

Cryotherapy in Sports Physiotherapy: An Update

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Abstract

Cryotherapy and stimulation both having post injury positive effect in treatment to reduce pain inflammation edema as well as gaining the strength via activation of inhibited muscles. There may have some tolerance issue with patient while using stimulation (NMES) which can be reduced by prior use of ice over the muscle, infact short duration of cryo application may increase the threshold to tolerate higher stimulation to produce powerful contraction. Cryotherapy and stimulation widely used after knee injury to activate quadriceps after reflex inhibition achieved due to pain, and inflammation. Studies proved that cryotherapy can used in acute condition whereas stimulation is used in chronic condition for gaining strength. Cryotherapy also used after every soft tissue injury specially in sports injuries but some studies support the use of cryotherapy for 15 min reduce dynamic postural stability after lower limb injury

Keywords: Cryotherapy; Inflammation; Cryo Stimulation.

Introduction

Cryotherapy has been used in physiotherapy as well as sports for several purposes. For eg cryotherapy is a very useful modality to reduce inflammation, pain and swelling..

A.M Pusey gave the word cryotherapy to indicate the management of skin problems using low temperatures [Zagrobelyny et al. 1999; Jezierski 2006;]. Nowadays, cryotherapy means using spectrum treatments purposed for lowering the body surface temperature without tissue destruction, while in cryosurgery diseased tissues are destroyed through freezing.

The world's first cryogenic- temperature chamber was set up in Japan, in 1978. [Zagrobelyny 2003; Skrzek 2009].

There are multiple spectrum of types and methods of cold application done by the use of ice bags,

silicone gel, wet cold (which is not tolerated well by many people), partial bathing in cold water or whole body bath (temperature below 10°C). Cooling leads to heat loss, the treated body region undergoes vasoconstriction and other physiologically mediated responses [Rawecka&Rokita, 2006].

Cryotherapy is treatment modality for many of clinicians in soft tissue injury in acute condition to promote quicker recovery in many of athletes for fast return inflammation and competition. Cryo is always used as the first choice in sports injury management as well as in recovery from high intensity work out. Cryotherapy facilitates edema reduction and produce analgesia, inflammation in inflammation by reducing muscle temperature and vasoconstriction. This is the reason why cryo is taken as first choice by sportsman off field and on field both.

Stimulation also have been used in injured tissue to activate the muscle as it is inhibited due to local pain edema swelling ect. Stimulation can produce muscle contraction which further result in activation of muscle leads to gaining strength and so functional outcomes can be seen.

In contrast many of studies also reports negative and adverse effect of cryotherapy as (Bleakley et.al., 2012) reported that in his recent literature review that cryotherapy application affects in negative manner in following outcomes; vertical jump height, agility performance and sprint time. These tasks are the

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integral component of field based sports. (Pritchard and Salibaet.al., 2014) said athletic performance may adversely affected as athlete return to participation immediately after cryotherapy. (Uchioet.Al., 2003) said that 15 minutes cryotherapy application can decreased knee joint position sense acuity and increased knee joint stiffness.

CRYO with Stimulation

First study which has been done as RCT explains beside all these advantages and disadvantages of only cryotherapy, cryo with stimulation is also a most effective treatment choice to activate and produce strong contraction of muscles for any inhibited muscle after injury. As neuromuscular electrical stimulation (NMES) is mainly used for rehabilitation in weak and damage muscles. NMES also used for strengthening of weak muscles after injury and following ligament repair in knee and total joint arthroplasty (SnyderMackler L et al., 2014). Many of studies supports the fact that NMES is only used after injury for strengthening of muscle and it is very uncommon to use in uninjured muscle. This is because as strength gain can achieve via any exercise program protocol too.

Sometimes cryotherapy can engaged with stimulation protocol to increase the threshold of the muscle to tolerate the stimulation discomfort and it found to be effective while using ice prior to stimulation as it lower the tissue temperature and increases muscle contraction threshold. Author conclude as if cryotherapy is engaged with stimulation to activate muscle, threshold of tolerance over stimulus pain can be improved and patient can tolerate and produce more powerful contraction over stimulus.

Effect of Tens Only on Quadriceps Activation Knee OA Subjects

A randomized control trial blinded has been done in year of 2011 in which subjects allocated in 2 groups with exercise+ tens and exercise only. Author found after follow up and treatment that group with exercise and tens has been improved faster and better than only exercise. The inability to optimally activate the quadriceps muscle may be modulated by both cortical and spinal reflex mechanisms. (Palmieri RM et.al., 2004) primary outcome measures, quadriceps central activation ratio, and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) were evaluated at baseline and at 2 weeks and 4 weeks of the intervention and concluded as improved in TENS group (Brian. G et.al., 2011) (Cheing GL et. Al., 2004).

Comparison of Stimulation VS Cryo for Activation of Muscle

Study which is RCT review supports NMES is indicated in those patients who unable to perform action or even to achieve strong voluntary contraction of the muscle which is required for muscle strengthening programs. These patients may limit due to pain or swelling which can inhibits voluntary muscle contraction. This unable to even generate muscle contraction is due to reflex inhibition.

NMES can help to overcome this reflex inhibition and can help to generate powerful muscle contraction. But patient may unable to tolerate electrical current that has been chose for stimulation (Farquhar S et.al., 2004). This is the reason many researcher support the application of ice over the tissue just with stimulation. Many studies has been done as RCT to prove that TENS and cryotherapy is improving quadriceps activation in those who diagnosed with knee pathologies (Pietrosimone B Get al., 2014). There are sufficient evidence to prove that TENS and cryotherapy is used to improve quadriceps activation in those having knee injury and demonstrate as quadriceps failure in activation. As it is known that quadriceps failure can be the result of swelling/ pain or both in the joint (Palmieri-Smith RM et al., 2013). Patients who under gone recent surgery for knee and having acute quads activation failure are advise to go for cryotherapy only as it decreases cell metabolism, pain in inflammatory phase and control edema formation (Merrick MA et.al., 2004). But those having chronic pain in knee and quad activation is fail, are advise to go for TENS more than cryo unless attempting to control inflammation and swelling after exercise. As inflammation period subsides cryo can replaced by TENS to activate quads, control pain and to facilitate exercise further (Levin MF et al., 2012). Cryotherapy can be applied in those days when patients having pain so better to introduce basic simple exercise, non weight bearing as SLR ect. As patients has been showing some strength as well as reduced swelling and pain, TENS can be administered to gain strength.

Clinical Recommendation for CRYOVS Stimulation

We can conclude as TENS and cryo both are effective in case of activating muscle and improves strength mainly in knee pathology for quadriceps. But both of them their own role and time period to apply. Clinicians may wisely opt for their option according to patient condition.

Effect of Cryotherapy in Ankle Sprain

study include effect of Cryotherapy in soft tissue injury specially in ankle sprain and effects has been shown over functional outcomes. 43 male and female taken as subject of age 16-50 yr having acute injury in ankle. Both control and treatment group explained and cryotherapy given to treatment only and after author found treatment group came with improved functional outcomes. Even ROM has been improved, and swelling is reduced. 2 week of follow up done and functional activity as stairs climbing, weight bearing is improved with reduction of pain.

When a RCT done to see the effect of cryotherapy in 2 different method, using: standard ice application (n = 46) or intermittent ice application (n = 43). The method used for cryotherapy was same across groups and consisted of melting iced water (0°C) in a standard pack. Outcome measures included Function, pain, and swelling. They found to have improvement in both the groups but, intermittent group found to be more effective in terms of pain, edema and swelling reduction. But functional like difficulty running on uneven ground and making cutting movements outcome were same may due to functional instability rather than pain (Garrick JG et al., 2006).

Effect of Cryotherapy Over Dynamic Postural Stability

Last article which done to see the effect of cryotherapy after ankle injury on postural stability shown some negative effect as it done for 15 min application over ankle joint which can ultimately decrease cutaneous temperature on talofibular and deltoid ligament. This 15 min application of cryotherapy can negatively influence dynamic postural stability performances. Reach distance in, posterolateral, posterior, and anterolateral direction of star excursion balance test and mean velocity has been decreased after cryotherapy (karlfullam et al., 2015).

Conclusion

As many of studies done over cryotherapy along with stimulation at different different perspective and approaches. RCT has been done to see the effect and to stabilize a evidence based practice in physiotherapy as cryotherapy had been used since last many years in sports injury. These studies make a background approach to practice in clinics and onfield with cryotherapy. Studies found and

concluded as TENS can be used to increase threshold of tolerance for stimulation given to patients which is necessary to achieve activation of muscles after injury specially in quadriceps. As muscles get inhibited due to pain edema and swelling as reflex inhibition after injury. They must need to activated with some support tool as cryotherapy and TENS or NMES. Tens has proved as benefits in activating muscles after inhibition. Cryotherapy also used for same purpose but with different duration.

Cryotherapy is used in acute condition after injury to activate muscle and reduce pain, swelling. Cryo is only for acute when pain inflammation is high. Whereas tens can be use for chronic condition while pain subsides and weight bearing starts.

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