Intervention of Muscle Damage – Evidence Based Approach

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Section .

Overview

- Delayed Onset Muscle Soreness (DOMS)
  - Definition & Mechanism
- Intervention for DOMS
  - Anecdotal Evidence
  - Evidence Based Sports Medicine
- Clinical Implication & Recommended Intervention Protocol
- Question????

Section 1. Delayed Onset Muscle Soreness

Section .

DOMS

- *Muscle damage* from performing new exercise, weight lifting, or any kind of eccentric exercise following *eccentric contraction*.
- Dull and aching pain usually begins 12-48 hours after eccentric exercise.
- Pain peaks at 2-3 days following eccentric exercise
- Subsides within 10 days.
- s/s
  - Pain
  - Decreased ROM
  - Decreased force production even though no pain exist: *disruption of contractile component of muscle*
- Muscle usually repaired without residual dysfunction or scarring

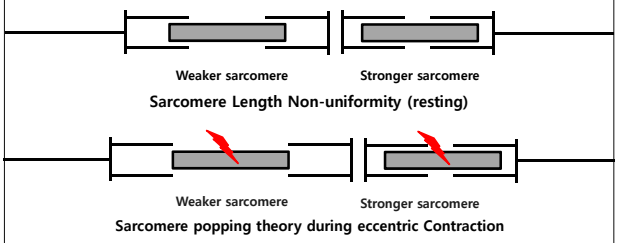
Section . *1 Delayed onset muscle soreness*

Mechanism of DOMS

- DOMS may be the result of excessive mechanical loading of the muscle rather than an intrinsic difference in physiology of eccentric contraction
  - Excessive tension could mechanically disrupt the connective tissue, myofilaments, sarcomere, sarcolemma, or sarcoplasmic reticulum
    Armstrong, 1990; Armstrong, 1984, Byrd, 1992; Byrd et al 1989
  - Damage of extracellular matrix
    Stauber, 1989
  - Alteration in Z-line were found
    Friden & Lieber, 1992
  - Myofiber and extra matrix damage resulted from eccentric contraction
    Fritz & Stauber, 1988

Section . 1 Delayed onset muscle soreness

Mechanical Aspect of DOMS



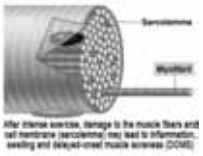
Muscle damage will be taken place at weaker sarcomere and propagates to adjacent weak sarcomere and results in micro trauma inducing inflammation

Section 2. Interventions for DOMS

Section . 2 Interventions for DOMS

Anecdotal Evidence of Intervention for DOMS

- **Objectives: Treated symptomatically**
  - **Reduce pain, swelling, inflammation, and muscle spasm**
- **Treatment:**
  - **RICE to decrease pain and inflammation**
  - **Treatment not begin immediately after injury**
    - 24-48 hours after exercise
    - Peaks at 2-3 days after exercise
  - **Combination of exercise and modalities**



Section . 2 Interventions for DOMS

- **Treatment Option in Literature**

Authors	Treatment	Efficacy
Cicerone et al[17]	Trolamine salicylate phonophoresis	Effective
Denegar et al[18]	TENS	Effective
DeVries[20,21]	Static stretching	Effective
Hasson et al[22]	High speed, voluntary muscle contraction	Effective
Hasson et al[23]	Ibuprofen	Effective
Haynes & Perrin[24]	Topical counterirritant	Effective
Hill & Richardson[25]	Topical trolamine salicylate cream	Effective
Prentice[32]	Static or PNF stretching + cold or heat	Effective
McGlynn et al[26]	Stretching and biofeedback	Reduced EMG, but not pain
Prentice[32]	Heat	Not effective alone
Yaszay et al[27]	Ice massage	Not effective alone
	Continuous ultrasound	Increases pain
Denegar et al[28]	Microcurrent	Not effective, + analgesic effect
Hasson et al[29]	Dexamethasone Iontophoresis	Questionable

Page. JAT, 1995, 30, 1, 29-34

Section . 2 Interventions for DOMS

Interventions for Exercise Induced Muscle Damage – Evidence Based SM

- **Systematic review and meta-analysis to analyze the effect of cryotherapy, massage, stretch, and low intensity exercise on Delayed Onset Muscle Soreness (DOMS)**

Section . 2 Interventions for DOMS

Evidence of the physiotherapeutic interventions used currently after exercise-induced muscle damage: Systematic review and meta-analysis

Rui Torres[a,b,*], Fernando Ribeiro[b,c], José Alberto Duarte[c], Jan MH Cabri[d]

Physical Therapy in Sport. 2012, 13, 101-114

- **Massage for Exercise Induced Muscle Damage (DOMS)**
  - **9 RCT Studies**
  - **Significant reduction in "muscle soreness"**
  - **Pain relief between 24-48 hours**
  - **But, not 72 hours**
  - **Muscle strength improved**
    - Only 1 hour after injury!!
  - **"0.33cm reduction" of VAS pain and "1.87%" strength improvement**
  - **Report mean difference and CI not "effect size"**
    - May not be different if it is analyzed with effect size

Section . 2 Interventions for DOMS

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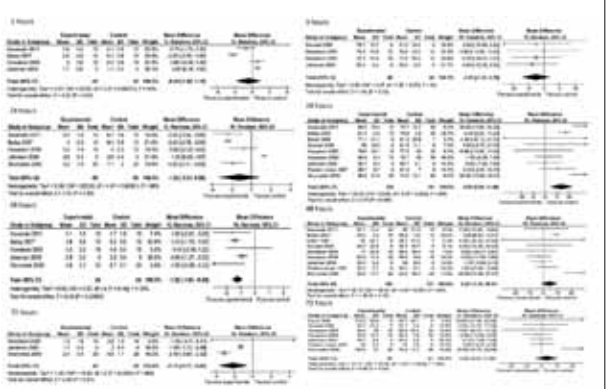
- **Cryotherapy for Exercise Induced Muscle Damage (DOMS)**
  - **10 RCT studies**
  - **Ice water immersion or ice bath**
  - **Significant reduction in "muscle soreness" at 48 and 72 hours**
    - Heterogeneity results across studies
  - **No significant effects on "muscle strength" at 1, 48, and 72 hours**
  - **Interesting findings**
    - Repetitive episode of cryotherapy may be more effective than single bout of cryotherapy
      - Contradicted results across studies
      - Eston & Peter, 1999; Skurvydas et al, 2006 reported positive effect
      - Goodall & Howatson, 2008; Howatson et al, 2005 reported negative effect

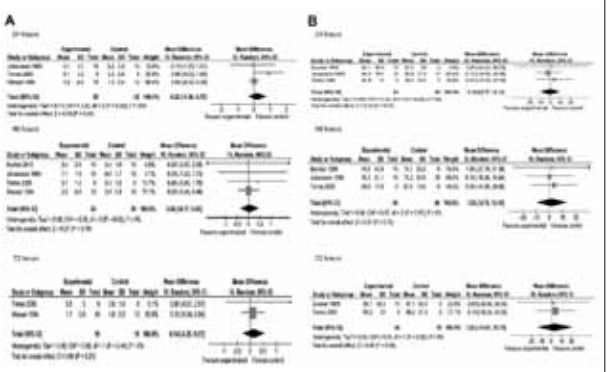
Section . 2 Interventions for DOMS



Section . 2 Interventions for DOMS

- **Stretch for Exercise Induced Muscle Damage (DOMS)**
  - **9 RCT studies**
  - **Various forms of stretching**
    - Before exercise (single episode)
    - Before (single) and after exercise (repeated)
    - After exercise only (repeated)
  - **No positive effects of any form of stretching for "muscle soreness" or "muscle strength" following DOMS**

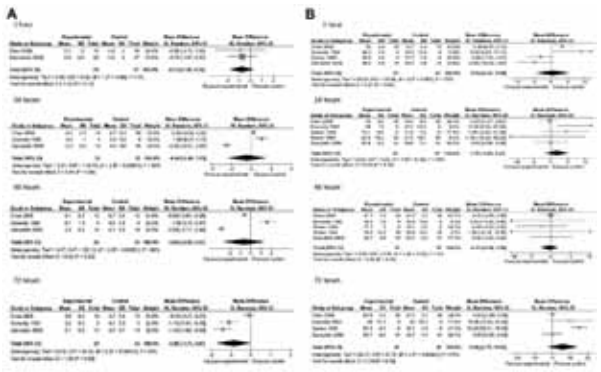
Section . 2 Interventions for DOMS



Section . 2 Interventions for DOMS

- **Low Intensity Exercise for DOMS**
  - **7 RCT studies**
  - **Various forms of strengthening**
  - **No positive effects of any form of low intensity exercise for "muscle soreness" or "muscle strength" following DOMS**

Section . 2 Interventions for DOMS



Section 3. Clinical Implication

Section . 3 Clinical Implication

Clinical Implication

- Massage therapy may be effective to reduce muscle soreness at 24-48 hours
  - SORT Strength-of Recommendation Grades B, Level of evidence 1
- Cryotherapy may be effective to reduce muscle soreness at 48-72 hours.
- Strength may be increased 24 hours
  - SORT Strength-of Recommendation Grades B, Level of evidence 1
- Along with these intervention
  - Topical (skin) and/or phonophoresis (US) Trolamine Salicylate
  - Topical counterirritant maybe useful
  - SORT Strength-of Recommendation Grades B, Level of evidence 2
- Stretch & low intensity exercise are not effective at all.
  - SORT Strength-of Recommendation Grades B, Level of evidence 1

Section . 3 Clinical Implication

Recommended Intervention protocol

- Before and after rigorous eccentric exercise
  - Rest
  - Petrissage and effleurage massage to reduce muscle soreness
  - Ice immersion after exercise
- 24-72 hours
  - Ibuprofen to reduce swelling
  - Topical (skin) and/or phonophoresis (US) Trolamine Salicylate or Topical counterirritant when soreness start to develop
  - Ice immersion for 15 min at least 3 times a day (multiple episode)
  - Petrissage and effleurage massage to reduce muscle soreness
- Day 5-10
  - Same protocol as 24-72 hours
  - Add low intensity strengthening exercise to maintain strength without decrease strength