

## Mini Review

# The Use of Cryotherapy in Acute Sports Injuries

Leonarda Galiuto\*

Department of Cardiology, Catholic University of the Sacred Heart, Italy

**Abstract**

In this paper, we analyze and describe the scientific evidence supporting the therapeutic value of cryotherapy based on the outcome analysis. Although a definitive conclusion on the efficacy of cryotherapy cannot be drawn based on current scientific evidence; the general consensus is to continue to use such therapy soon after acute sports injury and their surgical treatment.

**INTRODUCTION**

Although the use of the reduction of skin temperature to treat muscular injuries is known since the ancient Greeks and it was mentioned by Hippocrates (470-370 BC), the terms cryotherapy has been first introduced by Pursey in 1908 to describe the treatment of skin lesions with very low temperatures.

Currently, the terms refers to different modalities of treatment aimed at lowering the body surface temperature, thus cooling the injury site without tissue disruption [1]. Cooling results in heat loss, the treated body area experiences vasoconstriction, decrease in inflammatory reaction and relative symptoms [2]. An efficient cryotherapeutic agent should have a pre application temperature within range of 10 to 15°C [3].

In the treatment of acute sports injuries, cryotherapy is largely used, but the scientific evidence of the efficacy of such therapy is anecdotal, since not only randomized trials but even well designed clinical studies are limited. Furthermore, several devices and modalities of application exist and which is the most effective in each condition is not yet known.

On the other hand, cryotherapy is largely available, of low cost and with limited collateral effects, thus, the knowledge of possible beneficial effects of temperature lowering on the injured muscle has allowed the empirical use of such therapy.

In the modern sports medicine, each therapy should be proposed and provided to a patient only if supported by robust scientific evidence.

**Aim of the paper**

Aim of this paper is to collect and analyze the scientific evidence supporting the therapeutic value of cryotherapy based on the outcome analysis and to propose the most validated method of application based on published data.

**Method**

This is a systematic review of the literature, performed

**\*Corresponding author**

Leonarda Galiuto, Catholic University of the Sacred Heart, Fondazione Policlinico A. Gemelli Largo A. Gemelli 800168 Rome, Italy, Tel: 0039-06-30154432; Fax 0039-06-3055535; Email: lgaliuto@rm.unicatt.it

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according to the PRISMA statement [4], and based on the analysis of papers collected in PUBMED searched for “acute sports injury and cryotherapy”. Fifty-two review papers have been collected and analyzed. Among them, only twenty fulfilled the criteria of being clinical studies and having strong methodology and significant results. Those 20 papers have been identified and discussed.

**Types of acute sports injuries**

Musculoskeletal injuries are among the most common injuries that occur during the athletic activities with a reported incidence as high as 55% for all observed injuries [5]. We distinguish direct trauma or contusion from indirect trauma, which can be a passive injury (tensile overstretch) or active injury (eccentric overload), that can be either acute strain or delayed onset muscle soreness (DOMS). Cryotherapy has been mostly tested with scientific supporting evidence in ankle sprain and DOMS. Furthermore, data exists and have been collected in form of systematic review in the setting of arthroscopic anterior cruciate ligament reconstruction [6].

**Mechanism of action**

Cryotherapy is, by definition, the therapeutic application of any substance to the body that removes heat, resulting in decreased tissue temperature. Cold decreases tissue blood flow by causing vasoconstriction and reduces tissue metabolism, oxygen utilization, inflammation, muscle spasm and pain.

**Method of application**

The most recent surveys of clinical practice have identified a large variability in the optimal mode, duration and frequency of the application. The mode of application can be ice pack, crushed ice bags, vapo coolant spray, ice massage, cold whirlpool, cold compression device. As far as the duration and frequency of treatment, it ranges from 10 to 20 minutes 3 to 4 times per day up to 20 to 30 minutes, or 30 to 45 minutes every 2 hours. Up to the

present, there is no consensus on which of these methods is the most effective, nor on which is the ideal duration of therapy or whether it should be used intermittently or continuously [7]. To maximize the therapeutic effect of cryotherapy, an optimal tissue temperature reduction of 10 to 15°C may be necessary in order to achieve local analgesia and maximally lower metabolism.

In the clinical practice, ice is commonly combined with compression, making difficult to determine the value of cryotherapy alone. However, the initial consensus seems to be that the addition of ice to compression is more effective than compression alone [8].

### Clinical setting of applications

In sports medicine, cryotherapy is mainly used in the acute setting and in the rehabilitative phase of soft-tissue injury. However, the basis for ice application in each stage is quite different. In the immediate post-injury, ice reduces metabolism, thus minimizing secondary hypoxic injury and the degree of tissue damage. In the rehabilitative phase, cold therapy is used mainly to relieve pain, which facilitates earlier and more intense exercise [9].

In the literature, there are reports of different types of acute injuries treated with cryotherapy, especially acute ligament sprains, while limited data are present relating muscle contusion or strains. In the recovery phase, cryotherapy has been studied in a range of post-operative procedures [10,11].

### Outcome measures

The most common outcome measure used in the majority of the studies is reduction of pain as measured by visual/analog scale and/or analgesic consumption. However, data were collected as continuous variable in a short duration of time, with the longest follow-up being 4 weeks, with limited data available to provide the effect size calculation [12].

### Adverse treatment effects

Although cryotherapy is considered a relatively safe procedure, some side effects have been reported such as bradycardia, Reynaud's phenomenon, cold urticaria, nerve and tissue damage, slowed wound healing, frostbite.

### CONCLUSIONS

Cryotherapy is largely used in the clinical practice in the treatment of acute sports injuries, both in the immediate and in the rehabilitation phase, with the main therapeutic goal to

reduce pain and slower tissue metabolism. There is a plethora of clinical studies analyzing this issue, but because of the lack of randomized and blind model along with poor outcome data and large variability of study design, a definitive conclusion on the efficacy of cryotherapy cannot be drawn based on current scientific evidence.

However, since contraindication and possible malignant side effects are really limited, the general consensus is to continue to use such therapy soon after acute sports injury and their surgical treatment.

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