ISSN NO. 2320–7418 DOI: 10.22270/jmpas.V10I4.1240

International open access journal

Journal of Medical Pharmaceutical and Allied Sciences

Journal homepage: www.jmpas.com

Case report

Physiotherapeutic intervention relieving tarsal tunnel syndrome in a runner

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ABSTRACT

"Tibial Nerve Dysfunction" or "Posterior Tibial Nerve Neuralgia" are terms used to describe Tarsal Tunnel Syndrome (TTS). It is a form of compressive neuropathy that emerges when the structures in the tarsal tunnel are compressed. In athletic individuals, TTS tends to be associated with running, jumping or impacted sports and so, is very common in middle aged runners. The symptoms include pain, paresthesia and numbness is the most common clinical presentation. A well designed physical therapy program plays an important role in recovering from such hampering conditions, a physical therapy rehabilitation program consist of pain reduction by using hot fermentation, contrast bath or paraffin wax bath. Strengthening of the musculature around ankle to avoid unnecessary forces on the joint along with balance training, agility training and education regarding footwear is essential for a complete recovery. Here, we report a case of 21 year old male, a Track Runner, presenting to the physiotherapy department at Acharya Vinoba Bhave Hospital Sawangi (M), Wardha with the complaints of severe pain and numbness in his right ankle over medial region of foot for past 5 days. Investigatory findings revealed that he was diagnosed with Tarsal Tunnel Syndrome over his right foot. Thereafter, he was treated conservatively with physical therapy interventions such as ankle exercises, stretching techniques, taping, theraband, strengthening etc. The purpose of this case study is to: To study the physiotherapeutic interventions, playing a major role in managing the case of tarsal tunnel syndrome. Conclusion: This case study concludes that physiotherapeutic interventions and exercises plays an important role in managing the signs and symptoms of tarsal tunnel syndrome.

Keywords: Tarsal Tunnel Syndrome, Tibial Neuropathy, Entrapment Neuropathies, Pain, Running Athlete, Numbness.

Received - 09/06/2021, Reviewed - 05/07/2021, Revised/ Accepted- 04/08/2021

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INTRODUCTION

Tarsal tunnel syndrome causes compression which is neurological pathology. Location of the tunnel under flexor retinaculum, posterior to medial malleolus. The tarsal tunnel is the fibro-osseous area and is small and located under and behind the medial malleolus. Antero-superiorly medial malleolus bounds the same, the posterior talus and calcaneus laterally, and is protected against by a flexor retinaculum. Tarsal tunnel contents flexor digitorum longus tendon, tibial nerve, Flexor hallucis longus tendon, posterior tibialis artery [1].

One-third of the running injuries accounts for foot and ankle injury [2]. Elite and recreational runner's experiences foot and ankle injury. The majority of the injuries are overuse injuries. Tendinopathies and entrapment injuries have a high incidence in running athlete [3]. In the athletic individuals, TTS is associated with jumping, running or Commonly in soccer players [4]. Sporting activities leads to tarsal tunnel syndrome under some conditions [5]. The occurrence is much more common in females and in people who are much involved in weight bearing activities.

The clinical presentation of TTS includes a triad of tingling and numbness and pain over ankle or plantar aspect of foot [6]. Symptoms usually get worsened at night or after physical exertion. The diagnosis is made after a thorough evaluation that requires pain assessment, Manual Muscle Testing to check the strength of muscles [7].Treatment protocol for TTS patients includes physical therapy and medical management. Medical management includes NSAIDS, pain medications [8]. Physiotherapeutic interventions, firstly, includes RICE therapy that is Rest Ice Compression Elevation. Thereafter, physical agents such as ice, ointment, electro modalities are used [9].

Therapeutic exercises such as calf muscle stretching, ankle exercises, tibialis posterior strengthening plays a vital role in patients of tarsal tunnel syndrome [10].

Case presentation

A 21 year old running athlete (Track Runner) came in department of physiotherapy with severe pain while walking and numbness in his foot over medial part of ankle. Pain was gradual in onset for over 2 weeks which became severe a week ago. Pain was sharp shooting in nature and was present over the area of tarsal tunnel. It aggravated while walking or running and relieved in resting position. On evaluation patient rate 8/10 on VISUAL ANALOG SCALE. At the initial evaluation, the patient had not run for about a week. The patient was previously running 10 kilo meters per day. Some amount of tenderness was also reported over the area of medial malleolus. Often, pain used to get worsened at night and also with forced dorsiflexion or eversion.

Clinical findings

Tinel's sign positive, dorsiflexion – eversion test positive

On Examination

Pain was assessed using a verbal 0-10 scale; Visual Analogue Scale (0/10 assessed as no pain and 10/10 assessed as severe pain). At initial evaluation, pain was 8/10. The patient described his pain as sharp and burning in nature Pain gradually increased in right medial ankle which felt following a 10 min of running that forced him to discontinue running and seek medical care.

On Palpation

Palpation of patient's right foot and ankle revealed tenderness on medial malleoli's posterior side.

Special Test

Positive Tinel's sign on patient's right extremity. Tinel's sign is meant to elicit the patient's symptoms by having practitioner tap on posterior tibial nerve where compression is experienced. The patient demonstrated the positive dorsiflexion-eversion stress test, which was performed by placing foot and ankle in maximum dorsiflexion and eversion with MTP joint in extension and holding for 5-10 sec.

Table 1. Timeline

Date of Injury	05-01-2021
Date of Admission	06-01-2021
Date of Physiotherapy Management	07-01-2021

Diagnostic Assessment

Clinically TTS is diagnosed based on a comprehensive clinical examination and medical history. Plain X-ray of the patient revealed no structural abnormalities. EMG studies showed severe TTS on right ankle and foot.

THERAPEUTIC INTERVENTIONS

Most of the TTS cases are managed either conservatively or surgically. If conservative management fails, surgical interventions is performed on TTS patients. Pharmacological management is given to reduce pain and inflammation.

Therapeutic Exercise Given to Patient

Patient Education

Education regarding the condition is given to the patient and important of exercise is explained to the patient and relative, importance regarding proper use of the footwear with a soft, supporting sole, changing shoes after they are worn off and foot hygiene is explained to avoid the infections.

Ankle pumps and ankle circles

Patient was made to sit in a relaxed and comfortable position. The patient was asked to push down as far as he could and pull up as far as he could with a rolled towel put in front of his foot. Patient was asked to perform 10-15 Reps. the patient was educated about the benefits of the exercises.

Calf stretches

Patient was in sitting position. The therapist tied the belt over the ball of his right foot; neither too tight nor too loose. The therapist explained the procedure to the patient to stretch the strap and hold it for 30 sec and then relax. The patient was asked to perform 10-15 Reps [11]. Both gastrocnemius and soleus stretches are to be performed by the patient.

Ball exercises

The ball was placed under the arch of foot of the patient and was asked to roll it, so all the tendons going through tarsal tunnel go down to the foot; the area over there will be loosened, also over the heel .this will loosen the tendons and will improve the mobility.

Theraband exercises

Theraband are used for strengthening muscles. The patient is educated and was explained about the procedure. The use of therabands compromises blood flow and speeds up healing. They also help rest some of the receptor cells in the muscle tissue that causes excessive muscle tightness. The patient is asked to perform 10-15 Reps. this will help in tibialis posterior strengthening.

In Standing

Heel to toe raise: The patient is made to stand in a comfortable position; feet apart, shoulder width apart. The patient is instructed to stand on his toes and then slowly go down, in to a "slow controlled motion". Patient is asked to perform 20-25 reps. of this exercise. Progression –with one foot alternately (20-25 Reps,)

Proprioceptive Training

Close Standing: The Patient is asked to stand with both the feet together with eyes open first then with eyes closed for 1 minute. Tandom Walking: the patient is asked to walk on a straight line marked on the floor with one foot in front of other in forward and then in backward direction. Advance training: The patient is made to stand on one leg on a wobble board first with eyes open and later progression is

made by closing the eyes for 1 minute.

Agility Training

Agility Drills using a Ladder:

1. The patient is made to jog in the ladder in forward and backward direction 10 rounds each.
2. Then patient is made to go sideways on the ladder first with left leg followed by right leg 10 reps each.
3. Jumping in the ladder the patient is asked to jump two blocks in front and block backwards.
4. Progression is made by asking the patient to jump with a single leg first in the box then to the left then again in the box and then to the right side of the ladder.

Balance Training

Balance training is an important part of rehabilitation as for sports balance is very important. Ankle is one of the main joint responsible of balance. In balance training initially standing on both legs with smaller base of support was given proceeding to tendon.

Table 2. Range of Motion Comparison pre and post

ROM	Pre rehab		Post Rehab		Pre Rehab		Post Rehab	
	AROM Right	PROM Right	AROM Right	PROM Right	AROM Left	PROM Left	AROM Left	PROM Left
Dorsiflexion	10*	15*	13*	17*	12*	18*	12*	18*
Plantarflexion	35*	38*	55*	60*	30*	35*	55*	60*
Inversion	33*	45*	32*	45*	31*	37*	32*	38*
Eversion	10*	13*	10*	15*	9*	15	9*	17*

Return to running

As the patient wishes to return back to running and regular training activities, the therapist advises the patients and addresses the following points:

- The involved leg should be as mobile and flexible as the other.
- The capability to balance should be equal in both the legs.
- The involved foot and ankle must be as mobile and flexible as the other.

DISCUSSION

This case study describes a unique and multifaceted approach to conservatively and successfully manage TTS in an athlete. The tarsal tunnel syndrome is a rare disorder caused by damage to tibial nerve or its branches, usually due to compression as it passes through the tarsal tunnel (entrapment neuropathy). The tarsal tunnel is a narrow passageway formed by bones and soft tissues that lies on the inside of the ankle.

Physiotherapy plays an important role in strengthening mobility exercises [12]. Tarsal tunnel syndrome is an entrapment neuropathy of posterior tibial nerve [13]. Patient presents with pain and affected range of motion. The symptom triad of pain, numbness and paraesthesia is typically present. Physiotherapeutic interventions plays an important role as they assess range of motion and degree of pain. standing on hard surface. One leg standing on the affected leg on hard surface was given and then progressed to one leg standing on unstable surface. Apart from balance training proprioceptive training was also given by giving perturbation.

Foot Intrinsic Muscle Strengthening

Foot intrinsic muscle strengthening is important and is provided by placing a small towel on rough surface and asking the patient to try to bring the towel closer by moving the toes and by increasing the arch of foot. Initially this exercise is performed in sitting and the progressed to standing. 10 repetitions are performed for 3 times a day. Physiotherapy rehabilitation is done in the patient in 4 phases and 12 week

Post rehab assessment

Pain- patient rated 2/10 on VAS Range of motion of all movements at ankle joint is taken post rehab no numbness was present. Dorsiflexion-eversion test is negative. Tinel's sign is negative.

Physiotherapy rehabilitation improves range of motion through strengthening, various stretches, therabands, taping, etc. Generally, conservative management is used in treatment of TTS. Proper rehabilitation and patience of both therapist and patient will help patient recover fast and will help to build much more confidence and faith in his therapist [13].

CONCLUSION

Conservative intervention of TTS with use of a multi-faceted approach is proved to be beneficial in resolving symptoms of TTS in a running athlete. Interventions like balance training, agility training along with strengthening of the musculature around the joint to injury to reduce the likelihood of potential ankle injuries in future. Accompanied with all the mentioned treatment a proper use of footwear is also important for injury prevention. Physiotherapeutic interventions plays an important role in managing signs and symptoms of tarsal tunnel syndrome.

Abbreviations

TTS-Tarsal Tunnel Syndrome

ROM-Range of Motion

VAS-Visual Analog Scale

AROM-Active Range Of Motion

PROM-Passive Range Of Motion

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How to cite this article

Sakshi Kamani, Om C. Wadhokar, Neha Chitale, Pratik Phansopkar, 2021. “Physiotherapeutic Intervention Relieving Tarsal Tunnel Syndrome in a Runner”. Jour. of Med. P’ceutical & Allied Sci. V 10 - I 4, 1240 P-3167-3170. doi: 10.22270/jmpas.V10I4.1240