EFFECT OF NEURODYNAMIC SLIDING ON PAIN, FLEXIBILITY AND FOOT FUNCTION IN SUBJECT WITH PLANTAR FASCIITIS.

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Subject in which paper can be included is – Physiotherapy or related to it.

EFFECT OF NEURODYNAMIC SLIDING ON PAIN, FLEXIBILITY AND FOOT FUNCTION IN SUBJECT WITH PLANTAR FASCIITIS.

Abstract- Plantar Fasciitis is one of the most common musculoskeletal disorders affecting the lower extremity function. PHP is predominantly affects elderly as well middle aged individuals. Plantar Fasciitis is thought to be multifactorial, it may be intrinsic and extrinsic factors have been reported. Reduced talocrural dorsiflexion, pronated foot posture, high body mass index and prolonged work-related weight bearing are independent risk factors for PF. Pain is noticeable during initial few steps, prolonged weight bearing, standing, walking and daily activities. There are various physiotherapeutic interventions with different levels of evidence are available for the treatment like Laser, Ultrasound, joint mobilization, soft tissue releasing techniques, stretching, strengthening etc. But approximately 40% pain is relieved.

Nervous system is able to adapt mechanical loads, and it must undergo distinct mechanical events such as elongation, sliding, cross-sectional change, angulation, and compression. If these dynamic protective mechanisms fail, may cause altered neurodynamics. Neural Mobilization techniques is used to restore the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function.

Key words- Plantar Fasciitis, Neurodynamic sliding, Foot function.

INTRODUCTION

Plantar Fasciitis is one of the most common musculoskeletal disorders affecting the lower extremity function. Around 10% of general population both sedentary & physically active people gets affected once in their life by Planter Heel Pain. PHP is predominantly affects elderly as well middle aged individuals. (Prakash, S., et. al.,2014)

The plantar fascia is a thick, fibrous connective tissue that provides dynamic shock absorption and static support of the longitudinal arch. The proximal insertion disorder of the plantar fascia is best known as plantar fasciitis. PF, once viewed as an inflammatory condition of the plantar fascia, is now thought to be a degenerative condition due to repetitive micro trauma of the plantar fascia at its origin. Lemont and colleagues reported noninflammatory pathologic changes, such as thickening, fibrosis and degeneration of the plantar fascia at the medial calcaneal tubercle, with no evidence of histological inflammation. (Drake, M., et. al.,2011)

The development of PF is thought to be multifactorial. Intrinsic as well extrinsic risk factors have been reported. Reduced talocrural dorsiflexion, pronated foot posture, high body mass index and prolonged work-related weight bearing are independent risk factors for PF. (Drake, M., et. al.,2011) With advances of age there was observed a change in reduced compressibility & thickness (atrophy) of heel pad which further reduces shock absorbent capacity. (Van de Water, A. T., et. al., 2010)

The most widely reported clinical sign of PF is pain localized to the medial tubercle of the calcaneus. Pain can be dull or sharp stabbing in nature. Patients often complain that the pain is most noticeable during the first few initial steps after prolonged periods of non-weight bearing, although it can also be triggered by long periods of weight bearing activities like walking, standing and care the most essential function for daily living. Heel pain & difficulties in weight bearing activities further restrict job related performance, social participation, and health related quality of life. (Thong-On, S., et. al., 2019)

There are various physiotherapeutic interventions with different levels of evidence are available for the treatment for plantar fasciitis but approx.. 40% relieved in pain.

Nervous system is able to adapt mechanical loads, and it must undergo distinct mechanical events such as elongation, sliding, cross-sectional change, angulation, and compression. If these dynamic protective mechanisms fail, the nervous system is vulnerable to neural edema, ischemia, fibrosis and hypoxia, which may cause altered neurodynamics. In planter Fasciitis altered...
foot biomechanics, Windlass mechanism, repeated micro trauma due to stress or weight bearing activities thought to be affect neurodynamic functions of neural structure passing from foot which might be reason for having persisting pain in heel. Patient with PF have been reported tightness in calf muscle & plantar fascia. In plantar fasciitis, the fascia undergoes degeneration and becomes tight thereby leading to hypomobility within the ankle-foot complex, especially talocrural, subtalar and 1st tarsometatarsal joints(Prakash, S., et. al., 2014).

Mechanosensitivity of neural structure may altered muscle flexibility which might be responsible for calf muscle & plantar fascia tightness. Neural Mobilization techniques is used to restore the dynamic balance between the relative movement of neural tissues and surrounding mechanical interfaces, thereby allowing reduced intrinsic pressures on the neural tissue and thus promoting optimum physiologic function. Hence the purpose of the study is to assess the efficacy of neural sliding technique of neural mobilization as a part of conservative treatment strategy for planter fasciitis.(Sweeting, D., et. al., 2011)

MATERIALS AND METHODS

36 patient is recruited based on the inclusion criteria divided into 2 groups Group A (n=18), and Group B (n=18). Subjects who has unilateral or bilateral heel pain, age between 20-50yrs, having tenderness around heel, heel pain which restricted functional activity of lower extremity were included. Subjects were excluded from the participation like steroids injections, presence with musculoskeletal condition like fracture, OA, RA etc. Neurological condition like stroke, foot drop or any skin disease to the plantar fascia and an inability to understand instruction and a complete questionnaire. Informed consent & baseline Data were taken before giving Intervention. Ankle ROM was measured by Universal Goniometer. range of motion that is Planter flexion, Dorsiflexion were taken. NPRS & Foot Function was assessed by Foot Function Index. (Mehmood F et.al.,2020)(Wang,W.,et.al., 2020)

Group A: Patient will be in supine lying maintain normal curvature of the head and spine and maintain both the hip and knee joints of the superior leg at 90degree flexion in the supine position. The participant’s knee and thigh were fixed by the therapist’s arms and torso to control the movement of the hip and knee joints. The participant’s foot was held using the opposite hand of the therapist. Subsequently, knee flexion, dorsiflexion, and inversion of the foot were performed on the subject in order to conduct the neurodynamic technique of the distal tibial nerve. To perform the neurodynamic of the proximal tibial nerve, knee extension, plantar flexion, and inversion of the foot were done simultaneously, will applied these intervention 10times for a total of 10-15minutes. (Jung, J. H., et. al., 2020)

Group-B Patient will be asked to come with clean foot for the treatment. Patient will be taken in prone position with foot will be keep out of the plinth. Then with Alcohol Based Saline treatment part & U/S probe will be cleaned. A ultrasound gel will apply on the head of the ultrasound probe and start the ultrasound with probe touched to the point of the maximal tenderness. Will set the frequency 1MHz, pulsed mode and then I will increasing a intensity up to 1.8W/cm2. Applied a US with figure of 8 techniques for approximately 5mins. (Sonu Punia, et. al., 2015) Stretching of calf muscles and plantar fascia (stretching was held for 30seconds, and repeated 3 times). Patient will be in supine lying and therapist is in front of patient then ask patient to do active ankle dorsiflexion, plantar flexion, eversion and inversion. Ask them to do these movement 10times in one session. Patient will be in supine lying and therapist will be in standing with Thera-band and then therapist ask to do dorsiflexion then plantar flexion, eversion and inversion then therapist will resist the movement with Thera-band. Therapist ask them to do same movement 10times with 10sec hold.

Intrinsic foot muscle strengthening.

(1) Patient is in seating on chair with foot is supported to floor. Therapist ask patient to pick up a towel and put it in side. Ask patient to do these movement 10times in one session.

(2) Patient will be in seated with foot supported to the ground. Then will tell patient to do gathering a towel (Toe Curling) like movement with toe for 30times per session.

RESULTS: Study design: A comparative study consisting of 57 subjects who randomized in to 2 groups, 30 subjects in Positional release therapy (PRT) group and 27 subjects in Deep transverse friction massage group. Paired t test was used to find the significance of parameters pre and post test. Unpaired t test was used for the comparing both the groups. Data were reported as a mean and standard deviation and Maximum values of variables were analysed by the statistical package for social science (SPSS) version 23.0 (IBM, Corporation)

**TABLE-1: Baseline Characteristics Data**

<table>
<thead>
<tr>
<th>Groups</th>
<th>M</th>
<th>F</th>
<th>Age(Mean)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-A</td>
<td>3</td>
<td>15</td>
<td>31.66</td>
</tr>
<tr>
<td>Group-B</td>
<td>5</td>
<td>13</td>
<td>37.77</td>
</tr>
</tbody>
</table>

**TABLE 2-Mean difference in Range of Motion & NPRS in Group-A**

<table>
<thead>
<tr>
<th></th>
<th>Pre T</th>
<th>Post T</th>
<th>T-</th>
<th>P</th>
</tr>
</thead>
</table>

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<table>
<thead>
<tr>
<th>Group</th>
<th>MEAN</th>
<th>SD</th>
<th>MEAN</th>
<th>SD</th>
<th>value</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPRS</td>
<td>5.44</td>
<td>1.58</td>
<td>1.11</td>
<td>1.23</td>
<td>20.25</td>
<td>0.0001</td>
</tr>
<tr>
<td>DF</td>
<td>17.66</td>
<td>2.85</td>
<td>19.66</td>
<td>1.18</td>
<td>-3.99</td>
<td>0.01</td>
</tr>
<tr>
<td>PF</td>
<td>48.16</td>
<td>2.28</td>
<td>49</td>
<td>1.68</td>
<td>-2.83</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**TABLE 3- Mean difference in ROM & NPRS in Group-B**

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre T Mean</th>
<th>SD</th>
<th>Post T Mean</th>
<th>SD</th>
<th>Test</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPRS</td>
<td>5.05</td>
<td>1.36</td>
<td>4.66</td>
<td>1.3</td>
<td>3.28</td>
<td>0.04</td>
</tr>
<tr>
<td>DF</td>
<td>17.77</td>
<td>2.18</td>
<td>19.33</td>
<td>0.9</td>
<td>-4.93</td>
<td>0.0001</td>
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<tr>
<td>PF</td>
<td>48.86</td>
<td>6.07</td>
<td>50</td>
<td>4.5</td>
<td>-2.2</td>
<td>0.04</td>
</tr>
</tbody>
</table>

**TABLE 3 - Mean difference of FFI within Group-A & Group-B**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Pre</th>
<th>Post</th>
<th>Tes</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Group A</td>
<td>FF I</td>
<td>36.2</td>
<td>16.1</td>
<td>8.55</td>
</tr>
<tr>
<td>Group B</td>
<td>FF I</td>
<td>27.4</td>
<td>4.66</td>
<td>22.7</td>
</tr>
</tbody>
</table>

**DISCUSSION**

The main purpose of the study was to evaluate the effects of neurodynamic sliding technique on pain (as measures by the NPRS score), Ankle Rom (as measured by the goniometry) & Foot Function (as measured by the FFI) in Plantar Fasciitis patients. The results indicate that both the groups improved in measures of Pain, ROM, and Foot Function.

Group A suggested that neurodynamic sliding technique was effective for improving Pain, ankle joint range of motion & Foot Function. Improvement in present study can be explained by study, done by Shocklock et. al., that suggest that Mechanosensitivity is a gateway to neurogenic pain and is when nerve fibers covert mechanical events into impulses. This mechanism operates in normal nerves and those with pathological changes. In the pathological state, nerve injury is increased Mechanosensitivity. The nerve ends generally been considered to be an important site from which inflammation is triggered. Neural sliding implied here is the sliding of the nerves as an approach to physical treatment of pain. Neurodynamic sliding activates venous flow at the nerves entrapment sites, resulting in improved oxygenation of the nerves. This may reduces Mechanosensitivity of the neural structures. According to these theories we got improvement in pain. (Shacklock, M. et. al., 1995). Yolanda Castellote-Caballero et. al., suggested that altered neurodynamic function can restrict a ROM of joint. When we applied neurodynamic sliding can increase flexibility and improve function of the joint hence we got improvement in Ankle Joint Rom. (Castellote-Caballero, Y., et. al., 2014).

The findings of the study are in agreement with Merve Akdeniz Leblebicier et. al., suggested that nerve mobilization is one of the conservative treatment methods, they perform a tibial nerve mobilization in the Tarsal Tunnel Syndrome patients. They also said that nerves system has biomechanical & physiological functions. In daily routine it gets stretched and compressed due to this nerves increases Mechanosensitivity and it transfers into the impulses and reduces muscles tension and flexibility of the function. They added that after neural mobilization patients reduces the pain and improves the ROM. This may explain the reason for improvement in Foot Function Index. (Leblebicier, M. A., et. al., 2022).

Group B suggested that Result shows that conventional therapy is effective in improving pain in plantar fasciitis which is supported by Shushwant Prakash et. al. They said that plantar fasciitis is non-inflamatory degenerative disease and it thought to be multifactorial in origin with factor such as obesity, decrease ankle joint range of motion. It reduces the Ranges of Ankle...
dorsiflexion and plantar flexion mostly. For that intrinsic foot muscles strengthening are most helpful exercise for maintaining foot arches and stretching exercises reduces tension in fascia thereby it creates windlass mechanism and allows toes to dorsiflexion. They concluded that manual therapy and conventional therapy both are effective in plantar fasciitis. ( Prakash S. et. al., 2014)

Group B was less effective to improve Functional component. The comparison of myofascial release with positional release on plantar fasciitis patients studied by Harlapur A.M. et. al, they shows significant improvement in pain, flexibility and FFI score. They concluded that both the group are effective in Pain and functions of the foot. By myofascial release there is change in 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. Positional release therapy increase muscle flexibility by placing the muscle in a shortened position to promote muscle relaxation in contrast to placing the muscle in a lengthened or stretched position. ( AM, H. et.al., 2010). According to these theories conventional treatment takes time for recovery. So, here it might be the reason for improvement of NDS than Conventional treatment. ( Castellote Caballero, Y., et. al.,2014)

CONCLUSION
This study concluded that both the techniques were effective. Group A (Neurodynamic sliding technique) showed more improvement in pain, range of motion & Foot function as compared to Group B (conventional treatment).

REFERENCES: