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Individualized conservative treatment for medial tibial stress syndrome: A case study

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ABSTRACT

Recreational runners, military trainers, dancers, and individuals who jump or move quickly are the main cause of shin splints. It is most commonly known as overuse injury. The most commonly impacted areas of the tibia are the anterior and posterior. In this condition medial side is most commonly affected, or antero- lateral side and sometime both of the side is painful which was difficult to diagnose. Overuse of the foot flexors, as well as leg discomfort and stiffness. If not addressed, it might lead to major complications like nerve entrapment, compartment syndrome, soleus syndrome. X-ray investigation aids in the identification of the damaged portion, MRI finding which help to confirmed soft tissue involvement and CT scan for sensitive structure. While physiotherapeutic rehabilitation aids in the improvement of the condition and speedy recovery. Early conservative treatment helps to decreases the progression of the symptoms. The goal of this case study is to inform readers about the conservative treatment options available for shin splints. Make recommendations to enhance the treatment and functioning results of the patient.

Keywords: Shin splits, pain, physiotherapeutic rehabilitation, lower extremity injury, medial tibial stress syndrome.

1. INTRODUCTION

Shin splints are most frequent among recreational runners, military trainees, dancers, and those who jump or walk fast. It is most commonly seen in runners, ballet dancer, run on uneven surfaces improper shoes sole all these factors provoke the symptoms. The anterior and posterior aspects of the tibia are the most typically affected (Garcia, 2017). Medial side is most commonly involved than lateral side sometime anterolateral side also shows the symptoms and both of the side also shows same symptoms Leg pain and stiffness, as well as overuse of the foot flexors. It might happen as a result of fascial traction or a bone stress response (Sharma, 2017). Shin splints usually affect the anterior and posterior lateral leg muscles.

Triceps surie tightness is a common occurrence. This has been related to a biomechanical reason (Flynt and Balon, 2014). This form of damage is caused by tension on the anterior, posterior, and lateral aspects of the muscle. Soleus

muscle involve and it is not treated it is considered as soleus syndrome it is difficult to diagnosed the condition on basis of symptoms. Anterior, lateral and posterior leg muscle involved deep as well as superficial muscle involve as the condition progress. Investigation finding helps to rule out the confirmatory diagnosis. X-ray usually done to find out the fracture of tibia and any bony abnormality involved (Pawar, 2021).

In the athletic population MRI most commonly done for soft tissue involvement also CT scan for sensitive structure. Pressure studies the investigation is not proven but in physical examination that pain while doing activity which was cramping like pain while doing high intensity activity and relieved on rest (Bates, 1985). Conservative management on early cases shows significant effect. Goal of the treatment to relived pain (Bhandakkar et al., 2020). Physiotherapeutic management include various modality to reduce pain stretching and strengthening program with mild to moderate intensity exercises for the stability and flexibility (Athawale et al., 2021). IASTM tool use to release soft tissue adhesion which cause cramp like pain the tool help to improve circulation and release adhesion with the help of cryotherapy it reduced the pain symptoms (Pietrzak, 2014).

2. PATIENT INFORMATION

A 25-year-old man complained of a little soreness in his right leg when he went to the outpatient clinic. Initially, the pain was modest, but it steadily worsened. NPRS score of 6/10 on movement and 4/10 on rest while doing assessment (table 1). There had been no trauma, X-ray shows there is no fracture, no surgical intervention, or fever in the past (figure 1). On examination, the patient had a mesomorphic build and was a member of his college team, so he regularly practiced as long as he could run. On systemic examination, there was no discernible soreness on the distal two-thirds shaft of the right leg, indicating grade 2 discomforts/ tenderness. There was no discoloration or any deformity in affected side of leg, and all vital parameters were normal. His medical history includes weight-bearing discomfort when walking and jogging.

Swelling of the ankle and shin; increased pronation of the right ankle–foot in comparison to the left; reduced and painful active and passive ankle dorsi and plantar flexion, in table 2 range of motion, valued shown; and His ankle–foot complex was in full painful active and passive inversion and eversion were among the client's affected extremities. Manual strength testing was all ankle muscles tested received a 4/5 rating, table no. 3 MMT grading shown before and after assessment. The anterior and posterior and lateral parts of leg were all painful to the touch. Because to irritation, Ankle stability testing and ligament stress tests were not completed. Without stretching or warming up the body patient start the running and because of high intensity run on uneven surface experiencing pain which was cramp like and was progressive in nature.

Fig1: A 25-year-old male present with right shin pain

X ray showing there is no fracture.

Table 1 NPRS Score indicates before and after assessment of pain

NPRS	ON ASSESSMENT	AFTER 2 WEEKS
ON ACTIVITY	6/10	2/10

ON REST	4/10	0/10

Table 2 range of motion indicates the right lower limb range of motion before and after assessment

ROM	ON ASSESSMENT ACTIVE ROM	ON ASSESSMENT PASSIVE ROM	AFTER 2 WEEKS ACTIVE ROM	AFTER 2 WEEKS PASSIVE ROM
KNEE FLEXION	0-100	0-115	0-130	0-130
ANKLE PANTARFLEXION	0-30	0-35	0-40	0-45
ANKLE DORSIFLEXION	0-30	0-35	0-45	0-50
INVERSION	0-15	0-20	0-25	0-30
EVERSION	0-15	0-18	0-25	0-30

3. CLINCAL FINDING

Affected extremity in right leg is having tenderness which was grade 2. Swelling is on right leg as well as ankle. Right ankle plantar flexion, dorsiflexion as well as inversion and eversion are painful while doing passive as well as active range of motion. Table 3 showing manual muscle testing of right knee flexors and extensor was 4/5 and also ankle plantar flexors, dorsi flexors, invertor and evertor graded 4/5. One leg hop test was also negative.

Table 3 MMT indicates before and after assessment of MMT of right leg

MMT	ON ASSESSMENT	AFTER 2 WEEKS
KNEE FLEXION	4/5	5/5
KNEE EXTENSION	4/5	5/5
ANKLE PLANTERFLEXION	4/5	4/5
ANKLE DORSIFLEXION	4/5	4/5
INVERSION	4/5	4/5
EVERSION	4/5	4/5

Therapeutic intervention

Goals of the intervention

Increase the calf complex's local load capacity.

Improve strength by focusing on the essential muscles that help with load management.

Increase your bone load capacity by doing weight-bearing workouts.

Start the exercise initially with stretching and then start the other exercise program

Calf stretches (fig 2)

Gluteal stretch (Fig 3)

Toe walking and strengthening (fig 4)

Heel walking to stretch and strengthen

Standing ankle dorsiflexion stretch

Straight knee calf wall stretches

Toe raise

Figure 2 showing calf stretching giving to the patient

Figure 3 showing gluteus stretching giving to the patient

Figure 4 showing patient actively participate in strengthening exercise

Figure 5 Showing using IASTM treatment on patient

1. Step ups

Simple, but extremely powerful! Step-ups work the Gluteal Max while also exercising the Gluteal Med and presenting a proprioceptive challenge. During the running in the stance phase of gait component, gluteal muscles are critical for absorbing stress (Loudon and Reiman, 2012). This exercise is primarily and foremost for control; practising it after you've exhausted all of your other workouts may affect movement quality. It is simple to advance or adjust the demands of patients while changing physiology.

2. Soleus squat

This is a great isometric alternative that will work both the Soleus and Quadriceps - two important muscles for absorbing weight during running. The quadriceps was discovered to be the most important contributor to support (Schulze et al., 2014).

3. Calf rises with bent knee

The calf complex, particularly Soleus, faces a considerable difficulty. Soleus is regarded to be particularly significant in MTSS because it helps to lessen the bending force on impact experienced by the tibia, which is considered that it is a critical factor in the development of bone stress injury (Schulze et al., 2014).

4. Unilateral soleus bridge

With the weight on forefoot this bridge is performed on the step's edge. The goal is to prolong the lever to put the posterior chain to the test and to strengthen the soleus muscle. Although the light load on soleus, it will challenge Glute Max and the hamstrings (Sathe and Sadhna, 2017). During the swing phase hamstring muscle are more active, but they also contribute to the loading phase through co-contraction with the quads (Garcia, 2017).

5. Hip drop exercise

Ben's evaluation highlighted vulnerability in Glute Med, which he hopes to improve. Studies have revealed Glute Medius activity on high level, and we may use this to promote a "high free hip" to assist decrease pelvic descent during loading. It's a straight forward process to increase the burden in the opposing hand.

6. Standing calf raise exercise

The exercise will help to strengthen your gastrocnemius and soleus muscles. As previously stated, a robust calf complex is critical for MTSS bone stress reduction (Youdas et al., 2003). The forefoot striker of Ben, which has been linked to higher calf complex loads in studies. We want to make sure he's strong enough to handle this workload (Schulze et al., 2014).

7. Side leg raise

This old chestnut works on Glute Med with minor anterior hip flexor motion. It's an easy workout for strengthening isolated Glute Med. The activity includes hip and knee control (step up) as well as pelvic movement control (hip hitch) glute also worked in that, and now we're isolating it and working to exhaustion to encourage strength improvements (Bell-Jenje et al., 2016). I put this at the end because once your glutes are fatigued; controlling other movements becomes very difficult!

8. IASTM

Figure 5 shows using IASTM on patient. Start with the warm-up like stretching, cycling, and light jogging for 10 to 15 min, applies the IASTM instrument to the shin region with the right pressure with 30-to-60-degree angle for 120 to 160 sec. The frequency of this Graston method varies depending on whether the pain is acute or chronic, but it has a considerable effect on shin discomfort. Then start stretching 3 repetitions with 30 sec hold then strengthening exercises with low load and high repetition with the patient tolerance. Cryotherapy helps to relieve pain once it has been used. Cryotherapy given for 10 to 15 min after all the procedure has done. The patient is advised to consume the recommended amount of water during the therapy period(Rankin, 2015). It provides proper nutrition through fluid and helps not to exhaust the patient or not undergoes in hypoxic condition.

Follow up and outcome measures

Outcome measures

Lower Extremity Function Scale: 51/80 on assessment; after 2 weeks: 64/80

Follow up

Following the completion of treatment, a two-week post assessment is taken in a follow-up session.

4. DISCUSSION

The bone results were consistent with shin splints, based on the patient's history. Shin splints are characterized by an intermittent linear, longitudinal pattern of somewhat increased uptake throughout the long bone's posterior medial cortex, most likely observed from the medial or lateral perspectives. In shin splints, the pattern of uptake reflects the underlying physiology (Sathe and Sadhna, 2017). When the foot stretches before lifting off the ground during the running phase, the gastrocnemius and soleus muscles activated. When the foot is extended for longer periods of time, such as in sprinting, these calf muscles offer greater force for running (Balducci et al., 2016). As a result of the increased power, the soleus, which connects directly to the tibial cortex on the posteromedial side, is put under higher stress. The muscle on the periosteum of the tibia tightens and pulls as a result of the increased stress, creating stress along the diaphysis (Sathe and Sadhna, 2017).

The linear pattern represents periostitis along the insertion of these muscles (on the delayed phase of the bone scan alone). The findings demonstrate that physiotherapy treatment is a rapid and efficient way to reduce pain and improve exercise tolerance in patients (Kemmler et al., 2009). A thorough first treatment for each lower leg might take up to one hour in extreme situations. In succeeding therapy sessions, the amount of time spent will decrease (Fick et al., 1992). Furthermore, the approach is extremely unpleasant for the patient, which must be disclosed to the patient before to treatment in order to increase therapy tolerance (Basset, 1999). The patient is motivated to continue the treatment course because of the instant therapeutic success.

As previously stated, the initial treatment usually results in a considerable improvement in pain and activity tolerance. Athletes must receive prompt diagnosis and treatment for MTSS in order to return to full exercise in a timely manner (Bais et al., 2020). There is currently insufficient data to support our current MTSS therapy and treatments. In the acute period, however, most studies recommend rest, ice, and analgesics. Many specialists also advise altering the training programmed, stretching and strengthening the lower extremity, using suitable footwear, correcting biomechanical anomalies with orthotics and manual treatment, and gradually returning to activities (Boudreau et al., 2009).

5. CONCLUSION

Most of the evidence shows that recreational runners are more prone to develop the shin splints or medial tibial stress syndrome. Both male and female are developed the symptoms. Pain usually presents the symptom mainly on while walking, running initially. Physiotherapy plays important role in individual suffering from shin splints. The treatment of primarily to relived pain and improve function. Electrotherapeutic modality with manual therapy helps to improve function.

Ethics and dissemination

Prior to the start of the study, the committee on institutional ethics must approve it. First and foremost, the patient must be treated with dignity. The patient is taken for review once the inclusion and exclusion criteria have been met.

Informed consent

Therapist will get the participant's written informed permission on a consent form with name and signatures and provide confidentiality verification.

Author's contribution

Nikita S. Deshmukh	Principal Investigator
Dr. Pratik Phansopkar	Supervisor

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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