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Effectiveness of Myofascial Release with Foam Roller Versus Static Stretching in Healthy Individuals with Hip Adductor Tightness: A Randomized Clinical Trial

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ABSTRACT

Background: *Hip adductors are a group of muscles that stabilize the pelvis during weight transfer in lower limbs in a gait cycle. This muscle group commonly goes into tightness as the full available range of motion is scarcely used which in turn may be a predisposing factor in the development of knee and low back pain.* ***Aim:*** *Traditional method of static stretching has proved to be effective in reducing tightness. Foam roller is an upcoming method used for stretching of various muscle groups which has shown superior results. The aim of the study was to compare the treatment methods.* ***Methods:*** *Thirty young healthy individuals were selected after screening for bilateral hip adductor tightness using smartphone inclinometer for hip abduction range of motion. They were randomized to either the foam roller or static stretching group. Subjects attended a baseline session, followed by 5 days intervention, and reassessment on the 5th day post intervention. Outcome measures used were hip abduction range of motion using smartphone inclinometer, single leg hop test and 8 direction star excursion balance test for dynamic postural stability.* ***Results:*** *Both the groups showed significant improvements in hip abduction range of motion, single leg hop test and SEBT. When compared, the foam roller group showed marginally better results than static stretching. The results also showed significant pre-post differences within the respective groups.* ***Conclusion:*** *Treatments have shown significant results in both groups however, myofascial release with foam roller has proved to be marginally more effective than static stretching in releasing hip adductor tightness, increasing hip abduction range of motion and improving dynamic balance.*

Keywords: Tightness, Myofascial release, Foam roller, Smartphone inclinometer

INTRODUCTION

Tightness is defined as adaptive shortening or lengthening of a muscle and its connective tissue which is a slow, non-pathologic process occurring in response to the range of motion being utilized in the related joints. With shortening the connective tissue elements of a muscle are in a continuously shortened state and the muscle has increased reactivity to both central and peripheral stimuli [1]. Morphologically, there is a reduction in the number of sarcomere units in series, there is no decrease in individual sarcomere length and it can be resolved in a relatively short time with stretching exercises [2]. Tightness of hip adductors is relatively common and may result from adaptive changes in muscles that are not routinely stretched [3]. Hip flexibility has been identified as one of the primary etiologic factors associated with musculotendinous strains. Groin injuries account for 10% to 18% of all soccer injuries [4,5].

The adductors function by reflex response to gait activities. In bilateral stance, the adductors act as synergists to the abductor muscles when both feet are on the ground thus enhancing side to side stabilization of the pelvis [6]. Functional role of adductors is to stabilize the pelvis during weight shifting from one limb to the other. This role is seen during gait as the adductors contract during the transitions from stance phase to swing and swing to stance [3].

Causes of adductor tightness can be a secondary complication due to underlying pathology as seen in disorders of central nervous system resulting in spasticity which include cerebro-vascular accidents (strokes), cerebral palsy, multiple sclerosis, in individuals advised bed rest and who do not receive active or passive exercise [3]. Other factors include sedentary lifestyle, postural malalignment, and muscle imbalances etc. [2].

In an ambulatory individual, extreme tightness of the adductors of the hip can create significant problems in gait, leading to Scissors gait. During swing, the limb with the tightness may have difficulty passing the stance limb, causing the individual to trip over the stance limb. The limb with the tightness also may land in front of the opposite limb at the beginning of the double limb support, again presenting a threat to tripping [3]. Hip adductor tightness has been associated with patellar maltracking leading to patellofemoral pain syndrome [7]. In recent research the strength and low flexibility of hip muscles is also being reviewed as a cause for low back pain [8].

Stretching involves the application of manual or mechanical force to elongate or lengthen structures that have adaptively shortened and are hypomobile [9]. Three methods of stretching to develop flexibility have emerged: ballistic stretching, static stretching, and proprioceptive neuromuscular facilitation (PNF) techniques. Static stretching has become the most widely used method for increasing ROM because of the simplicity of execution and lower potential for tissue trauma [10]. Recent study has proved that static stretching and PNF techniques were equally effective for immediately increasing flexibility of the hip adductors in female ballet dancers [11].

Static stretching is a commonly used method of stretching in which soft tissues are elongated just past the point of tissue resistance and then held in the lengthened position with a sustained stretch force over a period of time. The duration of static stretch is based on the patient's tolerance and response during the stretching procedure. The duration of a single stretch cycle can range from 5 seconds - 5 minutes [2].

Myofascial release (MFR) refers to the manual massage technique for stretching the fascia and releasing bonds between fascia and integuments, muscles, bones, with the goal of eliminating pain, increasing range of motion and balancing the body. The fascia is manipulated, directly or indirectly, allowing the connective tissue fibers to reorganize into a more flexible, functional fashion. The purpose of MFR is to release restrictions within the deeper layers of fascia. Evidence shows that MFR is safe, effective, and designated to be utilized individually or with appropriate modalities, mobilization, exercise, and flexibility programs [12].

MFR is classified under two broad categories: direct myofascial release, indirect myofascial release [7]. In indirect MFR the individual uses a soft roll, or ball (tennis ball, soccer ball) on which one has to rest his body weight, then, by using gravity to induce pressure along the length of the specific muscle or muscle groups, rolls their body on the object, slowly (1-2 seconds an inch), allowing for the fascia to be massaged. Upon sharp pain, individual must back up and hold the position, so as to not force undue stress upon the fascia and muscle. By holding the roll just before the pain, it allows the myofascial time to relax and release before continuing through the roll. If the pain does not go away, one may have to use a softer object [13].

There are many studies proving interventions effective on muscles like quadriceps, hamstrings, etc. But there is paucity of literature in hip adductor tightness. Hence this study is aimed at finding the effectiveness of static stretching and MFR with foam roller in reducing hip adductor muscle tightness and comparing the effect of both the interventions.

METHODS

Study Design

Randomized clinical trial.

Ethics

The study was approved by the institutional ethics committee on 29/10/2014, in accordance with the ethical standards of experimentation.

Sample Size

Fifteen subjects were included in each group; hence the total study population was 30.

$$Z = \frac{10 \times (21.16 + 3.24)}{5^2}$$

$$Z = \frac{10 \times (21.16 + 3.24)}{5^2} = 15$$

where, d_1=11; d_2=16; S_1=4.6; S_2=1.8

Inclusion and Exclusion Criteria

The inclusion criteria were:

1) Healthy males and females in the age group of 18-25 years
2) Subjects with hip abduction less than 35 degrees unilaterally
3) Subjects willing to participate.

The exclusion criteria were:

1) Present pathology of hip and spine
2) Previous history of hip trauma/surgery
3) Subjects with limb length discrepancy of the lower limb
4) History of low back pain in the past six months
5) Hip joint hyper mobility
6) UMN/LMN lesion

The subjects who met the inclusion and exclusion criteria were included in the study.

Grouping

Thirty subjects were randomly allocated into two groups by using the envelope method. Brief demographic data was taken. Group A was given static stretching (n=15) and Group B was given myofascial release with foam roller (n=15).

Methodology

Group A was given static stretching. The subject was positioned in supine on the treatment table. The non-treatment leg rested outside the table with knee positioned at 90 degrees. The treatment leg was passively stretched for 30 seconds hold, for 4 sets of 2 repetitions with 30 seconds interval between the repetitions.

Group B was given myofascial release with foam roller (manf: co-fit 90 cm, blue, smooth surface). The subject was given a demonstration by the therapist and guided with instructions while performing the release. The foam roller was positioned beneath the adductor muscles with hip in abduction and external rotation while the patient assumed a prone lying position with the body weight supported on elbows. This was performed for 4 sets of 2 repetitions with 30 seconds interval between repetitions.

The therapy was given to one hip adductor muscle group followed by the other. Both the results were compared.

The outcome measures used in this study were Hip Abduction Range of Motion using Smartphone Inclinometer for flexibility; Single Leg Hop Test and 8 Direction Star Excursion Balance Test for dynamic stability. The values were assessed for the dominant and the non-dominant leg. Pre-intervention values of all the outcome measures in the subjects were noted prior to the beginning of the study on Day 1. This was followed by intervention for 5 consecutive days. The post intervention measures were taken on Day 5 and the values were compared.

Statistical Analysis

The statistical analysis was done using the SPSS Version 16 software. $p<0.05$ was considered significant, paired t-test value, SD and mean of the data were analyzed and compared.

After screening 50 subjects for hip adductor tightness, 30 subjects who met the inclusion and exclusion criteria were taken for the study and were randomly allocated to either Group A (static stretching) or Group B (foam roller). Group A had 3 males and 12 females and Group B had 4 males and 11 females.

RESULTS

There was no significant change in the baseline characteristics between both the groups (Table 1).

Table 1 Comparison of two groups (Group A and Group B) with respect to age, height, weight, and BMI scores

Variables	Group A		Group B		t-value	p-value
	Mean	SD	Mean	SD		
Age	21.4	2.23	22	1.31	-0.8987	0.3765
Height	158.13	16.23	162.8	6.56	-1.0327	0.3106
Weight	59	11.03	54.8	5.28	1.3299	0.1943
BMI	25.92	12.65	20.63	1.51	1.6084	0.119

Outcome Measures Analysis

Hip Abduction ROM

There was a significant difference in the pre- and post-test values of hip abduction range of motion for the right and left leg in both the groups. The % of change in Group B right: left (42.3:45.9)% was more in both legs as compared to Group A: Right: Left (33.5:32.0)% (Figure 1).

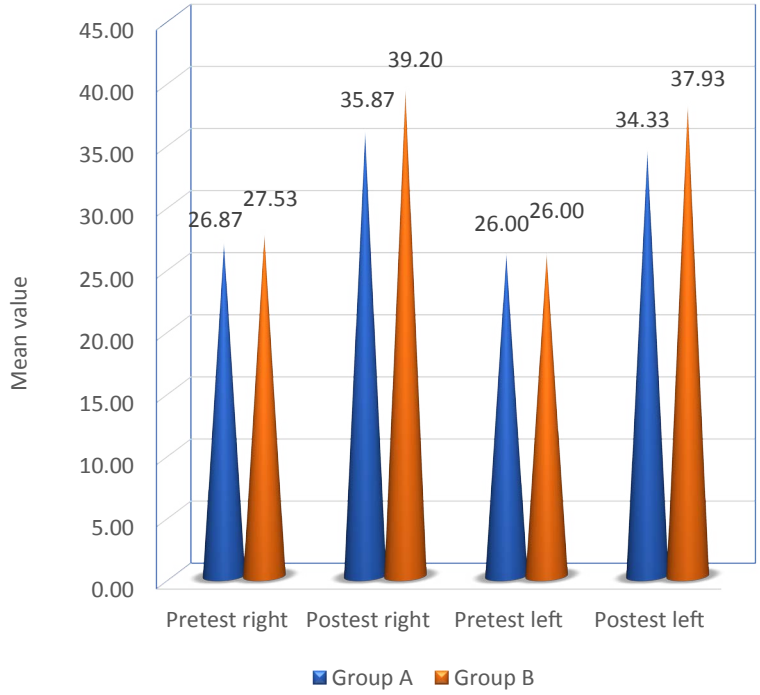

Figure 1 Comparison of two groups (Group A and Group B) with respect to range of hip abduction scores in right and left sides at pre- and post-test

Single Leg Hop Test

There was significant difference in the percentage of change in Group A in both right and left leg (10.6%; 11.6%). However, there was no change in the values of Group B in both legs in Single Leg Hop Test. There was a difference in the pre- post values for right and left leg in both the groups (Figure 2).

Star Excursion Balance Test

There was a significant difference in the pre- and post-test values of right and left ranges in the star excursion balance test in both the groups. In anteromedial, medial, posteromedial, posterior, and posterolateral groups there was a significant difference in Group A and Group B. In anterolateral group there was a significant difference in the right side in Group A and right and left in Group B. In anterior group there was a significant difference in the per cent of change in right and left in Group A and left in Group B. In the lateral group there was a significant difference in the per cent of change in the left side of Group A and left and right of Group B.

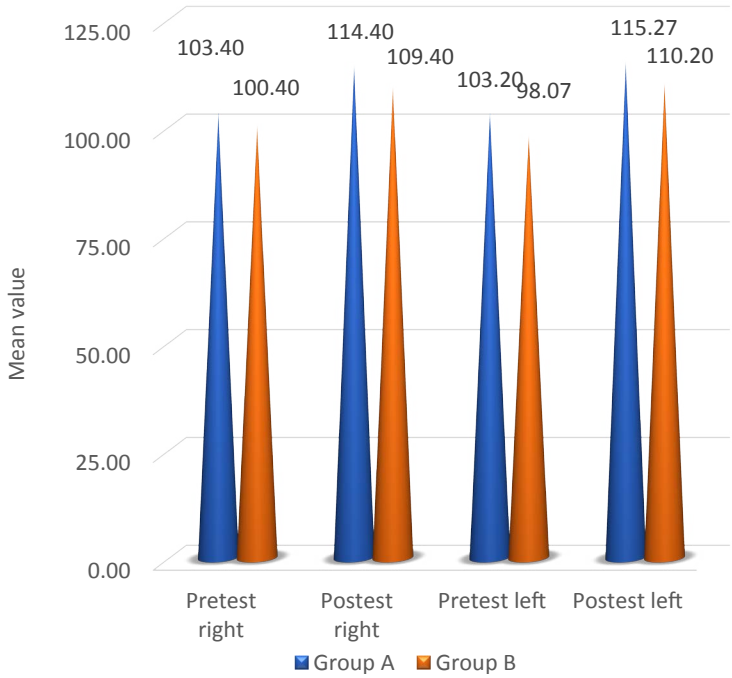

Figure 2 Comparison of two groups (Group A and Group B) with respect to single leg hop test scores in right and left sides at pre- and post-test

DISCUSSION

The current randomized clinical trial found that both static stretching and myofascial release with foam roller when given for 5 days intervention reduces hip adductor muscle tightness. There was a clinically and statistically significant difference in hip abduction range of motion, single leg hop test and SEBT AM, M, PM, P, PL for both the groups. In A, AL, L groups the change was clinically significant but statistically not significant. Group B: i.e., foam roller group, showed marginally better results when compared to Group A This suggests that foam roller is a slightly better option in reducing tightness of hip adductors when subacute effects are intended.

According to the available literature there is dearth of evidence that states the effectiveness of myofascial release with Foam roller for hip adductor tightness for subacute duration and comparing these effects with conventional stretching protocols.

A study was done by McDonald, et al. to evaluate the effect of an acute bout of self-myofascial release on quadriceps using foam roller on ROM, the study showed significant results. The proposed theory for increased range of motion was that after foam rolling there is a change in the thixotropic property of the fascia encasing the muscle. Fascia is made up of colloidal substances, and when it is disturbed, via heat and mechanical stress, it softens and takes on a more gel-like state, but when left undisturbed it thickens and becomes more viscous, taking on a more solid state and forms cross links inhibit improper biomechanics and decrease ROM. The use of foam roller mechanically shears out these crosslinks and remobilize the fascia back to its gel like state, increasing the soft tissue compliance and hence allowing greater ROM [14].

Similar mechanism was explained by Roylance, et al. who performed a study to compare the effectiveness of static stretching and postural alignment exercises when given with and without foam roller, the group which received foam roller in conjunction with static stretching and postural alignment exercises had shown improvements in the joint range of motion [15].

A study was done by Davis, et al. to determine the effectiveness of 3 stretching techniques on hamstring flexibility using consistent stretching parameters, the results showed increased hamstring length after static stretching protocol. Static stretching is a common technique used by strength and conditioning specialists and athletes to increase muscle length. This type of stretching takes the muscle to its end range and maintains this position for a specified duration.

Mechanism of static stretching static stretching may be the facilitation of the Golgi tendon organ (GTO). Static tension placed on the muscle tendon unit has been shown to activate the GTO, which may produce autogenic inhibition of the muscle that is stretched [16].

The same mechanism for increased hip abduction ROM was stated in a study conducted by Rubini, Ercole, et al. which was done to determine the immediate effect of static and proprioceptive neuromuscular facilitation on hip adductor flexibility in female ballet dancers [17].

A study by Solanki, et al. was done to compare the immediate effects of adductor stretch MWM versus MET to check hip adductor flexibility by using Single Leg Hop Test and SEBT which gave positive results, the present study has used the same outcome measures to assess muscle flexibility and has shown positive results [18].

Future scope for the present study could be a follow up of the study population to confirm the association of hip adductor tightness in PFPS and low back pain and compare it with age, BMI matched controls.

CONCLUSION

Administration of a 5-day intervention for myofascial release with foam roller has proved to be more effective than static stretching in releasing hip adductor tightness, increasing hip adduction range of motion and improving balance when subacute effects are intended.

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