vs. dry towel (more of an insulator)
    - Temperature difference

Energy Transfer- Conduction

Energy Transfer- Conduction

Energy Transfer- Convection

Energy Transfer- Evaporation

- Evaporation: transfer of heat from the body by conversion of a volatile liquid into a vapor when the liquid is applied to the skin
- Vapocoolant: low boiling point so exposure to air results in boiling and evaporates taking energy/heat away from the tissue
  - Transition from liquid to gas requires energy which is taken from the skin
  - Counter irritant

Energy Transfer- Evaporation

- Vapocoolant spray generally lower skin surface temp to 59ºF which causes little change in subcutaneous temp
- Superficial effects- no changes below epidermis
- Brief

Vapocoolants

Used to “spray and stretch”

Ethyl chloride – explosive, flammable, highly toxic

Fluoromethane – nonflammable, chemically stable, nontoxic, nonexplosive

Cold compression systems

- Continuous or manually intermittent flow of cold water
- Pressure/compression
- Cold water molecular activity
- No insulation

Biocompression.com

Energy Transfer Summary

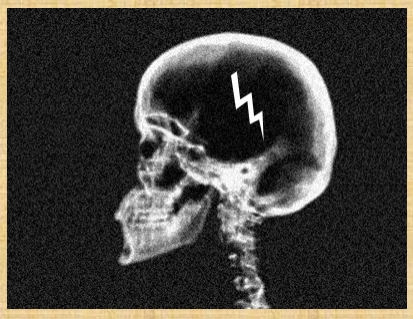
Table 3–1
Methods of Energy Transfer with Cold Modalities

	Conduction	Convection	Evaporation
Cold or ice packs	✓		
Ice massage	✓		
Vapocoolant sprays			✓
Controlled-cold units	✓		
Cool whirlpool or cold baths	✓	✓ with agitation of water via turbines	

Michlovitz and Nolan, 2005

What factors influence the patient's response to cold therapy?

- Hint: recall conduction equation



What factors influence the patient's response to cold therapy?

- Temperature difference between cold stimulus and tissue
- Time of exposure
- Thermal conductivity of area being cooled
  - Bone > Muscle > Fat
  - Fat has lower thermal conductivity so it acts more like an insulator, providing resistance to heat transfer
- Type of cooling agent
- Total body surface area cooled

Cryotherapy Effects

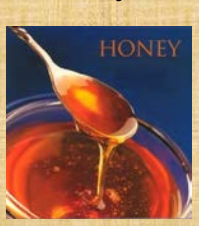
- Hemodynamic
- Metabolic
- Neuromuscular

Cryotherapy Effects- Hemodynamics

- Vasoconstriction of cutaneous blood vessels
  - Decreases blood flow
  - Less leakage and less edema (think back to inflammation!)
- Reflex Vasoconstriction: cold triggers reflex activation of sympathetic adrenergic nerve fibers which leads to release of norepinephrine on the adrenergic receptors of smooth muscles surrounding blood vessels, causing reflex vasoconstriction
  - Results in vasoconstriction in deeper and more distal tissue

Cryotherapy Effects- Hemodynamics

- Edema control
  - Apply early (5-10 min) post-injury
  - Works best with compression
  - Not effective if edema caused by immobility or venous insufficiency
- Increase in blood viscosity
  - Think of honey when cold
  - Less bleeding in cold weather



Cryotherapy Effects- Metabolic

- Decreases metabolic rate
  - Reduces the potential for further cell death from secondary cell hypoxia
    - Acute traumatic injury results in poor oxygen supply and further cell death
    - Minimized by slowing metabolism
  - May help reduce destructive joint disease in arthritic conditions
- Decreases inflammatory process

Cryotherapy Effects- Neuromuscular

- Alters peripheral nerve activity
- Decreases sensory and motor conduction velocity...so what
- Be careful when applying ice over a superficial nerve
  - May cause nerve death

Cryotherapy Effects- Neuromuscular

- Pain control
  - Decrease nerve conduction velocity of A-delta and C fibers
  - May act as counter-irritant
  - Decreases edema
    - less mechanical activation of nociceptors

Cryotherapy Effects- Neuromuscular

- Changes in muscle strength 
  - Short cold applications may increase muscle strength
    - Facilitates alpha motor neuron activity (Clendenin)
  - Example = person with poor dorsiflexion due to paralysis- swipe with ice- increase activity

Cryotherapy Effects- Neuromuscular

- Changes in muscle strength ↓
  - Longer cold applications (i.e. immersion of limb in cold water X 30 min) may decrease muscle strength for up to one hour then increases in muscle strength for 1-3 hours
    - Reduced blood flow
    - Increase in viscous properties of muscle
  - Be careful with athletes who are returning to playing field

Cryotherapy Effects- Neuromuscular

- Decreases spasticity
  - Decreases gamma motor neuron activity
  - Cooling affterent spindles and GTO discharges are decreased which can persist up to 90 min
- Signs of reduced spasticity
  - Decrease amplitude of deep tendon reflexes
  - Decreased frequency and duration of clonus
    - Clonus- characterized by rapidly alternating muscular contraction and relaxation
  - Improved ability to participate in exercise program
  - May be able to stretch more
- Cannot always be accurately predicted
- Brainstorm: What type of patient would this benefit?

Adverse Effects

- Tissue death
- Frostbite
- Nerve damage

Indications

- Acute/subacute traumatic and postsurgical injuries (think back to inflammation)
- Pain
- Muscle spasm
- Spasticity disorders
- Post therapy/exercise

Ice packs applied over soft cast (Schaubel)

- Less splitting of casts (less swelling)
- Less inflammation (lower WBC counts)
- Fewer hematomas
- Lower narcotic levels (less pain)

RICE

- Rest, Ice, Compression, Elevation
- Acute traumatic injuries

MICE

- Motion (controlled), Ice, Compression, Elevation

Table 3–4

RICE (Rest, Ice, Compression, and Elevation)

Intervention	Technique	Rationale
Rest	Immobilization, limited weight bearing Limited-range active motion	Limit inflammation, protect injured tissues
Ice	Ice packs Ice baths Controlled-cold compression	Reduce bleeding Control pain Reduce microvascular permeability Reduce metabolism to limit secondary hypoxic injury Limit edema
Compression	Light compressive bandages Elasticized gloves for hand edema	Limit edema Maintain gains in edema reduction
Elevation	Extremity positioned above heart level	Reduce hydrostatic pressure to limit edema formation

Michlovitz and Nolan, 2005

→ Increasing hydrostatic pressure outside of vessel so decrease leakage

Cryokinetics

- Cold + Exercise
- Restore motion by decrease muscle spasm, exercise-induced soreness, and pain
- Example

Myofascial Pain Syndrome

- Sxs= localized and referred pain, decreased ROM
- Characterized by myofascial trigger points
- Treatment includes spray and stretch over the trigger point
  - What if you don't have spray and stretch?
  - What else could be used?

Spasticity Reduction

- Associated with UMN lesion
- Characterized by increased resistance to passive stretch, increased DTR and clonus
- Cold applied over hypertonic muscle for 10-30 min may reduce hypertonus (~ 90 min)
- Allows individual to perform functional activities with greater ease
  - Gait training

Guidelines

- Evaluate patient for cold hypersensitivity
  - Soak wash cloth in cold tap water
  - Wrap around wrist and hold 20 seconds
  - Once removed, skin should be mildly pink (HA release)
  - If blotchy, pink and white, or very white then likely have sensitivity to cold

Cold urticaria- post ice cube application

Guidelines

- Administer treatment 10-30 min
  - Depends on method of application
  - Patient tolerance
  - Condition
  - Tissue type
  - Treatment purpose
- Cold application may mask pain- be careful when stretching or exercising
- May increase joint stiffness

Documentation

- Type of cold agent
- Duration
- Site
- Patient position
- Response: skin, pain, edema, motion

Types

- Commercial cold packs
- Ice massage
- Cold baths
- Vapocoolant spray
- Controlled cold-compression unit (cryocuff)

Commercial Cold Packs

- Stays cold 5-20 min
- Apply over a moist towel
- Be careful with chemically activated cold packs
  - Alkaline pH can burn if pack splits open

Ice Massage

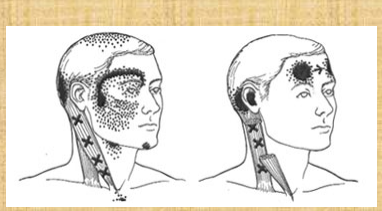
- Water frozen in *paper* cup
- Apply to small area with overlapping strokes
- Use over muscle belly, tendon, bursa, trigger points before friction massage
- Patient will experience 4 stages: CBAN
  - Cold
  - Burning
  - Ache
  - Numbness

Cold Baths

- Immerse limb in water *55-64ºF*
- The lower the temp, the shorter the duration of immersion
- If immersing big area, more likely to have systemic effects

Vapocoolant sprays

- Ethyl chloride- volatile, flammable
- Fluori-methane- safe, non-flammable



Cryocuff

- Can adjust temp
- Sleeve is inflated intermittently to increase tissue pressure to force edema into lymphatics

Contraindications

- Always ask patient if they have ever had a sensitivity to cold!
- Cold urticaria- cold allergy- massive release of HA- wheals (white spots with red middle), face flushes, low blood pressure, high heart rate, syncope (loss of consciousness)
- Cryoglobulinemia- abnormal blood protein forms precipitate- ischemia/gangrene
  - Seen in RA, leukemia, lupus
  - May be idiopathic

Contraindications

- Raynauds disease- vasospastic disease
- Paroxysmal cold hemoglobinurias- release of hemoglobin in urine- rapid breakdown of blood cells occurs post cold application
  - May see blood in urine after cryotherapy
- Circulatory compromised areas
- Over regenerating nerves
- Circular insufficiency or peripheral vascular disease

Precautions

- Hypertensive patients
- Poor sensation
- Poor cognition
- Very young or very old
- Healing wounds
- Superficial nerves
- Cooling large areas
- Using wet medium
- Long duration

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Questions?

- Thank you!

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