

EFFECTS OF MULLIGAN'S TWO LEG ROTATION TECHNIQUE IN HAMSTRING FLEXIBILITY: PRE-POST EXPERIMENTAL STUDY

EFFECTUL TEHNICII "MULLIGAN'S TWO LEG ROTATION" ASUPRA FLEXIBILITĂȚII ISCHIOGAMBIERILOR: STUDIU COMPARATIV EXPERIMENTAL

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Cuvinte cheie: tehnica Mulligan's two leg rotation, scurtarea ischiogambierilor, extensia activă a genunchiului.

Abstract

Introduction. Mulligan's Two Leg Rotation Technique (TLR) is a painless technique, and can be tried in any subjects with hamstrings tightness, low back pain and who has limited and/or painful straight leg raise (SLR). It can be extremely useful in patients who have a gross bilateral limitation of straight leg rising. TLR Technique is a new technique that has been developed by Dr. Brain R Mulligan and colleagues (2010). Limited Literature is available on the efficacies of Mulligan's TLR techniques in Hamstrings flexibility. **Aim** of the study was to evaluate the changes in Pre-Post effects of TLR technique in Hamstrings flexibility in healthy individuals.

Material and Method. After obtaining ethical clearance from the institution, based on eligibility criteria, participants were included and prior Informed consent forms were signed by each participant. 20 participants were allocated in the study. Using Active Knee Extension (AKE) Pre hamstring measurements were taken for all the participants and Mulligan's TLR technique was applied and Post hamstrings measurements were taken. Pre and Post measurements of every individual were analyzed.

Results. Post treatment effects had a significant increase in hamstrings flexibility for the all participants.

Discussion. Limited literature is available on the efficacy of mulligan's two leg rotation technique; this study is one of the first kinds to evaluate the effects on individuals with hamstrings tightness.

Conclusion: Results of this study suggests Mulligan's two leg rotation technique to be effective in increasing hamstrings flexibility.

Rezumat

Introducere: Tehnica Mulligan's Two Leg Rotation (TLR) este o tehnică nedureroasă, care poate fi încercată în cazul pacienților cu scurtarea ischiobambierilor, dureri lombare joase și care au semnul Laseque pozitiv (SLR). Este foarte folositor la pacienții cu limitare masivă bilaterală a flexiei membrelor inferioare cu genunchii extinși. Tehnica TLR este o tehnică nouă concepută de dr. Brain R Mulligan și colab. (2010). Există puține studii privind eficiența acestei tehnici asupra flexibilității ischiogambierilor.

Scopul acestui studiu este de a evalua modificările efectelor pre-post aplicare a tehnicii TLR asupra flexibilității ischiogambierilor la subiecții sănătoși.

Material și metodă. După obținerea acordului etic, pe baza criteriilor de eligibilitate, participanții au fost incluși în studiu, nu înainte de a obține consimțământul informat al participanților. Studiul s-a realizat pe 20 de subiecți. Pentru pre-post evaluări ale flexibilității genunchilor s-a folosit Extensia Activă a Genunchilor (AKE) la pacienții luați în studiu. S-au analizat rezultatele individuale test-retest la fiecare subiect în parte.

Rezultate. Flexibilitatea ischiogambierilor a crescut la toți subiecții la care s-a aplicat tehnica TLR.

Discuții. Există puține studii privind eficiența acestei tehnici asupra flexibilității ischiogambierilor, acest studiu fiind unul dintre puținele de acest gen.

Concluzii: Rezultatele acestui studiu sugerează că tehnica "Mulligan's two leg rotation" este eficientă în creșterea flexibilității ischiogambierilor.

Introduction

Regular physical activity has been regarded as an important component of a healthy lifestyle and has proven to increase longevity and overall quality of life.[1] Muscle flexibility is

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defined as “The ability of a muscle to lengthen allowing one joint (or more than one joint in series) to move through range of motion” and loss of muscle flexibility “as decrease in the ability of the muscle to deform”. Resulting in decreased range of motion about a joint due to decrease in the muscle length.[2]

Posterior femoral muscles includes Biceps femoris, Semitendinosus, Semimembranosus, often familiarly termed as Hamstrings, which crosses hip and knee joints integrating coaxial extension with genu flexion. Functioning as a unit, the hamstrings are responsible for flexion and extension of knee joint, as well as extension of hip through the movement of the thigh in a reverse direction.[3] Being a two joint muscle its important characteristic is, hamstrings plays a crucial role in many daily activities such as walking, running, jumping, and controlling some movement of the trunk.[4] In gait cycle, hamstrings plays a important role in stance phase. They operate effectively as knee flexors from a position of hip flexion by increasing the length and tension in muscle group. [5]

Hamstrings muscle is a postural muscle and as it is biarticular, it has tendency to shorten even under normal circumstances. [6] Since it is a superficial two joint muscle, they tend to become very tight leading to a muscle imbalance, which can give rise to number of postural problems and leave us to open muscle injury.[7] Tight Hamstrings usually start at the age of 5 or 6 years, when children start their seated school careers. Prevalence & incidences of Hamstrings tightness in normal individuals in day today life is high due to limited activity and lack of regular exercise.[8] Investigations suggest adequate flexibility of the Hamstring muscles is necessary for a healthy lower back.[9] The flexibility of the Hamstrings provides for a functional mechanical advantage, while tight or shortened hamstring muscles adversely affect spinal mechanics.[10] A lack of pelvic mobility, due to tightness in the hamstring muscles, could limit pelvic mobility and cause strain on the lumbar spine. Hamstrings muscle tightness in normal healthy individual being the potential threat to alter and limit pelvic mobility and cause strain on the lumbar spine. In addition, tight hamstring could reduce the lordotic curve, which may impair spinal loading and alteration in the Lumbar Pelvic Rhythm will generate more strain on the lumbar segment giving rise to LBP. [11, 12]

Mulligan’s Bend Leg Raise Technique (BLR) and Two Leg Rotation Technique (TLR) are painless technique, and can be tried in any patients with hamstrings tightness, low back pain and who has limited and/or painful straight leg raise (SLR). It can be extremely useful in patients who have a gross bilateral limitation of straight leg raising. [13]

There is a scarcity of the studies documenting the efficacy of Mulligan’s Two Leg Rotation (TLR) technique on hamstrings flexibility in healthy subjects. Hence this study intended to evaluate the changes in Pre-Post effects of TLR technique in Hamstrings flexibility in healthy individuals.

Materials and methods

This study was conducted at KLE University Belgaum. Study design is Single group Pre-Post Experimental study. 20 subjects were included in the study based on the inclusion criteria. Inclusion criteria for the study subjects was Both male and female, Age group 18 to 25 years of age, Active Knee Extension (AKE) measurement more than 15 degree, Subjects who are able to comprehend command and willing to participate in the study. Subjects with Low Back Pain, History of any injury to Hamstrings muscle, History of any recent Abdominal, Back Surgeries, Subjects apprehensive for the Stretching Techniques were excluded from the study.

Ethical clearance was obtained from the ethical committee of the institution prior to the commencement of the study. Based on eligibility criteria subjects were included by convenience method and prior informed consent forms were signed by every subject included.

All the participants were explained about need for the study, confidentiality of the documentation, procedure for the measurements, and the treatment procedure. Baseline Measurements prior the study was conducted that is Pre-treatment AKE measurement for

hamstrings flexibility. Mulligan's Two Leg Rotation technique was applied to all the participants with a hold of 30 seconds for 10 repetitions and 1 minute rest between each stretch.

Mulligan's Two Leg Rotation [TLR]: Technique: subjects received TLR technique for Bilateral hamstring muscles. Subject was in supine lying, therapist stood at the side of limited AKE and subject gripped the side of the plinth with his/her opposite hand to the side receiving TLR. Both legs were flexed so that the feet are off the plinth. Keeping shoulders on bed, subject took his legs slowly to the side of limited AKE. If painful the degree of flexion at hips was altered (more or less) to enable further pelvic rotation. When the subject reached the limit, the position was sustained for 30 seconds and then back to start position. 1 minute rest was given between each stretch and was done for a set of 10 repetitions. Similarly procedure was done for opposite side. **(Figure 1)**



Figure 1: Mulligan's Two Leg Rotation technique.

Post-treatment AKE measurements were conducted for both hamstrings flexibility

Outcome measures

Active Knee Extension (AKE) Measurement

Subject was positioned supine on the plinth, and the lower extremity not being measured was secured to the table with a Mulligan's belt across the thigh. Another Mulligan's belt was placed over the anterior superior spines of the ilia to stabilize the pelvis. Subject then flexed his hip to 90 degrees (the angle was confirmed with a universal goniometer) and subject was instructed to grasp behind the knee with both the hands to stabilize the hip at 90 degree of flexion. Subject then actively extended each knee in turn as far as possible. Fulcrum of the universal goniometer was placed over the centre of axis of knee joint and AKE was measured.

(Figure 2)

AKE test is a reliable and valid tool in measuring the hamstrings muscle tightness, with reliability coefficients for test measurements were 0.99 and reliability coefficients for retest measurements were 0.99.[14]



Figure 2: Procedure for AKE measurement

Statistical analysis

Data was computed and analyzed using SPSS (Statistical Package for Social Science) software version 16. Mean SD was calculated for Pre and Post data for both male and female subjects and for right and left hamstrings. Test of Significance namely Paired T Test was used to compare the data. Level of significance was set up at $P < 0.001$.

Results

The results of the study were analyzed in terms of improvements in active knee extension i.e decrease in the AKE measured using universal goniometer.

Mean SD for right hamstrings flexibility for pre and post AKE scores were statistically significant with difference 2.81 ± 1.10 and $P < .001$. **Table 1.**

Table 1: PRE- POST AKE measurements for Right Hamstrings

Pre Rx	Post Rx	Difference	Paired T	P value
46.3 ± 8.61	43.5 ± 8.66	2.81 ± 1.10	11.332	< .001

Mean SD for left hamstrings flexibility for pre and post AKE scores were statistically significant with difference 3.1 ± 1.41 and $P < .001$. **Table 2.**

Table 2: PRE- POST AKE measurements for Left Hamstrings

Pre Rx	Post Rx	Difference	Paired T	P value
41.75 ± 8.46	38.65 ± 8.28	3.1 ± 1.41	9.829	< .001

Mean SD for pre and post AKE scores for both right and left hamstrings flexibility for male subjects were statistically significant with difference $2.75 \pm .88$ and $P < .001$ for right and 2.75 ± 1.03 and $P < .001$ for left hamstrings flexibility. **Table 3.**

Table 3: PRE- POST AKE measurements for Male Subjects

	Pre Rx	Post Rx	Difference	Paired T	P value
RIGHT	48.1 ± 9.46	48.4 ± 9.69	$2.75 \pm .88$	8.775	< .001
LEFT	45.75 ± 7.28	43 ± 6.98	2.75 ± 1.03	7.514	< .001

Mean SD for pre and post AKE scores for both right and left hamstrings flexibility for female subjects were statistically significant with difference 2.83 ± 1.26 and $P < .001$ for right and 3.33 ± 1.61 and $P < .001$ for left hamstrings flexibility. **Table 4.**

Table 4: PRE- POST AKE measurements for Female Subjects

	Pre Rx	Post Rx	Difference	Paired T	P value
RIGHT	45.08 ± 8.18	42.25 ± 8.10	2.83 ± 1.26	7.745	< .001
LEFT	39.08 ± 8.40	35.75 ± 8.03	3.33 ± 1.61	7.153	< .001

Discussion

To the best of our knowledge, there is no study evaluating the effectiveness of Mulligan's Two Leg Rotation (TLR) for improving the hamstrings flexibility in healthy young subjects. The results of the present study demonstrated that Mulligan's TLR increases post-intervention hamstring flexibility in terms of AKE measurements. For both male and female subjects, both right and left AKE measurements were significantly reduced post intervention which was statistically significant.

A study by Cheraladhan et al conducted an experimental study to compare immediate effects of Mulligan's Bent leg raise and passive stretching in individuals in the age group of 20-30 years, pre and post measurements of straight leg raise reported improvements in bent leg raise

group were statistically improved as compared to passive stretching group. [15] The results of the present study are similar to the previously reported study for immediate increase in the hamstrings flexibility in terms of AKE measurement following TLR technique.

Study by Toby Hall et al reported no immediate effect following single intervention of Mulligan's Bent Leg Raise (BLR) technique on hamstrings flexibility, but had increase 24 hours following the intervention. [16] Immediate post effects seen in the present study were relatively more statistical improved as compared to the previous studies evaluating immediate effects on hamstrings flexibility post BLR and Traction with Straight Leg Raise (TSLR).

Another study by Toby Hall et al reported immediate increase in the outcome of straight leg raise following Mulligan's TSLR. [17] These results are in accordance with the results of the present study for Mulligan's technique in increasing hamstrings flexibility is effective in patients with low back pain.

Study by Neha Jain et al reported both Mulligan's BLR and Straight Leg Raise (SLR) technique were effective in improving hamstrings flexibility immediately after the intervention in healthy subjects. [18] Results of the present study provide an important platform for the therapists to compare the most effective Mulligan's intervention for improving the hamstrings extensibility.

The beneficial effect of TLR technique in increasing the hamstrings flexibility in the present study might be due to changes in muscle stretch tolerance of hamstrings and increased hamstrings viscoelastic properties caused during the application of the TLR technique. [19] Increases in muscle length are measured by "extensibility" that is improvement based on actual muscle lengthening (i.e., increased extensibility) which was well demonstrated by the decrease in AKE measurement in this study.

Shannon et al and Addison et al reported the functional problems associated with tight hamstrings [20, 21] and hence with results obtained from the present study, suggest Mulligan's TLR technique is applicable in increasing the Hamstrings flexibility there by reducing the risk for problems associated with tight hamstrings.

Limitations

- Limited number of subjects.
- Further studies are required with long term follow-up for the consistency of the effects.
- Comparative studies between Mulligan's TLR, BLR, TSLR technique are required to compare their efficacies.

Conclusion

Thus the study concludes stating results of this study suggests Mulligan's two leg rotation technique to be effective in increasing hamstrings flexibility.

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