A Study to Compare Immediate Effect of Suboccipital Muscle Inhibition Technique and Muscle Energy Technique on Hamstring Flexibility in Healthy Collegiate Subjects – An Interventional Study

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Abstract

INTRODUCTION: Hamstring is one of the commonest muscles that often get tight. The suboccipital muscle inhibition (SMI) technique is a manual technique that aims to relax the tension in the suboccipital muscles by decreasing the myofascial restriction in the suboccipital region. Muscle energy technique (MET) is a procedure that involves voluntary contraction of a patient's muscle in a precisely controlled direction, at varying levels of intensity and against a distinctly executed therapist applied counterforce. **AIM:** Aim of the study is to compare immediate effect of suboccipital muscle inhibition technique and muscle energy technique on hamstring flexibility in healthy collegiate subjects. **METHOD:** Total 40 subjects with hamstring tightness (both male and female) (age:18-26 years) were selected for study. Group A: Suboccipital muscle inhibition(SMI) technique. Group B: Muscle energy technique(MET) **OUTCOME MEASURE:** Active knee extension test(AKET). **RESULTS:** Results have shown significant difference between pre & post measurements in both the groups and no significant difference was found between the groups. **CONCLUSION:** Suboccipital muscle inhibition technique (SMI) and Muscle Energy Technique (MET) are equally effective in improving hamstring flexibility in healthy collegiate subjects.

Key Words: *Suboccipital muscle inhibition technique, Muscle energy technique, Active knee extension test, Popletial angle, Hamstring flexibility*

Introduction

Flexibility has been defined as the ability of a muscle to lengthen allows one joint or more than one joint in a series to move through a range of motion.[1] Flexibility is an important component of physical conditioning program used as an adjunct to muscle strength and endurance training.[1] Flexibility allows the tissue to accommodate more easily to stress, to dissipate shock impact and improve efficiency and effectiveness of movement that helps in minimizing or preventing injury.[1]

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Hamstring is one of the commonest muscles that often get tight.[2] Such damage mainly occurs in multi-joint muscles which have large functional excursion and a high percentage of fast twitch muscle fibers, and the hamstring muscle has been reported to be the multi-joint muscle which is most frequently damaged in the human body.[1,3]

Sitting for longer duration hours may be a contributing factor for reduced hamstring flexibility.[4] The prolonged sitting hours required in most of the jobs, and educational setups can affect flexibility of soft tissues, especially two joint muscles.[5,6]

Hamstring tightness is not only a causative factor for reduced range of motion but it can also lead to various other musculoskeletal[6]

Clinically, hamstring muscle length is not measured directly but instead, it is represented indirectly by angular measurements of unilateral hip flexion with the knee extended. Methods to assess hamstring flexibility include the Straight-Leg Raising (SLR) test, Sit and Reach (SR) test and Active Knee Extension (AKE) test.[7,8] The SLR test specificity has been questioned, as it is also widely used as a neurological test.

Even though hamstring flexibility assessment is easy using the Sit and Reach (SR) test, the validity of this test is considered poor. Among them AKE with plantar flexion is the gold standard measure for hamstring muscle length having excellent interrater and intrarater reliability(0.99) for assessing hamstring flexibility in healthy adults.[7,8]

The suboccipital muscle inhibition technique relaxes the tension in the muscles located between the axis and occiput, which regulates the upper cervical vertebra. The main functions of these muscles is to regulate body posture and rotation of the head.[4]

The suboccipital muscle inhibition (SMI) technique is a manual technique that aims to relax the tension in the suboccipital muscles by decreasing the myofascial restriction in the suboccipital region.[9]

When the tone of suboccipital muscles falls, it has been reported that the tone of knee flexors such as the hamstrings also decreases due to relaxation of the myofascia.[10] This is because the hamstrings and suboccipital muscles are connected by one neural system, which passes through the dura mater. Myers called this the superficial back line.[11,12,13]

Muscle energy technique (MET) is a manual technique developed by osteopaths and is now used in many different manual therapy professions.[14,15]

Muscle energy technique (MET) is a procedure that involves voluntary contraction of a patient's muscle in a precisely controlled direction, at varying levels of intensity and against a distinctly executed therapist applied counterforce.[16,17]

The systematic protocol for MET involves identifying a restrictive barrier within the normal range of joint motion, which is then followed by an isometric contraction of the agonist muscle. Subsequently, a passive stretch is applied to the muscle for a short period. This form of MET is also known as isometric CR or post-isometric relaxation (Chaitow, 2006a; Ward, 2003).[18]

There are many studies in literature which shows muscle energy technique and suboccipital muscle inhibition technique both are effective in improving hamstring flexibility, but no studies has compared both the techniques yet. So purpose of this study is to compare the effect of both the techniques in improving hamstring flexibility.

Aim of the Study

Aim of the study is to compare immediate effect of suboccipital muscle inhibition technique and muscle energy technique on hamstring flexibility in healthy collegiate subjects.

Objectives of the Study

- To evaluate immediate effect of suboccipital muscle inhibition technique on hamstring flexibility in healthy collegiate subjects.
- To evaluate immediate effect of muscle energy technique on hamstring flexibility in healthy collegiate subjects.
- To compare immediate effect of suboccipital muscle inhibition technique and muscle energy technique on hamstring flexibility in healthy collegiate subjects.

Hypothesis:

Null Hypothesis: There is no statistical significant difference between immediate effect of suboccipital muscle inhibition technique on hamstring flexibility in healthy collegiate subjects.

Alternative Hypothesis: There is statistical significant difference between immediate effect of suboccipital muscle inhibition technique on hamstring flexibility in healthy collegiate subjects.

Methodology

Study design: An Interventional study

Sampling technique: Convenient sampling for

selection of subjects and group allotment was done by simple random sampling

Study setting: Shree K. K. Sheth Physiotherapy college rajkot.

Sample size: 40 subjects (Group A – 20 subjects & Group B – 20 subjects)

Study population: subjects with hamstring tightness.

Study duration: One time study

Method of data collection:

40 subjects with hamstring tightness were selected for the study that fulfilled the inclusion and exclusion criteria. The details and purpose of the study were explained to all subjects and written consent was taken from them.

Selection Criteria

Inclusion criteria:

- Normal healthy individuals having hamstring tightness with Active knee extension (Popliteal angle) <125◦.[2]
- Age group between 18 to 26 year.[2]
- Gender : both male and female.[2]
- Subjects who are willing to participate in the study.

Exclusion criteria:

- Individuals with history of neck trauma [whiplash injury]. [2]
- Individuals with herniated disc, lumbar protrusion, cervical ligament instability. [2]
- Individuals with vertebrobasilar artery syndrome. [2]
- History of trauma or fracture of affected lower limb.
- Non consent subject

PROCEDURE:

Outcome measure: Active knee extension test (AKET)[17] was noted as an outcome measure at the beginning of the treatment session (pre-intervention) and immediately after treatment (post-intervention)

Active Knee extension test:

Active knee extension was measured with goniometer while the subject was in supine lying with hip stabilized at 90 degrees flexion. The goniometer was placed in such a way that non movable arm was aligned along the femoral shaft pointing greater trochanter and the movable arm along tibial shaft pointing the lateral malleolus with lateral knee joint-line as a fulcrum. The participants were asked to extend the testing knee actively as much as possible. Then the knee flexion angle (popliteal angle) was measured using goniometer. Three readings were taken for active knee extension of which average was calculated.

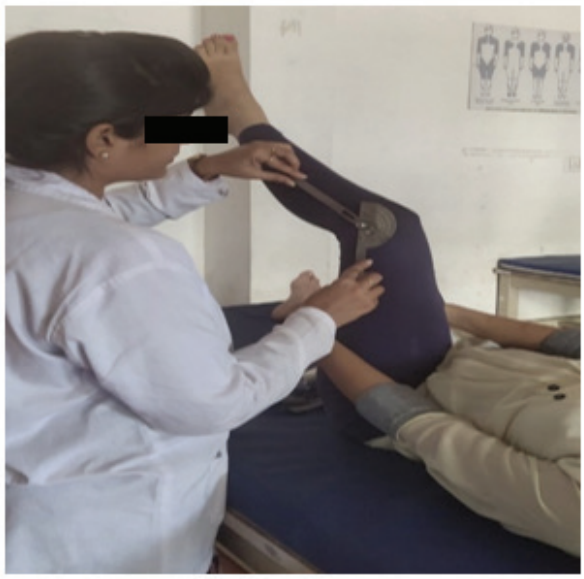

Fig 1: Active knee extension test

Group A (Suboccipital muscle inhibition technique[2]):

The Subject was in supine lying position. The therapist was standing head of the table and places the palms of hands under the subject's head. Pads of therapist's fingers on the projection of the posterior arch of the atlas which is palpated between the external occipital protuberance and spinous process of axis vertebra. The therapist has placed middle and ring fingers

of both hands the space between the occipital condyles and the spinal process of the second cervical vertebra. Then, with the metacarpophalangeal joints in 90º flexion, therapist rested the base of the skull on hands. Pressure was exerted upward and toward the therapist. The pressure was maintained for 2 minutes until tissue relaxation had been achieved. During the SMI technique, the subject is asked to keep his eyes closed to avoid eye movements affecting the sub-occipital muscle tone. The procedure was repeated 3 times with 20 seconds rest in between repetitions. Post treatment assessment was done with Active knee extension (Popliteal angle) test.

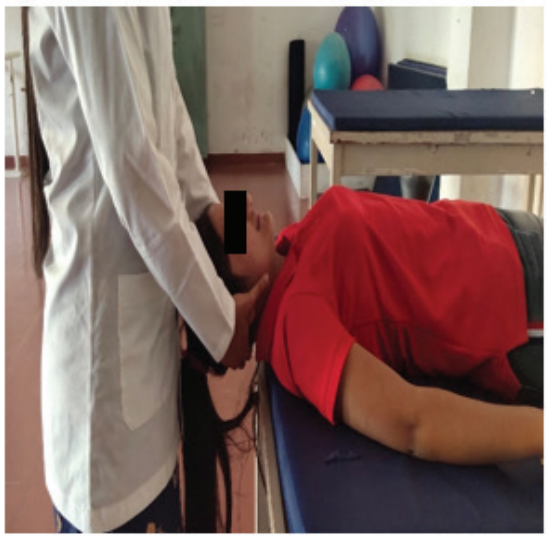

Fig 2: Suboccipital muscle inhibition technique

Group B (Muscle energy technique[5]):

Muscle energy technique was applied using postisometric relaxation technique. The Subject was in supine lying position. The therapist was standing at the side of the table on the side to be treated.The therapist stretched the hamstring muscle by passively flexing the hip with knee fully extended, allowing no hip rotation. The affected leg was rested on the therapist right shoulder. The hamstring muscle was stretched until the subject first reports a mild stretch sensation; this position was held for 7 sec. The participant was then instructed to isometrically contract the hamstring muscle for 3 sec by attempting to push the affected leg down towards the table against the resistance of the therapist with 20% effort. Following this, the participant was asked to relax for 5 sec. The therapist then passively stretched the muscle until a mild stretch sensation is reported. This stretch was held for 7sec. This sequence was repeated 3 times with each sequence separated from each by a 20 second interval. Post treatment assessment was done with Active knee extension (Popliteal angle) test.

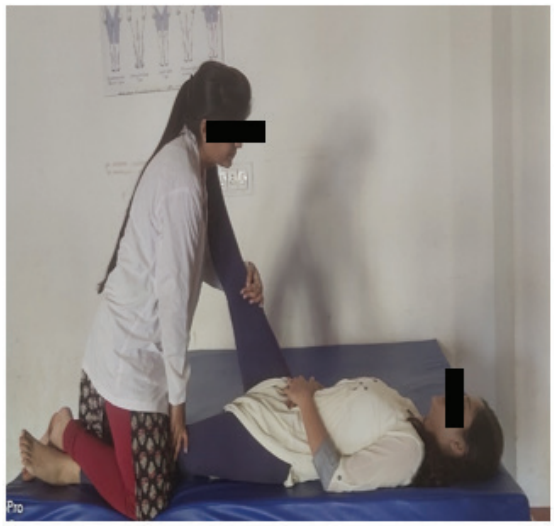

Fig 3: Muscle energy technique

Results

Statistical software:

All statistical analysis was done by SPSS statistics version 20.0 for windows software. Microsoft excel and word were used to generate graphs and tables.

Statistical test:

Means was calculated as a measure of central tendency for popliteal angle and Standard Deviation (SD) was calculated as a measure of dispersion. Pretreatment and post treatment data were analyzed by Wilcoxon signed rank test and comparison between two groups was analyzed by Mann-Whitney U test (Wilcoxon sum rank test).

Level of significance (p value) was set to 0.05.

Table 1: Mean and SD of pre and post treatment popletial angle of Group A and Group B

		GROUP A		GROUP B	
		Mean	**SD**	**Mean**	**SD**
Popliteal Angle	Pre treatment	110.25	7.691	111.75	7.122
	Post treatment	128.75	3.932	128.75	3.932

Table 2: Pre treatment and post treatment comparision of Group A and Group B and Between Group comparision of Group A and Group B

	Group A		Group B		Between group comparison for Group A and Group B	
	P value	**Result**	**P value**	**Result**	**P value**	**Result**
Popliteal angle	<0.05	Significant	<0.05	Significant	>0.05	Non- Significant

Discussion

In present study, when the values of pretreatment and post treatment were analysed, it was statistically significant in both the groups. When comparison was done between them, both the groups were equally effective in improving hamstring flexibility.

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.[10,19] Among them, in particular, the rectus capitis posterior minor muscle, which has 36 muscle spindles per gram, is known to contribute greatly to regulation of posture and the degree of tension.[10] The SMI techniques could increase the flexibility of the hamstring may be because the superficial back line was relaxed through relaxation of the suboccipital muscles.[10] Studies done on effect of SMI on hamstring flexibility resulted in improving flexibility due to the connection to dura mater, postural control, myofascial chain connection and was proved by Dr Rasika Panse[4] in which also supports the results of this study.

Treating the hamstring in patients with acute lower back pain for increasing hamstring length such as local site stretching techniques may cause aggravation of the local inflammatory response and may cause further muscle spasm and guarding.[2] So in such cases indirect technique can be used to improve hamstring flexibility

MET is claimed to be effective for a variety of purposes, including lengthening a shortened or contracted muscle, strengthening muscles, as a lymphatic or venous pump to aid the drainage of fluid or blood, and increasing the range of motion (ROM) of a restricted joint.[20] MET is said to inhibit motor activity via the Golgi tendon organs or the muscle spindles. Postisometric relaxation technique is effective for reduction of the tone of the muscles. The latency period of approximately 7-10 s that is present after the isometric phase. During this period, the movement toward the new position of a joint or muscle can be easier (due to the reduction in tone)[16]

Roshan Adkitte[16] et al, concluded Muscle energy technique has been shown to be an effective technique in increasing the flexibility of hamstring muscle

Dr. Ujwal L, Yeole[5] concluded that Muscle Energy Technique is more effective than Neural Tissue Mobilization for improving hamstring flexibility in young adults.

Limitations

- Unequal ratio of male and female in study population.
- Blinding was not done in the study

Further Recommendations

- Study could be done with large sample size.
- Treatment can be given for longer duration with follow up.

Clinical Implication

Both the techniques are equally effective in improving hamstring flexibility in healthy collegiate subjects. So, sub occipital muscle inhibition technique can be used when hamstring is injured or when there is severe pain and cannot directly work on hamstring.

Conclusion

Suboccipital muscle inhibition technique (SMI) and Muscle Energy Technique (MET) are equally effective in improving hamstring flexibility in healthy collegiate subjects.

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Ethical Clearance: Taken from ethical committee, Shree K. K. Sheth physiotherapy college Rajkot

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