Current Trends in the Use of Therapeutic Modalities in the Treatment of Sports Injuries

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Competencies and Proficiencies

1. What are therapeutic modalities and why are they used in the treatment of sports injuries
2. Transitioning from passive modalities to active care
3. Overview of cryotherapy and the controversies in the treatment of sports injuries
4. Introduction to extracorporeal shock wave therapy
5. Introduction to laser therapy
Therapeutic Modalities in Rehabilitation

- **Manual Therapy**
  - Soft tissue massage
  - Myofascial release
  - Joint mobilization
  - Manipulation
  - Acupuncture

- **Therapeutic Exercise**
  - Flexibility exercise
  - Strengthening exercise
  - Balance, coordination, proprioception
  - Relaxation exercise

- **Patient Education**
  - Body mechanics
  - Pain relief
  - Home exercise programs
  - Wellness
  - Risk reduction

- **Therapeutic Modalities**
  - Thermal heat and cold
  - Mechanical compression
  - Vibration
  - Shock therapy
  - Acoustic, ultrasonic
  - Electromagnetic: electrical stimulation, laser, light therapy, diathermy

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Part of a Comprehensive Plan

- Modalities are used to improve or ameliorate alterations in body function such as loss of ROM, pain, and tissue damage

- If a practitioner cannot explain the physiological and clinical reasoning for using a specific therapeutic modality, then perhaps the practitioner should not be using the technique!

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Part of a Comprehensive Plan

- **ACA and Choosing Wisely**
  - Avoid protracted use of passive or palliative physical therapeutic modalities for low-back pain disorders unless they support the goal(s) of an active treatment plan

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Evidence-Based Practice

- Integrating the best available research evidence with clinical expertise and the patient's unique values and circumstances

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Cryotherapy
True or False: Ice is used to decrease edema 2-3 days following trauma to the tissue.

• False

What does the RICE acronym stand for?

• Rest, Ice, Compression, Elevation

True or False: When applying the RICE protocol using a bag of crushed ice, the practitioner must apply a thin layer of toweling between the ice and the skin.

• False
Cryotherapy

- Application of cold results in:
  - ↓ tissue temperature, cell metabolism, and blood flow
- Types
  - Ice, cold water, cold packs, vapocoolant sprays

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**Cryotherapy: Indications / Safe**

Superficial cold can be used on:
- tissues over active epiphysis
- intact skin overlying implants containing metal, plastic, or cement
- skin overlaying electronic devices
- regions of known or suspected malignancy
- the lower back and abdomen of pregnant women
- recently radiated tissues
- reproductive organs
- areas affected by skin diseases
- the chest, heart, and head
- tissues inflamed as a result of recent injury or exacerbation of chronic inflammatory condition

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**Cryotherapy: Contraindications**

Superficial cold should not be applied to:
- persons with cold urticaria (also called cold allergy or cold hyperSENSITIVITY)
- to persons with Raynaud’s disease
- to persons with cryoglobulinemia
- to persons with hemoglobinuria
- to areas of impaired circulation
- to areas near chronic wounds
- over regenerating nerves
- to tissues affected by tuberculosis
- to hemorhaging tissue or in persons with untreated hemorhagic disorders
- to areas with impaired circulation
- to persons with active deep vein thrombosis or thromboembolism
- to anterior neck and carotid sinus

**Cryotherapy: Precautions**

Superficial cold can be applied with caution to:
- areas of impaired sensation that prevent people from giving accurate and timely feedback
- infected tissues
- tissue near or over eyes
- damaged or at-risk skin

Cold therapy that is intense or applied to a large surface sufficient to produce generalized peripheral vasodilatation should be applied with caution to:
- people with hypertension
- people with cardiac failure
Cryotherapy

- NBCE Practice Analysis of Chiropractic 2015
  - 89.9% of chiropractors report using cryotherapy
  - 55.4% of chiropractors indicated that they currently employ one or more CAs to perform direct patient contact duties in their offices
  - 71.5% of CAs are asked to perform cryotherapy

Therapeutic Modalities Present in the Athletic Training Clinics Surveyed:
- Ice machine 99%
- Hydrocollator 99%
- Ultrasound 97%
- Game Ready 69%
- Paraffin 63%
- Laser 39%
- Diathermy 20%

Scenario #1: Acute Ankle Sprain

“The center on the men’s basketball team went up for a rebound and landed awkwardly during practice. An initial evaluation was performed and it was determined that he suffered a grade II lateral ankle sprain. He was pulled from practice to begin treatment. Which treatment do you perform?”

49% chose Game Ready as the modality of choice
30% chose RICE with an ice pack
11% chose ice immersion with cryokinetics
10% chose other
Scenario #2: Subacute Ankle Sprain

“The basketball player with a grade II lateral ankle sprain has moved past the acute care phase (0-4 days) and is now moving into the subacute phase (4-14 days). You begin a before-practice rehabilitation protocol to remove any swelling that is left over from the injury and to facilitate range of motion exercises. The athlete is full weight bearing and is able to walk unassisted. Which cryotherapy modality would you choose for the rehab?”


Why Ice Delays Recovery

- Dr. Gabe Mirkin
  - Coined the term RICE
  - Rest, Ice, Compression, Elevation
  - *Sportsmedicine Book, 1978*

RICE Protocol

- Protect
- Optimally Load
- Ice
- Compression
- Elevation


PRICE Needs Updating, Should We Call The POLICE?

- Protect
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- Compression
- Elevation


Why Ice Delays Recovery

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- In 2014:
  - “It appears that both ice and complete rest may delay healing, instead of helping.”
  - “There is no reason to apply ice more than six hours after you have injured yourself.”


**Stages of Healing**

Management of Lateral Ankle Sprains

- Rest, ice, compression, and elevation (RICE) is almost universally accepted as best practice by athletic trainers and other health care professionals immediately after acute ankle sprains.
- The acute phase of injury is defined as the period from the time of injury until the signs of inflammation (pain, heat, swelling, redness, and loss of function) peak and then begin to diminish.

NATA: Conservative Management and Prevention of Ankle Sprains in Athletes

- Cryotherapy should be applied to acute ankle sprains to reduce pain, minimize swelling formation, and decrease secondary injury. **Evidence Category: C**
- Compression should be applied to acute ankle sprains to minimize swelling. **Evidence Category: C**

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Cryotherapy should be applied to acute ankle sprains to reduce pain, minimize swelling formation, and decrease secondary injury. Evidence Category: C

Compression should be applied to acute ankle sprains to minimize swelling. Evidence Category: C

The limb with the acute ankle sprain should be elevated to minimize swelling. Evidence Category: C

Functional rehabilitation is more effective than immobilization in managing grade I and II ankle sprains. Evidence Category: A

Management of Lateral Ankle Sprains

Most of the rationale for using RICE or individual components is based largely on low-quality clinical trials and laboratory studies with uninjured participants or animal models.

Although the clinical evidence is sparse, cryotherapy has been a mainstay of clinical practice for rehabilitation specialists.

https://blogs.bmj.com/bjsm/2019/04/26/soft-tissue-injuries-simply-need-peace-love/
Extracorporeal Shock Wave Therapy

Quiz

- What is the frequency range of human hearing?
- 20 to 20,000Hz

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  * Diagnostic imaging, therapeutic ultrasound, LIPUS, lithotripsy

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- What are the stages of tissue healing?
  * Inflammation, proliferation, maturation

Extracorporeal Shock Wave Therapy

- Most are familiar with the use of lithotripsy

- Concept of using high-energy shock waves is not new

- Single-impulse, focused acoustical sound waves having a rapid rise in pressure are used for ESWT

- Used to treat chronic musculoskeletal conditions such as calcific tendinopathy, lateral epicondylopathy, and plantar fasciopathy

Radial Pressure Wave

- Radial pressure waves

Extracorporeal Shock Wave Therapy

- **Contraindications:**
  - Bleeding conditions
  - Pacemakers
  - Medications that prolong blood clotting
  - Children
  - Pregnancy
  - Acute injuries

ESWT versus RPW

Extracorporeal Shock Wave Therapy

- Based upon a systematic review of nine placebo-controlled trials involving 1006 participants
  - There is "platinum" level evidence that shock wave therapy provides little or no benefit in terms of pain and function in lateral elbow pain
  - There is "silver" level evidence based upon one trial involving 93 participants that steroid injections may be more effective than ESWT

ESWT for Lower Limb Tendinopathy

- Accumulating evidence for the effectiveness of ESWT when treating lower limb tendinopathies
  - Greater trochanteric pain syndrome (GTPS), patellar tendinopathy (PT), and Achilles tendinopathy (AT)
- Conclusion:
  - An effective intervention
  - Should be considered for lower limb tendinopathy when other nonoperative treatments have failed

Extracorporeal Shock Wave Therapy

- ESWT has been proven an effective and safe non-invasive treatment option for tendon and other pathologies of the musculoskeletal system in a multitude of high-quality RCTs
- Optimum treatment protocol identified in this systematic review
  - Three treatment sessions at 1-week intervals, with 2000 impulses per session and the highest energy flux density that can be applied
Quiz

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  * 299,792,458 meters per second or 3.00 × 10^8 m/s

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- Name three examples of photoreceptors found in the human body or found in nature:
  * Chlorophyll, rods and cones in the eye, cytochrome C oxidase of the mitochondria

Light Amplification by Stimulated Emission of Radiation

- Originally theorized by Albert Einstein in 1917
- Not produced until the 1950's
- FDA approval for MSK conditions in early 2000's
Light Amplification by Stimulated Emission of Radiation

- All light is composed of photons, which are packets of light energy in the form of waves
- Lasers produce light that is highly refined
- Photons stimulate chromophores in a process known as photobiomodulation
- The stimulation of chromophores results in beneficial therapeutic outcomes:
  - Pain relief, accelerated healing, immunomodulation, wound healing, tissue regeneration, muscle relaxation, local vasodilation

Laser Classifications

- Class II: Produces an output up to 1mW
- Class IIIa: Produces an output up to 5mW
- Class IIIb: Produces an output between 5mW and 500mW
- Class IV: Produces an output greater than 500mW

Wavelength vs. Power vs. Energy

- Wavelength determines depth of penetration:
  - In nanometer (nm)
- Power determines saturation at the targeted depth:
  - In watt (W)
  - Consider ‘spot size’
  - Power density (W/cm²)
- Total energy delivered:
  - In joule (J)
  - Energy density (J/cm²)

NBCE Practice Analysis of Chiropractic 2015

- 23.5% of chiropractors report using cold laser
- 55.4% of chiropractors indicated that they currently employ one or more CAs to perform direct patient contact duties in their offices:
  - 16.3% of CAs are asked to perform cold laser
**Laser: Contraindications**

- Tissues infected with tuberculosis or other forms of erantial bacteria
- The low back or abdomen of pregnant women
- Regions of lesions or suspected malignancy
- Actively bleeding tissue or persons with uncontrolled hemorrhagic disorders
- Regions with active deep vein thrombosis or thromboembolitis
- Eyes
- Reproductive organs (testes)

**Goggles are Required**

- Protective eyewear must be worn with Class IIIb and Class IV lasers to prevent direct or indirect eye exposure
- Contraindications for Class IV, in addition to those from Electrophysical Agents:
  - Active epiphysis or open growth plates
  - Endocrine system, particularly thyroid
- Precautions for Class IV, in addition to those from Electrophysical Agents:
  - Tattoos

**Additional Considerations**

- Reviewed 22 clinical trials that assessed the safety and benefit of laser when compared to a placebo or another non-surgical treatment for CTS
- Most of these studies had weaknesses that could have compromised their results and caused them to overestimate or underestimate benefits or harms
- There is insufficient evidence to support laser being better or worse than any other type of non-surgical treatment in the management of CTS
The Use of Laser Therapy for Musculoskeletal Pain

- According to the more than 4000 studies on pubmed.gov, it can be concluded that the majority of laboratory and clinical studies have demonstrated that laser has a positive effect on acute and chronic musculoskeletal pain.
- Laser is beneficial for pain relief and can accelerate the body’s ability to heal itself.
- Laser does not correct situations involving structural deficits or instabilities whether in bone or in soft tissue.


Noninvasive Treatments for Acute, Subacute, and Chronic Low Back Pain

- For patients with chronic low back pain, clinicians and patients should initially select nonpharmacologic treatment:
  - Exercise
  - Multidisciplinary rehabilitation
  - Acupuncture
  - Mindfulness-based stress reduction
  - Tai chi or yoga
  - Motor control exercise
  - Progressive relaxation
  - Electromyography biofeedback
  - Low-level laser therapy
  - Operant therapy
  - Cognitive behavioral therapy
  - Spinal manipulation

Evidence-Based Practice

In Conclusion

Therapeutic Modalities in Rehabilitation
Thank You!

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