Modalities and Rehabilitation in the Training Room

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Objectives

• Enhance the learner’s understanding of...
  – The general management and rehabilitation of injuries at three stages of injury
  – The role of therapeutic exercise and modalities in the training room
  – A variety of training room therapeutic modalities and their indications and evidence for use

Process of Rehabilitation

“The restoration of normal anatomical and physiological function”

Rehabilitation Protocol

Determine Phase of Injury
  Acute/Subacute/Chronic

Determine Desired Outcome/Goals

Rule Out Precautions/Contraindications

Determine Therapeutic Modality

Develop Progression of Treatment

Stages of Injury

• Stage I: Acute Inflammatory Phase
• Stage 2: Regeneration and Repair
• Stage 3: Remodeling Phase

Stage I: Acute Inflammatory Phase

• Lasts up to 72 hours
• Immobilization?
• Avoid heat and massage
• Address psychological impact
Stage I: Goals
• Protect from further injury
• Control pain
• Limit swelling
• Promote normal healing

Stage I: Management
• Pharmacological interventions
• Physical Modalities
  – PRICES
• +/- Immobilization
• Therapeutic Exercises
  – Isometric
  – ROM?

Immobilization??
+ accelerates formation of granulation tissue
+ limits scar size
+ improved penetration of fibers through connective tissue
  - muscle atrophy
  - weakness

Early mobilization
• Increases tensile tissue strength
• Improved orientation of regenerating muscle fibers
• Stimulates resorption of connective scar tissue
• Improved recapillarization
• Decreases muscle atrophy and weakness

Stage 2: Regeneration and Repair
• Fibro-elastic/collagen-forming stage
• 48 hours ➔ 6 weeks

Stage 2: Goals
• Allow normal healing
• Maintain function of uninjured parts
• Minimize deconditioning
• Increases ROM
• Improve strength, endurance, power
• Increase aerobic capacity
• Improve proprioception
Stage 2: Management

- Modalities
  - Heat
  - E-stim
    - Enhance motor unit activation/recruitment
  - Soft Tissue Mobilization
- **Therapeutic Exercises**
  - Stretching/flexibility
  - Eccentric/concentric
  - Isometric/isotonic/isokinetic

Therapeutic Exercises

- Prescribed outline of exercise with
  - Type
  - Intensity
  - Duration
  - Frequency

Therapeutic Exercises

- Early strength gains → neurological factors
- Muscle hypertrophy occurs after several weeks of training
- Restoration of strength can take 3-6 months
- Maintenance training at lower frequency should be permanent component of program

Therapeutic Exercises

- Aerobic Conditioning
  - Cycling, swimming, rowing
- Proprioception/coordination/balance
  - Type
  - Intensity
  - Duration
  - Frequency

Soft Tissue Mobilization

- Controlled stress on scar tissue to influence final form and function
- Parallel fiber arrangement
  - Elastic
  - More mobility without irritation and pain

Stage 3: Remodeling Phase

- 3 weeks → 12 months
- Remodeling of collagen to increase functional capabilities of muscle, tendon, etc.
Stage 3: Goals
• Resolve:
  – Residual strength deficits
  – Imbalances
  – Asymmetry
• Return to competition
  – Absence of symptoms
  – Normal flexibility
  – Adequate strength (90%)
  – Ability to perform
  – Psychological aspect

Stage 3: Management
• Continued conditioning/exercises
• Development of sport specific skills
• Gradual RTP/training with team/coach
• Psychological preparation for play
• Prevention of further injury (maintenance program)

Rehabilitation Protocol

Therapeutic Modalities
• “no cookbook protocol”
• Play a role at each stage of injury/healing
• Formulate a treatment protocol/plan
• Awareness of side effects
• Safety measures
• Beware of marketing!!

Therapeutic Modalities
• Heat
  • Ultrasound
  • Phonophoresis
  • Cryotherapy
  • Electrical Stimulation
  • Laser
  • Kinesio taping

Heat
• Superficial
  – Conduction
    • Hydrocollator packs
  – Convection
    • Whirlpool tanks
• Deep
  – Convection
  • Ultrasound
  • Diathermy
Heat

- **Hydrocollator/Heating pack**
  - Indications: Chronic pain, muscle spasm, inc. blood flow
  - Precautions: Thermal hypersensitivity
  - Contraindications: Acute inflammation, malignancy, desensitized skin
  - Treatment Duration: 15–20 minutes or until heat has dissipated.

- **Indications:**
  - Chronic pain
  - Muscle spasm

- **Precautions:**
  - Thermal hypersensitivity

- **Contraindications:**
  - Acute inflammation
  - Malignancy
  - Desensitized skin

- **Treatment Duration:**
  - 15–20 minutes

Heat

- **Hydrotherapy (Warm Whirlpool)**
  - 98–108 F
  - Indications: Pain, muscular spasm, tissue extensibility
  - Precautions: Thermal hypersensitivity
  - Contraindications: Malignancy, desensitized skin
  - Treatment Duration: 15–20 min

Ultrasound

- **Deep heating agent**
- **Indications:**
  - Tissue extensibility
  - Chronic pain
  - Muscular spasm
  - Increasing blood flow
  - Inducing inflammatory response to resolve chronic injury

- **Precautions:**
  - Thermal hypersensitivity
  - Allergy to gel

- **Contraindications:**
  - Acute inflammation (thermal)
  - Malignancy
  - Desensitized skin
  - Eyes
  - Reproductive organs
  - Fluid-filled cavity organs
  - Epiphyseal plates
  - Infection

- **Possible effects:**
  - Deep tissue heating
  - Non-thermal tissue manipulation

- **Frequency:**
  - Number of wave cycles per second.
  - Common: 1 MHz - 3 MHz

  - Lower frequency ➔ deeper beam penetration
  - 1 MHz ➔ deep heating frequency (2–5 cm)
  - 3 MHz ➔ superficial structures (1–2 cm)

- **Indications (Thermal effects):**
  - Tissue extensibility, chronic pain, muscular spasm, increasing blood flow, inducing inflammatory response to resolve chronic injury

- **Indications (Non-thermal Effects):**
  - Increase local metabolism
  - Increase tissue-healing factors
  - Bone healing

- **Precautions:** thermal hypersensitivity, allergy to gel

- **Contraindications:**
  - Acute inflammation (thermal)
  - Malignancy
  - Desensitized skin
  - Epiphysal plates
  - Infection

Phonophoresis

- **Anti-inflammatory medication added to u/s coupling medium (gel)**
- **Ultrasound waves promote transdermal tissue absorption of medication**
Phonophoresis vs. Ultrasound for Myofascial Pain

- RDBPCT
- 60 patients
- Diclofenac phonophoresis and ultrasound therapy were effective in the treatment of patients with MPS.
- Phonophoresis was not found to be superior over ultrasound therapy.


Cryotherapy

- Ice bag
- Ice cups
- Frozen gel packs
- Cold whirlpool

Cryotherapy

- Decrease blood flow (capillary constriction)
- Reduce pain
- Decrease swelling
- Decreases inflammatory cytokine release
- Quicker healing time?

Cryotherapy

- Cold whirlpool
  - 50-60 F
  - Indications: Pain, muscular spasm, prevent or decrease swelling
  - Precautions: Hypersensitivity to cold
  - Contraindications: Infection, desensitized skin
  - Treatment Duration: 15–20 minutes

Cryotherapy for acute ankle sprains: a randomised controlled study of two different icing protocols

- 20 min continuous vs. 10 on/10 off/10 on
- Both groups repeated every 2 hours over the first 72 hours of injury
- Intermittent protocol had significantly (p<0.05) less ankle pain on activity than those using a standard 20 minute protocol
- One week after injury, NO significant differences between groups in terms of function, swelling, or pain at rest.


Effect of local cold-pack application on systemic anabolic and inflammatory response to sprint-interval training: a prospective comparative trial.

- 12 male handball players
- 4 x 250 m treadmill run, at 80% max
- Rest period with and without local cold-pack application
- Pre, immediately post, and 60-min post-exercise blood samples drawn
- “Local ice therapy immediately following sprint-interval training was associated with greater decreases in both pro- and anti-inflammatory cytokines and anabolic hormones supporting some clinical evidence for possible negative effects on athletic performance”
- Very small study!

Electrical Stimulation

- E-Stim
- Neuromuscular stimulation
  - Electric current/skin electrodes
- Transcutaneous Electrical Nervous Stimulation (TENS)
  - TENS = “non-specific” term that refers to all forms of E-Stim, however, there are small, portable, battery powered units referred to as “TENS units”

Electrical Stimulation

- Various Currents Used
  - Interferential Current (IFC)
  - Premodulated Current
  - High Voltage Pulsed Current (HVPC)
  - Russian Current
- Different in:
  - Intensity
  - Pulse frequency
  - Pulse duration
  - Polarity

Electrical Stimulation

- Indications:
  - Pain modulation, wound healing, muscle re-education, edema reduction, muscle recruitment
- Contraindications:
  - Pacemakers, cancerous lesions, hemorrhage, pregnancy, metal implants in treatment area

Therapeutic Laser

- Light Amplification by Stimulated Emission of Radiation
  - Anti-inflammatory
    - Vasodilation
    - Stimulates lymphatics
  - Anti-pain
    - Regulates Na-K pump in nerve fibers
  - Speeds healing
    - Inc capillaries
    - Stimulates collagen
    - Regenerates immune cells

Additive effects of low-level laser therapy with exercise on subacromial syndrome: a randomised, double-blind, controlled trial.

- 80 patients with subacromial syndrome
- Group 1: laser treatment (pulsed infrared laser) and exercise therapy for ten sessions for 2 weeks
- Group 2: placebo laser and the same exercise therapy
- Conclusion: LLLT combined with exercise is more effective than exercise therapy alone in relieving pain and in improving the shoulder ROM in patients with subacromial syndrome

Low-level laser therapy in ankle sprains: a randomized clinical trial

- 217 patients: acute lateral ankle sprains
- 12 treatments of laser therapy in 4 weeks as an addition to standard rehab (bracing and HEP)
  - 3 groups: high dose, low dose and placebo laser
- No sig difference in pain (primary outcome)
- CONCLUSIONS: Neither high- nor low-dose laser therapy is effective in the treatment of lateral ankle sprains


Low level laser therapy for nonspecific low-back pain

- Cochrane Database Syst Rev. 2008
- “insufficient data to draw firm conclusions on the clinical effect of LLLT for low-back pain.”
- “need for further methodologically rigorous RCTs to evaluate the effects of LLLT compared to other treatments, different lengths of treatment, wavelengths and dosages.”

Kinesio taping

- Elastic therapeutic tape with “a texture and elasticity very close to living human tissue”
- Designed in 1970s by Kenzo Kase, a Japanese chiropractor and acupuncturist
- Claim: lifts the skin and allows improved blood and lymph flow

Kinesio Taping in Treatment and Prevention of Sports Injuries: A Meta-Analysis of the Evidence for its Effectiveness

- 10 article Meta-analysis
- Only 2 studies investigated sports-related injuries (shoulder impingement)
- Efficacy of KT in pain relief was trivial
- Inconsistent range-of-motion and strength outcome results
- Conclusion: “little quality evidence to support the use of KT over other types of elastic taping in the management or prevention of sports injuries”
- Further studies needed

Rehabilitation Protocol

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Summary

- Effective training room rehabilitation is patient specific and may involve medications, exercises, procedures and modalities
- Develop a treatment protocol
- More research needed on the effectiveness of various modalities
- Psychological benefits of rehab
References


Physiotherapy Evidence Database

- PEDro: http://www.pedro.org.au
- Easy access to randomized controlled trials and systematic reviews of physiotherapy interventions.
- Method Score: 10/10
  - Random allocation; Concealed allocation; Baseline comparability; Blind subjects; Blind therapists; Blind assessors; Adequate follow-up; Intention-to-treat analysis; Between-group comparisons; Point estimates and variability