Original Article

A COMPARISON BETWEEN MULLIGAN TRACTION STRAIGHT LEG RAISE TECHNIQUE VS MUSCLE ENERGY TECHNIQUE ON HAMSTRING TIGHTNESS IN ASYMPTOMATIC MALE

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ABSTRACT

Background and Purpose: The Hamstring muscles of the back thigh are found to be the most prevalent for the tightness in the body. The purpose of this study is to compare effectiveness of Mulligan Traction Straight Leg Raise and Muscle Energy Technique methods in increasing range of motion and flexibility of knee joint.

Methods: The 60 subjects (n = 60) with hamstring tightness randomly divided into two groups. Each group consist of 30 male subjects. However group A had 28 as two dropout and group B had 26 as four dropout . Group A was treated with Mulligan TSLR and Group B had MET. The total treatment session was 3 times a week on alternate days for three consecutive weeks. The outcome measures were measured by active knee extension ROM by universal Goniometer.

Results: Independent t-test and paired t- test were used to analyse the data. The inter group comparison ROM score showed high significant difference after 3 weeks between the groups. The results of the study showed that MET may increase Knee ROM significantly more then Mulligan TSLR when applied for 3 weeks.

Conclusion: This study led to interference that Mulligan TSLR and MET are effective in reducing the hamstring tightness. When both groups are compared MET was found to be more effective than TSLR .

KEYWORDS: Hamstring Tightness, Muscle Energy Techniques (MET), Mulligan TSLR, Knee ROM.

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INTRODUCTION

Limited muscle extensibility is a common problem that affects various patient populations as well as healthy able bodied individuals.[1,2,3] . The ability of an individual to move smoothly depends on his flexibility, an attribute that enhances both safety and optimal physical activities.[4] Flexibility is an important physiological component of physical fitness, and reduced flexibility can cause inefficiency in the workplace and is also a risk factor for low back pain .[4] Muscle extensibility is an essential element of biomechanical function.[5] Flexibility has been defined as the ability of a muscle to lengthen and allows one joint (or more than one joint in a series) to move through a range of motion.[6,7] Loss of flexibility is defined as a decrease in the ability of a muscle to deform.[8] The literature reports a number of associated benefits of flexibility including improved athletic performance, reduced injury risk, prevention or reduction of post-exercise soreness, and improved coordination.[9,10] The hamstring muscles are important contributors to the control of human movement and are involved in a wide range of activities from running and jumping to forward bending during

sitting or standing and a range of postural control actions.[11 11] Hamstring muscle strains are the most common muscle injuries in athletes.[11] The proposed etiology includes insufficient flexibility, strength (force-generating capacity) impairment or imbalance, and dyssynergic contraction that can place excessive strain on the hamstring muscles.[12] The hamstrings are example of muscle groups that have a tendency to shorten.[13] Worrel et al stated that a "lack of hamstring flexibility was the single most important characteristics of hamstring injuries in athletes".[14] Reduced hamstring muscle flexibility has been also implicated in lumbar spine dysfunction, with a number of studies[15-18] showing a strong positive correlation between decreased hamstring flexibility and low back pain. Other researchers[18-21] have suggested that hamstring muscle function in a variety of movements is part of a coordinated motor program and thus the appropriate periods of lengthening and shortening and perhaps even the degree of lengthening itself may be a learned part of the motor control process. The posterior femoral muscles, biceps femoris, semitendinosus, and semimembranosus, are colloquially termed the 'hamstrings'.

MATERIALS AND METHODS

The purpose of this study was to compare effectiveness of Mulligan Traction Straight Leg Raise and Muscle Energy Technique methods in increasing range of motion and flexibility of joints. Source of data collection was from Sai Institute of Paramedical and Allied Science (SIPAS) (Dehradun, India). A sample of 60 asymptomatic subject with hamstring tightness with due consideration to the inclusion and exclusion criteria were included in the study. The 60 subjects (n = 60) was divided into two groups, Group A was treated with Mulligan TSLR and Group B had MET. Each group consist of 30 male subjects. However two dropout in group A and had 28 subject and group B had 26 as four dropout . The total treatment session was 3 times a week on alternate days for three consecutive weeks. Inclusion Criteria was: 1) Asymptomatic subject aged 18-25 years. 2) 20-50 degrees active knee extension loss with hip in 90 degrees flexion(Active Knee Extension test (Popliteal angle)).[3] 3) Full passive ROM of knee extension (to rule out inter articular knee joint pathology). 4) Male subject was only included. Exclusion Criteria was: 1) Volunteers involved in recreational or flexibility sport activities. 2) History of previous lower limb injury or pain from past one year. 3) History of fracture or surgery of back, pelvis, hip or knee. 4) Inflammatory condition that could affect motion. 5) Spinal deformity.

PROCEDURE:

Subjects were recruited as per the inclusion and exclusion criteria, and informed consent was obtained from all the subjects after the procedure was explained to them. All these subjects underwent screening for hamstring tightness. Subjects with pain and fulfilling any exclusion criteria were excluded. Active Knee Extension test (Popliteal angle) Subjects were assessed for hamstring tightness using the Active Knee Extension test (Popliteal angle). The subject were placed 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 the pelvis was 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 which was marked by a skin permanent marker. The fulcrum of the goniometer was centered 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 in contact with the horizontal cross bar frame 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 full circle goniometer was then used to measure the angle of knee flexion. Three repetitions were performed and an average of the three was taken as the final reading for Popliteal Angle .[4] Pre intervention data in the form of active knee extension Range of motion (popliteal angle) was collected according to the active knee extension test proc-

edure. Post intervention data in the form of active extension range of motion was collected on alternate days for 3 weeks.

For group A (TSLR)

This technique involves sustained traction applied to the limb with the knee extended. The patient is in supine lying on a very low bed or on the floor and therapist stand facing patient's affected side. Patient actively does the SLR and both the therapist and the patient note the range. Therapist now grasp patient lower leg proximal to the ankle joint and raise it off the bed to a position just short of the painful range. Therapist flexes his knees and holds the clasped leg to his (therapist's) chest. When the therapist extend his knees this will effectively apply a longitudinal traction to the leg provided the bed is low enough and the therapist is tall enough. Sustain this traction and undertake a straight leg raise as far as it will go provided there is no pain. If there is pain slightly rotate, abduct or adduct the hip while raising the leg. When pain free SLR with traction is given for three times.[22] Intervention was given on alternative days for 3 weeks.

For group B (MET)

The muscle energy technique was then applied to the other group. The subject's knee was extended to the first report of hamstring discomfort and a moderate isometric contraction (approx 75% of maximal) of the hamstring muscle was then elicited for a period of five seconds. After a period of three seconds relaxation, the technique was repeated three times with an interval of 20 sec in between sets.[23] Intervention was given on alternative days for 3 weeks.

Outcome measures

Pre values and post values was taken from the patients before and after treatment on alternate days for 3 weeks by Active Knee Extension test (Popliteal angle)[4].

RESULTS AND TABLES

Statistics were performed by using SPSS 13. Results were calculated by using 0.05 level of significance. The mean age for Group A was 21.88 with SD of 2.39 whereas the mean age for Group B was 22.86 with SD of 2.34. It was found that Group B had slightly higher mean value of age then Group A. The Mean and SD of knee Range of Motion at 0 week for Group A was found to be 37.19 and 7.38 respectively where as that of Group B to be 39.29 and 7.03 respectively. It was found that there was no significant difference in Knee ROM between the two group with t-value of -1.068 and p>0.05 at 0 week. . The Median for Group A on the 1st week post intervention was 8.92 with a SD of 1.90 and that of Group B was 7.86 with a SD of 2.03. When a comparison of the Mean value for Knee ROM at Median(0 week – week 1) was done between Group A and Group B. The t value was found to be 1.989 with P> 0.05. It means that there was no significant difference in improvement of Knee ROM when compared between Group A and Group B at Median in the 1st week. Though there was a slight better improvement in Knee ROM in Group B in comparison to Group A. When a comparison of the Mean for Knee ROM for the 2nd week was done, by comparing it with the Mean of the 0 week of both the Groups A & B. It shows that there was a significant improvement of Knee ROM in both the Group A & B. When the Mean value for Knee ROM was compared at Median (0 week – 2 week) between Group A and Group B, t value was found to be 1.316 with P>0.05. This shows that there was no significant difference between the two Group A & B at median. Though Group B showed slight better in increasing Knee ROM in comparison to group A. When a comparison of the Mean for Knee ROM for the 3rd week was done, by comparing it with the Mean of the 0 week it was found that both the Groups A & B showed significant Improvement. When a comparison of mean for Knee ROM at Median (0 week – 3 week) between Group A and Group B was done, it was found that the t value was 4.764 with P<0.05. This shows that there is a significant difference between the Knee ROM of 3rd week when compared between Group A and Group B. Showing that Group B was better then Group A at the 3rd week. Thus the study shows that when Mulligan TSLR and MET was applied to tight hamstring to increasing Knee ROM and gain hamstring flexibility for a period of 3 weeks, there was no significant difference between the two group up to the 2nd week. But on the 3rd week it was seen that MET showed higher significance.

Table 1: Mean and SD of Knee Range of Motion at 1 week for the subjects of Group A and Group B.

Knee Range of Motion	Group A		Group B	
	Mean	SD	Mean	SD
1st day week 1	33.46	7.35	36.64	6.95
2nd day week 1	30.77	7.37	34.11	7.06
3rd day week 1	28.27	7.37	31.43	7.01
MD (0 week – week 1)	8.92	1.9	7.86	2.03

Table 2: Mean and SD of Knee Range of Motion at 2 week for the subjects of Group A and Group B.

Knee Range of Motion	Group A		Group B	
	Mean	SD	Mean	SD
1st day week 2	25.85	7.41	29.21	6.83
2nd day week 2	23.04	7.23	26.04	6.8
3rd day week 2	20.65	7.1	23.43	6.9
MD (0 week – week 2)	16.54	1.9	15.86	1.9

Table 3: Mean and SD of Knee Range of Motion at 3 week for the subjects of Group A and Group B.

Knee Range of Motion	Group A		Group B	
	Mean	SD	Mean	SD
1st day week 3	17.96	7.12	21.68	7.26
2nd day week 3	15.81	7	19.93	7.43
3rd day week 3	13.69	7.46	17.96	7.58
MD (0 week – week 3)	23.5	1.61	21.32	1.74

Table 4: Comparison of mean value for Knee Range of Motion at MD (0 week – week 3) between Group A and Group B.

Knee Range of Motion	Group A Vs Group B	
	t value	P value
MD (0 week – week 3)	4.764	P < 0.05

DISCUSSION

The above finding supports the finding of Mohd. Waseem at al who proved that MET is significantly improving the hamstring flexibility (range of motion).[4] They also found that, on analysis of the muscle flexibility after 72 hours of the end of training did not reveal a significant maintenance of flexibility. The deterioration from the post-test values at the time of follow-up can be attributed to the fact that there was no maintenance program that was being followed during that period. Thus our study showed a maintenance and perhaps an increase in Knee ROM can be gained if MET is continued.

Our results also supports the finding made by Ballantyne F at al who found that Muscle energy technique produced an immediate increase in passive knee extension.[23] They suggested that a single application of MET produced no biomechanical change to the muscle, but created a change in tolerance to stretch. Even though our study was done for period of 3 week but we did not study lasting viscoelastic changes . Thus future research can be done on the concept of visco-elasticity in relation to muscle physiology with application of MET. Our study also supports the finding made by Emad T. Ahmed at al. They found that MET is more effective than static stretching alone to improve a hamstring muscle flexibility post burn contracture.[24] Even though they applied MET to burn contractures but still there result can be correlated with ours which shows that MET shows significant improvement in hamstring flexibility.

An increase in flexibility after muscle energy technique (MET) occurred due to biomechanical or neuro-physiological changes or due to an increase in tolerance to stretching.[25] It can be speculated on the neurological mechanisms that may produce increased range of motion of a joint after MET, however, there is little research to substantiate these theories. Kuchera [26] attributed the effectiveness of MET to the inhibitory golgi tendon reflex. This reflex is believed to be activated during isometric contraction of muscles, which is claimed to produce a stretch on the golgi tendon organs and a reflex relaxation of the muscle.[27, 28] This theory, however, is poorly supported by research. Increased tolerance to stretch, which has been demonstrated following passive static stretching of the hamstring muscles, may also play a role in the apparent increased flexibility of muscles following MET. Handel et al. [29] suggest that an increased stretch tolerance is a possible mechanism behind the increased ROM seen in their study after the contract-relax exercise program.

Mulligan TSLR on the other hand showed significant improvement when applied to tight hamstring for a prolong period of time (3 weeks). But It did not showed as much improvement as MET.

Our study supports the study that was done by Toby Hall [22] who proved that Mulligan TSLR shows a significant improvement in Knee ROM. The result is similar to that of Hall at al who found an increase of 13^0 in the range of SLR following

the application of TSLR technique to normal subject. The increase in range may be due to change in hamstring muscle stress tolerance. Our result also supports the finding made by Pratishtha at al who found that Mulligan TSLR stretch is more effective than BLR stretch in improving biceps femoris muscle performance and flexibility.[30]

The increase in straight leg raise range in TSLR group may be due to the fact that during TSLR stretch, various receptors exert an inhibitory influence on lower limb alpha-motoneuron activity. Golgi tendon organs around the knee, hip and spine probably initiate various segmental reflex pathways during traction of the limb. Likewise, Golgi tendon organs are activated during large amplitude stretching movements such as SLR. This processing of information in the nervous system may inhibit the activity of the muscles being lengthened during SLR by dampening the afferent activity of type II muscle spindles or by decreasing motor neuron excitability via 1-b fibers. Hence, improvement in range of SLR may be directly related to inhibition of the hamstring muscles rather than changes due to stretch tolerance.[30]

In our study it was hypothesized that there would be significant difference in the effects of Mulligan TSLR and muscle energy technique when applied to tight hamstring. And the results indicated that muscle energy technique was significantly better then TSLR when applied for a period of 3 weeks.

CONCLUSION

This study demonstrated that both Mulligan TSLR and MET are effective in improving Knee ROM in subject with tight hamstring. Although the results of the study showed that there was significant difference between the two groups with respect Knee ROM . The study showed that MET is significantly better then Mulligan TSLR.. However, both the technique can be given in clinical practice for improving hamstring flexibility.

Future Research

Future study can be done with longer protocol and broader sample size. The extent of effectiveness of the protocol can be checked by involving the control group in the study. The study could be also done using female subject. More investigation could be done using correlation with EMG activities of the muscle. Broad Age groups may be considered. Effects of MET/TSLR can also be seen in subjects with history of hamstring injury.

List of abbreviations:

MET: Muscle Energy Technique, TSLR: Traction Straight Leg Raise, AKE: Active Knee Extension, ROM: Range Of Motion, SD: Standard Deviation, SLR: Straight Leg Raise, SPSS: Statistical Package of Social Sciences, EMG: Electro Myography.

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Conflicts of interest: None

REFERENCES

1. Ada L and Canning A: Anticipating and avoiding muscle shortening. In Ada L and Canning A (Eds): Key issues in neurological physiotherapy. London: Butterworth Heinemann 1990:219–236.
2. Dalyan M, Sherman A and Cardenas DD: Factors associated with contractures in acute spinal cord injury. Spinal Cord 1998;36:405–408.
3. Leong B : Critical review of passive muscle stretch: implications for the treatment of children in vegetative and minimally conscious states. Brain Injury 2002;16:169–183.
4. Waseem M , Nuhmani S and Ram C. S.: Efficacy of Muscle Energy Technique on hamstring muscles flexibility in normal Indian collegiate males, International Journal of Sports Science and Engineering, Aug 30, 2009; 03 (03):180-186.
5. Odunaiya N.A, Hamzat T.K, Ajayi O.F: The Effects of Static Stretch Duration on the Flexibility of Hamstring Muscles. African Journal of Biomedical Research, 2005;8:79 – 82. ISSN 1119 – 5096.
6. Smith M A comparison of two muscle energy techniques for increasing flexibility of the hamstring muscle group. J body work and movement therapies 2008;12:312-317
7. Sharon S, Susan L, Ray G, Janine E. Lower extremity muscular flexibility in long distance runners. J Orthop. Sports Phys. Ther. 1993;17:102-7.
8. Zachezewski JE. Improving flexibility. In: Scully RM, Barnes MR, eds. Physical Therapy. 1989 Philadelphia, PA: JB Lippincott;698–699.
9. Hutson M. Sports injuries: Recognition and Management, 2nd ed. Oxford: Oxford University Press, 1996.
10. Hartig DE, Henderson JM. Increasing flexibility decreases lower extremity overuse injuries in military basic trainees. Am J Sports Med 1999;27:173–6.

11. Kujala UM, Orava S, Jarvinen M. Hamstring injuries: current trends in treatment andprevention. Sports Med. 1997;23:397–404.
12. Agre JC. Hamstring injuries: proposed aetiological factors, prevention, and treatment. Sports Med. 1985;2:21–33.
13. Turner D, Gossman R.M., Nicholson C.G and Lemons J . Comparison of cyclic and sustained passive stretching using a mechanical device to increase resting length of hamstring muscles. Phys Ther 1988;69(3):314-320.
14. Chaitlow L, Liebenson C (Ed) In: Muscle Energy Techniques: 2nd Edition, Donald R Murphy, London. Pp 95-106 (2001).
15. Agre JC, Baxter TL. Musculoskeletal profile of male collegiate soccer players. Arch Phys Med Rehabil. 1987;68:147–150.
16. Esola MA, McClure PW, Fitzgerald GK, Siegler S. Analysis of lumbar spine and hip motion during forward bending in subjects with and without a history of low back pain. Spine. 1996;21:71–78..
17. Tafazzoli F, Lamontagne M. Mechanical behaviour of hamstring muscles in low-back pain patients and control subjects. Clin Biomech (Bristol, Avon). 1996;11:16–24.
18. Halbertsma JP, Goeken LN, Hof AL, et al. Extensibility and stiffness of the hamstrings in patients with nonspecific low back pain. Arch Phys Med Rehabil. 2001;82:232–238.
19. Li Y, McClure PW, Pratt N. The effect of hamstring muscle stretching on standing posture and on lumbar and hip motions during forward bending. Phys Ther. 1996;76:836–845.
20. Cheron G, Bengoetxea A, Pozzo T, et al. Evidence of a preprogrammed deactivation of the hamstring muscles for triggering rapid changes of posture in humans. Electroencephalogr Clin Neurophysiol. 1997;105:58 71.
21. McGorry RW, Hsiang SM, Fathallah FA, Clancy EA. Timing of activation of the erector spinae and hamstrings during a trunk flexion and extension task. Spine. 2001;26:418–425.
22. Hall, T., Beyerlein, C., Ulla Hansson, U., Lim, H.T., Odermark, M., Sainsbury, D. . Mulligan Traction Straight Leg Raise: A Pilot Study to Investigate Effects on Range of Motion in Patients with Low Back Pain. The J. Man. & Manip. Ther. 2006a;14(2): 95 –100.
23. Ballantyne F, Fryer G, Mclaughlin P. The effect of muscle energy technique on hamstring extensibility: the mechanism of altered flexibility. J Osteopathic Medicine. 2003;6:59-63.
24. Emad T.Ahmed and Safa S. Abdelkarim; Efficacy of Muscle Energy Technique versus Static Stretching Technique in Increasing Hamstring Flexibility Post Burn Contracture "International Journal of Health and Rehabilitation Sciences" Jan 2013, Vol 2Issue1.
25. Freyer G. et al. Muscle energy concepts: a need for change. J osteopathic medicine. 2000:3:54-59.
26. Kuchera WA, Kuchera ML. Osteopathic Principles in Practice. 2nd ed revised. Kirksville, Missouri: KCOMPress;1992.
27. Shellock FG, Prentice WE. Warming-Up and Stretching for Improved Physical Performance and Prevention of Sports-Related Injuries.Sports Medicine. 1985:2(4); 267-278.
28. Hutton RS. Neuromuscular Basis of Stretching Exercises. In:Komi PV. Strength and Power in Sport. UK:Blackwell Sciences Ltd; 1992; 29-38.
29. Handel M, Horstmann T, Dickhuth HH,Gulch RW. Effects of contract-relax stretching training on muscle performance in athletes. European Journal of Applied Physiology.1997;76:400-408.
30. Pratishtha, K. & Jagga, V. Effect of Mulligan Stretching Techniques (TSLR AND BLR) on Biceps Femoris Muscle and Pelvic Rotation by Using Surface EMG and Bubble Inclinometer Respectively. Journal of Exercise Science and Physiotherapy 2012;8(1):3

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