A STUDY ON THE EFFECTIVENESS OF MYOFASCIAL RELEASE AND KINESIO TAPING IN THE MANAGEMENT OF PAIN AND RANGE OF MOTION AMONG MEDIAL TIBIAL STRESS SYNDROME SUBJECTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

MASTERS OF PHYSIOTHERAPY

(ELECTIVE- SPORTS PHYSIOTHERAPY)

Submitted

To

The Tamil Nadu Dr. M.G.R. Medical University

Chennai-600032

MAY 2018

(Reg.No.271650022)

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INTERNAL EXAMINER

EXTERNAL EXAMINER

A dissertation submitted in partial fulfillment of the requirement for the degree of **Masters of Physiotherapy - May 2018** to The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

CERTIFICATE

Certified that this is the bonafide work of Mrs.R.Sinthiya of R.V.S. College of Physiotherapy, Sulur, Coimbatore submitted in partial fulfillment of the requirements for the Masters of Physiotherapy Degree course from The Tamil Nadu Dr. M.G.R Medical University under the Registration No: 271650022.

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ACKNOWLEDGEMENT

I, thank GOD for providing me the wisdom and knowledge to complete my study successfully.

With due respect, I Would like to thank The Chairman, Managing Trustee and the Secretary of RVS Educational trust, for providing me an opportunity to be a part of this esteemed institution.

I express my heartfelt gratitude to my Principal Dr. R. Nagarani, M.P.T., M.A., Ph.D., for her support, encouragement and suggestion for the completion of this project.

I feel it to be my proud privilege to express my sincere and warm thanks to my study guide Mr. G. S. Thirumoorthy., M.P.T., Associate Professor, RVS College of Physiotherapy, who enlightened me in the right path with patience. I am grateful to his guidance, constant support and constructive criticism given at every stage of my study.

I immensely thank all the faculty members of Physiotherapy department for their kind advice and encouragement.

I humbly acknowledge all the love, support and care I received from my beloved husband Mr.Karthik, my parents Mr.Rajan, Mrs. Devi, and son Master. Sabareesh throughout my life in making me what I am now.

I would like to express thanks to my friends for their help to complete the study.

R. Sinthiya

DECLARATION

I hereby declare and present my project work "A study on the effectiveness of myofascial release and kinesiotaping in the management of pain and range of motion among medial tibial stress syndrome subjects. The outcome of original research work under taken and carried out by me under the guidance of Mr. G. S. Thirumoorthy., M.P.T Associate Professor, R.V.S. College of Physiotherapy, Sulur, Coimbatore, Tamilnadu.

I also declare that the material of this projects has not formed in anyway the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R. Medical University, Chennai.

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I INTRODUCTION

Shin Splints, also known as medial tibial stress syndrome (MTSS) is defined by the American Academy of Orthopaedic surgeons as “Pain along the inner edge of the shin bone.researcherslimited shin splints strictly to musculotendinous lesions of the leg. He included lesions of the tibialis anterior, extensor hallucis longus and extensor digitorum as anterior shin splints, lesions involving the posteromedial leg musclestibialis posterior, flexor hallucis longus, flexor digitorum longus and soleus are part of the posterior shin splint syndrome because there lesions often involve the periosteum as well, they will be clarified as part of what is known as medial tibial stress syndrome **(David *et al.,* 1986).**

According to oakes (1988) there are two types of posteromedial tibial pain, both of periosteal origin but with differing anatomical locations.The first area of tibial pain described by oakes is located on the subcutaneous anteromedial surface of the tibia at the junction of its middle and lower one thighs. The second area described by oakes is along the middle half of the posteromedial border of the tibia which can be combined with the first area or be a discrete linear pain, this is the line of attachment of some of the medial fibres of the flexor digitorum longus and of the deep fascia of the leg. The linear pain is thus a ‘tenoperiostitis’ because muscle attachments are involved, and this is what is often called MTSS.

Michael and Holder(1985) indicated that the solens muscle and its inverting fascia are implicated in tenoperiostitis at this porteromedial border of the tibia, especially if the heel is pronated. Accurate diagnosis of tibial pain requires a detailed history, evaluation of workload and state of conditioining, and examination of footwear. Careful palpation to reveal the site and size of area of tenderness will often give the diagnosis

without further investigation. Experts do not agree upon the cause of MTSS. With the cause unknown, prevention is very difficult. Proposed risk factors associated with MTSS are increased foot pronation, increased muscular strength of the plantar flexors, increased varus tendency of the forefoot or hind foot (or both), an abrupt increase in training intensity, inadequate calcium intake, hard or inclined (or both) running surfaces, inadequate shoes, and previous injury **(Bennett *et al.,* 2001).**

Graduated running programs, including preseason conditioning, are accepted methods of prevention for many injuries. Researchers mentioned that training errors were the cause of MTSS in nearly 60% of participants. Training errors include an abrupt increase in intensity, duration or frequency of training (measured as an increase of more than 30% of initial training mileage within 1 year); hill training; and a change in running surface to a harder or tilted type. In 12 trials involving 8806 participants, the prevention methods of stretching, use of insoles, footwear modifications, and training program alterations were studied. The only method that had some evidence (although it was not statistically significant) for preventing MTSS was training program alterations—reduction in the distance, frequency, and duration of running bouts. Most of these risk factors can be controlled. However, until we better understand the true causes of MTSS, attempting to control all of these risk factors for all of our athletes is nearly impossible **(Fredericson *et al.,* 1995).**

Treatment strategies for medial tibial stress syndrome frequently include rest and cross-training using low-impact activities such as stationary biking and underwater running. Once symptoms resolve, training should slowly accelerate (10% to 25% every 3 to 6 weeks). The efficacy of physical therapy and nonsteroidal anti-inflammatory drugs is quite acceptable. In military recruits, aspirin, phenylbutazone, heel-cord stretching exercises, and/or short walking cast for 1 week provided no significant decrease in the

duration of shin splints compared to rest alone. Off-the-shelf orthotics and calf stretching can improve medial tibial stress syndrome, even with chronic pain. Extracorporal shockwave therapy has shown promise; the value of the pneumatic leg brace is unknown. Circumferential strapand tapinghave not much evidence to effectively dampen posteromedial tibial stress. Unfortunately, current evidence does not support any prevention method for medial tibial syndrome (Edwards *et al.,* 2005).

Surgical outcomes studies on medial tibial stress syndrome are of poor methodological quality and design. The most effective surgical procedures involve release of the deep posterior compartment, including the soleus sling and removal of a strip of posteromedial tibia periosteum. A recent series of operatively treated cases noted good/excellent results in 69% and fair/poor results in 31% at 30 months postoperatively. Only 41% returned to their previous level of athletic activity. Complications occur frequently (hematoma, localized paresthesias, numbness, and stress fractures) **(Moen *et al.,* 2009).**

kinesio tape provides evidence to support the theory that it can correct biomechanical factors associated with injury but it does come with a host of limitations. There is no sham treatment to compare to and no way to determine the mechanism by which this loading change took place. The study only tested loading in walking which isn't usually a particularly provocative activity for MTSS. It would have been interesting to see if load changes occurred during running. The effect sizes were small to medium, time to peak force was increased by a small to moderate amount. Is this enough to significantly reduce load on the medial tibia? Is it enough to reduce symptoms? While this study provides some evidence of a change in load what we'd like to see is that this results in improvement in symptoms and function in patients with MTSS **(Griebert *et al.,*2014).**

Myofascial Release of the Calves, this technique involves the application of gentle, sustained pressure on the myofascial connective tissue for the purpose of eliminating pain and restoring motion in patients with MTSS **(Thacker *et al.,* 2002).**

1.1 Statement of study

A study to compare and find out the effectiveness of myofascial release of calves and taping in the management of shin pain and ankle dorsiflexion range of motion among medial tibial stress syndrome subjects.

1.2 Objectives of the study

- To find out the effectiveness of myofascial release in the management of shin pain among medial tibial stress syndrome subjects.
- To find out the effectiveness of taping in the management of shin pain among medial tibial stress syndrome subjects.
- To compare the effectiveness of myofascial release and tapingin the management of shin pain among medial tibial stress syndrome subjects.
- To find out the effectiveness of myofascial release in the management of ankle range of motion among medial tibial stress syndrome subjects.
- To find out the effectiveness of taping in the management of ankle range of motion among medial tibial stress syndrome subjects.
- To compare the effectiveness of myofascial release and taping in the management of ankle range of motion among medial tibial stress syndrome subjects.

1.3 Need of the study

There are many treatment protocols in the management of MTSS, but which of them are practically effective is not properly reported. The need of this study is to validate and compare the effectiveness of myofascial release and taping in the management of shin pain and ankle range of motion medial tibial stress syndrome subjects.

1.4 Hypothesis

1. It is hypothesized that there is no significant difference in shin pain and ankle range of motionfollowing myofascial release among medial tibial stress syndrome subjects.
2. It is hypothesized that there is no significant difference in shin pain and ankle range of motion following kinesiology taping among medial tibial stress syndrome subjects.
3. It is hypothesized that there is significant difference between myofascial release and kinesio taping in the management of shin pain and ankle range of motion among medial tibial stress syndrome subjects.

1.5 Operational definitions:

Medial tibial stress syndrome

Medial tibial stress syndrome was defined as pain and discomfort in the leg from repetitive running on hard surface or forcible extensive use of flexors. The theory is bony resorption that outpaces bone formation of the tibial cortex various names have been introduced for the complex of this kind of musculoskeletal disorders medial tibial stress

syndrome (MTSS), shin splints, medial tibial syndrome, skin soreness compartment syndrome **(Bates 1985).**

Myofascial release

Myofascial release is a manipulative treatment that attempts to release tension in the fascia due to trauma, posture, or inflammation. Connective tissues called fascia surround the muscles, bones, nerves, and organs of the **body (John 2017).**

Kinesio taping

Kinesio taping gives support and stability to your joints and muscles without affecting circulation and range of motion. It is also used for Preventive Maintenance, Edema, and to treat pain. Kinesio taping is a technique based on the body's own natural healing process **(Slupik*et al.,* 2007).**

Range of motion

Range of Motion is the measurement of movement around a specific joint or body part(Erin 2017).

II REVIEW OF LITERATURE

SECTION A: Studies on general aspects of medial tibial stress syndrome.

SECTION B: Studies on effect of myofascial release on medial tibial stress syndrome subjects.

SECTION C: Studies on effect of kinesiology taping on medial tibial stress syndrome subjects.

SECTION D: Studies on reliability and validity of goniometer in ankle range of motion.

SECTION E: Studies on reliability and validity on visual analogous scale.

SECTION A: Studies on general aspects of medial tibial stress syndrome

Thacker *et* al., (2002) mentioned in their study that medial tibial stress syndrome is one of the most common lower leg injuries in sports. Some studies show it accounting for 6% to 16% of all running injuries and also being responsible for as much as 50% of all lower leg injuries reported in select populations, provided a high quality review of literature on prevention of MTSS proposed risk factors associated with MTSS are increased foot pronation, increased muscular strength of the plantar flexors, increased varus tendency of the forefoot or hind foot (or both) an abrupt increase in training intensity, inadequate calcium intake, hard or inclined running surfaces, inadequate shoes and previous injury.

Couture *et al* (2002) explained in their study that experts do not agree upon the cause of MTSS. With the cause unknown, prevention is very difficult. Proposed risk factors associated with MTSS are increased foot pronation, increased muscular strength of the plantar flexors, increased varus tendency of the forefoot or hind foot (or both), an abrupt increase in training intensity, inadequate calcium intake, hard or inclined (or both) running surfaces, inadequate shoes, and previous injury.Most of these risk factors can be

controlled. However, until we better understand the true causes of MTSS, attempting to control all of these risk factors for all of our athletes is nearly impossible.

Johnell *et al.,* (1982) said that medial tibial stress syndrome (MTSS) is usually brought on by running or impact loading of the lower limb, and the resulting pain will typically limit running activity. MTSS is generally considered to be a discrete clinical entity that is differentiated from chronic exertional compartment syndrome, stress fracture, popliteal artery entrapment syndrome, and the various neuropathies. Coexistence and interrelationships of these entities is acknowledged but not clearly understood. Inconsistent use of terminology, such as "shin splint syndrome" and "soleus enthesopathy", is evident in the historic and current literature, and it is likely that such variation in nomenclature has contributed to the current lack of understanding of the condition. A range of hypotheses has been proposed in regard to the anatomic structures most likely to be the source of pain in MTSS, with myofascial strain, enthesopathy, periosteal inflammation, and bone stress reaction theories most prevalent. Histologic studies have been small, and very few have identified inflammatory markers within the periosteal margins with any consistency to support the periostitis hypothesis.

SECTION B: Studies on effect of myofascial release on medial tibial stress syndrome subjects.

Michael (2017) mentioned in his article that myofascial release is a combination of light stretching and massage to release muscle tension and break up scar tissue. The physiotherapist will apply moderate traction and twisting techniques in combination with gentle stretching in order to achieve this. Each stretch and massage technique can last for several minutes and be performed several times until the muscle is completely relaxed. Myofascial release provides benefit by combining stretching and massage. The techniques used and the length of time taken allows muscle to relax and also helps to

break up scar tissue that can be formed from tense, overused or injured muscles. It can also prevent injury occurring by maintaining flexibility and range of movement.

Scott (2015) did a study to review and critically appraise the current evidence and answer the following questions: (1) Does self-myofascial release with a foam roll or roller-massager improve joint range of motion (ROM) without effecting muscle performance (2) After an intense bout of exercise, does self-myofascial release with a foam roller or roller-massager enhance post exercise muscle recovery and reduce delayed onset of muscle soreness (DOMS) (3) Does self-myofascial release with a foam roll or roller-massager prior to activity affect muscle performance A search strategy was conducted, prior to April 2015, which included electronic databases and known journals. Included studies met the following criteria: 1) Peer reviewed, English language publications 2) Investigations that measured the effects of SMR using a foam roll or roller massager on joint ROM, acute muscle soreness, DOMS, and muscle performance 3) Investigations that compared an intervention program using a foam roll or roller massager to a control group 4) Investigations that compared two intervention programs using a foam roll or roller massager. The quality of manuscripts was assessed using the PEDro scale. A total of 14 articles met the inclusion criteria. SMR with a foam roll or roller massager appears to have short-term effects on increasing joint ROM without negatively affecting muscle performance and may help attenuate decrements in muscle performance and DOMS after intense exercise. Short bouts of SMR prior to exercise do not appear to effect muscle performance. The current literature measuring the effects of SMR is still emerging. The results of this analysis suggests that foam rolling and roller massage may be effective interventions for enhancing joint ROM and pre and post exercise muscle performance. However, due to the heterogeneity of methods among studies, there currently is no consensus on the optimal SMR program.

Greenman (2003) discussed about the variesmanual therapy modalities in treating MTSS it include correction of key dysfunctions of the kinetic chain. Manual therapy may be used to correct musculoskeletal abnormalities of the spine, sacroiliac joint, pelvis, and various muscle imbalances. A wide variety of manual medicine techniques, including myofascial release, osteopathic manipulation and physical therapy, can be used to address these dysfunctions. The goal of manual medicine is to restore normal range of motion of joints, improve symmetry of muscles and soft tissues and, ultimately, restore maximal function of the body as a unit. Correcting musculoskeletal dysfunctions can improve pain and overall function and may be helpful in preventing recurrence. Manual medicine has been commonly used to treat other lower extremity injuries with the benefit of improved pain and function. However, there is a paucity of RCTs about the role of manual medicine in treating specifically MTSS.

SECTION C: Studies on effect of kinesiology taping on medial tibial stress syndrome subjects.

Grieber*t et al.,* (2016) mentioned in their study that medial tibial stress syndrome (MTSS) is an overuse injury occurring among the physically active. Linked to increased strain on the medial tendons of the ankle, studies emphasize controlling medial foot loading in the management of this condition. Kinesio taping (KT) has gained popularity for treating musculoskeletal pathologies; however, its effect on MTSS remains uninvestigated. This study aimed to determine if healthy participants and patients with current or previous history of MTSS differ in the rate of loading, and if KT affects plantar pressures in these participants. Twenty healthy participants and 20 participants with current or previous history of MTSS were recruited and walked across a plantar pressure mat prior to KT application, immediately after application, and after 24-h of

continued use. Time-to-peak force was measured in 6 foot areas and compared across groups and conditions. ANOVA revealed a significant interaction between group, condition, and foot area ($F = 1.990$, $p = 0.033$). MTSS participants presented with lower medial midfoot time-to-peak force before tape application (95%CI: 0.014-0.160%, $p = 0.021$) that significantly increased following tape application ($p < 0.05$).These results suggest that KT decreases the rate of medial loading in MTSS patients. Future research might assess mechanisms by which this effect is achieved.

Griebert *et al* (2012) did a study to determine if lower-leg Kinesio taping has an effect on the rate of loading in subjects with medial tibial stress syndrome (MTSS). MTSS, commonly referred to as shin splints, is a common overuse injury that occurs in athletes. One of the major intrinsic risk factors of MTSS is an increase in pronation during the loading phase of gait. This study tested the effect of kinesio tape on rate of loading during gait in 20 healthy control subjects and 20 subjects with a history of MTSS. Subjects walked across a tekscan plantar pressure mat under 3 conditions: prior to tape application, immediately after tape application and after wearing the tape for 24-hours. Time-to-peak force (TTPF) measurements were recorded to measure rate of loading and compared between groups and across the three conditions in six areas of the foot using an analysis of variance. There was a significant interaction effect between group, condition, and foot area ($F = 1.990$, $p = 0.033$). Healthy subjects showed significantly higher TTPF values in the medial midfoot before tape application ($p = 0.021$) and MTSS subjects showed a significant increase in TTPF with tape application for the medial midfoot and lateral forefoot ($p = 0.022$, $p=0.043$, $p = 0.031$). Our results suggest that kinesio tape use may decrease the rate of loading in subjects with MTSS. This may be clinically significant in helping with the treatment of MTSS. Future research should assess how muscle activity is altered by tape use.

Mark *et al.,* (2008) did aprospective, randomized, double-blinded, clinical trial using a repeated-measures design. To determine the short-term clinical efficacy of kinesio tape (KT) when applied to college students with shoulder pain, as compared to a sham tape application. Tape is commonly used as an adjunct for treatment and prevention of musculoskeletal injuries. A majority of tape applications that are reported in the literature involve non-stretch tape. The KT method has gained significant popularity in recent years, but there is a paucity of evidence on its use. Forty-two subjects clinically diagnosed with rotator cuff tendonitis/impingement were randomly assigned to 1 of 2 groups: therapeutic KT group or sham KT group. Subjects wore the tape for 2 consecutive 3-day intervals. Self-reported pain and disability and pain-free active range of motion (ROM) were measured at multiple intervals to assess for differences between groups. The therapeutic KT group showed immediate improvement in pain-free shoulder abduction (mean ± SD increase, 16.9° ± 23.2°; $P = .005$) after tape application. No other differences between groups regarding ROM, pain, or disability scores at any time interval were found. KT may be of some assistance to clinicians in improving pain-free active ROM immediately after tape application for patients with shoulder pain. Utilization of KT for decreasing pain intensity or disability for young patients with suspected shoulder tendonitis/impingement is not supported.

SECTION D: Studies on reliability and validity of goniometer in ankle range of motion.

Collette *et al.,* (2006) mentioned in their study that active inversion and eversion ankle range of motion (ROM) is widely used to evaluate treatment effect, however the error associated with the available measurement protocols is unknown. This study aimed to establish the reliability of goniometry as used in clinical practice. 30 subjects (60 ankles) with a wide variety of ankle conditions participated in this study. Three

observers, with different skill levels, measured active inversion and eversion ankle ROM three times on each of two days. Measurements were performed with subjects positioned (a) sitting and (b) prone. Intra-class correlation coefficients (ICC) were calculated to determine intra- and inter-observer reliability. Within session intra-observer reliability ranged from ICC 0.82 to 0.96 and between session intra-observer reliability ranged from ICC0.42 to 0.80. Reliability was similar for the sitting and the prone positions, however, between sessions, inversion measurements were more reliable than eversion measurements. Within session inter-observer measurements in sitting were more reliable than in prone and inversion measurements were more reliable than eversion measurements. The findings show that ankle inversion and eversion ROM can be measured with high to very high reliability by the same observer within sessions and with low to moderate reliability by different observers within a session. The reliability of measures made by the same observer between sessions varies depending on the direction, being low to moderate for eversion measurements and moderate to high for inversion measurements in both positions.

SECTION E: Studies on reliability and validity on visual analogous scale.

Boonstra *et al*., (2008) conducted a study to determine the reliability and validity of visual analogue scale in chronic musculoskeletal pain aged over 18 years. The study population consist of 52 patients in reliability study and 344 patients in validity. It was concluded from the study that the validity of visual analogue scale was moderate to good and its reliability was questionable.

Bijur *et al*., (2001) did a study with prospective convenience sample of adults with acute pain. Interclass correlation coefficients (ICCs) with 95% confidence intervals and a Bland- Atlman analysis were used to assess reliability of paired VAS

measurements obtained 1 minute apart every 30 minutes over two hours. Reliability of the VAS for acute pain measurements as assessed by the ICC appeared to be high. They concluded that VAS is a sufficiently reliable scale to assess.

III METHODOLOGY

3.1 Study Setting

The study was conducted in Physiotherapy outpatient department of RVS College of Physiotherapy.

3.2 Selection of Subjects

Twenty medial tibial stress syndrome subjects who fulfilled the inclusion and exclusion criteria were selected for the study and consecutively assigned in to two equal groups,

Group A – Myofascial Release

Group B – Kinesiology Taping

3.3 Variables

3.3.1 Dependent variable

- Shin Pain
- Ankle Dorsiflexion Range of Motion

3.3.2 Independent variable

- Myofascial Release
- Kinesio Taping

3.4 Measurement tool

Variable	Tool
Shin Pain	Visual Analogous Scale
Ankle Dorsiflexion Range of Motion	Goniometry

3.5 Study Design

Pre-test and post-test experimental study design

3.6 Inclusion Criteria

- Clinically diagnosed MTSS subjects.
- Both sexes are includes.
- Subjects with Age group 20 – 30.
- Actively involved in sports.

3.7 Exclusion Criteria

- Stress fractures
- Burns
- Deep vein thrombosis
- Taking blood thinning medications
- Nerve damage.

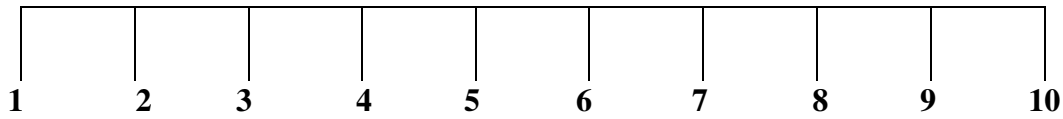
3.8 Orientation to the subjects

Before the collection of data, all the subjects were explained about the purpose of study. The concern and full cooperation of each participant was sought after complete explanation of the condition and demonstration of the procedure involved in the study.

3.9 Test administration

Visual Analogue Scale (VAS)

The visual analogue scale (VAS) is a subjective measure of pain. It consists of a 10 cm line with two end-points representing “no pain” and “worst pain imaginable”. During the visit, patients were asked to rate their pain by placing a mark on the corresponding to their current level of pain.



No pain **severe pain**

Goniometry

Dorsi flexion range of motion

Patients were made to sit in high sitting position. The fulcrum of the gonimeter was placed over the lateral aspect of lateral malleolus and the movable arm over the lateral aspect of fifth metatarsal and fixed arm over the lateral midline of the fibula. Then the foot was passively dorsiflexed by the therapist along with the movable arm and the maximum range of motion was measured in degrees and recorded for analysis.

3.10 Treatment Procedure

Myofascial release on calves

Patient position: Prone

Procedure

The therapist glided the lay from achilles proximally towards the heads of the gastrocnemius from the tissues just at the point where the superficial fascia and muscle feel in greatest contact. The patient was instructed to slowly and rhythmically dorsi and plantar flex their ankle joint while you apply moderate pressure caudally. Limited amount of lubricant was applied over the treatment area so that the glide wontslip over the skin. This was applied for ten minutes in one session. Daily two sessions, and the same was continued for two weeks.

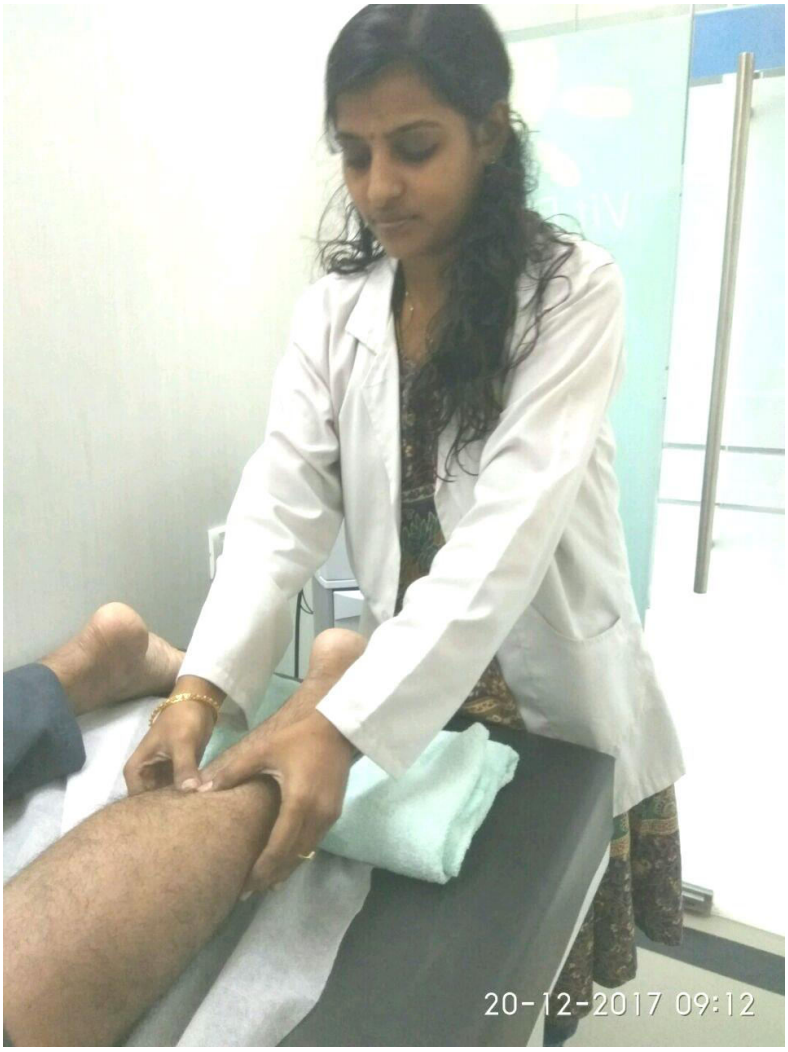


Figure 1: Myofascial release on calves

Kinesology taping for shin

KT was applied to the lower leg to reduce medial loading in MTSS. The tail of a single Y-strip of KT was placed on the proximal third of medial tibia. Each half of the Y-strip was applied in a manner that they lay anterior and posterior to the medial malleolus and terminated under the medial longitudinal arch of the foot. No tension was applied on the proximal and distal ends of the tape; while the remainder of the tape was applied with 75% tension, player was instructed not to remove the tape. This was maintained for two weeks.

Figure 2: Kinesology taping for shin

3.11 Collection of data

20 MTSS subjects were divided into two groups.

Group A – Received myofascial release

Group B – Received KT Taping

Subjects were given treatment for continuously 2 weeks. Before and after the completion of 2 weeks treatment intervention, shin pain and ankle dorsiflexion were evaluated by visual analogue scale and goniometry respectively.

3.12 Statistical Techniques.

The Collected data were analyzed by paired ‘t’ test to find out significance between pre and post test values of experimental groups and further unpaired ‘t’ test was applied to find out the difference between groups.

IV DATA ANALYSIS AND RESULT

4.1 Data analysis

This chapter deals with the systematic presentation of the analyzed data followed by the interpretation of the data.

a) Paired 't' test

$$\bar{d} = \frac{\sum d}{n}$$

$$s = \sqrt{\frac{\sum d^2 - \frac{\sum(\mathrm{d})^2}{\mathrm{n}}}{\mathrm{n}-1}}$$

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

Where,

d – Difference between pre test and post test values

$\bar{d} = \frac{\sum d}{n}$ – Mean of difference between pre test and post test values

n – Total number of subjects

s – Standard deviation

b) Unpaired t' test

$$s = \sqrt{\frac{\sum(x_1 - \bar{x}_2)^2 + \sum(x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where,

S = Standard deviation

n_1 = Number of subjects in Group A

n_2 = Number of subjects in Group B

$\bar{x}_1$ = Mean of the difference in values between pre-test and post-test in Group-A

$\bar{x}_2$ = Mean of the difference in values between pre-test and post-test in Group-B

Table 1

Mean value, mean difference, standard deviation and paired 't' value between pre and post test scores of pain among group A

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	7.5	3.6	0.98	7.46*
Post-test	3.9			

*0.005 level of significance

In Group A for pain the calculated paired 't' value is 7.46 and the 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than the 't' table value above study shows that there is significant difference in pain following myofascial release among medial tibial stress syndrome subjects.

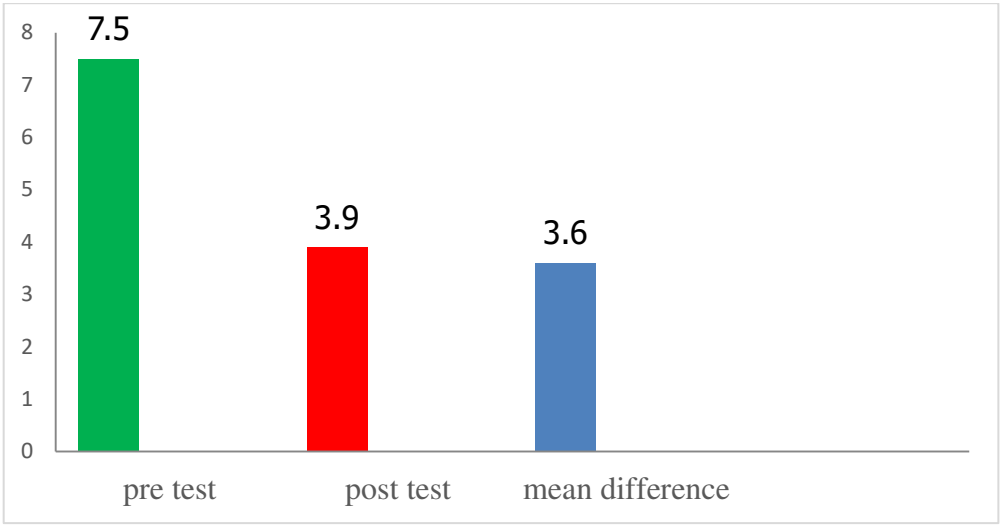


Figure 3 Graphical representation of pretest, post test and mean difference values of pain among group A.

Table 2

Mean value, mean difference, standard deviation and paired 't' value between pre and post test scores of pain among group B

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	7.9	3.8	1.58	5.2*
Post-test	4.1			

*0.005 level of significance

In Group B for pain the calculated paired 't' value is 5.2 and the 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than the 't' table value above study shows that there is significant difference in pain following kinesio taping among medial tibial stress syndrome subjects.

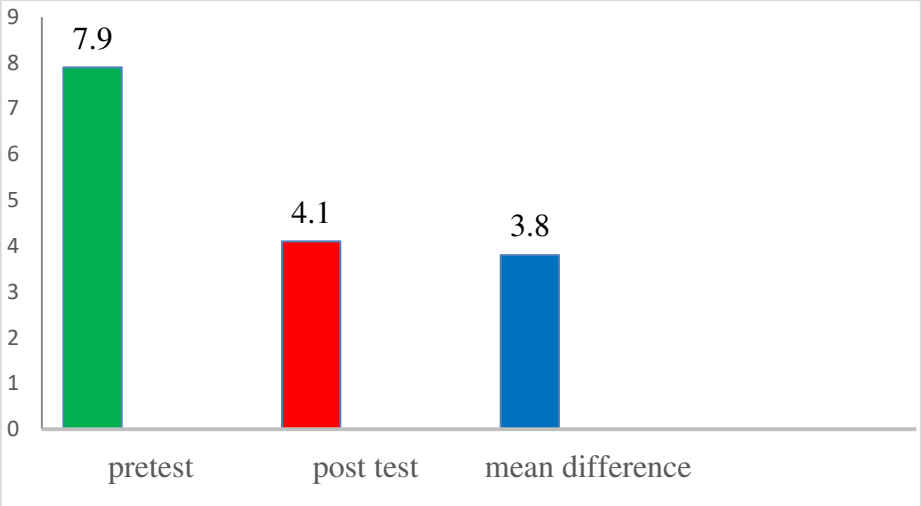


Figure 4 Graphical representation of pre test, post test and mean difference values of pain among group B.

Table 3

Mean value, mean difference, standard deviation, and unpaired 't' value of pain between group A and group B

S.no	Groups	Improvement		Standard deviation	Unpaired 't' test
		Mean	Mean Difference		
1	Group-A	3.6		0.54	1.23
2	Group-B	3.8	0.2		

0.005 level of significance

The calculated unpaired 't' value is 1.23 and the 't' table value is 2.878 at 0.005 level. Since the calculated 't' value is less than the 't' table value above study shows that there is no significant difference between myofascial release and kinesio taping in the management of pain among medial tibial stress syndrome subjects.

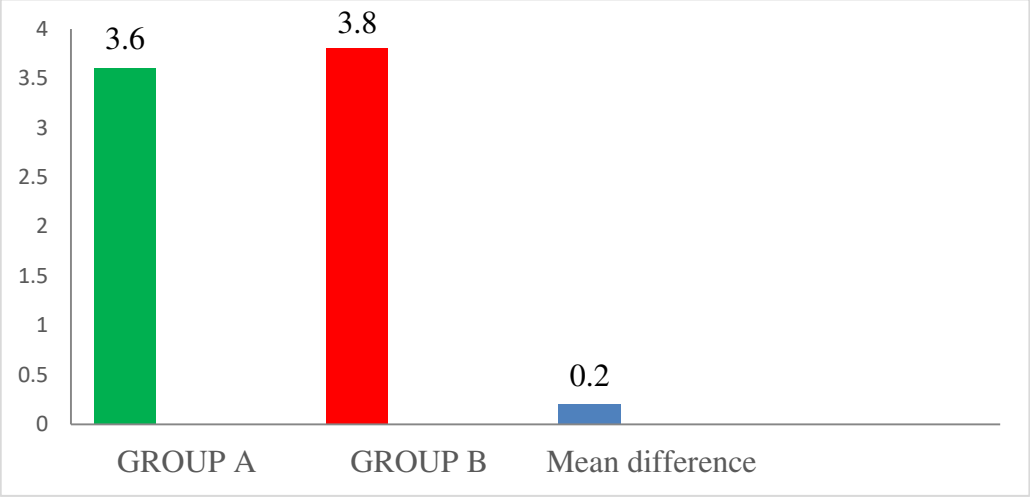


Figure 5 Mean difference values of pain in group A and group B

Table 4

Mean value, mean difference, standard deviation and paired 't' value between pre and post test scores of dorsiflexion range of motion among group A

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test Post-test	13.3 19	5.7	1.6	4.54*

*0.005 level of significance

In Group A for dorsiflexion range of motion the calculated paired 't' value is 4.54 and the 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than the 't' table value above study shows that there is significant difference in dorsiflexion range of motion following myofascial release among medial tibial stress syndrome subjects.

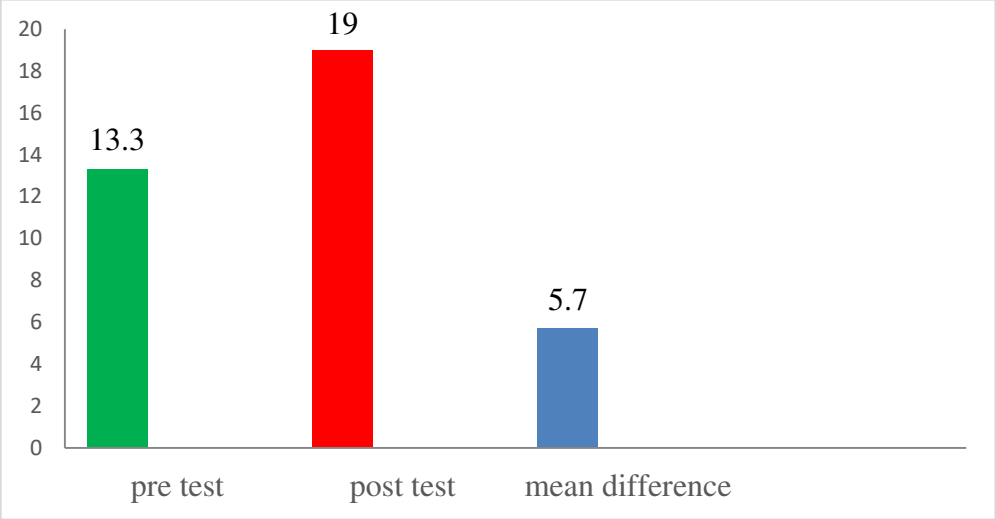


Figure 6 Graphical representation ofpre test, post test and mean difference values of dorsiflexion range of motion among group A

Table 5

Mean value, mean difference, standard deviation and paired 't' value between pre and post test scores of dorsiflexion range of motion among group B

Measurement	Mean	Mean Difference	Standard Deviation	Paired 't' value
Pre-test	12.7	5.6	1.78	4.21*
Post-test	18.3			

*0.005 level of significance

In Group B for dorsiflexion range of motion the calculated paired 't' value is 4.21 and the 't' table value is 3.250 at 0.005 level. Since the calculated 't' value is more than the 't' table value above study shows that there is significant difference in dorsiflexion range of motion following kinesio taping among medial tibial stress syndrome subjects.

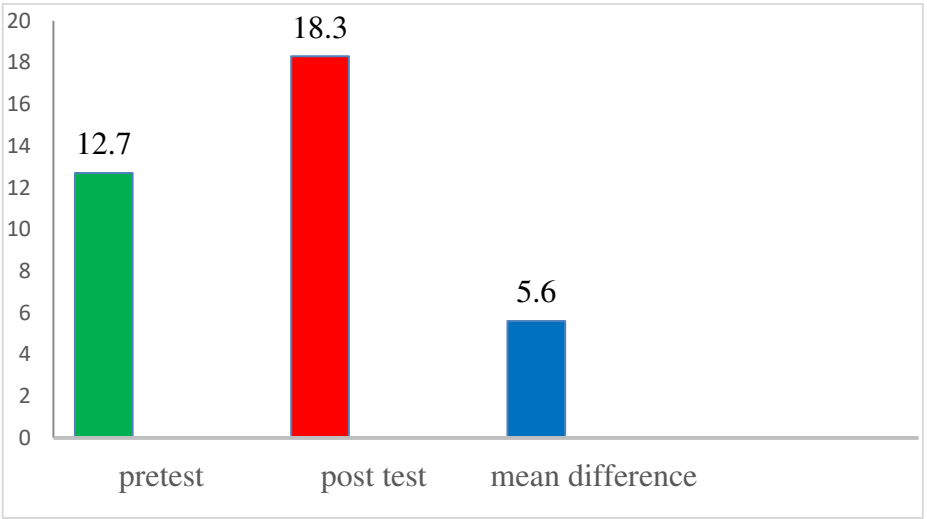


Figure 7 Graphical representation of pre test, post test and mean difference values of dorsiflexion range of motion among group B.

Table 6

Mean value, mean difference, standard deviation, and unpaired 't' value of dorsiflexion range of motion between group A and group B

S.no	Groups	Improvement		Standard deviation	Unpaired 't' test
		Mean	Mean Difference		
1	Group-A	5.7		0.93	1.02
2	Group-B	5.6	0.1		

0.005 level of significance

The calculated unpaired 't' value is 1.02 and the 't' table value is 2.878 at 0.005 level. Since the calculated 't' value is less than the 't' table value above study shows that there is no significant difference between myofascial release and kinesio taping in the management of dorsiflexion range of motion among medial tibial stress syndrome subjects.

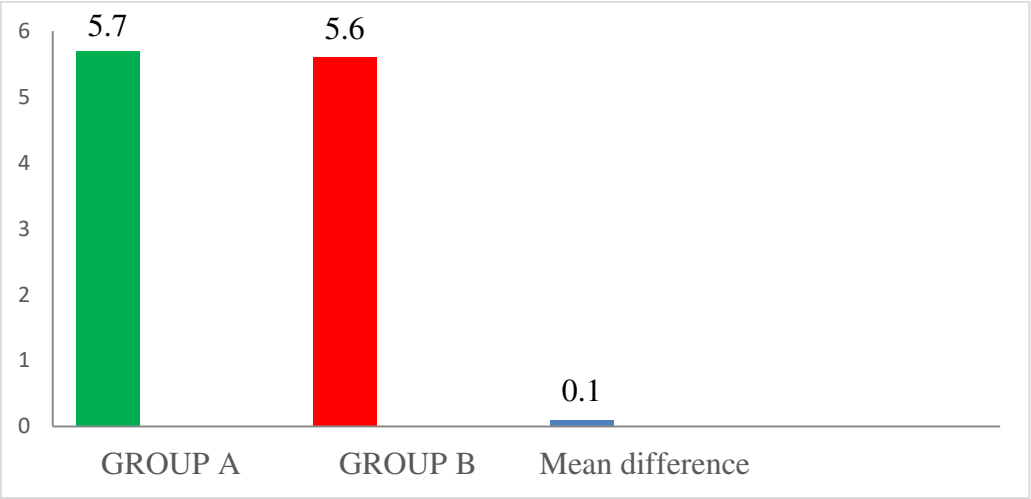


Figure 8 Mean difference values of dorsiflexion range of motion in group A and group B

4.2 Results

Twenty clinically diagnosed medial tibial stress syndrome subjects were taken and divided in to two equal groups A and B. Group a were treated with myofascial release and group B were treated with kinesio taping for a period of two weeks. Pain and dorsiflexion range of motion were measured before intervention and after two weeks by VAS and goniometry respectively.

Analysis of dependent variable pain in group A: The calculated paired 't' value is 7.46 and 't' table value is 3.250 at 0.05 level of significance. Hence, the calculated 't' value is more than 't' table value there is significant difference in pain following myofascial release in medial tibial stress syndrome subjects .

Analysis of dependent variable pain in group B: The calculated paired 't' value is 5.2 and 't' table value is 3.250 at 0.05 level of significance. Hence, the calculated 't' value is more than 't' table value there is significant difference in pain following kinesio taping in medial tibial stress syndrome subjects .

Dependent Variable Pain between Group A and Group B: The calculated unpaired 't' value is 1.23 and the table 't' value is 2.278 at 0.005 level of significance. Hence, the calculated 't' value is less than table 't' value there is significant no difference between myofascial release and kinesio taping in reducing pain among medial tibial stress syndrome subjects .

Analysis of dependent variable dorsiflexion range of motion in group A: The calculated paired 't' value is 4.54 and 't' table value is 3.250 at 0.05 level of significance. Hence, the calculated 't' value is more than 't' table value there is

significant difference in dorsiflexion range of motion following myofascial release in medial tibial stress syndrome subjects .

Analysis of dependent variable dorsiflexion range of motion in group B: The calculated paired 't' value is 4.21 and 't' table value is 3.250 at 0.05 level of significance. Hence, the calculated 't' value is more than 't' table value there is significant difference in dorsiflexion range of motion following kinesio taping in medial tibial stress syndrome subjects .

Dependent Variable dorsiflexion range of motion between Group A and Group B: The calculated unpaired 't' value is 1.02 and the table 't' value is 2.278 at 0.005 level of significance. Hence, the calculated 't' value is less than table 't' value there is no significant difference between myofascial release and kinesio taping in improving dorsiflexion range of motion among medial tibial stress syndrome subjects .

VDISCUSSION

Medial tibial stress syndrome is defined as pain along the posteromedial border of the tibia that occurs during exercise, excluding pain from ischemic origin or signs of stress fracture. The aim of this study was to compare and find the effectiveness of myofascial release and kinesiology taping in the management of shin pain and ankle dorsiflexion range of motion among medial tibial stress syndrome subjects. The study was carried out with twenty medial tibial stress syndrome subjects.

Result of the present study shows that there is significant difference in shin pain ankle dorsiflexion range of motion following both myofascial release and kinesiology taping.

The results of the present study is supported by Greenman (2003) he discussed about thevariesmanual therapy modalities in treating MTSS it include correction of key dysfunctions of the kinetic chain. Manual therapy may be used to correct musculoskeletal abnormalities of the spine, sacroiliac joint, pelvis, and various muscle imbalances. A wide variety of manual medicine techniques, including myofascial release, osteopathic manipulation and physical therapy, can be used to address these dysfunctions. The goal of manual medicine is to restore normal range of motion of joints, improve symmetry of muscles and soft tissues and, ultimately, restore maximal function of the body as a unit]. Correcting musculoskeletal dysfunctions can improve pain and overall function and may be helpful in preventing recurrence. Manual medicine has been commonly used to treat other lower extremity injuries with the benefit of improved pain and function. However, there is a paucity of RCTs about the role of manual medicine in treating specifically MTSS and Griebert *et al.,* (2016) they mentioned in their study that medial tibial stress syndrome (MTSS) is an overuse injury occurring among the

physically active. Linked to increased strain on the medial tendons of the ankle, studies emphasize controlling medial foot loading in the management of this condition. Kinesio taping (KT) has gained popularity for treating musculoskeletal pathologies; however, its effect on MTSS remains uninvestigated. This study aimed to determine if healthy participants and patients with current or previous history of MTSS differ in the rate of loading, and if KT affects plantar pressures in these participants.Twenty healthy participants and 20 participants with current or previous history of MTSS were recruited and walked across a plantar pressure mat prior to KT application, immediately after application, and after 24-h of continued use. Time-to-peak force was measured in 6 foot areas and compared across groups and conditions. ANOVA revealed a significant interaction between group, condition, and foot area ($F = 1.990$, $p = 0.033$). MTSS participants presented with lower medial midfoot time-to-peak force before tape application (95%CI: 0.014-0.160%, $p = 0.021$) that significantly increased following tape application ($p < 0.05$).These results suggest that KT decreases the rate of medial loading in MTSS patients. Future research might assess mechanisms by which this effect is achieved.

Hence all the three hypotheses are rejected.

VI CONCLUSION

Twenty medial tibial stress syndrome subjects were selected for the study and consecutively divided in to two equal groups group A and B. Group A subjects were treated with myofascial release and group B by kinesio taping for a period of two weeks. Shin pain and ankle dorsiflexion range of motion of all the subjects were measured at the beginning of the study and at end of two weeks intervention.

Shin pain and ankle dorsiflexion range of motion were measured by visual analog scale and goniometry respectively. The statistical results of the study revealed that both the techniques are effective in reducing pain and improving statistical among medial tibial stress syndrome subjects. But when comparing both there is no significant difference between two interventions.

6.1 Limitations

- Number of subjects were less
- Psychological factors were not considered
- VAS is a subjective assessment tool.

6.2 Suggestions

- Similar study can be carried out for largest sample size
- Predisposing risk factor can be added as a variable.

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ANNEXURES

Annexure I

Physiotherapy Assessment

1) Subjective Examination
    a. Name:
    b. Age:
    c. Sex
    d. Occupation:
    e. Weight:
    f. Height:
2) History Collection
    a. Present medical history
    b. Past Medical history
3) Objective Examination
    a. On observation
        i. Assess lower limb alignment (varus/valgus, tibial torsion, per planus)
            1. Swelling
            2. Bruising
            3. Asymmetry
    b. Standing
    c. Walking – assess gait mechanics (forwards, backwards, on toes, on heels).
4) Active Movements: Assess motor function and range of motion.

a. Plantar flexion / dorsiflexion

b. Inversion / Eversion

5) Passive Movements.

a. Plantar flexion

b. Dorsiflexion

c. Inversion/Eversion

6) Palpation

a. Evaluate Pain distribution

b. Warmth

c. Swelling

d. Pitting Edema

e. Presence of Crepitus with motion

7) On Examination

a. Ankle ROM – Goniometer

b. Shin Pain - VAS

Annexure II

Table: 7

Pre and post test values of shin pain in Group A

Sl. No.	Pre Test	Post Test
1	8	4
2	7	4
3	9	6
4	8	5
5	6	3
6	7	3
7	7	3
8	9	4
9	6	3
10	8	4

Table: 8

Pre and post test values of shin pain in Group B

Sl. No.	Pre Test	Post Test
1	9	4
2	8	5
3	8	5
4	7	4
5	9	6
6	6	3
7	8	3
8	7	3
9	9	4
10	8	4

Table: 9

Pre and post test values of ankle dorsiflexion range of motion in Group A

Sl. No.	Pre Test	Post Test
1	10˚	18˚
2	10˚	18˚
3	15˚	20˚
4	14˚	18˚
5	17˚	20˚
6	10˚	18˚
7	15˚	20˚
8	15˚	20˚
9	12˚	18˚
10	15˚	20˚

Table: 10

Pre and post test values of ankle dorsiflexion range of motion in Group B

Sl. No.	Pre Test	Post Test
1	15˚	18˚
2	10˚	18˚
3	10˚	18˚
4	15˚	18˚
5	12˚	20˚
6	13˚	20˚
7	15˚	18˚
8	12˚	20˚
9	15˚	18˚
10	10˚	15˚

Annexure III

PATIENT CONSENT FORM

I _____ voluntarily consent to participate in the research named "**A STUDY ON THE EFFECTIVENESS OF MYOFASCIAL RELEASE AND KINESOLOGY TAPING IN THE MANAGEMENT OF SHIN PAIN AND ANKLE RANGE OF MOTION AMONG MEDIAL TIBIAL STRESS SYNDROME SUBJECTS.**

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of Patient **Signature of Researcher**

Signature of Witness

Place:

Date: