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Original Research Article

Efficacy of Cryo-compression on Shin Splints in Female Amateur Marathon Runners

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ABSTRACT

Background: Medial tibial stress syndrome (MTSS) or Shin splints is exercise-induced lower leg pain along the distal posterior-medial aspect of tibia caused by repetitive loading stress during running and jumping. It is one of the most common lower leg sports injury. Cryotherapy is the most commonly used treatment during immediate care of athletic injuries and acute soft tissue injuries and is also included as part of RICE (rest, ice, compression and elevation). Cryotherapy is helpful in reducing swelling as well as it exerts analgesic effect. The external compression is also used during immediate care phase and it helps in decrease tissue temperature and prevent oedema formation. Cryotherapy in combination with intermittent pneumatic compression hypothetically help in reducing the physiologic effects of traumatic tissue damage which is based on the models of cryotherapy and static compression therapy. This study aims to establish the efficacy of cryo-compression on shin splints in female amateur marathon runners.

Methods: A total 30 subjects diagnosed with shin splints were selected for study. Subjects received cryo-compression for reducing pain and swelling and exercises to strengthen the muscles. Each session was conducted for 45 minutes duration, 5 days per week for 4 weeks. Outcome measure used was Numerical Pain Rating Scale (NPRS), Goniometry for ROM and Manual muscle testing (MMT).

Results: According to statistical analysis, the results of the study demonstrate that there was a significant effect of the use of cryo-compression on numerical pain rating scale ($p<0.0001$), range of motion (ankle plantarflexion, dorsiflexion, eversion and inversion) ($p<0.0001$), manual muscle testing – ankle plantarflexors ($p=0.0028$) and ankle dorsiflexors ($p<0.0001$) during the pre and post intervention assessment.

Conclusion: The conducted study shows that efficacy of cryo-compression on shin splints in female amateur marathon runners is very effective in reducing pain, increasing range of motion (ROM) and strength of muscles along with other treatment program.

KEYWORDS: Cryo-compression, shin splints, numerical pain rating scale (NPRS), range of motion, ankle plantarflexion, ankle dorsiflexion, ankle eversion, ankle inversion, manual muscle testing, ankle plantarflexors, ankle dorsiflexors.

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INTRODUCTION

Medial tibial stress syndrome (MTSS) or Shin splints is defined as exercise-induced lower leg pain along the distal posterior-medial aspect of tibia caused by repetitive loading stress during running and jumping. It is one of the

most common sports injury [1,2].

There are different signs and symptoms of MTSS or shin splints. Some symptoms are dull ache at the distal two-third or posteromedial tibial border which is felt on exertion, pain initially towards the end of run, pain which develops during exercise, swelling which is usually mild, numbness and weakness in the feet and in severe cases, pain on walking or even at rest. Similarly, signs are tenderness at the site of pain, sometimes slight oedema as there is thickening of the subcutaneous border of the tibia, tense muscle compartments or muscle herniae, occasionally there may be weakness and pain on passive stretch of the muscles running through the compartment and sometimes vascular disturbances [3-5].

There are four muscle compartments in the leg – anterior, deep posterior, superficial posterior and lateral. The anterior compartment comprises of tibialis anterior, extensor hallucis longus and extensor digitorum longus muscles, whereas deep posterior compartment includes tibialis anterior, flexor digitorum longus and flexor hallucis longus muscles, superficial posterior compartment includes gastrocnemius and soleus muscles and lateral compartment includes peroneus brevis and longus muscles [3-5].

There are different risk factors of MTSS. It includes body mass index (BMI), bone goniometry, gait kinematics, leg length differences (LLD), navicular drop, range of motion (ROM), training history and others [6].

The most commonly used treatment during immediate care of athletic injuries and acute soft tissue injuries is Cryotherapy and is also included as part of RICE (rest, ice, compression and elevation). It is effective in preventing swelling as well as it exerts analgesic effect [7-9]. The use of external compression is also used during immediate care phase. It helps to decrease tissue temperature and prevent oedema formation. Intermittent pneumatic compression is effective for reducing this oedema formation, increase in blood and lymph flow and stimulate the tissue healing. Thus, cryotherapy in combination with IPC hypothetically help in reducing the physiologic effects of traumatic tissue damage which is based on the models of cryotherapy and static compression therapy [9,10].

Thus, cryotherapy helps in reducing pain and compression therapy helps to reduce swelling and promote alignment of scar tissue and provide proprioceptive input to the injured body part. The combination of cold and compression increases the rate, magnitude and depth of temperature as well as the speed of lymph evacuation [11,12].

Some lower limb injuries are reported to occur more in females than males. There are many difference in lower extremity alignments in females and males. According to previous studies it is proved that females tend to demonstrate greater anterior pelvic tilt, femoral anteversion, tibiofemoral angle, quadriceps angle and genu recurvatum compared with males [13-15]. Hence this study is carried out to determine the efficacy of cryo-compression of shin splints in female amateur marathon runners.

METHODS

All female amateur marathon runners who were suffering from shin splints were identified as target population. An experimental study was carried out in which effect of cryo-compression was checked on shin splints in female amateur marathon runners with the help numerical pain rating scale (NPRS), goniometry for range of motion (ROM) and manual muscle testing (MMT) as the outcome measure. Study duration was 3 months. Total 30 participants were selected using the convenient sampling method. Inclusion criteria was female amateur marathon runners suffering from shin splints. Exclusion criteria was female professional marathon runners, males and history of recent fracture or trauma.

The participants were administered with the consent form followed by pre and post assessment, on basis of which 3 components were used as outcome measures – numerical pain rating scale (NPRS), goniometry for range of motion (ROM) and manual muscle testing (MMT) . The exercise protocol was explained to the participants along with the duration for which the treatment will last. Following 4

weeks of protocol administration, pre and post assessment were done, thus determining the effect of the exercise protocol.

Protocol:

Techniques	Application
Cryo-compression	For 20 minutes
Isometric exercises	For hamstrings and quadriceps (3 sets of 10 repetitions)
Seated towel scrunches	3 sets of 10 repetitions
Stretching exercises	For hamstrings and quadriceps
Strengthening exercises	For ankle plantarflexors and dorsiflexors
Proprioceptive balance training	One leg stance, squats, drop and jump tests
Change in the footwear	Should be effective at relieving pain, supports arches and reduce stress on the muscles and bones of lower limb.

RESULTS

On the basis of data analysis, it can be seen that there is a significant effect of cryo-compression along with other exercises on shin splints.

Table 1: Intensity of pain according to NPRS before and after study performed.

Pre Interventional	Post Interventional	P – Value
6.750±1.842	1.020±0.9015	<0.0001(significant)

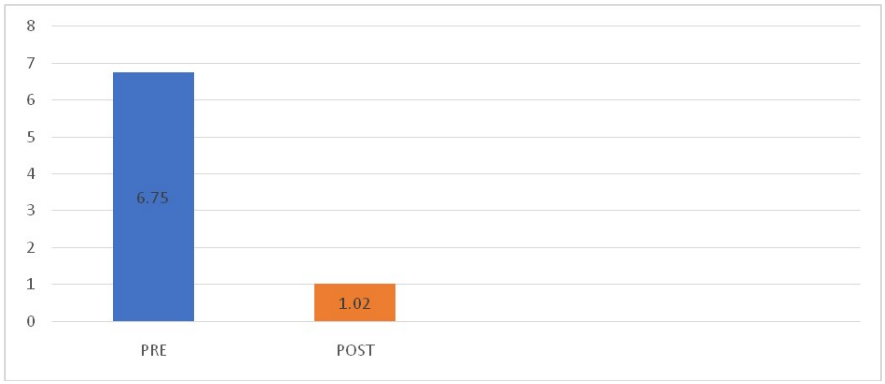

Fig. 1: Intensity of pain according to NPRS before and after study performed.

Table 2: ROM before and after study performed.

Movement	Pre Interventional	Post Interventional	P – Value
APF	41.933±2.84	47.433±2.402	<0.0001(significant)
ADF	12.30±2.68	17.80±2.25	<0.0001(significant)
AE	10.70±1.055	14.30±0.7497	<0.0001(significant)
AI	32.267±1.701	34.60±0.6215	<0.0001(significant)

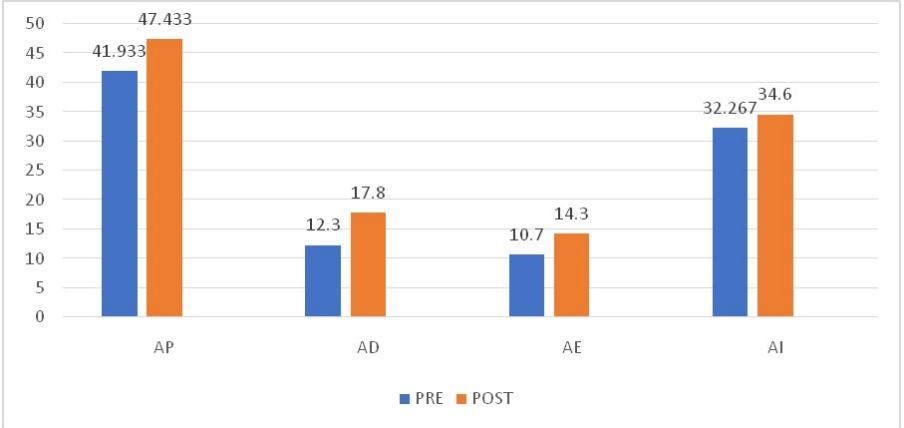

Fig. 2: ROM before and after study performed.

Table 3: MMT before and after study performed.

Muscles	Pre Interventional	Post Interventional	P – Value
AP	3.067±0.2537	3.633±0.7184	0.0028 (significant)
AD	3.10±0.3051	3.933±0.7849	<0.0001(significant)

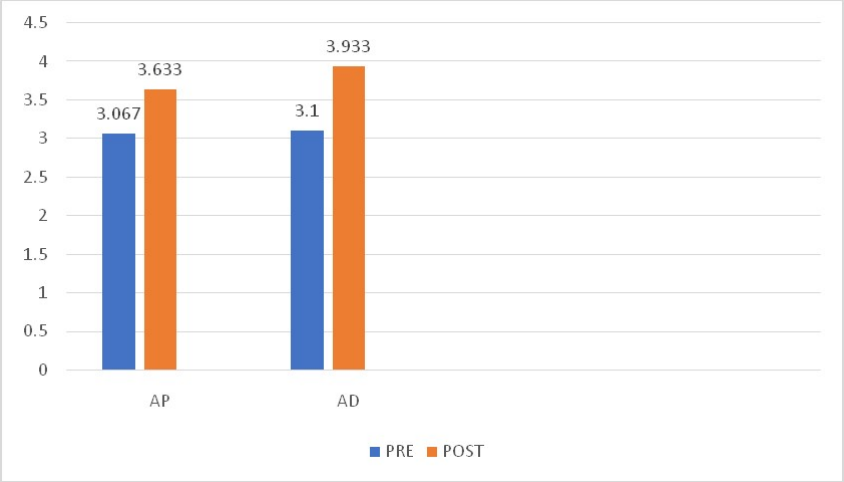

Fig. 3: MMT before and after study performed.

DISCUSSION

Medial tibial stress syndrome (MTSS) or shin splints is exercise-induced lower leg pain along the distal posterior-medial aspect of tibia caused by repetitive loading stress during running and jumping [1]. There is dull aching pain at distal 2/3rd of posteromedial tibial border which can start at end of run or during exercise [3,4]. Cryotherapy is most commonly used treatment during immediate care of athletic injuries and acute soft tissue injuries and it is also included as part of RICE [7]. Cryotherapy is effective in preventing swelling as well as it exerts analgesic effect [8,9].

The use of external compression is also used during immediate care phase. It helps to decrease tissue temperature and prevent oedema formation. Intermittent pneumatic compression is effective for reducing this oedema formation, increase in blood and lymph flow and stimulate the tissue healing. Thus, cryotherapy helps in reducing pain and compression therapy helps to reduce swelling and promote alignment of scar tissue and provide proprioceptive input to the injured body part [11,12]. Some lower limb injuries are reported to occur more in females than males. There are many difference in lower extremity alignments in females and males. According to previous studies it is proved that females tend to demonstrate greater anterior pelvic tilt, femoral anteversion, tibiofemoral angle, quadriceps angle and genu recurvatum compared with males [13-15]. This study was done to check the efficacy of cryo-compression on shin splints in female amateur marathon runners. The study result was obtained using outcome measures i.e. numerical pain rating scale (NPRS), goniometry for range of motion (ROM) andmanual muscle testing (MMT).

In the results, from figure and table 1 it can be seen that there was substantial difference in pre and post scores of NPRS ($p<0.0001$). Figure and table 2 represents the effect of cryo-compression and other intervention ROM (ankle plantarflexion, dorsiflexion, eversion and inversion) which also showed a considerable difference in the values pre and post intervention ($p<0.0001$). It can be seen from figure and table 3 that the muscle strength is also increased by MMT for ankle plantarflexors ($p=0.0028$) and for ankle dorsiflexors ($p<0.0001$).

In this study total 30 participants were included.This study was done to check the efficacy of cryo-compression on shin splints in female amateur marathon runners. The study result was obtained using outcome measures i.e. numerical pain rating scale (NPRS), goniometry for range of motion (ROM) and manual muscle testing (MMT). Multiple studies have been done to assess the effect of various physical interventions on shin

splints. However, no studies have found the efficacy of cryo-compression on shin splints in female amateur marathon runners. Thus, this study provide effect of cryo-compression with other treatment interventions for shin splints in female amateur marathon runners.

CONCLUSION

The results indicate that the efficacy of cryo-compression on shin splints in female amateur marathon runners is very effective in reducing pain, increasing range of motion (ROM) and strength of muscles. The study also concluded that stretching, strengthening exercises and proprioceptive balance training is important for return to sport activities.

ABBREVIATIONS

MTSS - Medial tibial stress syndrome
ROM – Range of motion
MMT – Manual muscle testing
NPRS – Numerical pain rating scale
APF – Ankle plantarflexion
ADF – Ankle dorsiflexion
AE – Ankle eversion
AI – Ankle inversion
AP – Ankle plantar flexors
AD – Ankle dorsiflexors.

Ethics Approval and Patient Consent:

The study was approved by the "Institutional Ethics Committee" of Krishna Institute of Medical Sciences, "Deemed to be" University, Karad, Maharashtra. The author had explained the study and the intervention to be given to the participants and had taken participants consent prior to the study from every participant.

AUTHORS CONTRIBUTION

Prachi Zope – Data collection, research design, research process, discussion, editing, manuscript drafting.

Namrata Kadam – Research process, review of literature, discussion, research analysis.

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Conflicts of interest: None

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