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EFFECTIVENESS OF MUSCLE ENERGY TECHNIQUE ON HAMSTRING FLEXIBILITY

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ABSTRACT

BACKGROUND: Hamstring tightness is a common problem faced by the general population as well as sports players. The MET is a widely accepted method for treating hamstring tightness and Active Knee Extension Test is a procedure used to measure hamstring flexibility. The study is to check the Muscle Energy Technique (MET) on hamstring flexibility.

OBJECTIVE: purpose of the study to investigate the of muscle energy technique (MET) on hamstring flexibility on collage female students.

MATERIAL& METHOD: 20 healthy students female subject with hamstring tightness were selected. Subject were assessed the popliteal angle .treatment given 5 conservative days and the outcome was measured in terms of popliteal angle (Active knee extension test)

RESULT: There was a significant difference between the subject treated with MET in terms of improvement in Active knee Extension Range of Motion (popliteal angle)

CONCLUSION: Result indicates that Muscle Energy Technique (MET) is significantly improving the hamstring flexibility.

KEYWORDS : Muscle Energy Technique (MET), popliteal angle, Active Knee Extension(AKE), Flexibility.

INTRODUCTION

Flexibility refers to elongation ability of skeletal muscle and tendons[1]. From the view point of therapists, flexibility is one of the most significant components of rehabilitation protocols[2]. It is specifically necessary in two-joint muscles for normal posture and flawless ADL[3]. According to Gleim, two definitions can be considered for flexibility[1]: Static flexibility measured via the Range of Motion (ROM), which is equal to tolerance threshold toward stretches, and dynamic flexibility that is the necessary resistance toward stretch and is measured via stiffness.[4]

One of the most important two-joint muscles of the body, prone to tightness, is hamstring muscle[5]. Incomplete knee extension followed by pain and discomfort behind the knee, when hip joint is in 90 degrees flexion position, is attributed to hamstring tightness.[3,6] It is also a risk factor for hamstring strain[2,7]. Hamstrings are the main flexors of knee joint and tight hamstrings causes altered biomechanics, resulting in joint reaction forces during routine daily activities. Knee remains in semi-flexed position leading to gravitational falls on the anterior of the knee. The length-tension relationship of quadriceps may also disturb which further aggravate the pathology with extra tension on patellar tendon. This may result in patellofemoral dysfunction and pain syndrome.[8]

Tight hamstrings not only disturb the biomechanics at knee joint but also joint reaction forces and mechanics of hip and ankle joints. This results in abnormal gait patterns and abnormal foot loading. Plantar fascia undergoes repetitive trauma that can result in plantar fasciitis and heel pain.[9]Unaffected functional activities require normal length and strength of hamstring muscle. Additionally, muscles attached on pelvic and spine control the normal curvature of spine.

Therefore, hamstrings are one of the important muscles, which control pelvic movements and in turn direct spinal movements. Pelvic, lumbar and thoracic spine parts are dynamically connected by various muscles. Hamstrings muscles resilience affects the thoracic and pelvic mobility when complete trunk flexion is performed with extended knees.[10]Gluteal muscle weakness is associated with hamstring tightness and it results in sacroiliac joint dysfunction.[11]Since normal length and strength of hamstring is crucial for normal lumbar pelvic rhythm, hamstring tightness results in altered lumbar pelvic rhythm and increased load. In performing stoop lifting lumbar-pelvic rhythm, the hamstring muscle may be shortened. Delayed lumbar extension results in increased load on posterior ligamentous structure leading to increased risk of spinal instability. These muscular irregularities can cause lower back complications. [12]

Low back pain causes reflex tightness of hamstring muscle and it is associated with patient's activities of daily living or its job activities or posture. Patients having low back pain usually have tight hamstrings that are not associated with work settings and sedentary life style. [13]

In normal gait cycle, terminal extension at knee requires normal flexibility of hamstring but if hamstrings are tight the person is unable to perform the terminal extension. Hamstring tightness cause altered biomechanics at knee resulting in abnormal gait pattern. Hamstring tightness is commonly seen in cerebral palsy patients. Therefore, they show abnormal gait patterns and are unable to complete the normal gait cycle. [14]

Muscle Energy Technique (MET) is a manual technique developed by osteopaths that is now used in many different manual therapy professions. It is claimed to be effective for a variety of purposes, including lengthening a shortened 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.[15] While MET is widely used by osteopaths and other manual therapists, there is limited research supporting and validating its use, as well as limited evidence to substantiate the theories used to explain the effects of MET.

It is a procedure that involves voluntary contraction of a patient's muscle in a precisely controlled direction, at varying levels of intensity. It is unique in its application as the client provides the initial effort while the practitioner facilitates the process. The benefits of MET include: Restoring normal tone in hypertonic muscles, strengthening weak muscles, preparing the muscle for subsequent stretching, improved joint mobility.[16] It includes two techniques post isometric relaxation technique and reciprocal inhibition. [16]Hamstring tightness is a common problem faced by the general population as well as sports players. The MET is a widely accepted method for treating hamstring tightness and Active Knee Extension Test is a procedure used to measure hamstring flexibility.

Thus, in this study, the effectiveness of MET in improving hamstring flexibility is focussed. Hence, the aim of present study was to evaluate the effectiveness of MET on flexibility of hamstring muscle.

NEED OF THE STUDY

A normal flexibility is necessary for an appropriate posture and flawless activity in daily life. Hamstring was the muscle of choice since hamstring tightness is present in all age groups and it increases with age and more over it is the muscle that is most prone to injuries during sporting activities. With regard to various methods that contribute to increasing flexibility of hamstring muscles, the current study aimed at investigating immediate effects of Muscle Energy Technique (MET) on hamstring flexibility and stiffness in healthy young females.

Moreover, there is lack of sufficient literature supporting immediate effect of MET on hamstring flexibility hence the need for the study.

OBJECTIVE

To determine the effectiveness of Muscle Energy Technique on hamstring flexibility.

REVIEW OF LITERATURE

- Dr. Roshan Adkitte conducted a study on "Effect of Muscle Energy Technique on flexibility of hamstring muscle in Indian national football players" and concluded that MET increases the flexibility of hamstring muscle in Indian national football players and hence it can prevent the injuries and improves their performance.
- Ballantyne F et al. did a study on "The effect of Muscle Energy Technique on hamstring extensibility: the mechanism of altered flexibility" and concluded that MET produced an immediate increase in passive knee extension.
- A study titled "Efficacy of Muscle Energy Technique on hamstring muscles in normal Indian collegiate males" done by Mohd. Waseem et al. concluded that there was a significant difference between the subjects treated with MET and control group subjects who were not given any treatment for hamstring tightness, in terms of improvement in active knee extension range of motion/popliteal angle
- A study was conducted by M.Ramesh on "Comparison of three different physiotherapeutic interventions in improving hamstring flexibility in individuals with hamstring tightness" and concluded that MET ("A comparative study of Muscle Energy Technique and dynamic stretching on hamstring flexibility in healthy adults" by Adel Rashad concluded that there was significant improvement in hamstring flexibility following application of MET and dynamic stretching but the improvement in MET technique was better than that of dynamic stretching.
- Post isometric Relaxation Technique - PIR) is more effective than ultrasound therapy with active static stretching and passive static stretching in improving the hamstring flexibility in individuals with hamstring tightness
- A comparative study titled "Immediate effect of Muscle Energy Technique and eccentric training on hamstring tightness of healthy female volunteers" done by Cheraladhan E.Sambandham concluded that there was a significant improvement of active knee extension range in both groups.
- "A comparative study of Muscle Energy Technique and dynamic stretching on hamstring flexibility in healthy adults" by Adel Rashad concluded that there was significant improvement in hamstring flexibility following application of MET and dynamic stretching but the improvement in MET technique was better than that of dynamic stretching.

METHODOLOGY

Study Design: Case series

Sampling method: Convenience sampling

Sample size: 20

Sources of data: The source of data for this study was obtained from a tertiary hospital in Mangalore.

Study Duration: 5 days

Inclusion criteria

a) Aged between 18- 25 year of age.
b) Female.
c) Tight hamstring (Inability to achieve greater than 120 of knee extension with hip at 90° of flexion).

Exclusion criteria

a) Acute or chronic low back pain.
b) Acute or chronic hamstring injury.
c) Any lower limb surgical history.

PROCEDURE

20 healthy female with hamstring tightness were selected. Subjects were assessed for hamstring tightness by measuring popliteal angle i.e. active knee extension test. Subjects were treated with Muscle energy technique. The treatment was given for 5 consecutive days. The subjects were treated approximately at the same time of each day.

The outcome was measured in terms of popliteal angle (Active knee extension test).

Popliteal Angle/ Active Knee Extension Test

Pre and post measurement data on popliteal angle were collected. Subjects were assessed for hamstring tightness using the Active Knee Extension test (Popliteal angle). The subject was in supine position with hips flexed 90° and knee flexed. A cross bar was used to maintain the proper position of hip and thigh. The testing was done on the right lower extremity and subsequently the left lower extremity and the pelvis were strapped down to the table for stabilization and control on accessory movements. Landmarks used to measure hip and knee range of motion were greater trochanter, lateral condyle of femur and the lateral malleolus. The fulcrum of the goniometer was placed over the lateral condyle of the femur with the proximal arm secured along the femur using greater trochanter as a reference. The distal arm was aligned with the lower leg using the lateral malleolus as a reference. The hip and knee of the extremity being tested were placed into 90° flexion with the anterior aspect of thigh stabilized at all times to maintain hip in 90° flexion. The subject was then asked to extend the right lower extremity as far as possible until a mild stretch sensation was felt .A goniometer was then used to measure the angle of knee flexion and was recorded as the popliteal angle.

Muscle Energy Technique

MET was applied using post isometric relaxation technique. While the subject was lying in supine position, the subject's hip was passively flexed by the therapist to 90°. From this position, the subject's lower leg was placed on the therapist's shoulder. The knee was then passively extended to the position where the subject first reported of any hamstring discomfort. The subject was asked to apply pressure over the shoulder for 7-10s following which a relaxation period of 10 seconds was given. After 10 seconds of relaxation, the technique was repeated three times.

Case	Age	Active knee extension angle	
		Pre treatment value	Post treatment value
1	23years	0-112°	0-178
2	23years	0-113°	0-161
3	22years	0-104°	0-147
4	22years	0-120°	0-172
5	23years	0-110°	0-166
6	22years	0-117°	0-159
7	22years	0-110°	0-177
8	23years	0-115°	0-159
9	23years	0-119°	0-160
10	23years	0-109°	0-150
11	24years	0-118°	0-158
12	23years	0-113°	0-160
13	23years	0-110°	0-170
14	23years	0-111°	0-166
15	24years	0-103°	0-151
16	22years	0-120°	0-170
17	23years	0-113°	0-158
18	23years	0-106°	0-163
19	23years	0-113°	0-170
20	22years	0-104°	0-165

RESULT

The result showed that there was a difference in the active knee extension range before and after MET sessions. The popliteal angle increased after 5 days of treatment and as the popliteal angle is inversely proportional to hamstring tightness, it implies that there was an increase in hamstring flexibility thereby it suggests that MET has a positive effect on hamstring tightness.

DISCUSSION

Hamstrings are one of the important muscles as it is necessary to maintain an appropriate posture and for flawless activity in daily life. It also controls pelvic movements and in turn direct spinal movements. Even in normal gait cycle, terminal extension at knee requires normal flexibility of hamstring. Hamstring was the muscle of choice of this study since hamstring tightness is present in all age group and it increases with age and more over it is the muscle that is most prone to injuries during sporting activities. Also there are well documented, reliable and valid methods of testing flexibility of hamstring muscles, such as the measure of popliteal angle/Active Knee Extension. The review of existing literature regarding the role of different techniques in improving hamstring flexibility reveals confusing picture. Therefore the current study was undertaken to investigate the efficacy of Muscle Energy Technique. For this purpose a comparison of pretest and post test values of popliteal angle was carried out.

20 healthy female BPT students were selected whose popliteal angle were less than 120 and for 5 consecutive days, MET sessions were given to them. The result of the study revealed that following a 5 days treatment program of MET, subjects were shown significant improvement in flexibility of hamstring muscle.

The main effects of MET can be explained by two distinct physiological processes: reciprocal inhibition (RI) and post isometric relaxation (PIR). Stretching of muscle causes an increase in the impulses transmitted from the muscle spindle to the posterior horn cell (PHC) of the spinal cord. In turn, the anterior horn cell (AHC) transmits an increase in motor impulses to the muscle fibres, which creates a protective tension to resist the stretch. But increased tension maintained for a few seconds is sensed within the Golgi tendon organs, which transmit impulses to the PHC and has an inhibitory effect on the increased motor stimulus at the AHC. This inhibitory effect causes a reduction in motor impulses and consequent relaxation. This implies that the prolonged muscle stretch will increase overall stretching capability due to the protective relaxation of the Golgi tendon organs overriding the protective contraction and this is what is happening if we do muscle energy technique. However, a fast stretch of the muscle spindles will cause immediate muscle contraction and – if not sustained – there will be no inhibitory action. When an isometric contraction is sustained, neurological feedback through the spinal cord to the muscle itself results in post-isometric relaxation (PIR), causing a reduction in tone of the contracted muscle. This lasts for approximately 20 to 25 seconds, during which the tissues can be more easily manipulated to a new resting length.

Ballantyn et al. conducted a study on the effects of MET on hamstring flexibility. They concluded that using MET in one session increased tolerance threshold toward hamstring stretches and elongation [17]The reported results by Smith (2008) indicated that both Greenland and Chaitow approaches in MET can increase AKE domain and their effects last for a week. [18]Waseem et al., in their investigation on the effects of MET on hamstring flexibility of males, concluded that MET may be an efficient method to increase popliteal angle [19].

Mazumdar compared the effects of MET and Mulligan traction SLR on hamstring tightness and concluded that both methods increased hamstring flexibility; however, MET was more effective than Mulligan TSLR technique [20].

According to Shellock and Hutton, effectiveness of MET may be related to inhibitory reflexes of Golgi tendon [23]; therefore, this reflex, followed by its subsequent active isometric contraction, leads to relaxation [24,25].

CONCLUSION

The study concludes that Muscle Energy Technique is effective in increasing the flexibility of hamstring muscle.

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