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Effectiveness of myofascial release technique vs therapeutic ultrasound in the management of plantar fasciitis

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ABSTRACT

Background and Objectives

Plantar fasciitis is a common foot disorder in which patients have pain and tenderness at the sole of the foot. Rest, exercises, orthotics, taping, cryotherapy, therapeutic ultrasound, electrical stimulation, whirlpool bath, and iontophoresis have been widely used to relieve plantar pain. Long term use of manual therapy techniques like myofascial release technique have been used in the past to reduce pain and improve ankle range of motion. The present study aimed to evaluate and compare the immediate effectiveness of myofascial release technique VS ultrasound on pain response and ankle flexibility in plantar fasciitis.

Material and methodology

A total of 30 participants with plantar fasciitis were randomly allocated to Group A (myofascial release group) and Group B (ultrasound group). Therapeutic ultrasound with intensity of 1W/cm² and frequency of 1MHz for 5 min was given for a single session to all the patients and then given the manual techniques. Visual analogue scale and FFI were outcome measures that were assessed pre- post-interventional.

Results

The study demonstrated statistical significant reduction in pain, in both groups. FFI showed significant improvement in Group A (MFR) as compared to Group B (US).

Conclusion

Use of manual techniques like myofascial release therapy is more effective than therapeutic ultrasound alone on reducing pain and improving ankle flexibility in patients with plantar fasciitis.

Keywords: Plantar fasciitis, Myofascial release, Therapeutic ultrasound, Conventional exercises.

INTRODUCTION

The human ankle/foot complex meet the stability demands of providing a stable base of support for the body in a variety of weight bearing

postures without undue muscular activities and energy expenditure, and acting as a 'rigid' lever for the mobility demands by dampening of rotations imposed by the more proximal joints of the lower limb, being flexible to absorb the shock of the

superimposed body weight as the foot hits the ground and allowing the foot to conform to the changing and varied terrain on which the foot is placed. Four of Cailliet's criteria for normal foot are absence of pain, normal muscle balance, central heel and straight and mobile toes [1]. Plantar fascia called as plantar aponeurosis, lies superficial to the muscles of the plantar surface of the foot. It has thick central part which covers the central muscle of the 1st layer, Flexor digitorum brevis and is immediately deep to the superficial fascia of the plantar surface. It acts as a truss, maintaining the medial longitudinal arch of the foot, and assists during the gait cycle and facilitates shock absorption during weight bearing activities [2]. Foot complaints are common in general practice and their incidence increases with age. Three out of four people complain of foot pain during the course of a life time [3], While approximately 20% of people aged 65 years or older complain of non traumatic foot problems [4]. Plantar fasciitis has been experienced by 10% of the population [5]. The foot is subjected to various types of injuries like laceration, contusion, ligaments sprains and rupture, fracture, penetrating wounds, etc. In addition, pathologic changes are imposed on the foot by congenital abnormalities, bacterial and fungal infections and dermatologic lesions, ill fitting shoes, walking on hard surfaces [6]. Different authors have described heel pain as achilles spurs, retrocalcaneal bursitis, subcalcaneal pain, posterior heel pain, plantar fasciitis etc. Heel pain commonly occurs in weight bearing due to inflammation of thick tissue at the sole. Stress to plantar fascia may also result from injury, or a bruise incurred while walking, running, or jumping on hard surfaces; or being overweight [7]. Hence, causes of heel pain may be described as plantar, lateral, medial, posterior, and diffuse [8], and may either be caused due to injury to the soft tissue, bone, nerve or plantar fascia [9]. Plantar fasciitis an inflammation of the plantar fascia is one of the most common causes of foot pain in which pain and tenderness are located inferiorly at the plantar fascia origin [10]. It is more common in sports that involves running, long distance walking, dances, tennis players, basket ball players and non athletes whose occupation requires prolonged weight bearing [11]. Other causes are mechanical stress involving compressive forces making foot's longitudinal arch flat [5]. Repeated micro traumas

cause inflammation at the origin of the plantar fascia over the calcaneal medial tuberosity. Traction forces during the support phase on gait lead to an inflammatory process, resulting in fibrosis and degeneration [12]. There is a loss of flexibility as the disease progresses due to calcaneal tendon retraction, fatigue, fascial inextensibility, and poor mechanics [5].

Various physiotherapy treatment protocols have been advocated in the past such as rest, taping, orthotics, silicon heel cups, stretching, myofascial release and positional release therapy Electrotherapy modalities liketherapeutic ultrasound, phonophoresis, laser, microwave diathermy, iontophoresis, cryotherapy, contrast bath have been tried in past. Non weight-bearing stretching exercises have shown to be helpful in reducing severe pain which occurs in the morning [13]. Therapeutic Ultrasound is a method of applying deep heat to connective tissue which plays an important role in relieving plantar heel pain by both thermal and mechanical effect on target tissue resulting in increased local metabolism, circulation and extensibility of connective tissue and tissue regeneration. To obtain increase in the viscoelastic properties of collagen, an elevation in tissue temperature of greater than 3° to 4°C is indicated [14]. Stretching of the shortened and contracted plantar flexors may positively influence an individual's functional activities of daily living and decrease the risk of injury. Regardless of the type of fitness and rehabilitation program, the goal of stretching is to change the physical characteristics of connective tissue [15]. Myofascial release technique is a soft tissue mobilization technique mostly given in the chronic conditions that causes tightness and restriction in soft tissues. This technique has been proposed to act as a catalyst in the resolution of chronic plantar fasciitis [16]

METHODOLOGY

Study design: cross – Randomized controlled trial

Study setting: MVP'S college of physiotherapy, Nashik

Duration of study- 6 months

Sample size: 30

Sampling technique: convenient sampling technique

Method of data collection the study has been approved by Institutional Ethical committee. Study Design was Randomized Controlled Trial. Patients

were randomly divided into two groups. All subjects were recorded for demographic characteristic including Name, age, sex, and address, history and underlying disease. The subjects who met the inclusion criteria were asked to participate in the study, all procedure were explained to the subjects, written informed consent was obtained from each subjects prior to participation. Then the participants were divided into two groups using simple random sampling method viz, Group A & Group B consisting of 15 patients in each group. In group A patients received myofascial release, Whereas Group-B received ultrasound therapy, both the groups received conventional therapy.

Group A - (Myofascial release group)

Participants were placed in prone lying position with foot placed outside the plinth. Then the part was cleaned and gel was applied to the involved site and then transducer head was moved in slow circular manner for 5 minutes. Subjects underwent myofascial release manually by using thumb and plantar cupping by using heel of hand and fingers technique for 10 min in supine lying for single session

Group B - (Therapeutic ultrasound group)

Therapeutic ultrasound with intensity of 1W/cm² and frequency of 1MHz for 5 min was given for a single session to all the patients

Both groups received passive stretching for ankle plantar flexors, firstly the soleus muscle was stretched with knee flexed and then gastrocnemius muscle was stretched with knee extended, over pressure was placed up on the bottom of the foot while the ankle was held in dorsi-flexion in supine lying. Passive plantar fascia stretching was performed in supine lying by application of force distal to the metatarsophalangeal joints on the affected side, pulling the toes upward towards the shin until a stretch was felt in the sole of the foot. Stretchings were performed for three repetitions each held for count of 30 sec for a single session in supine lying.

Outcome measures

1. Pain: This was recorded by 10 cm horizontal visual analogue scale (VAS), the participants were asked to mark their intensity of pain on a 10 cm long line in the data collection sheet with numbers 0 to 10 where 0 symbolized no pain and 10 was severe pain.
2. Functional foot index.

DATA ANALYSIS

Graph Pad Instat version 5 was used for data analysis in this study. Baseline characteristics of the two treatment groups namely Myofascial release group and ultrasound therapy group were compared to evaluate the success of randomization.

Table 1. Paired T test in group A for VAS

Variables	Mean	S.D	S.E	CAL T	TAB T
PRE Treatment	7.1	1.19	0.37	4.53	2.09
POST Treatment	5.0	1.41	0.44		

Table 2. Paired T test in group B for VAS

Variables	Mean	S.D	S.E	CAL T	TAB T
PRE Treatment	7.2	1.22	0.38	6.78	2.09
POST Treatment	4.4	1.17	0.37		

Table 3. Paired T test in group A for FFI

Variables	Mean	S.D	S.E	CAL T	TAB T
PRE Treatment	64.97	9.71	03.07	3.03	2.09
POST Treatment	48.00	13.48	4.26		

Table 4. Paired T test in group B for FFI

Variables	Mean	S.D	S.E	CAL T	TAB T
PRE Treatment	60.00	9.13	2.88	4.24	2.09
POST Treatment	36.52	11.47	3.71		

Table 5. Unpaired t test for VAS between group A & B

Variables	Meanof difference	S.D.	S.E	CAL T	TAB T
Group A	2.1	1.80	0.35	4.01	2.09
Group B	2.8				

Table 6. Unpaired t test for FFI between group A & B

Variables	Meanof difference	S.D.	S.E	CAL T	TAB T
Group A	16.87	9.43	2.98	3.43	2.10
Group B	24.48				

DISCUSSION

This clinical trial was conducted to evaluate and compare the immediate effectiveness of myofascial release technique and therapeutic ultrasound on pain and flexibility in subjects with plantar fasciitis. Both the groups had equal number of participants and were well matched in term of gender distribution. Age group of subjects ranged between 18 to 65 years

Therapeutic ultra sound has shown to relieve pain in plantar fasciitis, the results of which are similar to the present study. Therapeutic Ultrasound refers to mechanical vibrations which are essentially the same as sound waves but of a higher frequency. Therapeutic frequencies of ultrasound range from 0.5 to 5 MHz. It has been estimated that for an output of 1W/cm² there is a temperature rise of 0.8°C/ min [17]. If local temperature is raised between 40°C to 45°C hyperaemia will result [18]. To achieve a useful therapeutic effect the tissue temperature has to be maintained between these values for at least 5 mins [19]. Also heating fibrous tissue structures such as joint capsules, ligaments, tendons and scar tissue may cause a temporary increase in their extensibility, and hence a decrease in joint stiffness. Mild heating can also have the effect of reducing pain and muscle spasm and promoting healing process [20]. Pain relief may also occur due to the non thermal effects of pulsed ultrasound in the form of stimulation of histamine release from mast cells and factors released from macrophages that accelerate the normal resolution of inflammation [19]. Therapeutic ultrasound has the potential to accelerate normal resolution of inflammation provided that the inflammatory stimulus is removed [21]. The dosage for therapeutic ultrasound used in the present study was based on the evidence suggested by Hana Hronkova et al [22]. Which has caused complete

disappearance of pain in 50% of the subjects Pulsed Ultrasound was preferred for soft tissue repair and 1 MHz frequency was chosen as it is capable of reaching to deeper tissues [18].

Myofascial release has also shown to decrease pain and improve functional foot index in subjects with plantar fasciitis 30, the results of which are similar to the present study. Myofascial release technique and passive stretching with therapeutic ultrasound has shown to relieve pain and normalize the connective tissue by softening, lengthening and realigns the fascia [23]. Patients with plantar fasciitis present with reduced ankle range of motion and great toe dorsiflexion due to pain and a concomitant tight achilles.²⁴ Restricted movement in ankle may also be due to hyperactivity of the myotatic reflex arc which is caused by excessive gamma gain [25]. The goal of MFR is to release fascia restriction and restore its tissue. This technique is used to ease pressure in the fibrous bands of the connective tissue function, or fascia. Gentle and sustained stretching of myofascial release is believed to free adhesions and softens and lengthens the fascia. By freeing up fascia that may be impeding blood vessels or nerves, myofascial release helps in improving circulation and nervous system transmission. This technique has been widely used in physical therapy treatments in the chronic conditions causing tightness and restriction in soft tissues. It helps in change of the viscosity of the ground substance to a more fluid state which eliminates the fascia's excessive pressure on the pain sensitive structure and restores proper alignment. There is sufficient evidence to support the effectiveness of deep tissue procedures in treating strain/sprain injuries [26, 27]. It has also shown to stimulate fibroblast proliferation, leading to collagen synthesis that may promote healing of plantar fasciitis by replacing degenerated tissue

with a stronger and more functional tissue [28, 29]. The reasons mentioned above may explain the reason for relieving pain, improvement range of motion in myofascial release therapy group similar to the study. Direct MFR is a highly effective technique for subjects with plantar fasciitis who need to recover quickly. All the treatment methods were equally beneficial in relieving pain and improving ROM.

To conclude, the present study is the first to report the effectiveness of myofascial release technique vs therapeutic ultrasound therapy on pain response and flexibility in plantar fasciitis. Future

research should consider using a larger sample size in different populations like athletes and elderly population along with different electrical modalities, more number of treatment sessions and a follow-up.

CONCLUSIONS

Use of manual techniques like myofascial release therapy is more effective than therapeutic ultrasound alone on reducing pain and improving ankle flexibility in patients with plantar fasciitis.

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