

Effectiveness of Taping in the Management of Pain, Functional Disability and Navicular Drop among Treadmill Runners with Shin Splint

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ABSTRACT

Background and Aim: Shin splints are commonly described as pain within the anterior aspect of the leg which develops during or after prolonged weight bearing. Taping technique frequently utilized by clinicians with in the management of lower limb Musculo skeletal pain and injury. The aim of the study was to seek out and compare the effectiveness of taping and selected strengthening exercises on pain, functional disability and navicular drop among treadmill runners with shin splint.

Materials and Methods: 30 treadmill runners with shin splint were selected for the study and consecutively divided into 2 equal groups. Group A (n=15) was treated with taping with selected exercises, B (n=15) was treated with selected exercises alone. Pain, functional disability and navicular drop were measured by visual analogue scale, lower extremity functional scale and navicular drop test respectively.

Results: In Group A and B for pain, functional disability and navicular drop the calculated paired 't' values are 27.44, 20.40, 14.81, 15.87, 27.28 and 8.26 respectively, and therefore the 't' table value is 2.977 at 0.005 level. Since all the calculated paired 't' values are more the 't' table value it's concluded that there's significant difference within the values of all dependent variables following the intervention. In between group analysis the calculated unpaired 't' values for pain, functional disability and navicular drop are 9.88, 6.49 and 5.29 respectively, and also the 't' table value is 2.763 at 0.005 level.

Conclusion: The results of this study shows that both taping with selected strengthening exercises and selected strengthening exercises alone were effective in reducing pain, functional disability and navicular drop among treadmill runners with shin splint. But when comparing both it absolutely was found that taping with selected strengthening exercises is simpler and effective than selected strengthening exercises alone in reducing pain, functional disability and navicular drop among treadmill runners with shin splint.

Keywords: inflammation, pain, functional disability, navicular drop, lower extremity functional Scale (LEFS), VAS, navicular drop test (NDT)

INTRODUCTION

Shin splints are commonly described as pain within the anterior aspect of the leg which develops during or after prolonged running and weight bearing. Most often, there's pain and tenderness to palpation of the involved region resulting from an overuse sort of injury. The particular tissues involved within the etiology of injury are unknown.^[1] Many believe the most reason for shin splints involves underlying periostitis of the tibia because of tibial strain when under a load. However, new evidence indicates that a spectrum of tibial stress injuries

is probably involved in shin splints, including tendinopathy, periostitis, periosteal remodeling, and stress reaction of the tibia.^[2]

When people overuse their legs, they develop an uncomfortable awareness of those limbs manifested as a dull burning or aching. The cause is usually clear to the person with the matter as a result of the customarily obvious relationship to overdoing an exercise or activity and also the pain. "Shin splints" is that the lay term; physicians use the term medial tibial stress syndrome. The patho physiology that ends up in this pain is unclear,

although there are variety of competing theories.^[3]

Among overuse running injuries over 80% occur at or below the knee. And 40% injuries occur to the foot, ankle, and lower leg like plantar fasciitis, achilles tendinitis, and shin splints.^[4]

Medical diagnosis includes stress fractures and compartment syndromes, bone tumors or lipomas can even cause similar pain. Diagnosis will be made by history alone in a very majority of cases, but if the diagnosis is unclear, an X-ray and resonance imaging should be considered.^[5]

Most literature supports “rest” at the acute phase of shin splints. For several athletes, however, prolonged rest from activity is n’t ideal, and other therapies are necessary to assist the athlete return to activity quickly and safely.

Physiotherapy modalities like ultrasound, whirlpool baths, phonophoresis, augmented soft tissue mobilization, electrical stimulation, and unweighted ambulation could also be utilized in the acute setting, but they need not been shown to be definitively efficacious over other treatment options.^[6]

Literature has widely supported a daily regimen of calf stretching and eccentric calf exercises to stop muscle fatigue. Other exercises specialize in strengthening the musculus tibialis anterior and other muscles controlling both inversion and eversion of the foot.

Patients may additionally like strengthening core hip muscles. Developing core stability with strong abdominal, gluteal, and hip muscles can improve running mechanics and stop lower extremity overuse injuries.^[7]

Aligning with a kinetic chain approach to lower limb function, frontal and transverse plane hip motion has been shown to be strongly correlated to frontal plane foot motion during walking and increased navicular drop has also been shown to be associated with increased hip internal rotation during a single-leg squat. This is often supported by the finding of altered proximal control of gait, specifically the gluteus medius (abductor and external rotator of the hip) weakness, in individuals with exercise related leg pain. It’s also a commonly prescribed exercise for gluteus muscle with other hip exercises to extend complexity and to facilitate relevance to the functional tasks of walking and running.^[8]

Taping technique frequently employed by clinicians within the management of lower limb musculo skeletal pain and injury. A recent review of literature concluded that rigid tape produces a biomechanical effect, specifically by increasing medial longitudinal arch height, reducing calcaneal eversion and tibial internal rotation, reducing medial fore foot pressures and increasing lateral

midfoot pressures during standing, walking, jogging. The review also found preliminary evidence of a neuro muscular effect, specifically tibialis muscle activation during walking.^[9]

The purpose of study was to compare the effect of taping along with selected strengthening exercises and selected strengthening exercises alone within the management of pain, functional disability and navicular drop among treadmill runners with shin splint.

MATERIALS AND METHODS

Study Design

Pre and post-test experimental study design

Sampling Method

Consecutive sampling

Sample Size

30 treadmill runners with shin splint were selected for the study and divided into 2 equal groups. group A (n=15) was treated with taping with selected exercises, group B (n=15) was treated with selected exercise alone.

Variables

Independent variable

- Taping with selected strengthening exercises
- Selected strengthening Exercises

Dependent variable

- Pain
- Functional Disability
- Navicular height

Measurement tool:

Variable	Tool
Pain	Visual analog scale
Functional disability	Lower extremity functional scale
Navicular height	Navicular drop test

Study Center

Acharya Physiotherapy clinic and Rehabilitation center, Bangalore.

Study Duration

The study is conducted for a period of three months.

Inclusion criteria

1. Clinically diagnosed shin splint patients runs treadmill regularly a minimum of past one year.
2. Complaining diffuse pain on palpation of the postero medial border of the tibia.
3. Patients complaining pain quite over three weeks.

4. Unilateral involvement.
5. Both the sexes old between 18 to 25 years.

Exclusion Criteria

- Tibial fracture
- Osteoporotic conditions
- Compartment syndrome
- Lower limb length discrepancy
- Recent soft tissue lesions around knee and ankle joints
- Recent fracture deformities of lower limb
- Sciatica patients
- Allergic patients for taping
- Central nervous system dysfunctions
- Respiratory distress patients
- Vascular diseases

Materials used

- 35 cm rigid tape
- Fixomull
- Scissor
- Table
- Pillow
- Inch tape
- Marker
- Chair
- Cuff weights
- TheraBand
- Lower extremity functional scale

Method of Collection of Data

By direct observation method pain and navicular height values were collected with the tool visual analog scale and navicular drop test. Functional disability scores were collected by lower extremity functional scale questionnaires.

Treatment Procedure

30 clinically diagnosed shin splint subjects who fulfill inclusion and exclusion criteria were selected for the study and consecutively divided into two equal groups, A and B. Selected exercise regime got for both groups. Group A subjects additionally received taping support. Pain, functional disability and navicular drop were measured by VAS, lower extremity functional scale and navicular drop test respectively at zero level and end of two weeks.

Taping

Taping was performed employing a 35 cm rigid tape. Before applying the tape to the foot and lower leg, the

skin was cleaned with an alcohol swab. To forestall skin irritation, a hypo allergenic under tape [fixomull] was naturally applied with none force within the same manner before applying the rigid tape. Rigid tape applied above the fixomull, starting at the lateral malleolus of the ankle, then laterally across the metatarsals and continued over the fifth metatarsal base, and under the navicular tuberosity, the tape cross over the aspect of the ankle and wrapped round the lower leg.

Exercise Regime

Active strengthening exercises for Hip extensors, Hip abductors, Knee, Knee extensors, Dorsi flexors, Invertors got with various mode of resistance (Thera Band and weights). In one session 12 repetitions got for mentioned muscle group. The above exercises given for a period of two weeks, daily two sessions with a minimum of one minute rest between each exercise.

Hip abductor and external rotator muscle exercise

Clamshell exercise with thera band: Patient was lying down on the unaffected side in side lying position. Patient's affected leg was supported on unaffected leg. TheraBand was tied round the thighs and patient was asking to try and do hip abduction and external rotation.

Quadripod hip extension with knee extension: Patient was in quadripod position. Patient was asked to do hip extension and knee extension.

Knee extensor strengthening exercise: Patient starting position was high sitting. Weight cuffs was tied around ankle. Patient was asked to try to do knee extension.

Invertor strengthening exercise: Patient's starting position chair sitting. TheraBand was tied around patient's foot. Another end of thera band was tied opposite to the affected leg. Patient was asked to try to do inversion.

Measurement Procedure

Navicular Drop Test

Position the patient in standing, so there's full weight-bearing through the lower extremity and make ensure the foot within the subtalar joint neutral position ("talar head congruent"). Mark the situation of the navicular tuberosity and measure its distance from the supporting surface (floor or step). Ask the patient to relax then measure the amount of sagittal plane excursion of the navicular with a ruler. Normal value is 6-9 mm.

Lower Extremity Functional Scale (LEFS)

The Lower Extremity Functional Scale (LEFS) could be a questionnaire containing 20 questions about a person's ability to perform everyday tasks. The LEFS may be

employed by clinicians as a measure of patients' initial function, ongoing progress and outcome, additionally on set functional goals. The columns on the scale are summed to urge a complete score. The maximum score is 80. The lower the score, the greater the incapacity. Percentage of maximal function = (LEFS score) / 80 * 100.

Visual Analog Scale

It had been used for the measurement of pain. It assessed the pain severity by asking the subjects to point the current level of pain. Equipment required: A strip of paper on which there was a horizontal line of 10 cm length. The numbers 0 to 10 were marked on the line with 1cm width between each number. 0 was on one end of the line and 10 was on the opposite end of the line. The numbers represented the degree of pain intensity. 0 indicated no pain and 10 indicated maximum pain. The patient was asked to mark the number within the line at the point corresponding to the intensity of pain at that very moment.

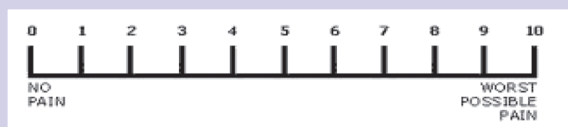


Figure 3: Visual Analogue Scale

DATA ANALYSIS AND RESULTS

Data Analysis

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

RESULTS

30 treadmill runners with shin splint were selected and divided into two equal groups. Group A was treated with taping and selected strengthening exercises and group B was treated with selected strengthening exercises alone.

Dependent variable pain between group A and group B:

The calculated unpaired 't' value is 9.88 and the table 't' value is 2.763 at 0.005 level of significance. Hence, the calculated 't' value is greater than table 't' value, there is significant difference between taping with selected strengthening exercises and selected strengthening exercises alone in reducing pain among treadmill runners with shin splint.

When comparing the mean values of group A and B, group A subjects treated with taping with selected strengthening exercises shows more difference than group B. Hence it is concluded that taping with selected strengthening exercises are more effective than selected strengthening exercises alone in reducing pain among treadmill runners with shin splint.

Dependent variable functional disability between group A and group B:

The calculated unpaired 't' value is 6.49 and the table 't' value is 2.763 at 0.005 level of significance. Hence, the calculated 't' value is greater than table 't' value, there is significant difference between taping with strengthening exercises and selected strengthening exercises alone in reducing functional disability among treadmill runners with shin splint.

When comparing the mean values of group A and B, group A subjects treated with taping with strengthening exercises shows more difference than group B. Hence it is concluded that taping with strengthening exercises are more effective than selected strengthening exercises alone in reducing functional disability among treadmill runners with shin splint.

Dependent variable navicular height between group A and group B:

The calculated unpaired 't' value is 5.29 and the table 't' value is 2.763 at 0.005 level of significance. Hence, the calculated 't' value is greater than table 't' value, there is significant difference between taping with selected strengthening exercises and selected strengthening exercises alone in reducing navicular drop among treadmill runners with shin splint.

When comparing the mean values of group A and B, group A subjects treated with taping with selected strengthening exercises shows more difference than group B. Hence it is concluded that taping with selected strengthening exercises are more effective than selected strengthening exercises alone in reducing navicular drop among treadmill runners with shin splint.

The calculated unpaired 't' value is 9.88 and the 't' table value is 2.763 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 taping with strengthening exercises and selected strengthening exercises among treadmill runners with shin splint.

The calculated unpaired 't' value is 6.49 and the 't' table value is 2.763 at 0.005 level. Since the calculated 't' value is more than the 't' table value above study shows that there is significant difference between Taping with Selected strengthening Exercises and selected strengthening exercises alone in the management of functional disability among treadmill runners with shin splint.

The calculated unpaired 't' value is 5.29 and the 't' table value is 2.763 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 navicular height following Taping with Selected strengthening Exercises and selected strengthening exercises alone among treadmill runners with shin splint.

Table 1: The table shows mean value, mean difference, standard deviation, and unpaired 't' value of pain among group A and group B

Sl. No.	Groups	Improvement		Standard deviation	Unpaired "t" Test
		Mean	Mean difference		
1	Group-A	6.46	3.13	0.864	9.88*
2.	Group-B	3.33			

0.005 level of significance

Table 2: The table shows mean value, mean difference, standard deviation, and unpaired 't' value of functional disability between group A and group B

Sl. No.	Groups	Improvement		Standard deviation	Unpaired "t" Test
		Mean	Mean difference		
1	Group-A	48.25	17.09	7.18	6.49
2.	Group-B	31.16			

0.005 level of significance

Table 3: The table shows mean value, mean difference, standard deviation, and unpaired 't' value of navicular height between group A and group B

Sl. No.	Groups	Improvement		Standard deviation	Unpaired "t" Test
		Mean	Mean difference		
1	Group-A	2.33	1.07	055	5.29
2.	Group-B	1.26			

0.005 level of significance

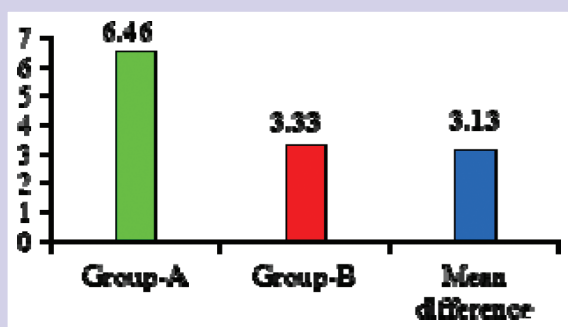


Figure 1: Shows mean and mean difference values of pain in group A and group B

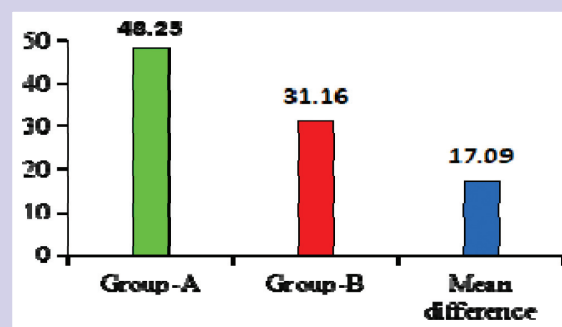


Figure 2 shows mean and mean difference values of functional disability in group A and group B

DISCUSSION

Shin splint is one in every of the important cause for low tibial pain. Taping is one amongst the wise physiotherapy management for this and also the aim of the study was to search out the consequences and compare the efficacy of taping with strengthening exercises and strengthening

exercises in reducing disability, navicular drop and pain in treadmill runners with shin splint subjects. Thirty shin splint subjects were selected for the study and divided in to 2 groups, Group A and B, each group incorporates 15 subjects. Group A was treated with taping with strengthening exercises and group B was treated with selected strengthening exercises.

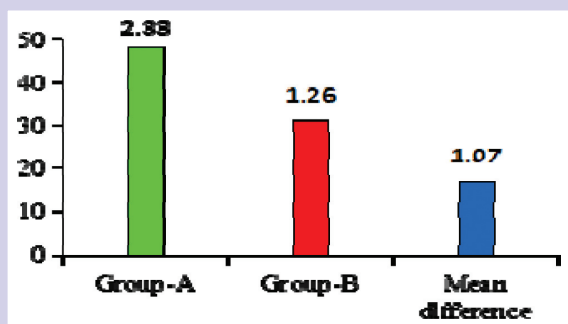


Figure 3 : Shows mean and mean difference values of navicular height in group A and group B

In the present study pain, navicular drop and functional disability were reduced significantly in both groups. This was supported by many studies.

In a study navicular drop was reduced significantly following rigid taping technique. This study aimed to judge the short-term effects of sports taping applied to the supporting lower leg during sitting, standing, walking, and jogging to limit the ND in healthy elite athletes. They concluded that RT technique-maintained NH during sitting and jogging, and therefore the RT technique might be a good preventive and treatment strategy for MTSS.

In this study twenty healthy participants and 20 participants with current or previous history of MTSS were recruited and walked across plantar pressure mat before taping 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. these results suggest that taping decreases the speed of medial loading in MTSS patients. ^[10]

In another study shows an association between hip abductor, adductor, and flexor muscle group strength imbalance and lower extremity overuse injuries in runners because in most running injuries hip muscle group strength imbalances must even be considered to realize favorable outcomes for injured runners. This study shows that addition of strengthening exercises to weak hip muscles offer better treatment in patients with running injuries. ^[11]

If the pain occurs because of a fallen longitudinal arch, the patient find relief from simple arch taping combined with 2 or 3 strips placed around the distal leg to support the extensor retinacula. Stretching and strengthening exercises for the hip, ankle & longitudinal arch can also be effective in decreasing leg pain. ^[12]

Forty healthy students were recruited for this

randomized, sham-controlled study. Participants were divided into two groups-experimental and sham application groups. The primary outcome measures were balance parameters. Athlete Single Leg (ASL), Limits of Stability (LoS), and Clinical Test of Sensory Interaction and Balance (CTSIB) were used to measure single-leg dynamic balance, dynamic postural control, and sensory interaction of balance, respectively. Dorsiflexion ROM and dorsiflexor muscle strength were the secondary outcomes. The mechanical correction technique of KT can be useful in providing immediate improvement in single-leg dynamic balance in healthy individuals. ^[13]

This study aimed to evaluate the short-term effects of sports taping applied to the supporting lower leg during sitting, standing, walking, and jogging to restrict the ND in healthy elite athletes. Twenty-four healthy elite athletes without a history of exercise-induced pain or injuries in the lower limbs participated in this study.

This study showed the taping technique-maintained navicular height during sitting and jogging, and the taping technique could be an effective preventive and treatment strategy for MTSS. Hence all the alternate hypothesis were accepted and all the null hypothesis were rejected.

Limitations

- Number of subjects were small
- Study was conducted between the age group 18-25
- Occupation was not considered.

CONCLUSION

A comparative study was conducted to investigate the efficacy of taping with strengthening exercises and selected strengthening in treadmill runners with shin splint subjects. 30 subjects were included within the study and consecutively divided into two groups, group A and B, each group contains 15 subjects. Group - A was treated with taping with selected strengthening exercises and group B was treated with selected strengthening exercises alone. Pain, functional disability, navicular height was measured before and after intervention by visual analogue scale, lower extremity functional scale and navicular drop test. The statistical result shows that there's improvement in both the groups. But when comparing both it had been found that taping with selected strengthening exercises is more effective than selected strengthening exercises alone in reducing pain, functional disability and navicular drop among treadmill runners with shin splint.

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