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RESEARCH ARTICLE
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COMPARATIVE EFFECTS OF GRASTON TECHNIQUE AND MYOFASCIAL RELEASE TECHNIQUE ON HAMSTRING FLEXIBILITY, PAIN AND LUMBAR ROM IN PATIENTS WITH NON-SPECIFIC CHRONIC LOW BACK PAIN

Osama Ramzan[1], Rabia Saeed[2], Hira Riaz[3], Dr. Rafia Imtiaz[4], Dr. Kanwal Fatima[5], Ahsan Taqweem[6], Ayesha Bashir[7], Dr. Anum Saleem[8], Dr. Intsam Aslam[9*]

[1]Clinical Physiotherapist, Yasmin Physiotherapy Center, Lahore Pakistan
[2]DPT, MS(MSK), Assistant Professor, University of Lahore Teaching Hospital, Lahore Pakistan
[3]DPT, MS-OMPT, Assistant Professor, University of Lahore, Pakistan
[4]Lecturer College of Physical Therapy, Government College University, Faisalabad, Pakistan
[5]DPT, MS-OMPT, Lecturer, Department of Allied Health Sciences, University of Sargodha, Pakistan
[6]Riphah International University, Lahore Campus / Physiotherapist at Get Physio Clinic Lahore, Pakistan
[7]M. Phill. Lecturer, Islamia University of Bahawalpur, Pakistan
[8]DPT (SMC), MSPPT (RIU), Lecturer, University of Lahore, Sargodha Campus, Pakistan
[9*]DPT (ANMC), MSPPT (RIU), Lecturer, PSRD College of Rehabilitation Sciences, Lahore Pakistan

***Corresponding Author:** Dr. Intsam Aslam
*Lecturer, PSRD College of Rehabilitation Sciences, Lahore Pakistan, Email address: dr.intsamaslam@outlook.com

ABSTRACT

Background: Non-specific Chronic low back pain (NSCLBP) is described as pain or discomfort in the lower back that originates from the waist to the inferior gluteal folds and lasts for at least three months with no radiculopathy or particular spinal disorders. Zygapophyseal joint pain, discogenic low back pain, sacroiliac joint (SIJ) pain & lumbar muscle strain are all clinical manifestations of NSCLBP.

Objectives: To evaluate the comparative effects of Graston technique and myofascial release on hamstring flexibility, lumbar pain and range of motion in patients with Non-specific chronic low back pain.

Methods: It was a randomized clinical trial where 42 male participants were included. Inclusion criteria included Participants with history of NSLBP for 3 or more months and having pain due to other pathology with exclusion criteria focusing on Participants enrolled in regular exercise or Yoga programs, having pain due to other pathology, Recent history (<3 months) of surgery and soft tissue injury. Group A received Graston technique on hamstring whereas the group B participants received therapist assisted compressive myofascial release. SPSS version 23.0 was used for the analysis of data, normality of data was assessed by Shapiro-wilks test. Friedman test and Wilcoxon signed ranked test was used for the within group analysis. The Mann-Whitney U test was used for the between group analysis.

Results: 42 male participants (mean age 41.76 ± 6.60) underwent Graston technique or myofascial release technique. The within group analysis of SRT, AKE, VAS and lumbar ROM showed that both Graston technique and myofascial release technique has significantly improved ($p<0.05$) the hamstring flexibility, lumbar pain and range of motion. The between group analysis showed that Graston technique was statistically significant ($p<0.05$) as compared to myofascial release technique group in improving the hamstring flexibility, lumbar pain and ROM in patients of non-specific chronic low back pain.
Conclusion: The Graston technique and myofascial release technique produced significant improvements in the hamstring flexibility, lumbar pain and range of motion, but the results produced by Graston technique were more significant as compared to myofascial release group on patients of non-specific chronic low back pain.

Keywords: AKE; Flexibility; Graston Technique; Hamstring; Lumbar ROM; Myofascial Release; NSCLBP; VAS.

INTRODUCTION

Low back pain is defined as the pain or discomfort that extends from the last rib to the buttocks and sometimes going down the lower extremities, it is usually felt on either side of the midline (1).NSLBP is characterized by soreness, tension, stiffness of the lower back with unknown pain origins & is the most common (more than 85 percent) case of LBP among Americans (2). The hamstring muscles arise from the inferomedial imprint on the top half of the ischial tuberosity and are placed on the upper part of the posterior side of the tibia. Tight hamstrings induce a posterior pelvic tilt and a reduction in lumber lordosis, both of which can cause low back discomfort. Hamstring muscle extensibility also limits pelvic mobility(3).

Due to a lack of adequate physical exercise, muscular weakening, and degenerative causes such as osteoarthritis, senile osteoporosis, and degenerative disc disease, the elderly had low back ache. It's also believed that having a tight hamstring muscle for an extended period of time causes back discomfort (4).The hamstrings are in charge of knee flexion and hip extension, as well as hip and knee joint stability when walking (5). Loss of hamstring flexibility promotes posterior pelvic tilting and lumbar lordosis decrease, resulting in a flat back that causes LBP (6). The assessment tools of the hamstring flexibility include the passive toe touch test, the sit and reach test (SRT) and straight leg raise test (SLR) (7). Instrument assisted soft tissue mobilization technique stretching, eccentric resistance exercise, myofascial release are the treatment options for the lengthening of shortened hamstring muscle (8).

The Graston technique (GT) is a soft tissue mobilization technique that employs a tool to cause mechanical micro-traumatic injury to the treatment site. It hastens the healing process by eliciting an inflammatory response, allowing for the restoration of flexible, normal tissue. (9). GT seems to have therapeutic benefits via inhibiting tissue adhesion, boosting collagen production, & increasing number of fibroblasts. GT has been shown to improve the flexibility of hamstrings that have been shortened (10). An instrument-assisted soft tissue mobilization (IASTM) technique known as the Graston Technique is that, incorporates soft tissue mobilization with stretching and strengthening program (11). The Graston Technique works in a way to relieve adhesions and limitations caused by musculoskeletal injuries. Localized discomfort, tendinopathies, epicondylitis, sprains, strains, and restricted range of motion are among conditions that the Graston Technique can help with (12). In addition to reducing discomfort and increasing range of motion, treating these dysfunctions may enhance patients comfort and functionality (13).

The application principle of the Graston Technique tools requires the patient to get a warm-up session so the tissues are prepared. The warmup session helps the blood circulation and nutrients supply essential for the recovery. For assessment of both deep and superficial structures, a range of stainlesssteel implements are employed with varied strokes and pressures on the body surface. The strokes given by six Graston technique instruments are sweeping, J-stroke strumming, fanning, and

the brushing. The Graston Technique instruments are categorized into two groups depending upon the curves & joint forms of the body, the convex and the concave (14).

Soft tissue mobilization is a type of manual physical therapy that works on the muscles, ligaments, and fascia to break down adhesions and improve muscular performance. Adhesions are the body's effort to heal a soft tissue damage by inducing a prolonged inflammatory response that results in extensive strands of collagenous scar tissue. These developing tissues tug against each other, causing pain trigger points. Breaking down or reducing adhesions, lengthening muscles and tendons, improving range of motion, decreasing pain, restoring function, and reducing edema and swelling are all goals of soft-tissue mobilization (15).

Myofascial release (MFR) is a commonly used manual treatment method that promotes continuous tissue flexibility or increases soft-tissue extensibility by compression, while restoring constricted fascia or normal muscle length (16). MFR is the form of soft tissue stretching, it is the application of continued and slow pressure to adhered fascia layer for 120-300 seconds to produce a release (17). MFR is a type of manual treatment that involves stretching the myofascial complex for a long period and at a low load in order to restore appropriate fascial length, alleviate pain, and enhance function (18).

METHODOLOGY

This randomized clinical trial was designed to evaluate the effect of instrument assisted and manually performed soft tissue mobilization therapy for enhancing the hamstring flexibility in patients of NSCLBP where 42 male participants were included into the study after screening through selection criteria. Ethical approval was obtained from The University of Faisalabad & informed consent was signed by the participants & then they were allotted to 2 equal groups i.e. Group A and Group B, by simple random sampling. As a baseline/warmup session both groups received 10 minutes of moist hot-pack and hamstring stretching session. The participants of group A received Graston technique on hamstring whereas the group B participants received therapist assisted compressive myofascial release. Hamstring flexibility was evaluated by sit and reach test and active knee extension test whereas pain was evaluated by visual analogue scale, and lumbar range of motion were measured by goniometer. The treatment was given 3 times a week for 4 weeks and the data was obtained at baseline, after 2^{nd} week and after 4^{th} week. SPSS version 23.0 was used for the analysis of data, normality of data was assessed by Shapiro-wilks test and all the test variables were violating the assumptions of normality, so, non-parametric tests were used. Friedman test was used for the within group analysis of sit and reach test, and active knee extension test, whereas Wilcoxon signed ranked test was used for the within group analysis of the visual analogue scale and lumbar ranges of motion. The Mann-Whitney U test was used for the between group analysis of the sit and reach test, active knee extension test, visual analogue scale and lumbar ranges of motion.

RESULTS

The age distribution showed that out of 42 participants in the study, 19 percent participants lied in the 30-34 years category, 21.4 percent participants lied in the 35-39 years category, 14.3 percent participants lied in the 40-44 years category while 45.2 percent participants lied in the 45-50 years category. The mean age of the participants was 41.76 ± 6.6 years. The BMI distribution of participants showed that out of 42 participants in the study, 11.9 percent were underweight, 23.8 percent were having normal weight, 35.7 percent were overweight and the rest 28.6 percent were obese. The mean BMI of the study participants was 26.26 ± 5.69. The normality test statistics for the Shapiro wilks test and the Kolmogorov Smirnov test were carried out. All the test variables were violating the assumptions of normality and so, non-parametric tests were used.

Table-1: Wilcoxon test statistics visual analogue scale

GROUP A	N	Mean	Std. Deviation	50th (Median)	Asymp. Sig.
Visual Analogue Scale at baseline	21	46.3810	13.50732	47.0000	**0.000**
Visual Analogue Scale after 4th week	19	22.1579	13.13292	25.0000	
GROUP B					
Visual Analogue Scale at baseline	21	47.6667	12.88151	47.0000	**0.000**
Visual Analogue Scale after 4th week	20	33.2000	12.97609	33.0000	

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Table-2: Friedman test statistics sit and reach test

GROUP A	N	Mean	Std. Deviation	50th (Median)	Asymp. Sig.
Sit and Reach test at baseline	19	-7.5263	3.51771	-7.0000	
Sit and Reach test after 2nd week	19	-2.4211	3.62577	-2.0000	**0.000**
Sit and Reach test after 4th week	19	3.5263	3.51771	4.0000	
GROUP B					
Sit and Reach test at baseline	20	-6.0000	3.41822	-5.5000	
Sit and Reach test after 2nd week	20	-3.6000	3.20197	-3.5000	**0.000**
Sit and Reach test after 4th week	20	-1.0500	3.30032	-.5000	

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Table-3: Mann Whitney U test statistics Active knee extension test between group A and B

	Active Knee Extension test at baseline	Active Knee Extension test after 4th Week
Mann-Whitney U	166.000	110.500
Wilcoxon W	397.000	300.500
Z	-1.384	-2.257
Asymp. Sig. (2-tailed)	.166	.024
Exact Sig. [2*(1-tailed Sig.)]		.024

Table-4: Mann Whitney U test statistics lumbar ranges of motion between group A and B posttreatment

	Lumbar Flexion after 4th week	Lumbar Extension after 4th week	Lumbar Right Side Bending after 4th week	Lumbar Left Side Bending after 4th week
Mann-Whitney U	55.500	17.500	83.000	64.000
Wilcoxon W	265.500	227.500	293.000	274.000
Z	-3.795	-4.902	-3.053	-3.592
Asymp. Sig. (2-tailed)	.000	.000	.002	.000

The Wilcoxon test statistics showed the significance value is less than 0.05 i.e. $p<0.0005$, which means both techniques have shown significant results but Garston technique has shown more significant results by reducing pain by 22.23 as assessed by VAS. Friedman test statistics for sit and reach showed that the significance value is less than 0.05 (i.e. $p<0.0005$), which means that the means both techniques have shown significant results but Garston technique has shown more significant results by increasing the score of sit and reach test by 11.04 cm in patients. The post-treatment values of the Mann-Whitney U test conducted on active knee extension test between the groups showed that significance value at $p=0.024$, which is below the level of significance, so, after looking at the descriptive statistics from the Friedman test it was concluded that the Garston technique had produced statistically significant improvements in the AKE values as compared to the myofascial release group.

The post treatment values for Mann-Whitney U test conducted on lumbar ranges of motion between the groups showed that the significance value at p=0.000, which is below the level of significance, so, after looking at the descriptive statistics from the Friedman test it was concluded that the Garston technique had produced statistically significant improvements in the lumbar ROM values as compared to the myofascial release technique group.

DISCUSSION

This study was a randomized clinical trial conducted on 42 participants of non-specific chronic low back pain patients with the hamstring tightness as assessed by straight leg raise angle of less than 70 degrees. The subjects were selected by purposive sampling and total of 71 participants were assessed for the eligibility but some of the participants were excluded as per the selection criteria and by means of lottery method 42 participants were randomized into two groups i.e. group A that received Garston technique on hamstring muscles by means of GT-1 Garston tool, and group B that received myofascial release technique on the hamstring muscles, both the group received the baseline treatment of hot pack and hamstring stretching as per defined criteria.

The hamstring flexibility, lumbar pain and lumbar ranges of motion were the principal parameters of the study. The hamstring flexibility was assessed by means of sit and reach test as well as active knee extension test, the lumbar pain was assessed by the numeric version of visual analogue scale that ranged from 0 to 100 mm, the lumbar ranges of motion were assessed by the goniometer as per Bedekar, Suryawanshi (19). The assessment for sit and reach test and active knee extension test were measured at baseline, then followed up after 2^{nd} week and 4^{th} week, whereas the visual analogue scale and lumbar ranges were assessed at baseline and post treatment. There were 2 dropouts in group A and one in group B, the protocol violation was managed through per protocol analysis The results of the study interpreted that both Garston technique and myofascial release technique on the hamstring among patients of non-specific chronic low back pain was found to be improving hamstring flexibility, reducing pain and increasing the lumbar range of motion, but the participants of group A that received Garston technique had more statistically significant results as compared to the myofascial release technique group.

The Garston technique was found to be increasing the hamstring flexibility, similar results were seen in study by Kim, Ms (10), where the effects of GT were seen on hamstring flexibility of young individuals, and the results showed that participants had increased range of motion after treatment. But this study targeted the population of non-specific chronic low back pain with hamstring tightness patients, so the results would be more clinically applicable.

The findings of the study explained that the Garston technique had positive impact on the hamstring extensibility and pain among the non-specific low back pain participants, similarly, in line to these results, the study by Hammer and Pfefer performed the Garston technique on hamstring for six times in an attempt to perform soft-tissue mobilization and that significantly improved the range of motion, in this study, the Garston technique was applied for 3 times a session and that gave promising results (20).

In clinical terms, a shortened hamstring restricts hip joint flexion or produces lumbar hyperextension, causing back pain. As a result, improving hamstring extensibility is critical in the rehabilitation of back pain sufferers. Soft tissue mobilization with the Graston instrument is a simple and effective strategy for restoring hamstring extensibility if low back pain is associated with hamstring shortening, knee arthritis, or functional limitations (6).

Because Myofascial trigger points cause spot discomfort, increases muscle flexibility, and breaking the fascial constriction, the improvement in functional impairment could be explained by increasing hamstring flexibility & lumbar ROM (21).

It is believed that the application of deep manual pressure stimulates interstitial and Ruffini mechanoreceptors, resulting in increased vagal activity, global muscle relaxation, reduced emotional arousal, and a calmer mind. Myofascial release technique stimulates intra-fascial mechanoreceptors.

Their stimulation alters proprioceptive input to the CNS, affecting tonus control of motor units in this tissue (22).

Kim et al. in 2014, compared the effects of Graston and self-MFR on knee join flexibility, hamstring and quadriceps strength recruiting 20 subjects with hamstring shortness. The participants were assigned into 2 groups, one receiving the GT and the other receiving the self-MFR. The knee ROM was measured by active knee extension test and the muscular strength was measured by the handheld dynamometer. The study resulted that SMR is an effective technique for restoring muscle length strength in subjects with hamstring shortness (10).

Jung et al. in 2017, conducted a cross-sectional study to evaluate the effects of self-myofascial release on hamstring flexibility. 22 participants were enrolled and evaluated for hamstring flexibility, depending upon the superficial back line, the suboccipital, hamstring, and planter regions were given the self-MFR. Wooden pole was used to give self-MFR on the points. The SRT, AROM and PROM were used to determine changes in flexibility of hamstring. The study resulted that there were statistically significant results on the hamstring flexibility of the self-MFR on the points by anatomy train. They concluded that the indirect application of self-MFR can be used at any time and place for increasing the extensibility of hamstring and it can also aid in increasing the pain threshold levels(23).

CONCLUSION

The Garston technique and myofascial release technique produced improvements in the hamstring flexibility, lumbar pain and range of motion, but the results produced by Garston technique were more significant as compared to myofascial release group on patients of non-specific chronic low back pain.

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