To study the effect of Suboccipital Muscle Inhibition and Neural Flossing Techniques on Hamstring Flexibility in Young Adults

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Abstract

Background: Prolonged forward bend sitting posture puts strain on hamstring leading to decreased flexibility. Hamstrings and suboccipital muscles are connected by one neural system. Abnormal lower extremity neuro-dynamics may alter resting muscle length and changes in the perception of stretch or pain. As neural flossing technique alter such sensation and improve hamstring flexibility. Hence in this study we aim to study the combined effect of suboccipital muscle inhibition and neural flossing technique on hamstring flexibility in young adults.

Objectives: To study combined effect of suboccipital muscle inhibition and neural flossing technique on flexibility of hamstring pre and post intervention using modified sit and reach test and active knee extension test and pain using NPRS.

Materials and Methodology: A study with Pre Post experimental design included 100 volunteers according to inclusion and exclusion criteria were selected by simple random sampling method. Intervention in form of suboccipital inhibition and neural flossing techniques was given thrice a week for period of 2 weeks. Data was documented on 1\(^{st}\), 3\(^{rd}\) and 7\(^{th}\) day of each week. Pre and post intervention hamstring flexibility was assessed.

Results: Comparison of pre and post intervention data was done, results showed the p-value was <0.001 which was extremely significant.

Conclusion: Hamstring tightness and stretch pain reduced significantly when combination of suboccipital muscle inhibition and neural flossing technique was given in young adults.

Keywords: Hamstring flexibility, SMI (sub-occipital muscle inhibition), NFT (neural flossing technique), SRT (sit and reach test), Active knee extension test, NPRS (Numeric pain rating scale).

Introduction

Flexibility is the ability to move a single or multiple of joints smoothly without any restriction and pain-free range of motion. Changes in flexibility may cause abnormal stress on musculoskeletal system leading to injury\(^{1,2}\) as it reduces strength, endurance, motor coordination and lead to high amounts of physical pain\(^{1,3}\). Shortness of hamstring muscles results in restriction of knee extension when the hip is flexed or hip flexion when the knee is extended\(^{4}\) also leads to postural changes in pelvic region.
causing posterior tilt and flat back. Hamstring tightness causes decrease in AKE range, dorsiflexion and lumbar lordosis decreases leading to postural deformities, bending forward deficit, hamstring strain or injuries, discomfort when sitting and a shambling gait.

The prolonged sitting posture has negative impacts on biomechanical and physiological perspective that is 50% of the body’s muscles contract to hold the body motionless while resisting gravity and the static forces costs more energy than dynamic movements. Limited mobility leads to musculoskeletal disorders, hamstring tightness and consequence is joint hypomobility, nerve compression or spinal disc degeneration causing LBP. Sitting for longer duration hours may be a contributing factor for reduced hamstring flexibility. Very few individuals can maintain same posture for long time in sitting position, as the ischial tuberosities give little support and back muscles cannot support trunk for very long time when no sufficient back rest provided.

Traditionally stretching was used to improve flexibility but a review found no evidence for stretching for prevention of hamstring injury as a sole intervention. Looking at the recent advances for improving flexibility, Soft tissue mobilization, Myofascial release techniques etc. are been studied for immediate effects on hamstring flexibility but there is dearth of literature on long term and combination of intervention technique effects. The suboccipital muscle inhibition (SMI) technique relaxes the tension in the muscles located between the axis and occiput, which regulates the upper cervical vertebra. Suboccipital muscles are: rectus capitis posterior major, rectus capitis posterior minor, obliquus capitis inferior, and obliquus capitis superior. The main functions of these muscles is to regulate body posture and rotation of the head. Hamstrings flexibility increases due to relaxation of the myofascia as the tone of suboccipital muscles falls, they are connected by one neural system, which passes through the dura mater known as superficial back line (SBL). In SMI technique, patient lies comfortably in supine lying and can be easily administered by the therapist inducing relaxation of the fascia by applying pressure softly to the suboccipital area.

Neural flossing technique (NFT) proposed by Michael Shacklock is an active procedure based on idea that the entire nervous system is continuous structure and it moves and slides in body as we move and the movement is related to physiological processes. NFT moves the nerve through the tissues proximally and distally to the maximum possible extent, by moving every joint and body part that the nerve crosses. NFT involves movement of peripheral nerves from a mean position along its bed. It can be initiated from either one or both ends of the nerve bed.

Methods

Study design: Pre- post Experimental design in which Subjects with age group 18 to 25 year were taken with tight hamstrings that are recreationally active and fulfill the inclusion criteria.

Participants and Eligibility

Inclusion Criteria
1. Willingness of the subjects to participate in the study (informed consent signature)
2. Unilateral or bilateral short hamstring syndrome
3. Active knee extension 125° or less

Exclusion Criteria
1. History of neck trauma or fractures
2. Herniated disc or protrusions, spinal deformities, acute back pain
3. Muscle tendon injuries of the hamstring

Materials
1. Plinth
2. Measuring tape
3. Universal Goniometer
4. Sit and reach test box
5. stopwatch
6. Chair

Permission was taken from the institutional ethical committee. All participants were young adults.
studying in university (mean ± SD = 19.91±1.96 years), recruited via classroom announcements. The required criteria was met by 100 participants (males =15; females = 85), subjects were explained aim and method of the study and written consent was taken. The participants were also asked to comment on their chair sitting hours in a day, BMI and pain related to hamstring stretch on NPRS. Active knee extension test, Modified Sit and reach test and NPRS were taken 5 mins before and 10 mins after interventions by a blind assessor.

**Interventions**

**Sub-occipital muscle inhibition technique:** The SMI technique was conducted with subject in a supine position with eyes closed. The therapist placed hands below the subject’s occiput and applied pressure to the area below the atlas, in the upward direction, toward the subject’s nose, toward himself/herself, and in the direction of the head, to induce relaxation of the suboccipital muscles. The pressure was maintained for 2 minutes until tissue relaxation had been achieved4,5.

**Neural flossing technique:** NFT was performed actively by participant sitting on a chair, with flexed knee and flex the neck at the same time, holding position for 5 seconds. The participant in turn extended the neck and the knee, slightly abduct and flexed the hip. This extended position was maintained for 5 seconds. The above procedure was repeated 15 times, for 3 sets with an interval of 5 minutes between each set12.

**Results**

Results were obtained by comparing pre and post intervention values of outcome measures (Modified SRT, AKE and NPRS) by using student paired t-test between group comparisons and mean, SD and mean difference values were obtained. When we compared SRT, AKE-R, AKE-L and NPRS in group; the obtain p-value was <0.0001 which is statistically highly significant. The mean difference shows there is increase in hamstring flexibility as SRT distance and AKE range increased and also the stretch pain reduced.

**Table no. 1: Demographic data**

<table>
<thead>
<tr>
<th>Demographic Data</th>
<th>(Mean±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19.92±2.17</td>
</tr>
<tr>
<td>BMI</td>
<td>22.88±4.71</td>
</tr>
<tr>
<td>Chair sitting hours</td>
<td>6.14±1.10</td>
</tr>
<tr>
<td>Gender</td>
<td>Male(15) Female(85)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>Mean±SD</th>
<th>Me</th>
<th>Mean Difference</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
<td>Post-Pre</td>
<td></td>
</tr>
<tr>
<td>SRT</td>
<td>15.99±5.64</td>
<td>27.47±5.03</td>
<td>11.48</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>AKE-R</td>
<td>129.45±11.00</td>
<td>154.95±6.83</td>
<td>25.50</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>AKE-L</td>
<td>135.20±9.98</td>
<td>156.65±3.13</td>
<td>21.45</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>NPRS</td>
<td>4.80±1.90</td>
<td>2.13±1.53</td>
<td>2.66</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Graph no. 1:** Graphs of combined effect of sub-occipital muscle inhibition and neural flossing technique pre- post intervention
Discussion

This research was conducted to examine the effects of the SMI and NFT in subjects with hamstring tightness. Pre and post intervention, hamstring flexibility was assessed using SRT, PAT and stretch pain using NPRS. Out of total participants, 85% were females and 15% were males. James W. Youdas, in his study found that there is significant effect of gender on HML, with women having more HML than their male counterparts but there was no direct co-relation of age on HML.13

The mean chair sitting time was 6.14±1.10 hours in a day and had mean BMI 22.88±4.71. Ghulam Fatima et al, conducted a study which concluded that in a majority of the students hamstrings tightness is observed and long duration sitting can be a contributory factor in hamstring tightness.9

From table 2 the mean values of pre and post intervention for Sit and Reach Test, Popliteal angle and NPRS statistically significant with P-value <0.0001 thus the combined effects of SMI and NFT showed significant improvement in hamstring flexibility. The fact that both techniques could increase the flexibility of the hamstring may be because in SMI, the superficial back line was relaxed through relaxation of the suboccipital muscles.12 The suboccipital muscles are the “proprioceptor monitors” that contribute significantly to regulation of head posture, and they have the most muscle spindles in the human body.5 The rectus capitis posterior minor muscle, has composition of 36 muscle spindles per gram and contributes to regulation of posture and the degree of tension.5 While NFT actively lengthens tissues and releases tension in nerve hence improves mobility.11 Abnormal posterior lower extremity neuro-dynamics may alter resting muscle length and changes in the perception of stretch or pain. As NFT alter such sensation and improve hamstring flexibility. In these exercises tension is increased at one end and lessened at the opposite end of the nerve, thus improving nerve excursion and reducing the pain.10 Hence combination of therapy can be used for improving hamstring flexibility.

SMI aims at application of soft traction to feel the tension of the soft tissues and remove the muscle barrier by repeatedly straining and relaxing, which is like “peeling an onion” 14 For fascia to relax effectively proper pressure and soft extension should be applied on the area where fascia limitation is felt. Manheim specified that “the endfeel” and soft tissue extension are of importance in myofascial release.15 According to Sung-Hak Cho, research results, SMI and SMFR, which were applied to subjects with shortening of the hamstring, resulted in immediate increases in flexibility of the hamstring, and it was confirmed that SMI was more effective.5 Studies done on effect of SMI on hamstring flexibility also resulted in improving flexibility due to the connection to dura mater, postural control, myofascial chain connection and was proved by Robert Scleip7 in 199616,17 which also supports the results of this study. Yolanda Castellote-Caballero, conducted a study which shows that a neurodynamic sliding intervention increases short-term hamstring flexibility.10 Anikwe EE in their study found that Nerve Flossing Technique reduced pain and improved hip range of motion as NFT causes a dynamic variation in neural pressure (by stretching at one end and relaxing at the other end), hence leading to evacuation of intraneural edema which might be present.12 Improvement in ROM is due to increase in the length of hamstring muscule,12,18, which might have resulted from repeated knee extension or due to decrease in pain intensity which possibly prevented the participants from achieving the ROM. This improvement in ROM is in agreement with some previous studies12,19

Hence this studies supports the results of previous studies done on hamstring flexibility using Sub-occipital muscle inhibition and neural flossing technique.20 This study resulted in improvement of flexibility and reduction of pain.
Conclusion
The combination therapy of sub-occipital muscle inhibition and neural flossing technique was effective in improving hamstring flexibility in young adults.

Limitation and Future scope of study
Study can be done in symptomatic patients while duration of study can be increased to study follow-up effects.

Conflict of interest: None
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References
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