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Comparative effect of Myofascial Release with Foam Roller, Mulligans Bent Leg Raise Technique and Proprioceptive Neuromuscular Facilitation Stretching on hamstring flexibility in athletes – A randomized clinical trial

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ABSTRACT

Most of the athletes have hamstring muscle tightness and this goes unnoticed for a prolonged period of time. Muscular flexibility is an important aspect of normal human function. Limited flexibility has been led to the numerous musculoskeletal overuse injuries and ultimately affected persons level of performance. The purpose of this study was to compare the effects of Myofascial release with foam roller, Mulligans Bent leg raise technique and Proprioceptive neuromuscular facilitation stretching technique on hamstring flexibility in athletes. 63 healthy subjects (21 in each group) were recruited in the study by simple randomization method. Group A subjects received Myofascial release using foam roller technique , Group B subjects were given Bent leg raise technique and subjects in Group C were given. Proprioceptive neuromuscular facilitation technique for hamstring tightness. The intervention was given on alternate days, four sessions for one week. Popliteal angle and Sit and reach tests for range and flexibility of the hamstrings were measured pre and post intervention. Statistical analysis was done using paired t-test to compare between the group and within the groups and level of significance was set up at <math><0.005</math>. Four sessions given on alternate days for one week proved to be effective in improving the popliteal angle and sit and reach test values in all the three groups. Mulligans Bent Leg Raise technique and Proprioceptive neuromuscular facilitation technique was effective in increasing the flexibility of hamstrings than myofascial release using foam roller technique.

Keywords: Hamstring tightness, Foam roller, Bent leg raise technique, Proprioceptive neuromuscular facilitation, Popliteal angle and sit and reach test

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INTRODUCTION

The Hamstrings are the group of muscles which comprises of biceps femoris, semitendinosus, and semimembranosus muscles. These muscles are primarily composed of type II muscle fibers^[1].

Flexibility is defined as the ability of a muscle to lengthen, allowing one joint or more to move through a range of motion (ROM), and is an essential component of normal biomechanical functioning. If the resting length of a muscle is altered, the capacity of a muscle to develop maximum tension is also affected^[2,3].

Decreased hamstring flexibility is considered to be one of the predisposing factors for hamstring strains and hamstring stretches are routinely used as part of a pre-exercise routine, usually after an aerobic warm-up.^[4]

Stretching before participation in athletic activities is a standard practice for all levels of sports, competitive or recreational. Athletes, coaches, trainers, physiotherapists, and physicians recommend stretching in an effort to both prevent injury and enhance performance.^[5]

Self myofascial release (SMR) using a foam roller is a relatively simple technique can be easily applied to release tension in muscles, tendons, fascia and/or soft tissues. Therefore, this technique has become popular among athletes^[6].

Existing evidence suggests that these tools can enhance joint range of motion (ROM) and the recovery process by decreasing the effects of acute muscle soreness, delayed onset muscle soreness (DOMS) and post exercise muscle performance. Commercial foam rollers are typically available in two sizes: standard (6 inch x 36 inch) and half size (6inch x 18 inches). With foam rolling, the client uses their bodyweight to apply pressure to the soft tissues during the rolling motion.^[7]

BLR is a Mulligan's stretching technique, a recent advancement in the management of the hamstring tightness. It is a painless and beneficial technique, which is indicated for hamstring tightness with limitation of straight leg raise (SLR)^[8]

In the PNF technique, the subject performed a hold contraction for 10 seconds and relaxed, allowing the knee to bend. Finally, the leg was straightened and the technique was finished.^[9]

Regular stretching is required to maintain normal muscle length to prevent muscle stiffness, lower the risk of musculoskeletal injuries and enhance physical performance. One needs to know the most effective and efficient technique to achieve hamstring flexibility as maintaining flexibility is necessary for general and athletic population as well as for health care professionals^[10].

MATERIALS AND METHOD

The approval of the study was obtained from the Institutional Ethical Committee. The study was conducted in Belagavi city where both male and female athletes aged between 18 to 25 years with hamstring tightness were included. The exclusion criteria comprised of any injuries such as low back pain, hamstring and quadriceps strain or any recent lower limb injury. Total 63 subjects were recruited in the study .All the subjects were explained about the study and a written informed consent was obtained. Subjects were randomly divided into Group (myofascial release using foam roller) Group B (Mulligan's Bent leg raise technique) and Group C (Proprioceptive neuromuscular facilitation technique). The intervention was given on alternate days, four sessions for one week.

Intervention

Group A (MYOFASCIAL RELEASE USING FOAM ROLLER):

In this technique, foam roller was placed between ischial tuberosity and a hard surface (i.e floor) with the subjects legs maintained in extended position and ankle relaxed. Subject were asked to support their body weight with their arm extended and were allowed to put maximal pressure on the foam roller. Subject were asked to actively move the foam roller to and fro from the posterior aspect of the hip to the posterior aspect of the knee at a rate of 5-8 secs and it was monitored by the therapist using a stopwatch. This protocol included three 1 minute repetitions with a 30 seconds break between repetitions .

GROUP B (MULLIGANS BENT LEG RAISE TECHNIQUE):-

The subject was in supine lying position and the therapist stands laterally to the affected side with the subjects hip and knee 90° flexed and positioned over the therapists shoulder (i.e the popliteal fossa resting on the shoulder). A longitudinal traction along the long axis of femur was applied and the subject was asked to push the therapist's shoulder with his/ her leg followed by voluntary relaxation. At this point of relaxation, the therapist pushed the knee up as far as possible in a pain free range. The stretch was sustained for 5-10 seconds and then relaxed.

Group C (PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION):-

The subject was in supine lying position and performed bilateral self-stretching of the hamstrings .The technique consisted of an active SLR with dorsi -flexion of ankle and toes. The subject was asked to raise his/her leg by turning the heel towards the opposite shoulder, while clasping the hand around the back of the thigh. Subject was instructed to hold the contraction for 10 seconds and then relax for 10 seconds, allowing the knee to bend.

OUTCOME MEASURES

popliteal angle and sit and reach test was checked pre and post the interventions on the first day and the 4th day .

Popliteal angle measurement (active knee extension)

Subject was in supine position on the plinth, and the lower extremity not being tested was stabilized across the thigh and over the anterior superior iliac spines. Subject was instructed to flex his/her hip to 90 degrees (the angle is confirmed with goniometer) and to grasp behind the knee with both the hands to stabilize the hip at 90 degree of flexion and to actively extend each knee in turn as far as possible. Fulcrum of the goniometer was placed over the lateral condyle of the knee joint and popliteal angle was measured.

Sit and reach test

This test involved sitting on the floor with legs stretched out straight ahead. Subject was instructed to remove his/her shoes and to place the sole of the feet against the wooden box. Both knees were locked and pressed flat to the floor. With the palm facing downward, and the hands on top of each other, the subject was instructed to reach forward along the measuring line as far as possible. Subject was ensured to keep the hands at the same level, not one reaching further forward than the other. After some practice, the position was held for at least one-two seconds and the distance was recorded.

RESULTS AND DISCUSSION

Table 1: Distribution of age, gender and BMI in Group A, B and C.

Variable	Group A	Group B	Group C
Gender	M-11 F-10	M-14 F-07	M-15 F-06
Mean age(in yrs)	19.24±1.26	21.86±2.08	21.24±1.95
Mean BMI(kg/m ²)	24.97±2.60	21.79±2.67	23.67±2.83

Out of sixty three participants in each group there were 23 female subjects and 40 male subjects. The mean age of the subjects in Group A was 19.24±1.26, Group B was 21.86±2.08 and in Group C it was 21.24±1.95. The mean BMI(kg/m²) in Group A , Group B and Group C was 24.97±2.60 , ,21.79±2.67 and 23.67±2.83 respectively(Table.1).

Table 2: Comparison of Group A, Group B and Group C with respect to popliteal angle and sit and reach test using paired t-test.

Measures	Groups	Pre intervention (baseline)	Post intervention (4th day)	p-value
Rt. Popliteal angle	A	35.67± 6.30	54.43± 6.10	<0.0001
	B	36.29±6.34	58.00±6.24	<0.0001
	C	35.62±7.87	46.05±11.07	<0.0001
Lt. Popliteal angle	A	35.19±6.04	56.52±6.42	<0.0001
	B	37.76±6.60	59.86±6.49	<0.0001
	C	35.29±9.91	48.00±10.96	<0.0001

Sit and reach test	A	17.05±3.68	7.14±3.51	<0.0001
	B	16.43±4.79	6.76±3.81	<0.0001
	C	17.14±3.86	10.19±3.49	<0.0001

*p<0.05

As shown in table 2, there was a significant difference within the groups in terms of popliteal angle and sit and reach test with p <0.0001.

Inter- group difference:-

When Group A was compared to Group B, there was no significant difference found in the right and left popliteal angle , sit and reach test values .

When comparing Group A with Group C, there was a significant difference found in the right and left popliteal angle , sit and reach test values.

When comparing Group B with Group C, there was a significant difference found in the right and left popliteal angle , sit and reach test values.

DISCUSSION:

The purpose of the present study was to compare the effects of Myofascial release with foam roller, Bent leg raise technique and Proprioceptive neuromuscular facilitation stretching on hamstring flexibility in athletes. An alternate day intervention was done for four days (four sessions) to see which technique is more effective in increasing the flexibility of hamstring muscle in terms of Popliteal Angle and Sit and Reach Test.

Our study showed significant improvements in hamstring flexibility using Mulligans bent leg raise technique and proprioceptive neuromuscular facilitation technique.

Self-myofascial Release (SMR) is one of the kind of massage used by the therapist along with functional movement and sports professionals. Foam rolling is said to cause an effect on the soft tissues by improving the joint range of motion and enhancing the muscular performance^[11].

The results obtained from the present study is consistent with the study conducted by Andrew et al. on 40 subjects to note the effects of foam rolling and static stretching on passive hip flexion range of motion and it was proved that use of a foam roller in combination with static stretching protocol is useful in improving range of motion^[12].

A study conducted by Toby Hall et al using Bent leg raise technique concluded that there was increase in SLR after the intervention in both patients with low back pain and in healthy subjects. The author proposed that the increase in SLR range of motion was mainly due to the increase in pain free stretch tolerance of the posterior hip joint structure^[13]. Similarly our study showed significant improvement in the hip flexion after a one week Mulligan BLR technique.

During hold-relax technique there is recruitment of the golgi tendon organ receptors within the hamstring -muscle tendon unit. The result our study was consistent with the study conducted by Scott et al. on 30 male subjects with limited hamstring flexibility where all subjects performed 6 warm-up active knee extension ,experimental group received 5 modified hold-relax stretches and control group rested quietly supine on a table for 5 minutes, proved that sequence of 5 modified hold-relax stretches produced significant increase in hamstring flexibility that lasted for 6 minutes after the stretching protocol ended ^[14].

As per our knowledge, this is the first study which compared the effect of myofascial release using foam roller , Mulligans bent leg raise technique and proprioceptive neuromuscular facilitation technique on hamstring tightness in athletes with alternate four session intervention.

CONCLUSION:

It was concluded that 4 sessions given on alternate days for one week proved to be effective in improving popliteal angle, sit and reach test values in all the three groups. Mulligans Bent Leg Raise technique and proprioceptive neuromuscular facilitation technique was effective in increasing the flexibility of hamstrings than myofascial release using foam roller technique. Since this study has given a better result in athletes it can be recommended for the use of the patients with hamstring tightness.

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