Available online at **www.ijmrhs.com**

ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2017, 6(4): 102-108

Effect of Bowen Technique versus Muscle Energy Technique on Asymptomatic Subjects with Hamstring Tightness: A Randomized Clinical Trial

Vijay Kage[1*], Farhana Bootwala[2] and Gayatri Kudchadkar[2]

[1] Department of Orthopaedic Physiotherapy, KLEU Institute of Physiotherapy, Belagavi, Karnataka, India

[2] KLEU Institute of Physiotherapy, Belagavi, Karnataka, India

**Corresponding e-mail: vijay.kage123@gmail.com*

ABSTRACT

Background: *To study and compare the effectiveness of Bowen technique and muscle energy technique in asymptomatic subjects with hamstring tightness.* ***Methods:*** *Forty-eight normal healthy subjects (24 in each group) were recruited in the study under simple randomization method. Group A received three alternate sessions of Bowen technique and Group B received three alternate sessions of muscle energy technique for hamstring tightness. Popliteal angle and Sit and reach tests for flexibility and hand-held dynamometer for strength of the hamstrings were measured pre-intervention and post intervention. Data was evaluated using t-test.* ***Results:*** *The group treated with Bowen technique showed significant improvement in Popliteal angle ($p<0.001$) as compared to muscle energy technique. The sit and reach flexibility test ($p<0.001$) was equally significant for both the groups. There was significant improvement in hand-held dynamometer ($p<0.001$) in group treated with Muscle energy technique as compared to Bowen technique.* ***Conclusion:*** *Three alternate sessions of Bowen technique and muscle energy technique proved to be effective in improving hamstring flexibility, range of motion and strength of the hamstring muscle. The group treated with Bowen technique proved to be more effective in improving flexibility of hamstring and range of motion when measured with popliteal angle. Muscle energy technique group showed more improvement in increasing the strength of the hamstring muscle at the end of the third treatment session.*

Keywords: Hamstring tightness, Bowen technique, muscle energy technique, popliteal angle, sit and reach test, hand-held dynamometer

INTRODUCTION

The movement of the human body is caused by the muscular system. There are about 700 muscles attached to the bones of the skeletal system that help to make up half of the person's body weight roughly [1]. Skeletal muscles are made up of contractile and noncontractile connective tissues [2]. The characteristics of contractility and irritability is given by the contractile elements of the muscle [3].

The greatest measurable force that can be exerted by a muscle or muscle group to overcome resistance during single maximum effort is the muscle strength [3]. The ability of a muscle to contract repeatedly against a load (resistance), produce and sustain tension, and resist fatigue over an extended period of time is the muscle endurance [3].

Hamstring muscle is located at the back of the thigh. This muscle starts in the gluteal region and courses through the back of the thigh and ends in the popliteal fossa. Three muscles together form the hamstring muscle- biceps femoris muscle, semitendinosus muscle and semimembranosus muscle. These muscles are responsible for the flexion of the knee joint as well as help in extension of the thigh [4].

The major aetiological factors in musculoskeletal injuries are considered to be due to muscle stiffness of the lower extremity and the consequential decrease in joint flexibility [5]. The ability of the muscle to lengthen allowing one joint (or more than one joint) to move through the range of motion is due to the flexibility of the muscle. If a muscle has good flexibility it will allow muscle tissue to accommodate to imposed stress more easily and allows efficient

and effective movement. If there is enhanced muscle flexibility it will assist in preventing or minimizing injuries and enhance performance of the muscle [6].

The muscle which is found to be most prevalent for the tightness in the body is the hamstrings [5]. Worrel, et al. stated that a "lack of hamstring flexibility was the single most important characteristics of hamstring injuries in athletes" [7].

Tight hamstrings have been involved in lumbar spine dysfunction and shows strong positive correlation between low back pain and reduced hamstring flexibility [8]. Tightness of the muscle is a limiting factor for ideal physical performance as well as daily activities and an important intrinsic factor for sports injuries [5].

Bowen technique was developed by late Tom Bowen in Geelong, Australia which is a dynamic system of muscle and connective tissue therapy [9]. It is a soft tissue remedial therapy, in which therapist uses fingers or thumb to apply gentle rolling moves over muscles, tendons, and other connective tissues in specific parts of the body [10]. A classic Bowen technique session usually lasts from 15 to 45 minutes [9].

Muscle energy technique (MET) is a manual therapy technique used by many manual therapy professionals [11]. It targets the soft tissues primarily and can be called as active muscular relaxation technique [7]. It is a direct active post facilitating technique also known as post-isometric relaxation technique-PIRT which follow different principles individually [5]. It is a procedure in which controlled, voluntary isometric contractions of a target muscle group are widely advocated [8].

Outcome measures used in the study are-Sit and reach test for flexibility, popliteal angle and hand held dynamometer for strength.

METHODOLOGY

Both males and females from KLE'S Institute of Physiotherapy were included in the study. Total 48 subjects were recruited in the study. Subjects were randomly divided in group A (Bowen's technique) and group B (Muscle energy technique). All the subjects recruited in the study read and signed the informed consent form approved by the institutional review board of the university.

Inclusion Criteria

- Asymptomatic subjects with hamstring tightness.
- Both males and females.
- Age between 18 to 24 years.
- 20° to 50° Active knee extension loss with hip in 90° of flexion.
- Full passive range of motion of knee extension (to rule out inter-articular knee joint pathology).
- Subjects willing to participate in the study.

Exclusion criteria

- Subjects if they have any history of lower extremity injury in past 3 months
- Any fracture or surgery done for back, pelvis hip or knee.
- Any neurological symptoms involving prolapsed intervertebral disc or radiating pain.
- Spinal deformity
- Any recent abdominal surgery.

Intervention

Group A (Bowen technique)

1) The thumb is placed on top of the designated muscle (Figure 1).
2) Quietly hook the thumb into the lateral edge of the muscle to form a challenge or pressure against the muscle. Create a slight pause as the nervous system registers a tension which point out "something is about to occur".

3) As we begin to flatten the thumb in a medial direction, the muscle will pluck or plop or respond in some manner.

4) Carry the skin and challenge the muscle.

5) First with the thumbs (left side of body) followed by the fingers (right side of body). Often, the hands are placed on the back with an inch of space between the thumbs and fingers so that the hands can play the muscles simultaneously.

6) Alternate day intervention will be given for 1 week.

7) The treatment time for each session will be 20 minutes.

Figure 1 Bowen technique

Group B (Muscle energy technique)

1) In this technique, first the subject's knee was extended till the subject reports of hamstring discomfort (Figure 2).

2) Moderate isometric contraction of the hamstring muscle was given for a period of five seconds.

3) A three second relaxation period was given.

4) This technique will be repeated for three times (for a total of four contractions).

5) Alternate day intervention will be given for 1 week.

6) The treatment time for each session will be 20 minutes.

Figure 2 Muscle energy technique

Outcome measures

Popliteal angle, sit and reach test and hand held dynamometer were checked pre- and post-intervention on the first day and post intervention on the 3rd session.

1) ***Popliteal angle measurement (active knee extension):*** Subject will be in supine position on the plinth. Subject then flexes his hip to 90°. Subject then actively extends each knee in turn. Fulcrum of the goniometer will be placed over the lateral condyle of the knee joint and popliteal angle is measured.

2) ***Sit and reach test:*** This test involves sitting on the floor with legs stretched out straight ahead. Shoes should be removed and the soles of the feet are placed against the wall. Both knees should be locked and pressed flat to the floor. With the palm facing downward, the subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the same level. After some practice, the subject reaches out and holds that position for at least one-two seconds while distance is recorded.

To assess the strength of the hamstring muscle hand held dynamometer is included in this study. It is used to evaluate resistance to stretch during passive knee extension. The position of the patient is supine and hip and knee is flexed at 90° and the dynamometer is placed just proximal to malleoli. Stabilization of the subject at the shoulder is done by another therapist.

Statistical analysis

The statistical analysis was done using t-test to compare between the groups and within the group and level of significance was set up at $p<0.001$.

RESULTS

The study included 48 subjects. The group treated with Bowen technique showed more improvement in popliteal angle when measured with active knee extension test as compared to muscle energy technique. Sit and reach test was equally significant for both the groups. Significant increase in strength was noted in muscle energy technique group compared to Bowen technique when measured with hand-held dynamometer. The groups with age and gender distribution is depicted in Table 1. Tables 2-6 show comparison between the two groups with regards to the techniques and the scores during pre-and post-test.

Table 1 Showing distribution of age and gender in Group A and Group B

Variables	Group A	Group B
Gender	Male 11	Male 11
	Female 13	Female 13
Average age (in years)	21.6 ± 1.63	20.8 ± 2.06

Table 2 Comparison of Group A and Group B with respect to right popliteal angles at pre-test, post 1 day and post 5 days

Groups	Pretest		Post 1 day		Post 5 days		Changes from pretest to			
							Post 1 day		Post 5 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	36	6.35	44.88	6.29	54.42	5.98	8.88	2.8	18.42	4.06
Group B	39.08	6.93	48.04	5.47	58.21	6.01	8.96	3.76	19.13	4.61
% of change in group A							24.65%$^{\#}$, p=0.001*		51.16%$^{\#}$, p=0.001*	
% of change in group B							22.92%$^{\#}$, p=0.001*		48.93%$^{\#}$, p=0.001*	
P-value	0.115		0.0692		0.0336*		0.9309		0.575	

Table 3 Comparison of Group A and Group B with respect to left popliteal angles at pre-test, post 1 day and post 5 days

Groups	Pretest		Post 1 day		Post 5 days		Changes from pretest to			
							Post 1 day		Post 5 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	35.33	6.34	46	6.93	56.46	6.43	10.67	3.42	21.13	5.42
Group B	38.42	6.14	49.33	6.37	60.04	6.17	10.92	5.78	21.63	6.35
% of change in group A							30.19%$^{\#}$, p=0.001*		59.79%$^{\#}$, p=0.001*	
% of change in group B							28.42%$^{\#}$, p=0.001*		56.29%$^{\#}$, p=0.001*	
P-value	0.0938		0.0895		0.0500*		0.856		0.7704	

Table 4 Comparison of Group A and Group B with respect to Sit and reach test scores at pre-test, post 1 day and post 5 days

Groups	Pretest		Post 1 day		Post 5 days		Changes from pretest to			
							Post 1 day		Post 5 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	17	3.8	11.79	3.86	7.08	3.35	5.21	2.17	9.92	2.12
Group B	17.21	4.51	12.79	4.55	7.25	3.77	4.42	1.47	9.96	2.26
% of change in group A							30.64%$^{\#}$, p=0.001*		58.33%$^{\#}$, p=0.001*	
% of change in group B							25.67%$^{\#}$, p=0.001*		57.87%$^{\#}$, p=0.001*	
P-value	0.8634		0.4156		0.872		0.1455		0.9478	

Table 5 Comparison of Group A and Group B with respect to right hand held dynamometer scores at pre-test, post 1 day and post 5 days

Groups	Pretest		Post 1 day		Post 5 days		Changes from pretest to			
							Post 1 day		Post 5 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	9.5	3.71	9.54	3.76	10.83	3.85	0.04	0.2	1.33	0.96
Group B	9.75	2.31	9.75	2.31	11.54	2.73	0	0	1.79	0.78
% of change in group A							0.44%$^{\#}$, p=0.3277		14.04%#, p=0.001*	
% of change in group B							0.00%$^{\#}$, p=1.000		18.38%#, p=0.001*	
P-value	0.7804		0.8182		0.4663		0.3225		0.0764	

Table 6 Comparison of Group A and Group B with respect to left hand held dynamometer scores at pre-test, post 1 day and post 5 days

Groups	Pretest		Post 1 day		Post 5 days		Changes from pretest to			
							Post 1 day		Post 5 days	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Group A	9.38	3.66	9.42	3.72	10.83	3.93	0.04	0.2	1.46	0.98
Group B	9.71	2.33	9.71	2.33	11.25	2.47	0	0	1.54	0.93
% of change in group A							0.44%$^{\#}$, p=0.3277		15.56%#, p=0.001*	
% of change in group B							0.00%$^{\#}$, p=1.000		15.88%#, p=0.001*	
P-value	0.7082		0.7462		0.6623		0.3225		0.7637	

DISCUSSION

The present study was done to compare the effects of Bowen technique and muscle energy technique (MET) on asymptomatic subjects with hamstring tightness. An alternate day intervention was done for five days (three 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 and also the strength of the hamstring muscle which was assessed using the hand-held dynamometer (HHD).

Out of twenty-four participants in each group there were thirteen female subjects and eleven male subjects. Homogeneity in regard with the number and gender of the participants were maintained in both the groups. The study comprised of subjects aged between 18-24 years in both the groups. Demographic data of the participants was collected in terms of height (cm), weight (kg) and BMI (kg/m^2). Group A and Group B were given three sessions each for alternate days which lasted for a total of five days of treatment sessions.

A study done by Ayla et al in recreationally active young adults for estimating the hamstring flexibility proved that reproducibility and criteria related validity of the sit and reach test has coefficient of variation (CV) 8.74% and intra-class correlation coefficient (ICC) 0.92 [12].

Active knee extension test/Popliteal angle test was found as the gold standard test for the measurement of hamstring flexibility with intra-tester reliability (ICC) of 0.94 in a study done by D. Scott Davis on concurrent validity of four clinical tests [13].

A study done by Richard W. Bohannon to check the test-retest reliability of hand-held dynamometry during a single period of strength assessment concluded that hand held dynamometer can be considered a reliable tool to check

the strength of the muscle. This technique has proved to be of great value to clinician as inter-tester reliability and normative data are established [14].

A study was conducted by Michelle Marr to see the effects of Bowen technique on hamstring flexibility over time concluded that a single treatment session with this technique significantly increased the flexibility of the hamstring muscle in asymptomatic individuals and also maintained this level of increase in hamstring flexibility for one week, showing continuing improvements. The superficial pressure applied during the technique, however lack of joint loading, warm-up or stretching, weight bearing, invalidates alterations attributable to tissue creep through loading or plastic deformation of tissues [10].

After the application of Bowen therapy for three alternate sessions, our study also showed significant improvements in hamstring flexibility in terms of sit and reach test and increase in range of motion in terms of popliteal angle. The strength of the hamstring muscle did not show much improvement after this treatment session but slight improvement was seen in strength when measured with the hand-held dynamometer.

The Bowen technique is named after late Tom Bowen who developed this technique in Geelong, Australia. It is a soft tissue remedial therapy, in which therapist uses fingers or thumb to apply gentle rolling moves over muscles, tendons, and other connective tissues in specific parts of the body [10].

F Ballantyne, G Fryer, P McLaughlin conducted a study to see the effect of muscle energy technique on hamstring extensibility concluded that there was an immediate increase in the range of motion of knee joint when measured with passive knee extension test following a single application of muscle energy technique. Since there was no evidence of visco-elastic change, the change in the range of motion was possibly due to an increased tolerance to stretch [11].

Muscle energy technique (MET) is a manual therapy technique [11] which targets the soft tissues primarily and can be called as active muscular relaxation technique [7]. It is a direct active post facilitating technique also known as post-isometric relaxation technique-PIRT which follow different principles individually [5]. It is a procedure in which controlled, voluntary isometric contractions of a target muscle group are widely advocated [8]. It is effective for lengthening of shortened muscle, strengthening the muscle as a lymphatic or venous pump to help drainage of fluids and for increasing range of motion (ROM). After muscle energy technique (MET) there is viscoelastic change in muscle which helps in increasing muscle flexibility [11].

After the application of muscle energy technique for three sessions alternately our study also showed significant improvement in the flexibility of hamstrings when measure with sit and reach test, increase in the range of motion was seen in the active knee extension test and significant increase was seen in the strength of the hamstring muscle which was measured using the hand-held dynamometer.

Hence our study concluded that when Bowen technique and muscle energy technique are compared they both are equally effective in increasing the flexibility, range of motion and strength of the hamstring muscle when delivered for three sessions alternately.

It also concluded that Bowen technique proved to be a little more effective than MET in terms of increase in the range of motion as it was a passive technique and the muscle was relaxed completely because of the moves and deep pressure applied by the therapist. But on the other hand, MET proved to be significantly effective in increasing the strength of the hamstring muscle because this technique was an active technique and the subject had to actively participate and apply his own strength against the therapist.

As per our knowledge, this is the first study which compared the effects of Bowen technique and muscle energy technique (MET) on hamstring tightness in healthy individuals with alternate three session intervention.

Hence both the techniques can be used clinically to increase the flexibility and strength of the hamstring muscle.

CONCLUSION

On the basis of statistical analysis, we conclude that 3 sessions on alternate days for a week proved to be effective in improving popliteal angle, sit and reach test for flexibility and hand held dynamometer for strength measurements in both Bowens technique as well as muscle energy technique but Bowen technique has shown more improvement in hamstring flexibility and ROM than muscle energy technique. Increase in strength was seen more in muscle energy

technique then the Bowen technique. Since this study has given a better result in normal subjects it can be recommended for the use of the patients with hamstring tightness. This study analyses the immediate effect of hamstring flexibility, so the maintenance of flexibility of hamstring muscle for long term can be done as a further study. These techniques can also be used for athletic population. Since this study recruited small number of subjects, the number of subjects can be increased in further studies.

ACKNOWLEDGEMENT

The authors are thankful to the principal of their institute Dr. Sanjiv Kumar for allowing us to use the facilities of esteemed institution. Authors would like to thank Dr. Shivalingappa Javali for help and cooperation in the statistical analyses of this study. We would also like to thank all the participants in this study without whom the study would have been impossible.

REFERENCES

[1] Howtomedia, Inc. Muscular System. [cited 2016 Sep 29]. Available from: http://www.innerbody.com/image/musfov.html#full-description.

[2] Levangie, Pamela K., and Cynthia C. Norkin. *Joint structure and function: A comprehensive analysis*. FA Davis, 2011.

[3] Kisner, Carolyn, and Lynn Allen Colby. *Therapeutic exercise: Foundations and techniques*. Fa Davis, 2012.

[4] Chaurasia's, B. D. "Human anatomy: Regional and applied, dissection and clinical. vol. 2, CBS Publishers." (2010): 1-466.

[5] Sambandam, Cheraladhan E., Jagatheesan Alagesan, and Shilpi Shah. "Immediate effect of muscle energy technique and eccentric training on hamstring tightness of healthy female volunteers: A comparative study." *International journal of current research and review* 3.9 (2011): 122-26.

[6] Bandy, William D., Jean M. Irion, and Michelle Briggler. "The effect of static stretch and dynamic range of motion training on the flexibility of the hamstring muscles." *Journal of Orthopaedic & Sports Physical Therapy* 27.4 (1998): 295-300.

[7] Waseem, Mohd, Shibili Nuhmani, and Ram, C. S. "Efficacy of muscle energy technique on hamstring muscles flexibility in normal Indian collegiate males." *Calicut medical journal* 7.2 (2009): e4.

[8] Ahmed, Adel Rashad. "A comparative study of muscle energy technique and dynamic stretching on hamstring flexibility in healthy adults." *Bulletin of Faculty of Physical Therapy* 16.1 (2011).

[9] Bowtech Pty Ltd. What is Bowtech? [cited 2016 Sep 6]. Available from: http://www.bowtech.com/WebsiteProj/Pages/About/AboutBowtech.aspx.

[10] Marr, Michelle, et al. "The effects of the Bowen technique on hamstring flexibility over time: A randomised controlled trial." *Journal of bodywork and movement therapies* 15.3 (2011): 281-290.

[11] Ballantyne, Fiona, Gary Fryer, and Patrick McLaughlin. "The effect of muscle energy technique on hamstring extensibility: the mechanism of altered flexibility." *Journal of Osteopathic Medicine* 6.2 (2003): 59-63.

[12] Ayala, F., et al. "Reproducibility and criterion-related validity of the sit and reach test and toe touch test for estimating hamstring flexibility in recreationally active young adults." *Physical Therapy in Sport* 13.4 (2012): 219-226.

[13] Davis, D. Scott, et al. "Concurrent validity of four clinical tests used to measure hamstring flexibility." *The Journal of Strength & Conditioning Research* 22.2 (2008): 583-588.

[14] Bohannon, Richard W. "Test-retest reliability of hand-held dynamometry during a single session of strength assessment." *Phys Ther* 66.2 (1986): 206-209.