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The Effect of Cryotherapy on Inflammation and Myofiber Regeneration following Acute Skeletal Muscle Injury: A Critically Appraised Topic

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DEPARTMENT OF SPORTS MEDICINE



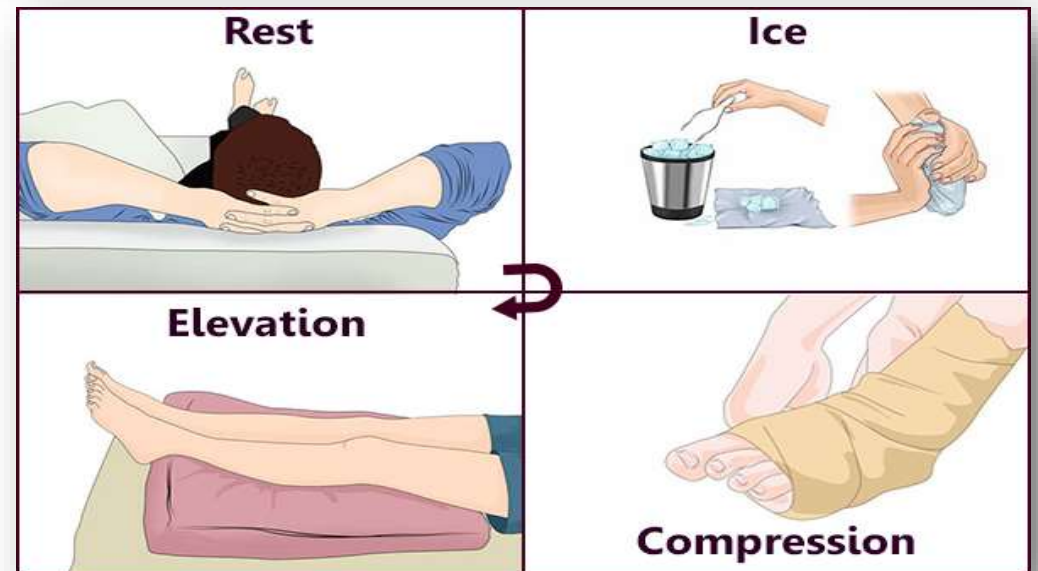
Introduction

Goals of the presentation

- Clinical Scenario
- Search Strategy
- Quality Assessment of the Evidence
- Clinical Bottom Line
- Implications for Practice, Education, and Future Research

Clinical Scenario

- ▶ Skeletal muscle injuries occur at an incidence rate between 10 - 55% (Hotfiel, 2018)
- ▶ Signs of inflammation
 - ▶ Pain
 - ▶ Heat
 - ▶ Redness
 - ▶ Loss of function
 - ▶ Swelling



Clinical Scenario

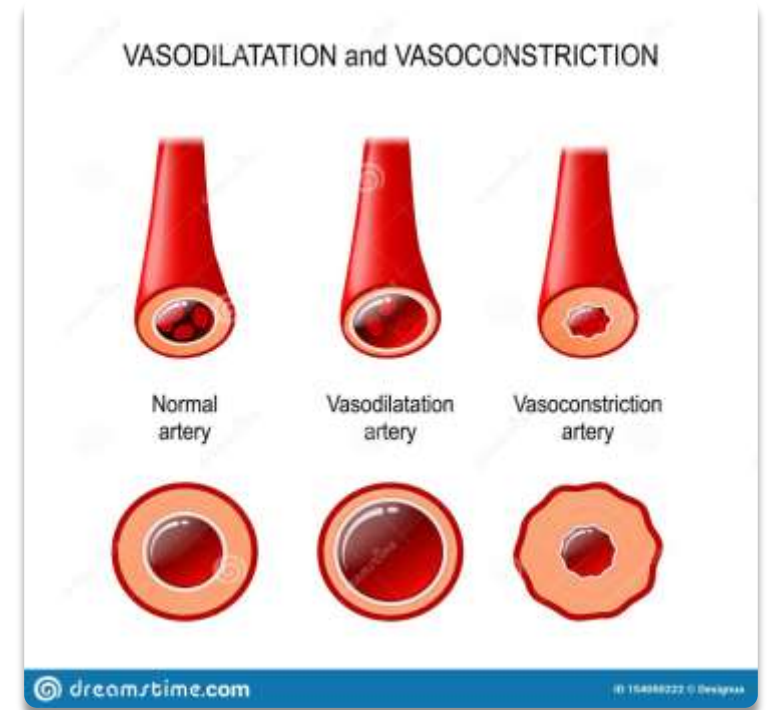
- ▶ Is inflammation after acute muscle injury bad?
 - ▶ No!

Clinical Question: In patients with acute skeletal muscle injury, how does treatment with cryotherapy compare to no treatment impact the inflammation process and myofiber regeneration?



Cryotherapy

- ▶ Purpose:
 - ▶ Decrease pain
 - ▶ Decrease inflammation
 - ▶ Decrease secondary hypoxic injury (Bleakley, 2019)
- ▶ Types
 - ▶ Ice bags/packs
 - ▶ Cold water immersion
 - ▶ Whole Body Cryotherapy



Wound healing process

▶ Skeletal muscles heal in 4 overlapping phases (Sass 2018, Laumonier 2016, Li 2018)

▶ **Hemostasis**

▶ Stop the bleeding

▶ **Inflammation**

▶ Clear area of damaged tissue

▶ **Proliferation**

▶ To repair damaged tissue

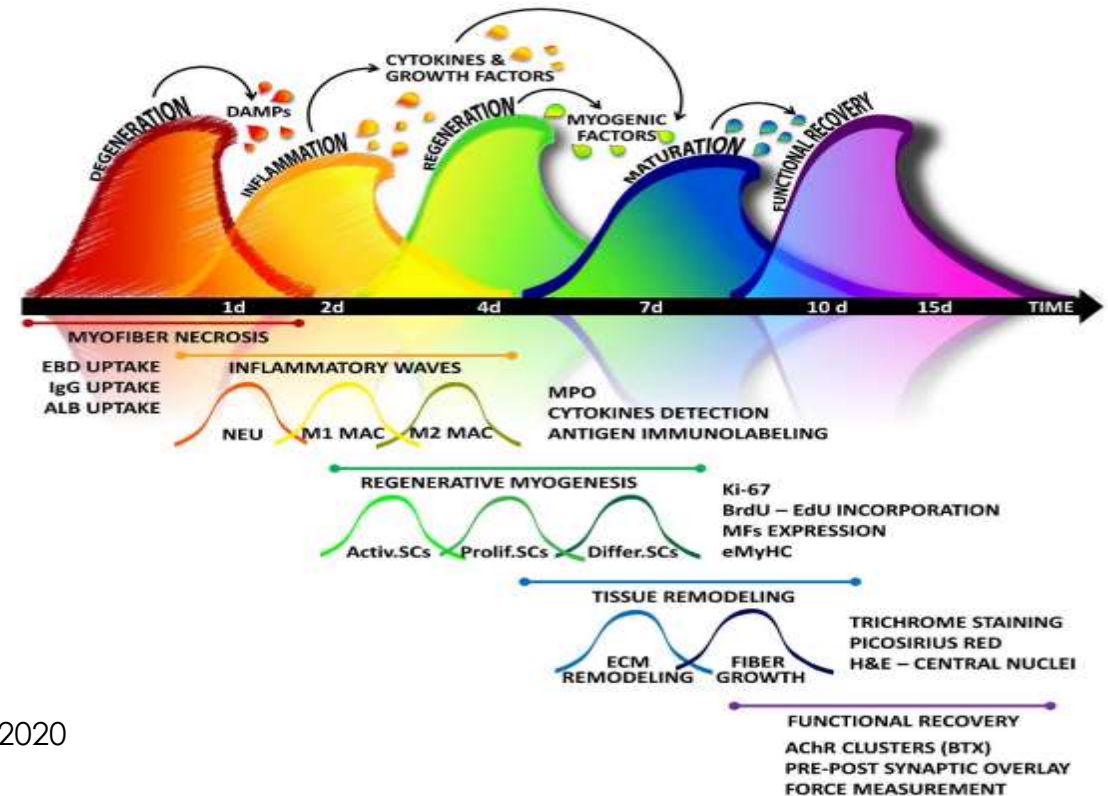
▶ **Remodeling**

▶ Develop final scar tissue formation

▶ Guided and regulated by:

▶ Cytokines

▶ Growth Factors



Search strategy

PICO

- Patient/Population
 - Patients with acute skeletal muscle injury
- Intervention-
 - Cryotherapy
- Comparison
 - No treatment (sham)
- Outcome
 - Changes in inflammatory markers, growth factors, myofiber regeneration

Sources/Search Terms

- MEDLINE
- Search Terms- Search included the keywords, “cryotherapy” or “Ice” or “cold therapy” and “muscle recovery” or “muscle damage” or “muscle regeneration” and “growth factor.”

Inclusion/Exclusion Criteria

- **Inclusion**
 - Articles that investigated direct comparison between cryotherapy and placebo for muscle recovery after muscle damage
 - Articles with inflammatory markers and/or growth factors
 - Evidence that is level 2 or higher
 - Published after 2010
- **Exclusion**
 - Articles published before 2009

Results of Search

- ▶ 4 Total Studies
 - ▶ 1 Randomized Control Trial
 - ▶ 3 Translational Animal Studies
- ▶ Key findings
 - ▶ All 4 of the studies showed a significant decrease in inflammatory cytokines and growth factors after the use of cryotherapy compared to a control group.
 - ▶ 3 of the 4 studies showed no significant difference in myofiber regeneration between the cryotherapy group and the group with no treatment.
 - ▶ 1 of the 4 studies showed a decrease in myofiber regeneration in the cryotherapy group when compared to no treatment.

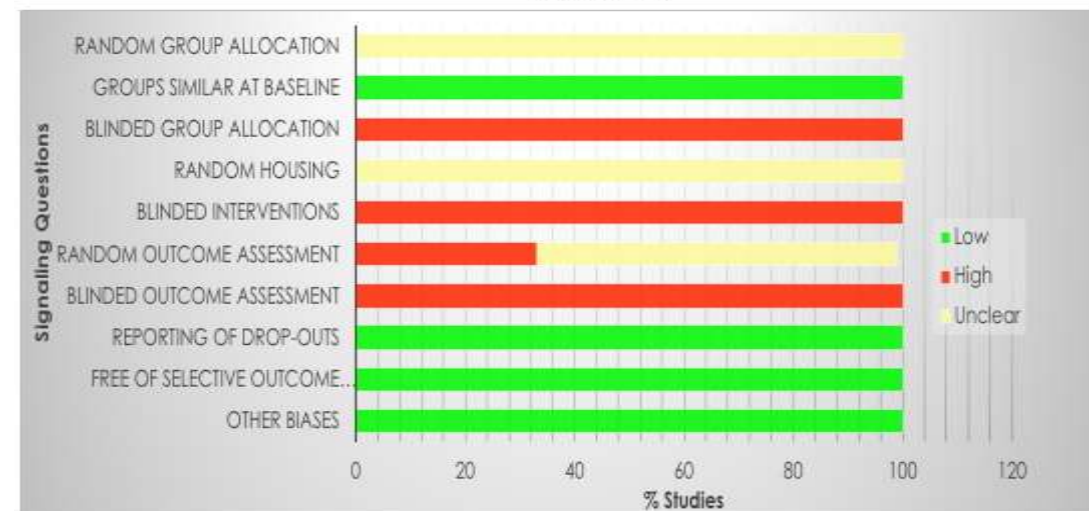
Quality Assessment

- ▶ SYRCLE risk of bias tool for animal studies
- ▶ PEDro Scale

Quality of Reporting



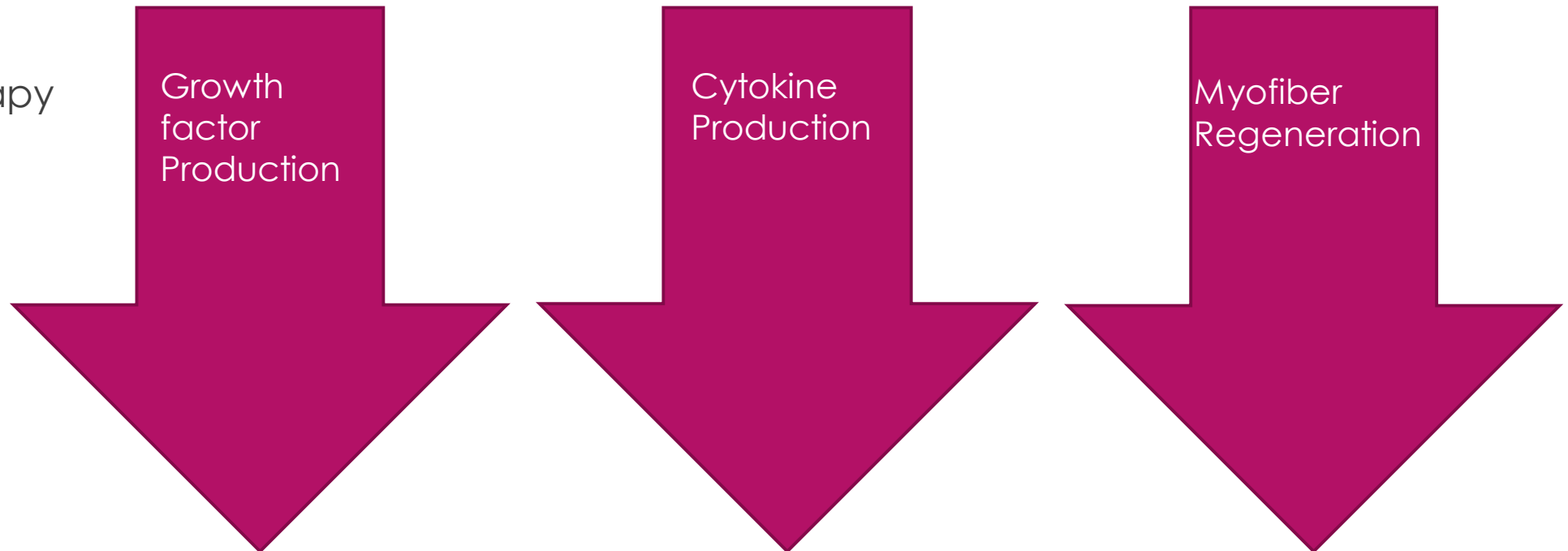
Risk of Bias



Clinical Bottom Line

- ▶ Cryotherapy does not accelerate myofiber regeneration and even shows that it may decrease the wound healing process when compared to no treatment. (Zembron-Lacny 2018, Singh 2017, Takagi 2011, Ramos 2016)

- ▶ Cryotherapy



Future Research

- ▶ Human participants
- ▶ New modalities for treatment of soft tissue injury
- ▶ Set cryotherapy protocol
- ▶ Studies that investigate effects of cryotherapy on tendons, ligaments and bone



Different Approach

Different approach for the treatment of acute soft tissue injury is needed

▶ PEACE

- ▶ Protection
- ▶ Elevation
- ▶ Avoid anti-inflammatories
- ▶ Compression
- ▶ Educate

▶ LOVE

- ▶ Load
- ▶ Optimism
- ▶ Vascularization
- ▶ **Exercise**

Dubois, 2020

P		PROTECTION Avoid activities and movements that increase pain during the first few days after injury.
E		ELEVATION Elevate the injured limb higher than the heart as often as possible.
A		AVOID ANTI-INFLAMMATORIES Avoid taking anti-inflammatory medications as they reduce tissue healing. Avoid icing.
C		COMPRESSION Use elastic bandage or taping to reduce swelling.
E		EDUCATION Your body knows best. Avoid unnecessary passive treatments and medical investigations and let nature play its role.
&		
L		LOAD Let pain guide your gradual return to normal activities. Your body will tell you when it's safe to increase load.
O		OPTIMISM Condition your brain for optimal recovery by being confident and positive.
V		VASCULARISATION Choose pain-free cardiovascular activities to increase blood flow to repairing tissues.
E		EXERCISE Restore mobility, strength and proprioception by adopting an active approach to recovery.

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