

Effectiveness of Foam Roller on Plantar Fascia and Hamstring in Combination with Active Release Technique for Hamstring Tightness in College Students

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Abstract

Introduction: In normal human function flexibility is an important aspect. Smooth, unrestricted, painfree ROM are done by a single joint or series of joints. The knee joint is stabilized by hamstring muscles, extension of knee decelerates by contracting eccentrically lead to flexion of knee and hip extension. When there is lack of ability of muscle to change its length from its state of full contraction to full stretch led to hamstring tightness.¹

Need of Study: Hamstring tightness leads to high risk of recurrent injury, decreases the performance of daily living of students. It also lead to back pain and gait abnormality. So ART in combination with foam roller can decrease hamstring tightness and decrease back pain and student will do their activities without restriction.

Methodology: 30 subjects included in the study. At the mid of the treatment session mid tests done to see the improvement and post tests was done at the end of treatment session. Hamstring tightness were evaluated by finger to floor distance test Sit and reach test and Active knee extension test of subjects were done to note the pretest score. Treatment of Foam roller and active release technique was given to patient for 6 days per week for a consecutive 4 weeks.

Result: Data was analyzed by using one sample t-test. Pre and Post score were taken via with SRT and AKET. P value < 0.05.

Conclusion: Foam roller treatment on plantar fascia and hamstring with Active release technique show its beneficial effect for hamstring tightness in college students.

Improvement is easily seen by taking sit and reach test and active extension test as an outcome measure.

Keywords: Foam rolling; Active knee extension test; Active release technique; Sit and reach box.

Introduction

In normal human function flexibility is an important aspect. Smooth, unrestricted, pain free ROM are done by a single joint or series of joints. The knee joint is stabilized by hamstring muscles, extension of knee decelerates by contracting eccentrically lead to flexion of knee and hip extension. When there is lack of ability of muscle to change its length from its state of full contraction to full stretch led to hamstring tightness.¹

Draw the pelvis in to posterior rotation during normal daily postures only because of reduced hamstring extensibility. Herniations in the lumbar curve and changes the biomechanical line of pull of back and strains the back during usual day to day activity all are developed by it and cause thoracic kyphosis, spondylosis, disc herniation changes in lumbopelvic rhythm and low back pain.²

Find the specific tissues that are restricted is target by ART. Physically work on soft tissue back

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to their normal texture and length with the help of various hand position and soft tissue manipulation method.³

Mechanical friction is caused between the foam roller and superficial and deep layers of soft tissue when foam roller is applied. It helps in stimulation of primarily mast cells and produce histamine and lead to vasodilatation. Vasodilatation help to increase blood flow to the area treated and quicker as well as complete diffusion of waste products from the tissue to the blood and finally increase intramuscular tissue temperature and blood flow, both the seeffects cause increase in viscoelastic properties of muscle.⁴

In college going students of age group 18 to 25 the prevalence of hamstring tightness is very high. There is higher percentage of prevalence of hamstring tightness in right lowerextremity, between 30 to 45 degreee verity of hamstringtightness is high. Shanka Weerasekara et. al conducted study and found that hamstring tightness higher in those who are engaged in sports.⁵

The patients with nonspecific LBP have high prevalence of hamstring and iliotibial band tightness and concluded that hamstring tightness is large in number that is 85 % ascompared to iliotibial band tightness that is 21.66%.⁶

In modern society sedentary style of living also lead to pos turalabnormalities. The prolong sitting hours required is most of jobs and educational setup scan affects of ttissues flexibility especially two join tmuscles. Dysfunctional motorcontrol pattern leading to a sub maximal finning pattern of postural muscles due to hamstring tightness resulting in function of hamstring as stabilizers rather than their main function of primemovers. This primary function change led to present ation of ham string tightness. According to Gajdusek et. al 2011. In forward bending hamstring flexibility also affect the pelvic as well as thoracic angle and ROM. Hamstring tightness also associated with lumbar pelvic rhythm, development of plantar falsities as well as patellar tendinopathy and patellofemoral pain syndrome.⁷

Patients suffer from shortening of hamstring can detected by various test and Finger to floor distance test (FFDT) is one of the tests to detect hamstring tightness frequently. A plat form of 20cm in which subject stood after removed the shoes and feet to get her. Subject asked for forward bending as far as possible and maintains knees, arms, fingers in extended positioning than vertical distance from middle finger of subject to platform was measured

in centimeters. The test was possible when subject did not touch the plat form and negative when subject touch the platform.⁸

Foam rolling exercise used for preventive as well as rehabilitative purpose. Endurance and strength enhanced by formrolling. It show sits beneficial effect in following ways-

- Stress relaxation improvement.
- Reduction in delayed on set of musclesoreness (DOMS) and pain.
- Anaerobic capacity improved.
- Increase Range of motion.
- Muscle and connectivet is suet one decrease.
- Sensmotoric function and coordination increased.
- Warming up and blood flow increased
- Improving strength.

Foam rolling treatment proceed towards Active release technique (ART). It is the method for treating tendon, nerve and My ofascial and also for strain injury, acute in jury and functional fixation damage due to abnormal posture. All the adhesions of scar tissue and soft tissue thar lead to pain, spasm, muscle weakness, tingling and other many more symptoms are resolved by ART.⁹

Objective of study

To find the effect of foam roll eronhamstring and plant a fascia for ham string tightness.

To find the effect of Active Release Technique on ham string for ham string tightness.

To find the combined effect offoamroller and Active Release Technique for hamstringtightness.

Need of Study

Hamstring tightness leads to high risk of recurrent injury, decreases the performance of daily living of students. It also lead to back pain and gait abnormality. So ART in combination with foam roller can decrease hamstring tightness and decrease back pain and student will do their activities without restriction.

Purpose of study

Now a days most of students require prolonged sitting on chair due to their studies and due to their work on computer Sedentary life style is associated with obesity as well as muscle tightness led to chronic problem. So, ART with foam roller help

us to release muscle tightness and student able to give full performance in every field and achieve the irgoal.

Hypothesis

Experimentalhy pothesis

There may besignificant effecto Foamrolleron plant arfascia and hamstring with Active release technique for Hamstring tightness in college students.

Nullhypothesis

There may not besign if icant effect of Foamrolleron plant arfascia and hamstring with Active release technique for Hamstring tightness in college students.

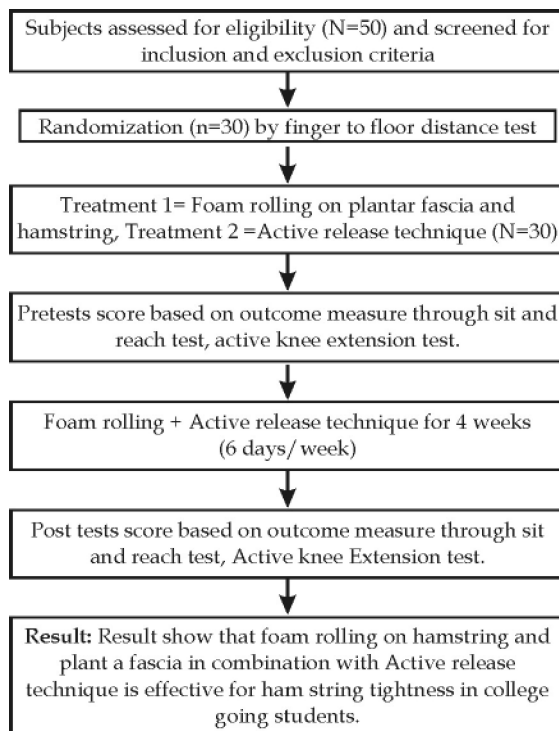


Fig. 2.1: Work plan with flowchart.

Review of literature

Oliva Stovern et. al 2019 conducted study One ffectoftraining with a foamroller on Ankle and Knee ROM, Hamstring flexibility, Agility and vertical jump height.20 subjects completed 6 weeks of form rolling which was held three days per week. Fourteen volunteers with similar characteristics served as a control group. Pre and post testing evaluation included measurement of ankle dorsiflexion and knee flexion ROM, hamstring flexibility, agility and vertical jump height. Concluded that six weeks

of formrolling had a positive effect on hamstring flexibility and did not negatively affect agility of vertical jump height.¹⁰

Shradha Kothawale et. al 2018 conducted study oneffectivenessof position alreleasetechniqueverses Active release technique on hamstringstightness. Sixty participants with hamstrings tightness meeting the inclusion and exclusion criteria were allocated into two groups. Group A PRT, Group B ART with twenty-nine participants in PRT group and twenty eight in ART Group. AKE and Sit and reach test was measured using goniometer to determine effectiveness of the technique and concluded ART can be used asaneffective physiotherapeutic intervention inreducingham stringstight nessinstantly.¹¹

Gopi contracture MPT Rehabilitation 2017 conducted study on Effect of activerelease technique on hamstrings flexibility in patients having chronic low back pain. 15 subjects were taken in the study. Measurement of the severity of pain by using VAS degree of hamstrings tightness by active knee extension test and functional disability by Modifies Oswestry disability index was done. They all were given ART, isometrics back exercise and hot pack to back. Conclusion was that ART improves hamstrings flexibility and reduce LBP and disability over.¹²

Andrew R Mohr et. al on 2014 conducted study on effect of form roller and static stretching on passive Hip flexion ROM. Forty subjects volunteered to participate in these investigations. During each of 6 session subjects passive hip flexion ROM was measured before and immediately after staticstret ching,formrollingandstaticstretching, form rolling or nothing. Result was supported the use of form roller in combination with a static stretching protocol.¹³

Vijay Kage, Rakhi Ratnam on 2014 conducted study on Immediate effect of active release technique and mulligan bent leg raise in subjects with hamstring tightness, total 40 normal healthy subjects (20 in each group) were included in the study under simple randomization method. Group A given Active Release Technique and Group Bgiven Mulligan Bent Leg Raise technique for hamstring tightness and result shown that single session of Active release technique is better as compared to Mulligan bent leg raise technique to improve hamstring flexibility and range of motion.¹⁴

Kwangsun Do et. al on 2018 did study on acute effect of self myofascial release using a form roller on the plantar fascia on hamstring and lumbar spine

superficial backline flexibility. The participants were then randomly assigned to SMR group, then the group received passive mobilization of ankle joint in the supine position and the showed that SMR on plantar fascia was immediately effective for improving the flexibility of SBL of lumbar spine and hamstring.¹⁵

Vibhuti Vinod Singh Gaur et. al. on 2020 conducted study on Short Term Effects of Muscle Energy Techniques. Active Release Technique in Improving Hamstring Flexibility and Pain in Patients with Acute Anterior Cruciate Ligament (ACL) Tear. 60 subjects were divided into three groups. The muscle energy technique group included 5 minute warm up followed by MET routine for 6 minutes and ART group included 5 minute warm up followed by an ART routine for 6 minutes and concluded that both the techniques muscle energy technique and active release technique are equally effective.¹⁶

Divya. G Patel et. al 2016 conducted study on Immediate effect of application of bilateral self myofascial release on plantar surface of foot on hamstring and lumbar spine flexibility: A study was conducted on 30 subjects who were randomly allocated into 2 groups. Group A self myofascial release was given. Group B was a control group (no therapy). Baseline and post flexibility was assessed by sit and reach test (SRT) and Active Knee Extension (AKE) test and concluded that a single session of SMR on bilateral plantar aspect of foot is effective in increasing hamstrings length, but there was no change seen in lumbar spine flexibility in young asymptomatic individuals.¹⁷

Dr. Jash Desai et. al (2020) did study on Comparison on self myofascial release techniques using foam roller and Lacrosse ball in individuals with hamstring tightness. 32 individuals, 18-30 years, both genders, with Hamstring Tightness, divided in two groups. Group A(n=16) performed foam rolling and Group B(n=16) performed self release with lacrosse ball and concluded that Self myofascial release with foam roller showed statistically significant difference in improving Hamstrings flexibility as compared that with Lacrosse balls.¹⁸

Methodology

Sample

30 patients with Hamstring tightness by finger to floor distance test who were willing to take treatment for four weeks session after a written consent were taken.

Sample random sampling was applied and 30 patients were selected by finger to floor distance test and was included in the study. Study Centre Shri Mahant Indresh Hospital /University Patel Nagar Dehradun. UK. Study Duration. The duration of study was four weeks. selection criteria inclusion criteria Age group between 18 to 30 years were affected by hamstring tightness. Gender Heterogeneous population. Hamstring tightness present in college students (finger to floor distance test) exclusion criteria any history of lower extremity injury in past 3 months, UMN, LMN, Chronic low back pain, No recent injuries of hamstring muscles. Variables. Independent Variables Foam Roller. Active Release Technique. Dependent Variables Hamstring Flexibility Hip and Knee Rom

Outcome Measures Sit and Reach Test (Srt), Active Knee Extension Test (Aket) Sit and Reach Test

Material Used

- Couch.
- Foam roller (Cylindrical roller and ball).
- Yoga mat.
- Goniometer.
- Stop Watch.
- Stepup.
- Pen and note book.
- Sit and reach box.
- Measuring.

Procedure

30 patients between age group of 18-30 years were included in study after taking a written consent from patients. Patients were made aware of the research study and procedure to be followed. 30 patients were selected that is both male and female by finger to floor distance test. All 30 patients follow the pre tests that is Sit and reach test and Active knee extension test and then treatment were given which included foam roller on hamstring and roller ball on sole of foot and then Active release technique for hamstring muscle and then post tests were done.

The study was of 4 weeks, 6 days per week at department of Physiotherapy in Indresh hospital Examination included assessment which was performed on first day then at the mid and then last day of treatment and data was recorded.

Treatment

Foam roller on hamstring muscles

In the foam roller technique generally in previous articles it was observed that foam roller was applied actively on patients mostly the athletes because they were trained and have strong biceps so they easily done it on sitting position. This study is on college going students, they were not able to applied form roller actively on hamstring because of weak biceps so passive foam roller treatment was given by therapist. Position of patients was prone lying and then the rapist applied form roller pressure on hamstring to release the muscle.

From the distal end of hamstrings (the popliteal fold) to the proximal end (glutealfold) a roll was started and then reversed. The roller intensity is maintained constantac cording to patient not too high not too low. During the treatment the roller was rolled by a constant pressure by the therapist. Four sets were performed which included 30 second sexercise and 30 second rest. (Fig. 4.7).

Foam roller ball on sole of foot

The patients were asked to take a sitting position. They were then instructed to roll the ball on sole of each foot, from behind the metatarsal head to the heal concentrating on the medial arch. Participants were instructed to feel discomfort but no pain, by applying as much pressure as possible to the soles, as greater pressure help to increase the flexibility. Four sets were performed-30 second exercise and 30 second rest. (Fig. 4.6)

Active Release Technique

Patient was in apron position on treatment table. The knee was then flexed to shorten the hamstrings. The therapist then evaluated the texture and tightness of hamstrings by palpating and manually contacting the exterior skin to see where maximum tightness could be felt. Tension was placed on bellies of hamstrings longitudinally at a specific tension and asked the patient to extend his knee as per protocol. Cycle was repeated 10 times. (Fig. 4.8)



Fig. 4.6: Foam roller ball on sole.

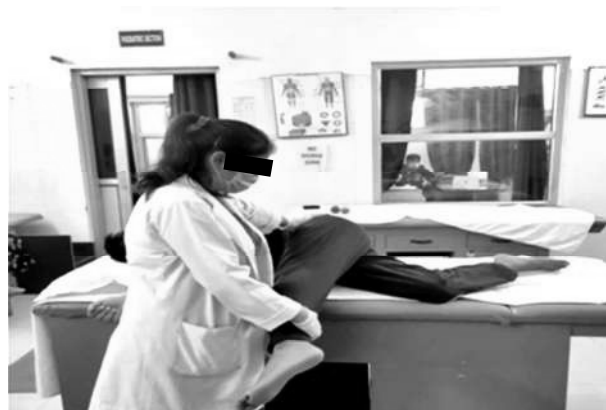


Fig. 4.7: Foam Roller on hamstring.



Fig. 4.8: Active release technique.



Fig. 4.9: Hamstring stretching.

Data Analysis

This chapter deals with the statistical analysis of the 2 outcome measure that is SRT and AKET, between pre, mid and post treatment of hamstring tightness patients. The data was analyzed by one Sample t-test used to compare pre, mid and post treatments scores of SRT and AKET. The data was analyzed by SPSS 20 (Statistical Package for the social Sciences)

Result

This chapter deals with the result of data analysis of the data of two outcome measures that is SRT and AKET with in 30 patients. The score were analyzed and interpreted to determine the treatment is effective in improving hamstring tightness in college students one sample t-test was used to analyze and compare pre, mid and post treatment score within the 30 patients. Significant level of 0.05 was used for data analysis.

T-Test

Table 6.1: One Sample Statistics.

	N	Mean	Std. Deviation	Std. Error Mean
Srtpre	30	16.40	2.717	.496
Srtmid	30	20.97	2.404	.439
Srtpost	30	24.96	1.950	.356

Table 6.2: One Sample Test.

	t	Df	Test Value=0			
			Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Srtpre	33.072	29	.000	16.403	15.39	17.42
Srtmid	47.776	29	.000	20.973	20.08	21.87
Srtpost	70.115	29	.000	24.960	24.23	25.69

SRT Comparison of Pre Mid and Post Values.

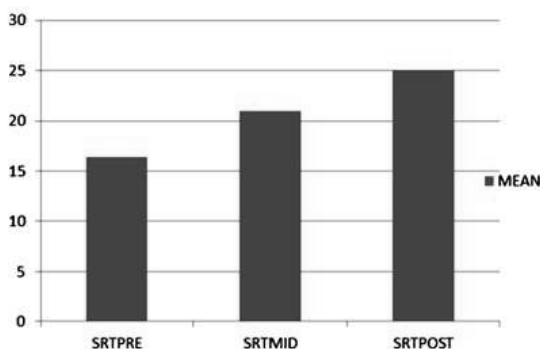


Fig. 6.1: SRT Comparison of Pre, Mid and Post Value.

Explanation

From the above table we can check the value of mean is less in PRESRT than it improve in MID SRT and highest in POST SRT. It shows that there is significant improvement in POST SRT as compared to PRE SRT and MID SRT. Thus Foam roller on hamstring and plantar fascia in combination with active release technique is effective in improving hamstring tightness in college students. Analyzing SRT revealed significant difference in POST SRT, Mean and standard error of mean (24.96 ± .356) when compared to PRE SRT Mean and standard error of mean (16.40±.46) and MID SRT Mean and standard error of mean (20.97±.439). (Table 6.1, 6.2) (Fig. 6.1)

T-Test

Table 6.3: One Sample Statistics.

	N	Mean	Std. Deviation	Std. Error Mean
Akepre	30	34.53	5.211	.951
Akemid	30	29.77	6.306	1.151
Akepost	30	25.93	6.958	1.270

Table 6.4: One Sample Test.

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
					Akepre	36.298
Akemid	25.853	29	.000	29.767	27.41	32.12
Akepost	20.415	29	.000	25.933	23.34	28.53

AKE Comparison of Pre Mid and Post Values.

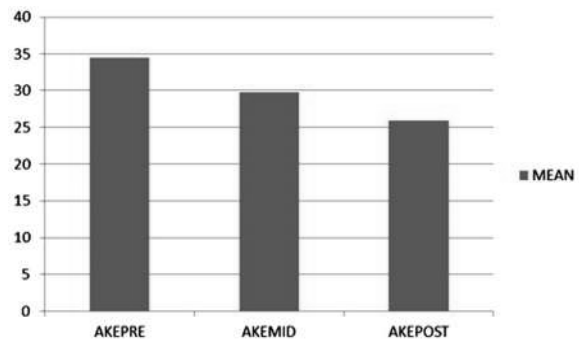


Fig. 6.2: AKE Comparison of Pre Pre, Mid and Post Values.

Explanation

From the above table we can check the value of

mean is high in Preake than low in Mid Ake and lowest in Post Ake. In patients with improvement by treatment the Ake value decreases. It shows that there is a significant improvement in Post Ake as compared to Pre Ake and Mid Ake. Thus Foam roller on hamstring and plantar fascia in combination with Active release technique is effective for hamstring tightness in college students. Analyzing Ake revealed significant difference in Postake, Mean and standard error of mean (25.93 ± 1.270) when compared to Pre Ake Mean and standard error of mean ($34.53 \pm .951$) and Mid Ake Mean and standard error of mean (29.771 ± 1.151). (Table 6.3, 6.4) (Fig. 6.2).

Discussion

The purpose of study was to study the effect of foam roller on hamstring and plantar fascia with ART for hamstring tightness in college going students. In this study 30 subjects were included according to FFDT of agegroup 18 to 30 years.

Improvement in hamstring flexibility in college going students is one of the most important aim of treatment so they can do their activity of daily living properly. If hamstring flexibility can maintain it prevent the back pain of students because now a days due to sedentary life style of student's hamstring flexibility decreases. Working on computer, desk work for long periods of time and less involvement in sports activity make hamstring tight easily. Mainly the goal of treatment of foam roller and ART is to improve hamstring flexibility so patient can do their daily activity without restrictions. In this study patient was selected by finger to floor distance test and then two outcome measures was used as pretests and posttests. Post tests show marked improvement in patients by giving the treatment which is foam roller and ART technique.

In a research by Mansi Gala et . al proved that Self myofascial release therapy and transverse massage therapy both are effective in improving hamstring flexibility in desk job workers but self - myofascial release therapy showed better results. One more study by Hariharasudhan Ravichandran et al show that effectiveness of active release technique may varies among athlete and non athlete which requires future studies. So this study was done to see effect of foam roller and Active release technique together in hamstrung tightness. Through in this study improvement was seen when treatment was given to subject. Pre tests and post tests help to see the improvement in subjects.

Limitation of Study

- In college going students, giving foam roller actively is not possible as they are not trained like a athlete and their biceps are weak, therefore, passive foam roller treatment was given by me. It was not possible to measure the amount of pressure applied to hams by me and it only depended on my patient's comfort and tolerance level.
- This treatment has shown its beneficial and desired effects in around 10 to 15 days but how long its effect will last is also a part of study as there is no follow up done by me.
- Proper follow-up was not done due to Covid19 pandemic.

Future Research

The future research can be proceeded on study not only by releasing hamstring muscle and by releasing the sole of foot for hamstring tightness to prevent LBP. We can also release the calf muscles to increase hamstring flexibility because calf muscles have direct link to hamstring muscle and it can show more better effect. Subjects can be asked to do actively and result scan be compared between the active and passive procedures.

Conclusion

Foam roller on hamstring (passively by the rapist) and foam roller ball (actively by patient) on sole of foot in combination with Active release technique have shown its beneficial effect on increasing hamstring flexibility in college going students. So, it is better to use the foam roller technique and active release technique to increase hamstring flexibility and decrease the low back pain especially for those who have sedentary lifestyles. Foam roll can be used for different group of muscles that is for hamstring, calf muscle and for sole of the foot. Thus the Experiment hypothesis that is Foam roller on hamstring and plantar fascia in combination with Active release technique is effective is accepted.

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