Chapter 15

Part I: Application of Superficial Cold Modalities

Introduction
- Effective use of therapeutic modalities requires much more than “how to” knowledge

Effective Use of Therapeutic Modalities

Objectives
- Effectively prepare you to be a technician for the application of superficial therapeutic modalities

Objectives
- Briefly discuss the methods of energy transfer associated with therapeutic modalities
- Describe the general types of therapeutic modalities used by athletic trainers
- Describe the physiological effects of cold application
- Discuss the indications, contraindications, and precautions associated with cold modalities
- Discuss factors that influence the therapeutic effectiveness of cryotherapy

Thermal Energy Transfer
- Conduction
  - Transfer of heat between two objects that are in physical contact with one another
- Convection
  - Transfer of heat through the movement of air or fluids
- Conversion
  - Transfer of heat through the conversion of one form of energy to another
### Categories of Therapeutic Modalities

- Superficial cold (2-5 cm.)
- Superficial heat (2 cm.)
- Deep heating (2-5 cm.)
- Electrical
- Mechanical

### Categories of Therapeutic Modalities

- Mechanical
  - Therapeutic massage
  - Cervical Traction
  - Biofeedback
  - Continuous passive motion (CPM)
  - Intermittent compression unit

### Categories of Therapeutic Modalities

- Electrical
  - High-volt pulsed stimulation
  - Transcutaneous electrical nerve stimulation (TENS)
  - Interferential stimulation
  - Iontophoresis

### Categories of Therapeutic Modalities

- Deep heating
  - Ultrasound
  - Phonophoresis
  - Diathermy

### Types of Therapeutic Modalities

- Superficial heat (2 cm.)
  - Hot pack
  - Paraffin bath
  - Warm whirlpool

### Types of Therapeutic Modalities

- Superficial cold (2-5 cm.)
  - Ice bag/pack
  - Ice massage
  - Ice immersion
  - Cold whirlpool
  - Cryokinetics

### Cryotherapy
Cryotherapy

- Temperatures range from 32°F - 65°F depending on the modality
- Therapeutic benefits require skin temperatures of at least 57°F

Sensations Associated with Cold Applications

- Cold
- Burning
- Aching
- Pins & needles
- Numbness

These sensations are most pronounced with ice immersion.

Sensations Associated with Cold Applications

- Educating the patient about the sensations associated with cold applications can make the cold more tolerable.
- Repeated applications make the cold more tolerable (adaptation)

Focus: Pre-application Parameters

- Local physiological effects
- Indications
- Contraindications
- Precautions
- Therapeutic effectiveness
- Unfounded recommendations

Local Physiological Effects of Cold Applications

- ↓ metabolism
- ↓ blood flow
- ↓ inflammation
- ↓ muscle spasm
- ↓ pain
- ↑ joint stiffness
- ↓ muscle tissue extensibility

Local Physiological Effects of Cold Applications

- ↓ strength
- ↓ power
- ↓ endurance
- n/a proprioception/balance

Clinical implications?
**Indications for Cold Applications**
- Acute injury
- Acute & subacute inflammation
- Acute or chronic pain
- Acute or chronic muscle spasm
- Postsurgical pain & edema

**Physiological Effects**
- Decreased metabolism
- Decreased blood flow
- Decreased inflammation
- Decreased muscle spasm
- Decreased pain
- Decreased joint stiffness
- Increased muscle tissue extensibility

**Use of Cold in Treatment of Acute Injuries**
- Most important physiological effect
  - Decreased cellular metabolism
  - Decreased need for O₂
  - Decreased secondary hypoxic injury

**Use of Cold in Treatment of Acute Injuries**
- Primary injury vs. secondary injury

**Contraindications for Cold Applications**
- Cold allergy/hypersensitivity
  - Urticaria – hives produced by cold application
- Raynaud’s phenomenon
- Uncovered open wounds
- Compromised circulation
- Cardiac disorder
- Anesthetic skin
- Advanced diabetes

**Precautions for Cold Applications**
- Do not apply ice to the skin for longer than 1 hour
- Be careful when applying a cold-gel pack directly to the skin for longer than 5-10 minutes
- Do not apply cold-gel packs under compression bandage

**Precautions for Cold Applications**
- Be careful when applying compression over an ice bag to body parts where major nerves are superficial (ulnar, peroneal) – may cause nerve palsy.
- Do not apply the wrap too tightly.
Nerve Palsy
- Occurs in < 0.001% of the cold applications
- Best prevention
  - Awareness of the possibility
  - Warn your athletes
  - Take precautions (apply compression a little looser)

Frostbite
- Occurs rarely in the treatment of musculoskeletal injuries
- Fear of frostbite causes many clinicians to be too conservative in the use of cold modalities

Frostbite
- Risk factors
  - Exceeding the recommended treatment duration (> 1 hr)
  - Using temps below the recommended treatment temperature
  - Patients with severe circulatory problems
  - Reusable cold pack (gel-packs)

Factors Influencing Therapeutic Effectiveness
- Most significant temperature changes occur in skin & synovium
- Magnitude of temperature changes depends on:
  - type of cold modality used
  - treatment time

Factors Influencing Therapeutic Effectiveness
- Tissue rewarming effected by the magnitude and duration of cold application
  - Generally, the longer the ice is applied, the longer the rewarming
  - Deeper tissue takes longer to rewarm than superficial tissue
Factors Influencing Therapeutic Effectiveness

- May take up to 2 hours for tissue rewarming, depending on the tissue
  - Fingers rewarm faster than ankle, forearm, or knee.
  - Rewarming is accelerated by activity

Clinical implications?

Unfounded Beliefs/Recommendations

- Cold-induced vasodilation (CIVD) causes increased swelling after 20 minutes of cold application

Unfounded Recommendations

- Limiting ice applications to 20 minutes to avoid frostbite
  - Ice applications are of little value if they don’t cool the deep injured tissues
  - Depending on the depth of the tissue, 20 minutes may not provide optimum benefits

- Never applying ice (other than ice massage) directly to the skin
  - In most cases, failure to apply ice directly to the skin will result in less than optimum results

Cold-gel packs should not be applied directly to the skin. Care should be taken when applying ice directly to the skin over superficial nerves.

- Avoid compression when applying ice
  - Compression is imperative for treating acute musculoskeletal injuries
  - Compression increases the therapeutic effects of cold applications

Unfounded Recommendations

Summary

- Discuss the methods of energy transfer associated with therapeutic modalities
- Discuss the general categories of therapeutic modalities
- Describe the physiological effects of cold application
- Discuss the indications, contraindications, and precautions associated with cold modalities
- Discuss factors that influence the therapeutic effectiveness of cryotherapy
What questions do you have?

What’s Next?

Prior to class on Monday:
- Read Chapter 15 - section on thermotherapy

Monday Lab (9/8/03):
- Finish wound care lab
- Application of superficial cold & heat
- Policies & Procedures
  Acknowledgement Statement
  DUE