Clinical-like cryotherapy improves footprint patterns and reduces synovial inflammation in a rat model of post-traumatic knee osteoarthritis

Germanna Medeiros Barbosa, Jonathan Emanuel Cunha, Thiago Mattar Cunha, Lizandra Botaro Martinho, Paula Aiello Tomé Souza Castro, Francisco Fábio Bezerra Oliveira, Fernando Queiróz Cunha, Fernando Silva Ramalho & Tania Fátima Salvini

Abstract (300 word limit)

Statement of the Problem: Cryotherapy is a non-pharmacological treatment commonly used to control inflammation and improve function after acute traumas. However, there are no definitive findings about its effects on chronic joint diseases such as knee osteoarthritis (KOA). The aim of this study was to investigate the effects of clinical-like cryotherapy on functional impairment and synovial inflammation in a rat model of KOA generated by anterior cruciate ligament transection (ACLT). Methodology & Theoretical Orientation: Thirty-two male Wistar rats were randomly divided into four groups (n = 8/group): Control, KOA, KOA + Cryotherapy and KOA + Placebo. The last two groups were submitted to the relevant interventions twice a day for five days (61 to 65), with each session lasting 20 min. Gait test, skin temperature, thermal response threshold and joint swelling were assessed in all groups before ACLT surgery, and pre (60th day) and post (66th day) intervention protocols. On day 66, the animals were euthanized and exsanguinated to remove the synovial membrane for histopathological examination and synovial fluid to determine the leukocyte count and cytokine concentration. Findings: After the intervention period (66th day), footprint area only increased in the KOA + Cryotherapy group ($P = 0.004$; 14%) when compared to KOA and KOA + Placebo, but did not differ from controls. Cryotherapy lowered the synovial fluid leukocyte count ($P < 0.0001$; ≥95.0%) and cytokine concentration ($P < 0.0001$; ≥55%) when compared to the KOA and Placebo groups. Synovial score and synovial fibrosis did not differ in the KOA groups. Conclusion & Significance: In conclusion, footprint patterns improved in rats with ACLT-induced KOA as a result of clinical-like cryotherapy, which also lowered the synovial fluid leukocyte count and inflammatory cytokine concentration in these rats.

Recent Publications (minimum 5)

1. Cunha, J. E. et al. Knee osteoarthritis induces atrophy and neuromuscular junction remodeling in the quadriceps and tibialis anterior muscles of rats. Sci. Rep. 9, 6366 (2019).
2. Vieira Ramos, G. et al. Cryotherapy Reduces Inflammatory Response Without Altering Muscle Regeneration Process and Extracellular Matrix Remodeling of Rat Muscle. Sci. Rep. 6, 18525 (2016).
3. Dantas LO, Moreira R de FC, Norde FM, Mendes Silva Serrao PR, Alburquerque- Sendín F, Salvini TF. The effects of cryotherapy on pain and function in individuals with knee osteoarthritis: a systematic review of randomized controlled trials. Clin Rehabil. (2019).
4. Oliveira, N. M. L., Rainero, E. P. & Salvini, T. F. Three intermittent sessions of cryotherapy reduce the secondary muscle injury in skeletal muscle of rat. J. Sports Sci. Med. 5, 228–34 (2006).
5. Dantas LO, Breda CC, da Silva Serrao PRM, Aburquerque-Sendín F, SerafimvJorge AE, Cunha JE, Barbosa GM, Durigan JLQ, Salvini TdF (2019) Short-term cryotherapy did not substantiallyvreduce pain and had unclear effects on physical function and quality of life in people withvknee osteoarthritis: a randomised trial. Journal of Physiotherapy.

Photograph

Biography (150 word limit)



BSc in Physical Therapy from the Federal University of São Carlos (UFSCar)
MSc in Anatomy from the São Paulo State University (UNESP), Botucatu.
PhD in Sciences (Human Physiology) from ICB, University of São Paulo (USP).
Sandwich Doctorate – internship abroad at the Department of Physiology, Neurophysiology, University of Bonn, Germany.
Postdoctorate from the NeuroMuscular Research Center, Boston, United States.
Dr has her expertise in develop research projects in animal models and in individuals with movement disorders and indication for physical therapy treatment. She develops projects that analyze neuromuscular adaptations to different stimuli (exercises, denervation, joint inflammation, etc.) and use therapeutic resources (exercises, electrostimulation, cryotherapy, ultrasound, laser, etc). In humans, controlled clinical trials are developed in her laboratory to evaluate the possible effects of physiotherapeutic interventions in patients with movement disorders.

Email: tania@ufscar.br

Notes/Comments