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ORIGINAL ARTICLE

COMPARATIVE EFFECT OF CRUSHED ICE AND ELASTOGEL COLD WRAP ON ANKLE SPRAIN

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Abstract

Aim of the study: The aim of this study was to find the comparative effect of crushed ice and elasto gel cold wrap treatments on ankle pain and disability among acute ankle sprain patients.

Methodology: This was a comparative study conducted at Radial orthopedic clinic, Chennai. This study included both male and female subjects with acute ankle sprain. 20 acute ankle sprain patients were taken as subjects and they were divided into two groups, Group A and Group B with 10 subjects in each group. Group A and Group B were applied with elasto gel and crushed ice respectively. Once the application was finished in the clinic all the patients were asked to apply ice in home for every 2 hours. This was done in 3 consecutive days. VAS scale and Foot and Ankle Disability Index (FADI) were used as measurement tools to find the outcome of disability and pain of ankle joint. **Result:** There is a significant mean difference (VAS: 2.4 < 4.46), (FADI: 30.060 < 32.750) found between the elasto gel cold wrap and crushed ice application on pain and disability among the acute ankle sprain patients. **Conclusion:** The study concluded that elasto gel cold wrap is more effective than crushed ice on treatment of patients with acute ankle sprain.

Keywords: Crushed ice, elasto gel cold wrap, Visual Analogue scale (VAS), Foot and Ankle Disability Index (FADI).

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INTRODUCTION

A sprained ankle, also known as an ankle sprain, twisted ankle, rolled ankle, floppy ankle, ankle injury or ankle ligament injury is a common medical condition where one or more of the ligaments of the ankle are torn or partially torn. A sprained ankle is a very common injury. Approximately 25,000 people experience it each day. A sprained ankle can happen to athletes and non athletes, children and adults. It can happen when you take part in sports and physical fitness activities. It can also happen when you simply step on uneven surface or step down at an angle.

Ankle sprains happen when the foot twists, rolls or turns beyond its normal motions. You can sprain your ankle, if the foot is placed unevenly on a surface beyond the normal force of stepping. This causes the ligaments to stretch beyond their normal range in an abnormal position. The most common ankle sprain occurs on the lateral/outside part of the ankle.

Height, weight, limb dominance, ankle – joint laxity, anatomical alignment, muscle strength, muscle – reaction time, and postural sway are the risk factors for ankle sprains¹. There are multiple ligaments in the ankle. Ligaments in general are those structures that connect bone to bone. Tendons on the other hand connect muscle to bone and allow those muscles to exert their force. In the case of an ankle sprain there are several commonly sprained ligaments.

The two most important ligaments in the ankle are: 1. The anterior talo-fibular ligament, which connects the talus to the fibula on the outside of the ankle. 2. The calcaneal-fibular ligament, which connects the fibula to the calcaneus below. 3. Finally there is a third ligament which is not as commonly torn. It runs more in the back of the ankle and

is called the posterior talo-fibular ligament. These must be differentiated from the so called high ankle sprain ligaments, which are completely different and located higher up the leg. The measurements that are taken in the ankle free of skin and soft tissue is, areas of attachments of the anterior talofibular ligament, length and width of the anterior talofibular ligament, and locations of the attachments on the fibula and talus².

Cryotherapy is the local or general use of low temperatures in medical therapy. Cryotherapy is used to remove heat from the body causing vasoconstriction, decreased metabolic rate, reduced inflammation and pain relief. The function of ice application during immediate treatment is to slow cell metabolism, thereby reducing oxygen consumption in the injured area to limit tissue damage by preventing secondary hypoxic cell death. As a therapeutic modality, the cold application can be useful in certain situations. The early prolonged application of cold is the important concept in the use of cold for treating the acute injury³.

Cold wraps absorb heat energy from the body. The absorbed heat is then removed by evaporation allowing for hours of targeted cold therapy. Wraps are a two in one solution that provides cryotherapy and compression. Cryotherapy and compression help by reducing pain and swelling whether from arthritis, muscle pains, strains sprains repetitive motion injuries or bruises. Wrap can be used before during and after exercise. Wraps are odour free and contain no medications, menthol or alcohol.

For cryotherapy, elasto gel cold wrap stay for 20 mins - 40 mins after two are more hours in the freezer. The cool temperatures treat acute pain from new injuries, post - workout soreness or to help stop bleeding from trauma or surgical procedures. This method of cold therapy also aids in reducing swelling and

inflammation for many areas of the body. Crushed ice is used to reduce the body temperature pain and edema. ice cubs are crushed into smaller pieces and applied over the injured area. It helps to relieve pain in the post injury or sprain.

The Foot & Ankle Disability (FADI) Score is used to find the level of ankle injury. This scale contains the set of questions that questioner were given to the patients in pre and post of the treatment. From this questioner we can find the disability level of the ankle joint. After giving the treatment the improvement seen in the ankle joint is analyzed. Sheri A. Hale suggest that, in patients with chronic ankle instability, the FADI and FADI sports appear to be reliable in detecting functional limitations⁴.

Aim of the Study:

The purpose of this study is to compare the effect of crushed ice and elasto gel cold wrap treatment on ankle pain and disability during and after three consecutive days of treatment.

Need of the Study:

This study reveals the importance of elasto gel cold wrap and crushed ice. This is preliminary study done in ankle sprain, in future study the use of elasto gel cold wrap can be used to identify any sort of pain in ankle joint or any other joint.

Hypothesis

Null Hypothesis: There is no significant difference with the comparison of Elasto gel cold wrap and crushed ice.

Alternate Hypothesis: There is significant difference with the comparison of Elasto gel cold wrap and crushed ice.

Background of the study:

A sprain also known as a torn ligament is damage to one or more ligament in a joint often caused by trauma or the joint being taken beyond its function range of motion. The Severity of sprain ranges from a minor injury which resolves in a few days to a major rupture of one or more ligaments requiring surgical fixation and a period of immobilization. Sprain can occur in any joint but are most common in the ankle joint.

In the inversion ankle sprain the cold compression is appears beneficial, but increased frequency and duration of cryotherapy does not seems to enhance the rate of recovery⁵. There was marginal evidence that after ankle sprain and post-surgery, ice plus exercise is most effective. The addition of ice to comparison had any significant effect, and there was little evidence to suggest this⁶.

The cryotherapy following contusion will not decrease the microvascular diameters or decrease microvascular perfusion in striated muscles⁷. In the cutaneous and subcutaneous superficial tissues significant temperature reduction is produced by applying the cold therapy. The temperature changing in the tissue is more than 2.0 cm below the skin⁸.

There is a positive effect of cryotherapy in the acute injury on return to participation measurement⁹. Heat and contrast bath plus simultaneous exercise is not effective than the ice submersion with simultaneous exercise at reducing swelling. After minor surgery ice alone seemed to be more effective than applying no form of cryotherapy¹⁰.

METHODOLOGY

Study design: Comparative study

Study setting: Radial ortho clinic, Chennai, India

Sample size: 20 samples (group A 10 and group B 10)

Inclusion criteria:

Patients with acute ankle sprain and grade I & II ankle sprain were included for this study.

Exclusion criteria:

Chronic ankle sprain, Foot injury, Foot or ankle fracture, Calcaneal spur and Grade III ankle sprain were excluded from this study.

Instrumentation:

Crushed ice and elasto gel wrap were used for three consecutive days to promote the functional movements and reductions in pain and disability. The ice cubes are crushed and used as crushed ice, and then the ice kept in a towel and rolled and applied over the ankle region.

The elasto gel cold wrap is a combination of cold therapy and compression through the gel and wrap. Prior to cryotherapy treatment, subjects filled out a questionnaire about the mechanism of injury past history with ankle injuries and treatment were questioned to determine any contraindication to cold therapy.

Testing took place over three consecutive days after the injury with one treatment per day and results were recorded immediately pre and post treatment. The subjects were instructed not to apply compression, ice or elevation to their injured ankle while they were subjects of this study.

Materials and measurement tools :

Crushed ice, elasto gel , Visual Analogue Scale (VAS) and Foot Ankle Disability Index (FADI) used as Materials and measurement tools for this study ,Figure 1, 2 and 3.



Figure 1: Crushed Ice



Figure 2: Elastogel



Figure 3: VAS Scale

Testing procedure:

Participants were asked to sign a consent form prior to participation in the study. After signing in the consent form, the patient was situated in the chair in sitting position with foot placed on the floor. The crushed ice or elasto gel cold wrap is applied to the injured ankle for 20 minutes. For the crushed ice application the crushed ice is kept in a towel and rolled then it is applied to the injured ankle for 20 minutes. The elasto gel cold wrap is the combination of both cold and compression therapy. In this the elasto gel is kept inside the wrap then the cold wrap is applied around the ankle joint for 20 minutes. Before starting this treatment the elasto gel is kept in a freezer for 2 - 4 hours, Figure 4 & 5.

Temperature changes in the skin, subcutaneous, intramuscular and joint are depends on the application method, initial temperature and application time. After the cooling modality has been removed the intramuscular temperature continues to drop. Precautions should be taken because of prolonged application of ice at very low temperatures could have deleterious effects on various body system¹¹.

The patient pain level was also recorded pre and post treatment on all three days using the visual analog scale. The patient was given 10cm line with one centimeter markings perpendicular to the 10cm line extending across the line. One end of the 10cm line was labeled "No Pain" and the other end was labeled "Severe Pain". The patient was asked to mark the line to indicate when his or her pain level was pre and post treatment. Pain level were scaled on a 0 - 10 Scale, 0 was the equivalent of No Pain at all and 10 was the worst pain the patient has ever felt and he or she needed to go to the hospital right away for the treatment. Once the treatment is finished in the clinic the patient was asked to

apply the ice in home for every 2 hours.



Figure 4: Application of Elastogel



Figure 5: Application of crushed Ice

RESULT

	PRE	POST
MEAN	65.740	30.060

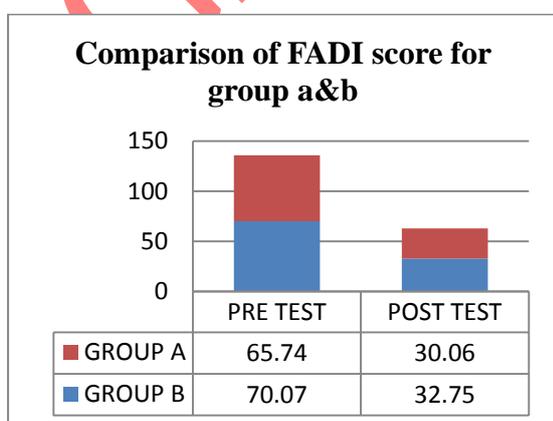
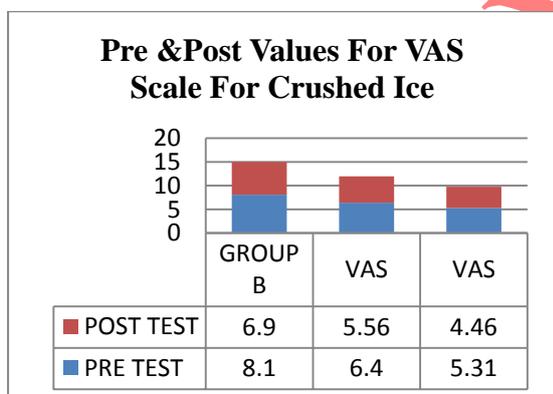
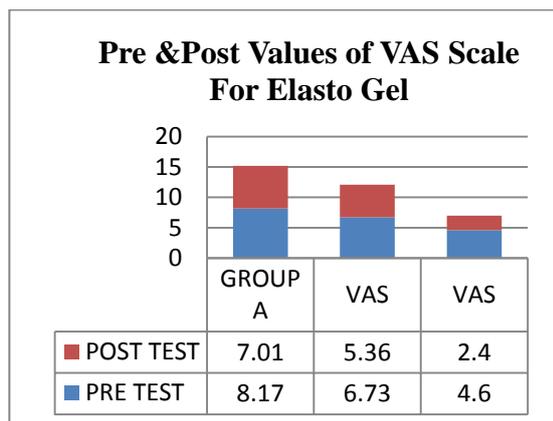
Table 1: Pre and Post Mean Value of Elasto gel cold wrap-FADI

	PRE	POST
MEAN	70.070	32.750

Table 2: Pre And Post mean value of crushed ice-FADI

	DAY 1		DAY 2		DAY 3	
	PRE	POST	PRE	POST	PRE	POST
ELASTO GEL COLD WRAP	8.170	7.010	6.730	5.360	4.600	2.4
CRUSHED ICE	8.10	6.9	6.4	5.56	5.31	4.46

Table 3: Pre and Post mean value of elastogel cold wrap and crushed ice (VAS Scale)



There is significant difference between the elasto gel cold wrap and ankle sprain compared with the crushed ice. (VAS - 2.4 < 4.46), (FADI -30.060 < 32.750).

DISCUSSION

This study is done to compare the effects of the crushed ice and elasto gel cold wrap treatment on angle sprain after consecutive days of treatment. The result of this study suggest that both the results of the crushed ice and elasto gel gold wrap decrease edema and pain levels in grade I and II ankle sprains.

Changes take place in the damaged tissue, followed by an injury. When the tissue undergoes damage, the cell goes for necrosis and debris occurs so the damaged cells should be replaced ones. When the injury occurred the body gets informed by the chemical mediators (histamine, leucotaxin, necrosin) which released from the cellular debris. The blood hemorrhages and leaks into the extra vascular spaces from the broken vessels and causing swelling. These events occur immediately after the soft tissue injury¹².

For the first and second degree ankle sprains, during the third, fourth and fifth days postinjury the cold therapy is the most appropriate of the three treatments(Heat, cold, and contrast bath)¹³.

The Crushed ice and elasto gel are found to be beneficial in heating acute soft tissue

damaged and decreasing angle pain over 3 treatments and during each individual treatment in the present study. The elasto gel is theorized to decrease angle edema due to its compression and cold and crushed ice theorized to decrease angle edema due to its cryotherapy components.

JH Dykstra et al, states that in reducing surface temperature the wetted ice is better than cubed or crushed ice, while in reducing intra muscular temperature both cubed ice and wetted ice were better than the crushed ice.¹⁴

FA Barber , states that continuous flow cold therapy lower VAS and linkert pain score in a better way than the crushed ice they also found that continuous flow cold therapy is much better than crushed ice for patients with ACL construction pain.¹⁵

Basur et al, suggests that cooling treatment with cryogel as an initial treatment reduces edema, pain and disability and also shorten the recovery period than the use of crepe bandage as an initial treatment.¹⁶

A.louise fincher et al, said that there is no statisticall or clinically significant effect on pain, medication usage or swelling in the first 4 postoperative days by using the intra-articular cold saline.¹⁷

Hocutt Jejr et al, derived that late cryotherapy or heat therapy is not an effective treatment than the early use of cryotherapy, continued with the adhesive comparison, of ankle sprain yielding earlier complete recovery.¹⁸

The results from the present study show that post treatment pain measurements were significantly decreased over the 3 days of treatment period.

Data from the present study agrees with levy and marmar, gibbons et al., supports the theory that after an acute soft tissue injury

cryotherapy may play a role in decreasing pain level.¹⁹

Results from the mean difference pain measurements observed that the elasto gel cold (VAS- 2.4) wrap group had a greater decrease in pain level compared to the crushed ice group

(VAS- 4.46), the decreased pain may be due to how effectively these modalities are staying at a consistent temperature and pressure throughout the treatment.

This study reveals the important of elasto gel cold wrap and crushed ice This is the preliminary test done in ankle sprain in future the elasto gel cold wrap can be used as pain reduction modality.

CONCLUSION

It is concluded that elasto gel cold wrap is effective than crushed ice in treating the ankle sprain.

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