Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 July; 6 (7s): 419-428

"Comparative Study of Dry-Needling VS Tens in the Trearment of Shin Splint in State Level Marathon Runners"

Dr. Soumik Basu[1], Dr. Selja Gautam[2], Dr. Tushar J Palekar[3], Dr. Pramod Palekar[4]

Associate Professor[1,4], PG student [2] and Dean and Principal[3]

Dr.D.Y.Patil College of Physiotherapy, Pune

Dr.D. Y .Patil Vidyapeeth, Sant Tukaram Nagar Pimpri, Pune-411018. INDIA

Selja Gautam,

Email Id- svinijb@gmail.com

Affiliation details: PG student in Musculoskeletal science and Sports Physiotherapy,

Dr.D.Y.Patil College of Physiotherapy, Pune

Dr. D.Y.Patil Vidyapeeth, Sant Tukaram Nagar, Pimpri, Pune-411018

Received: 11-May-2023

Revised: 08-June-2023

Accepted:02-July-2023

ABSTRACT:

Background :- Shin splint is one of the most common injuries presented in Athletes. Occurs due to overuse, exercise induced pain along the medial region of the shin and notably along

the posteromedial distal\third of the tibia and the muscles posterior to the tibial bone, known as "shin splints". History, investigation, palpation and observation is used to examine the injury. The treatment includes TENS, Dry needling, cryotherapy, hydro collateral packs. Etc.

Aims and objectives: To see the efficacy of Dry needling and TENS in the treatment of shin splint in state level marathon players.

Methods: Marathon runners both male and female with shin splint were allotted in two groups. A and B by simple random sampling with the chit method. Group A- 15 Athletes were treated by TENS and group B- 15 athletes were treated by Dry Needling. Both groups received treatment for 2 weeks and 7 sessions. Each session was around 30 minutes. Both groups were assessed by history, investigation, palpation and examination. Pain was assessed by NPRS and Pressure Algometer and ROM of the ankle by goniometer.

Result: All the outcome measures showed statistical significant P values and increase in Range of motion and mitigation of pain in both the groups. However, TENS was more acceptable modality among patients between the two as patients reported more apprehensive and sceptical with invasive method like Dry Needling.

Conclusion: The above study concludes that both Dry Needling and TENS are effective in reducing pain, increasing ROM. But clinically the patients had a better response to TENS as it is an non-invasive method, also more familiar than Dry- Needling.

Key words - Shin Splint, Marathon Runners, Dry Needling, TENS, Pressure Algometer

INTRODUCTION:

One of the most popular physical activities worldwide is running [1]. Although new and recreational runners frequently suffer from running-related injuries [5], which are frequently linked to training mistakes common to this demographic [5-7]. The lower leg has been shown to be one of the most often injured locations in this regard [8]. Today, running plays a significant role in the lives of many people. Overuse injuries still happen

rather frequently, despite more attention being paid to running injury prevention. . Running injuries can also be brought on by conditions like leg length inequality, restricted range of motion, weakened and imbalanced muscles, impaired neuromuscular coordination, and ligamentous laxity[9].

Overuse injuries are especially common in runners. The most frequent running-related ailments are medial tibial stress syndrome, patellofemoral pain syndrome, plantar fasciitis, Achilles tendinopathy, patellar tendinopathy, iliotibial band syndrome, and tibial stress fractures.[10]

Patients who feel exercise induced pain along the medial region of the shin and notably along the posteromedial distal\third of the tibia and the muscles posterior to the tibial bone, are said to have a condition popularly known as "shin splints" (Gerow et al. 1993). .Medial tibial stress syndrome is the most common or second-most often identified injury in studies of recreational runners. In mild situations, pain occurs during exercise, while in severe cases, pain occurs during rest [12]. Muscle overuse and persistent exhaustion lead to posteromedial muscular weakening [13]. The muscles, fascia, bone, and periosteal connections in the anterior compartment may become overused or injured over time, which is the suspected cause of anterior shin splints. Increased heel eversion and traction periostitis of the soleus or flexor digitorum longus muscles are causes of medial tibial stress syndrome [14]. .Bilateral soreness or discomfort in the medial side of the tibia, most usually in the distal area, is a common symptom in people with MTSS. The center of the medial tibia is where the discomfort is [15] The intensity of pain increases at the start of an exercise and decreases over time. It rises during exercise and falls during rest. [16]

According to Moore (2006), stress or overuse are thought to be the causes of shin splints. harm to the deep posterior compartment of the anterior's muscle-tendon units periosteum and underlying bone as a result of the tibial compartment.

1. There are four fascial compartments, specifically with regard to the leg (Moore, 2006): 1. Anterior Tibial Compartment:

2. . Deep posterior compartment:

3. . Lateral compartment:

4. Superficial posterior compartment:

ANATOMY AND BIOMECHANICS OF MUSCLES IN POSTERIOR COMPARTMENT: SOLEUS: The middle third of the medial border of the tibia is where the soleus, a flat, thick muscle, joins proximally to the posterior side of the head of the fibula. Moore, Michael and Holder from 1985 (2006).The anterior half of the Achilles tendon, which connects to the back of the calcaneus, is made up of the tendinous component of the soleus (Travell and Simons 1999).

FLEXOR DIGITORUM LONGUS MUSCLE:

According to Travell and Simons (1999), the flexor digitorum longus muscle is located on the rear of the tibia, medial to the tibialis posterior and deep to the soleus and gastrocnemius. The proximal attachment, which starts distal to the soleus attachment and includes the intermuscular septum shared with the tibialis posterior muscle, is to the posterior surface of the middle two-quarters of the tibia.

FUNCTION: assisting in the foot and ankle's stabilization throughout the midstance and late stance phases of walking. Maintaining balance while the body weight is on the forefoot, Flexing the distal phalanges, and Controlling foot motions in the sagittal and frontal planes.

TIBIALIS POSTERIOR:

The muscle in the calf with the deepest location is the tibialis posterior. It is situated between the soleus muscle

and the interosseous membrane. It is predominantly connected proximally to the interosseous membrane and the medial surface of the fibula, but it is also connected to the deep transverse fascia, the posterior surface of the tibia, and the intermuscular septa of the surrounding muscles.

Findings demonstrate that in a cynical practice and research setting, MTSS may be accurately diagnosed clinically utilizing history and physical examination. [17] During a physical examination, the distal two-thirds of the posteromedial tibial border can be palpated and felt to be painful. Sometimes the tibia can exhibit a little swelling.[18]

As opposed to injecting substances into muscles, ligaments, tendons, subcutaneous fascia, and scar tissue, dry needling calls for the insertion of tiny monofilament needles, similar to those used in acupuncture. To treat a range of neuromusculoskeletal pain disorders, dry needles may also be put close to peripheral nerves and/or neurovascular bundles. However, certain position statements by numerous US State Boards of Physical Therapy have confined the definition of dry needling to a "intramuscular" approach involving the exclusive treatment of "myofascial trigger points" (MTrPs). [19]

In order to relieve chronic pain without using drugs, transcutaneous electrical nerve stimulation (TENS) was developed. TENS is presently one of the most widely utilized electro analgesic methods. TENS has been used clinically for a variety of illnesses, including low back ache, arthritic and myofascial pain, pain that is mediated by the sympathetic nervous system,visceral pain pain, and post-surgical pain, according to hundreds of publications [20].TENS is often used and beneficial for a variety of chronic pain disorders. TENS is the process of applying pulsed square wave current to the peripheral nerve fibers of the body using surface electrodes implanted on the skin to regulate pain .A non-invasive, non-addictive therapy is TENS. TENS doesn't cause numbness or a nerve block.[21]

METHODS AND METHODOLOGY:

In this comparative study design, participants were recruited after approval of institutional ethical committee. Participants were recruited from Athlete inside group, wakad, pune. The participants who fulfilled the inclusion and exclusion criteria were recruited using the chit method and then were divided into two groups, Group A(TENS) and Group B(Dry needling). A signed consent was taken from all the participants before proceeding for the study. Participants were assessed at baseline using NPRS, Pressure algometer and ankle plantarflexion and then after the intervention of 14 sessions of Dry needling and TENS at 2 weeks.

INCLUSION CRITERIA:

1. Subjects with shin pain in the age group of 20-40 years.
2. State level marathon runners both male and female.
3. Subjects presenting the following sign-

- Pain and tenderness localized to the distal two third of the medial border of the tibia at the junction of the periosteum and the fascia.
- Pain in this area, exacerbated by weight bearing or physical activity and relieved at rest. -
- The presence of a tender spot on the shin.

4. Shin pain because of the marathon.
5. Marathon runners train for 6 or more months.

EXCLUSION CRITERIA

1. Subjects that do not have shin pain.
2. Subjects below the age of 20 and above the age of 40

3. Subjects with the possibility of stress fracture.
4. Subjects that are unwilling to participate
5. Subjects with needle phobia.
6. lymphoedema
7. Abnormal bleeding tendency
8. Diabetes
9. Inappropriate for any other reason.
10. Screened for stress fracture.

INTERVENTION

Group A: TENS was applied to the participant for 15 minutes, the intensity was increased and decreased as suitable to the participant. 2 electrodes were applied over the affected shin covering the painful area with ultrasonic gel and tapes.

Group B: Dry needling was performed at the trigger point over the affected shin. Fishing was done to clear the adhesions and the needle was kept inserted for 5 minutes. When soreness was experienced, icing was recommended to the participants.

RESULT

The study reported statistically significant results regarding both the groups A and B. The improvement was similar when compared with both the groups regarding NPRS, pressure algometer and ankle plantarflexion.

Data was analysed using the statistical package **SPSS 26.0** (SPSS Inc., Chicago, IL) and level of significance was set at **p<0.05**. **Descriptive statistics** was performed to assess the mean and standard deviation of the respective groups. Normality of the data was assessed using **Shapiro Wilkinson test**. **Inferential statistics** to find out the difference between the groups was done using **MANN WHITNEY U /INDEPENDENT T TEST** and within group analysis was done using **PAIRED T TEST.**

TABLE 1- COMPARISON OF AGE

		TENS DRY NEEDLING
AGE	**MEAN**	**32.14 33.93**
	SD	**5.21 4.93**
T VALUE		**1.37**
P VALUE (MANN WHITNEY U TEST)		**0.19**

***P<0.05 is statistically significant (Shapiro Wilkinson test ,p<0.05)**

Mann Whitney U Test Did Not Report Any Difference Between The Groups regarding Age (P>0.05)

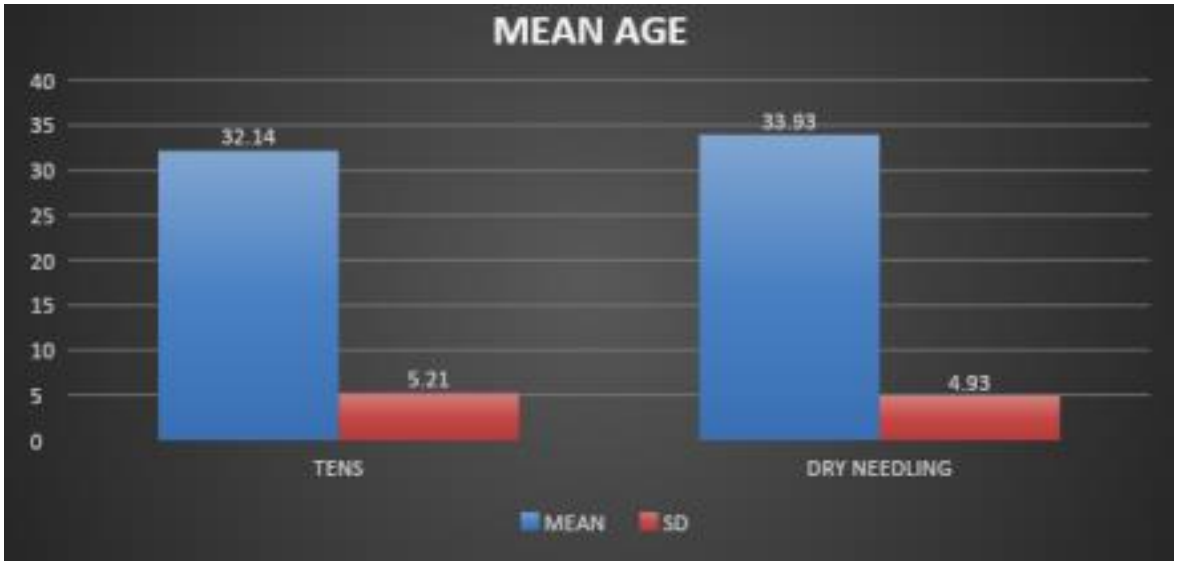


TABLE 2- COMPARISON OF GENDER

TENS DRY NEEDLING		
MALE 10(66.7%) 11(73.4%)		
GENDER	FEMALE	5(33.3%) 4(26.4%)
X^2 VALUE		1.09
P VALUE (Chi square TEST)		0.29

***P<0.05 is statistically significant**

Chi square test did not report statistically significant difference in frequency between the groups regarding GENDER.(p>0.05).

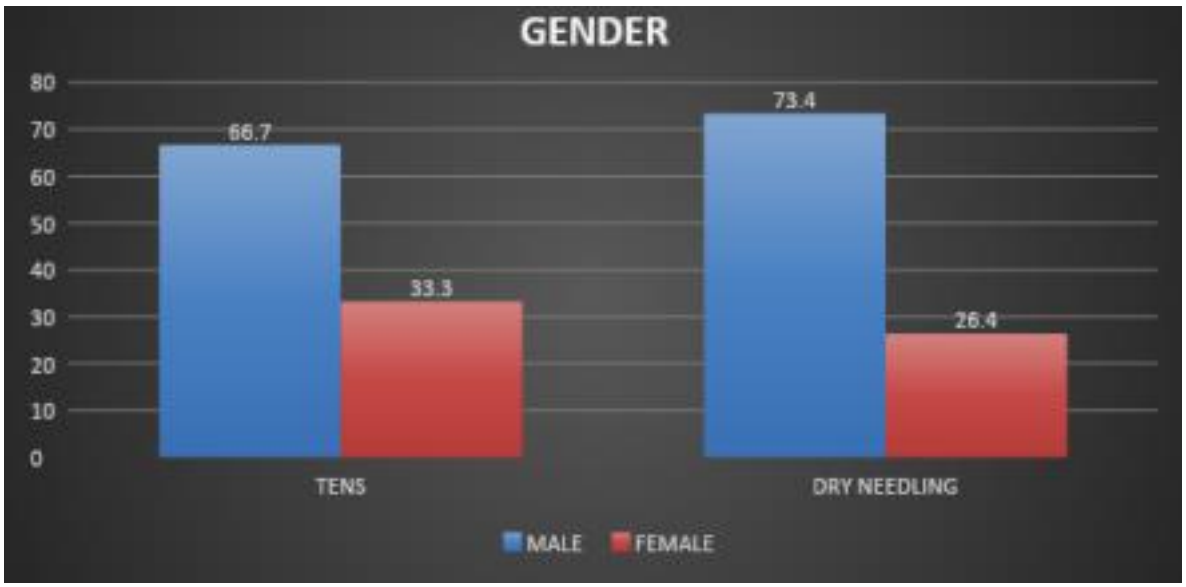


TABLE 3- COMPARISON OF PRESSURE ALGOMETER

		TENS DRY NEEDLING	T VALUE	P VALUE
ALGOMETER	**PRE**	**7.45±0.80 7.58±0.87**	**0.56**	**0.88**
	POST	**14.45±1.02 14.09±1.55**	**1.06**	**0.29**
T VALUE		**20.91 19.34**		
P VALUE (PAIRED T TEST)		**0.0001* 0.0001***		
% DIFFERENCE		**7±0.22 6.51±1.02**		

***P<0.05 is statistically significant (Shapiro Wilkinson test, p>0.05)**

Regarding Pressure Algometer , Between group analysis by Independent T Test Did Not Report Statistically Significant Difference With Respect To PRE And POST interval(P>0.05). Within Group Analysis By Paired t test Reported Statistically Significant Resultregarding both Both TENS & DRY NEEDLING (P<0.05.). Higher Mean Difference Was Observed regarding TENS than DRY NEEDLING (7> 6.51).

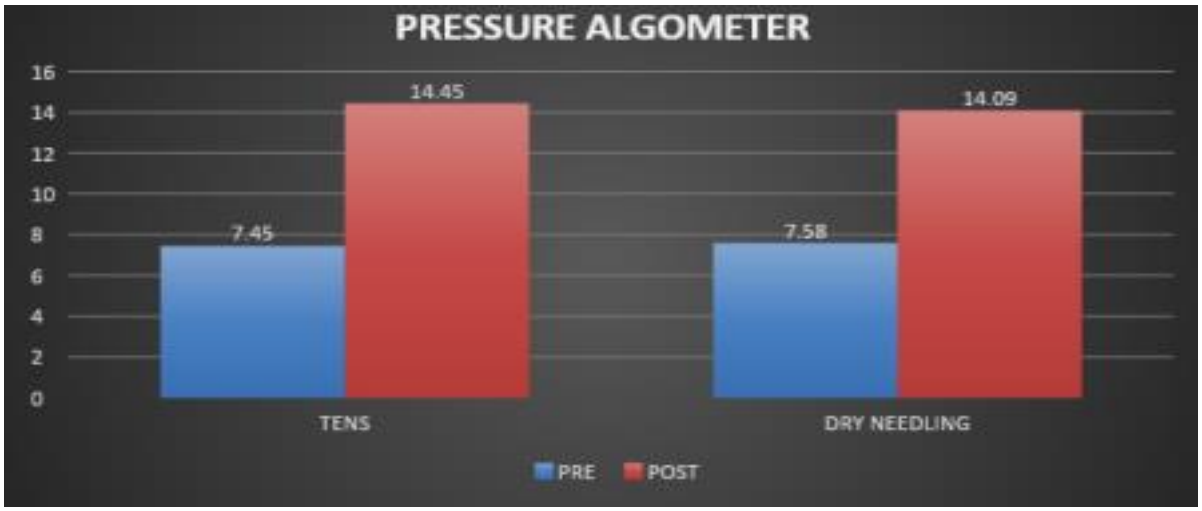


TABLE 4- COMPARISON OF NPRS

		TENS DRY NEEDLING	T VALU	
NPRS	**PRE**	**5.28±0.90 4.9±0.84**	**1.19**	**0.24**
	POST	**0.57±0.72 0.66±0.86**	**0.75**	**0.31**
T VALUE		**15.82 14.38**		
P VALUE (PAIRED T TEST)		**0.0001* 0.0001***		
% DIFFERENCE		**4.71±0.18 4.24±0.02**		

***P<0.05 is statistically significant (Shapiro Wilkinson test, p>0.05)**

Regarding NPRS , Between group analysis by Independent T Test Did Not Report Statistically Significant Difference With Respect To PRE And POST interval(P>0.05). Within Group Analysis By Paired t test Reported Statistically Significant Result Regarding both Both TENS & DRY NEEDLING (P<0.05.). Higher Mean Difference Was Observed regarding TENS than DRY NEEDLING (4.71> 4.24).

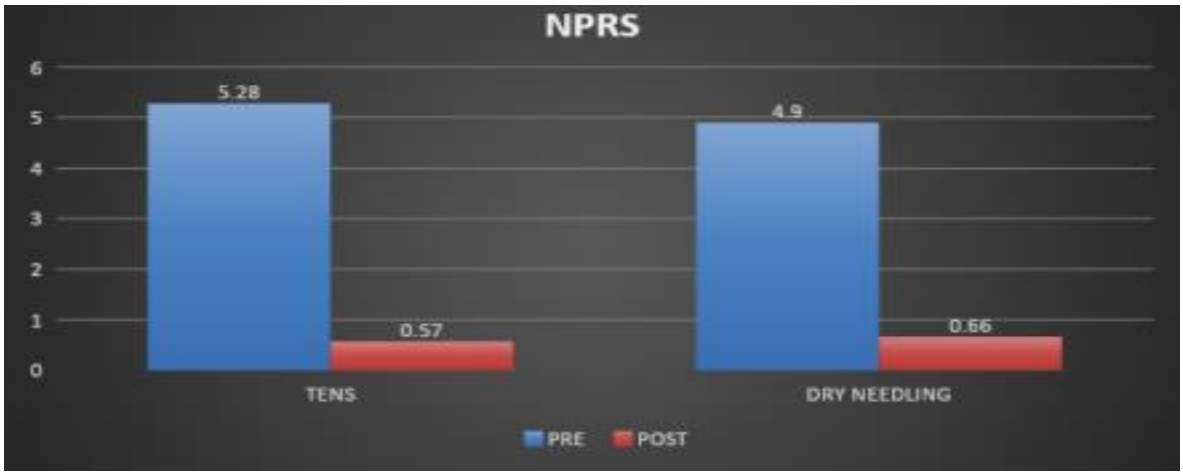
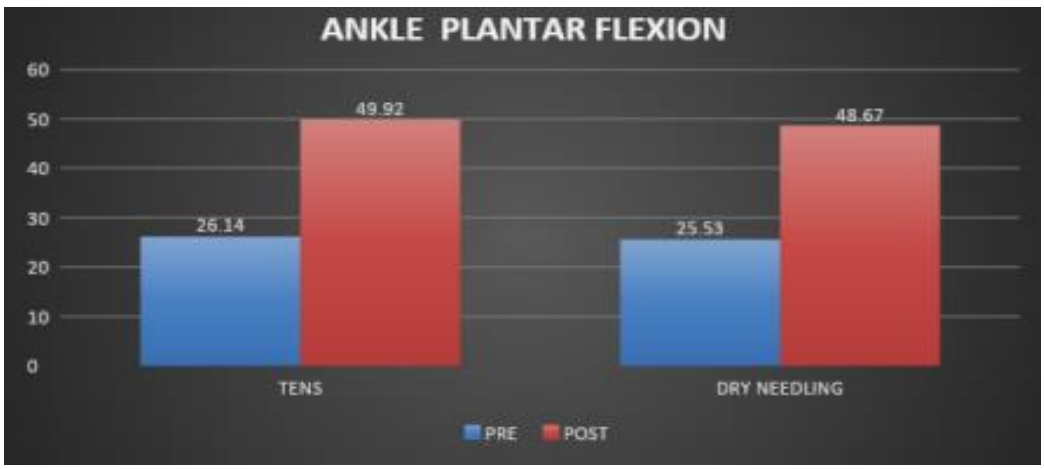


TABLE 5- COMPARISON OF ANKLE PLANTAR FLEXION

		TENS DRY NEEDLING	T VALUI	
NPRS	**PRE**	**26.14±3.33 25.53±2.89**	**0.24**	**0.79**
	POST	**49.42±1.45 48.67±1.89**	**0.19**	**0.86**
T VALUE		**24.84 14.38**		
P VALUE (PAIRED T TEST)		**0.0001* 0.0001***		
% DIFFERENCE		**23.28±1.88 23.14±1**		

***P<0.05 is statistically significant (Shapiro Wilkinson test, p>0.05)**

Regarding ANKLE PLANTAR FLEXION , Between group analysis by Independent T Test Did Not Report Statistically Significant Difference With Respect To PRE And POST interval(P>0.05). Within Group Analysis By Paired t test Reported Statistically Significant Result regarding both Both TENS & DRY NEEDLING (P<0.05.). Higher Mean Difference Was Observed regarding TENS than DRY NEEDLING (23.28> 23.14).



DISCUSSION

The aim of the present study was to compare the efficacy of TENS and Dry Needling in the treatment of shin splints in state level marathon runners.

Both groups A and B i.e TENS and Dry Needling showed significant statistical improvement post treatment of 2 weeks in pain pressure threshold, NPRS, and ankle plantar flexion ROM.

PRESSURE ALGOMETER: After treatment for both group A and B, this device displayed the pain pressure threshold over the shin, which led to an elevated pain threshold. Both therapies sought to lessen shin discomfort using invasive and non-invasive means. Because TENS addresses pain gait mechanism and dry needling addressed trigger point release, which dissolves adhesions and lessens pain, pain was decreased in both treatments. At the conclusion of the therapy, statistically speaking, there was little change between groups A and B. T value in table 3 shows that progress in groups A and B is comparable

T value in table 3 shows that progress in groups A and B is comparable.

NPRS: Both group A (TENS) and group B (Dry-needling) experienced less pain and a lower NPRS score after the intervention. There was no statistical significance after treatment compared to groups A (TENS) and B(Dry-needling) as the discomfort was diminished via trigger point release in group B and in group A (TENS) by pain gait mechanism. According to the T value in table 4 , the improvement in groups A and B is equal.

ANKLE PLANTAR FLEXION: There was an improvement in ankle plantarflexion's range of motion after the intervention. Movement and range of motion increased as the discomfort subsided. Results from groups A and B were comparable, as shown in table 5.

While performing dry needling, techniques like pricking, which cleared the adhesions and released the trigger point that eventually decreased pain, improved ROM and increased pain threshold. While giving TENS, the pain gate mechanism worked into action which decreased pain, improved ROM and increased pain threshold.

Both the groups showed significant change over time. Which was similar to each other. But during the procedure, patients had better response to TENS as it was an non-invasive method, which they were already familiar with. Where else , in dry needling, being an invasive method was difficult for most of the participants to accept as a treatment method. Some level of convincing and explanation was required for them to understand.

Therefore, the patients responded well to TENS treatment.

Also, while performing Dry needling, the local area was minutely punctured that caused interstitial fluids to accumulate in the area causing inflammation and irritation to the target area which resulted in muscle soreness which needs to be treated by icing and vitamin C supplements. So the treatment had to be given every alternate day.

Where else, in TENS, it can be given everyday without any such complication. In a study done by Liza Payne on the relative effectiveness of three treatment protocols in the treatment of Medial Tibial Stress Syndrome,

Between TENS, dry needling, and electro needling, there was a negligible finding. Although it was claimed that there is no difference between therapies, all groups improved during the course of the treatment. Contrarily, there was a substantial difference between the needling and electro-needling groups in the NPRS, but not between these two groups and the TENS group.

The NPRS results would seem to indicate that the patient's functional progress should have a similar course. However, one may contend that the reporting of pain (NPRS) and functional

ability (PDI) may differ inherently for any of the following reasons: it is believed that a patient's discomfort will lessen with more exercise(Melzack and Wall,1975).

In contrast to the patient reporting functional capacity, the patient may thus describe the pain as being higher during measurement interval (i.e., at the measurement time), despite the fact that the hypothesis put forward by Melzack and Wall (1975) suggests that increasing activity may reduce pain (gate control theory).

Therefore, the degree of functional capacity may not accurately reflect the patients suffering. This is in line with the pathophysiology of the MTSS, which shows that pain increases with greater activity (Bhatt et al., 2000), as opposed to pain decreasing with decreased activity (especially with decreased activity immediately followed activity) (Bhatt et al.,2000).

In light of the foregoing reporting before or after activity or during pain may have influenced the outcomes. Gender might have potentially been a confounding factor, although this impact is improbable because gender was found to be homogenous in the groups baseline assessment. Therefore, in order to elicit the result more advanced and possibly to more significance, the suggested future research should be considered: the research should be done for a longer period of time, with combining the effect of TENS with Dry needling and with more measurements. Dry needling with PENS(percutaneous electrical nerve stimulation) can also be studied. Clinically, TENS was more user friendly than dry needling technique and was well accepted by Sports persons . On the contrary, the patient's education was mandatory before treating them with dry needles.

CONCLUSION

The above study concluded that both TENS and Dry Needling have similar beneficial effects for mitigating pain in shin splints statistically . But clinically TENS has more acceptance among patients than Dry Needling as it is a non-invasive treatment compared to Needling .Patients are more sceptical about harmful effects of invasive methods then of non-invasive modality like TENS . Education about Dry Needling in pain mitigation requires more to gain confidence among patients prior to the Needling manoeuvre. One the contrary most patients were comfortable with dual channel pocket TENS before and after the treatment sessions.

REFERENCES:

1. Van Middelkoop M, Kolkman J, Van Ochten J, Bierma-Zeinstra SM, Koes BW. Risk factors for lower extremity injuries among male marathon runners. Scandinavian journal of medicine & science in sports. 2008 Dec;18(6):691-7.
2. Nikolaidis PT, Rosemann T, Knechtle B. A brief review of personality in marathon runners: the role of sex, age and performance level. Sports. 2018 Sep 18;6(3):99.
3. Hoffman MD, Ong JC, Wang G. Historical analysis of participation in 161 km ultramarathons in North America. The International journal of the history of sport. 2010 Aug 1;27(11):1877-91.
4. Videbæk S, Bueno AM, Nielsen RO, Rasmussen S. Incidence of running-related injuries per 1000 h of running in different types of runners: a systematic review and meta-analysis. Sports medicine. 2015 Jul;45:1017-26.
5. Hreljac A. Etiology, prevention, and early intervention of overuse injuries in runners: a biomechanical perspective. Physical Medicine and Rehabilitation Clinics. 2005 Aug 1;16(3):651-67.
6. Hespanhol Junior LC, De Carvalho AC, Costa LO, Lopes AD. Lower limb alignment characteristics are not associated with running injuries in runners: Prospective cohort study. European journal of sport science. 2016 Nov 16;16(8):1137-44.
7. Malisoux L, Nielsen RO, Urhausen A, Theisen D. A step towards understanding the mechanisms of running-related injuries. Journal of Science and Medicine in Sport. 2015 Sep 1;18(5):523-8.
8. Van Gent RN, Siem D, van Middelkoop M, Van Os AG, Bierma-Zeinstra SM, Koes BW. Incidence and determinants of lower extremity running injuries in long distance runners: a systematic review. British journal of sports medicine. 2007 Aug 1;41(8):469-80.
9. Renström AF. Mechanism, diagnosis, and treatment of running injuries. Instructional course lectures. 1993 Jan 1;42:225-34.
10. Kozinc Ž, Sarabon N. Common running overuse injuries and prevention. Montenegrin Journal of Sports Science and Medicine. 2017 Sep 1;6(2):67.

11. Moen MH, Tol JL, Weir A, Steunebrink M, De Winter TC. Medial tibial stress syndrome: a critical review. Sports medicine. 2009 Jul;39:523-46.
12. Wilder RP, Sethi S. Overuse injuries: tendinopathies, stress fractures, compartment syndrome, and shin splints. Clinics in sports medicine. 2004 Jan 1;23(1):55-81.
13. Newman P, Witchalls J, Waddington G, Adams R. Risk factors associated with medial tibial stress syndrome in runners: a systematic review and meta-analysis. Open access journal of sports medicine. 2013 Nov 13:229-41.
14. Brotzman SB, Manske RC. Clinical orthopaedic rehabilitation e-book: An evidence-based approach-expert consult. Elsevier Health Sciences; 2011 May 6.
15. Thacker SB, Gilchrist J, Stroup DF, Kimsey CD. The prevention of shin splints in sports: a systematic review of literature. Medicine & Science in Sports & Exercise. 2002 Jan 1;34(1):32-40.
16. Pietrzak M. DIAGNOSIS AND MANAGEMENT OF ACUTE MEDIAL TIBIAL STRESS SYNDROME IN A 15 YEAR OLD FEMALE SURF LIFE-SAVING COMPETITOR. International Journal of Sports Physical Therapy. 2014 Aug;9(4):525.
17. Winters M, Bakker EW, Moen MH, Barten CC, Teeuwen R, Weir A. Medial tibial stress syndrome can be diagnosed reliably using history and physical examination. British Journal of Sports Medicine. 2018 Oct 1;52(19):1267-72.
18. Moen MH, Tol JL, Weir A, Steunebrink M, De Winter TC. Medial tibial stress syndrome: a critical review. Sports medicine. 2009 Jul;39:523-46.
19. Dunning J, Butts R, Mourad F, Young I, Flannagan S, Perreault T. Dry needling: a literature review with implications for clinical practice guidelines. Physical therapy reviews. 2014 Aug 1;19(4):252-65.
20. Chao AS, Chao A, Wang TH, Chang YC, Peng HH, Chang SD, Chao A, Chang CJ, Lai CH, Wong AM. Pain relief by applying transcutaneous electrical nerve stimulation (TENS) on acupuncture points during the first stage of labor: a randomized double-blind placebo-controlled trial. Pain. 2007 Feb 1;127(3):214-20.
21. Lamina S, Shmaila H, Muhammed SA. Transcutaneous electrical nerve stimulation (TENS) in the symptomatic management of chronic prostatitis/chronic pelvic pain syndrome: a placebo-control randomized trial. International braz j urol. 2008;34:708-14.