

EFFECTS OF ACTIVE RELEASE TECHNIQUE VERSUS MULLIGAN TECHNIQUE ON PAIN AND FUNCTIONAL DISABILITY IN PATIENT WITH DEEP GLUTEAL SYNDROME

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ABSTRACT

Background: Deep gluteal syndrome is characterized by pain or loss of sensations in the hip, posterior thigh and buttock area, affects people of age 18-50 years. This syndrome is mostly under diagnosed and thus not get proper treatment, for this active release and Mulligan techniques, used as a co-adjutant treatment with conventional physical therapy and found to be effective but the literature lacks the effectiveness between the two techniques.

Purpose: To compare the effects of active release versus Mulligan technique on pain, range of motion in patients deep gluteal syndrome.

Methodology: Twenty-four individuals (13 females and 11 males) with deep gluteal syndrome pre-diagnosed by an orthopedic, were assessed from DHQ Hospital, Layyah. After fulfilling the inclusion criteria, the participants were randomly divided into two groups receiving active release and Mulligan along with conventional physiotherapy. Outcome measures were pain (NPRS) and function (LEFS) collected at the baseline, 6th session, and 12th session.

Results: The mean age for participants was 30.58 ± 5.64 years. The within-group analysis showed a statistically significant improvement in pain and function among active release and Mulligan group ($P < 0.05$). The between group analysis showed that both the groups active release and Mulligan group had equal effects on pain and function at the baseline, 6th and 12th session among patients with gluteal syndrome as the difference was not significant ($P > 0.05$).

Conclusion: Both the active release and Mulligan group had equal effects in alleviating pain as well as improve function among individuals with gluteal syndrome.

Keywords: Deep Gluteal Syndrome, Active Release Technique, Mulligan Technique

INTRODUCTION

Deep gluteal syndrome (DGS) is characterized by pain or loss of sensations in hip, posterior thigh and buttock area. It comes with radicular pain which originates due to non-discogenic entrapment of sciatic nerve specifically in the gluteal space. Presence of pain in buttock area other than discogenic origin is mainly due to extra pelvic entrapment of sciatic nerve that includes structures like piriformis muscle, fibrous band containing blood vessels, space occupying lesions, gluteal muscles and hamstrings muscles. Due to diversity of multiple structures present in gluteal space, cause of sciatic nerve entrapment could be of any reason, that is why now the term deep gluteal syndrome is preferred over piriformis syndrome (1). The DGS is common in population among subjects with age group between 18-50 years. It is very important to diagnose DGS correctly as its symptoms highly mimic with sciatica and piriformis syndrome. General diagnostic pathway for DGS should be composed of detailed history taking (posterior hip pain, difficulty sitting for 30 min, radicular pain etc.) physical examination (positive seated piriformis test, positive pace sign and tenderness in deep gluteal space) and imaging tests (2). Deep to the gluteus maximus muscle lies the piriformis muscle underneath which sciatic nerve courses. Piriformis muscle sometimes entraps or irritates the sciatic nerve which

also causes pain in buttock, hence called piriformis syndrome, which is over-diagnosed by the most of the practitioners according to the recent literature (3). The reason behind the increased female to male ratio is the anatomical structure of the female, the broad pelvis, increased fat ratio among females, the hormonal imbalance that might affect the bones and the muscles (4). Mobilization techniques on lumbar spine, hip and sacroiliac joint restores normal joint function, range of motion and mobility. Reports of several clinical cases and case series show the success of movement with mobilizations (MWMs) to manage various musculoskeletal conditions. A manual therapy technique called Mulligan's therapy was developed by Brian Mulligan for treatment of musculoskeletal problems. A sustained force which also called accessory glide is performed while painful movement is performed (5). Manual therapist uses non-invasive and patented soft tissue mobilization technique called Active Release Technique (ART). It helps to locate and breakdown the adhesions and scar tissues which causes pain, weakness, numbness and stiffness (6). The adhesions are the result, if the muscles are kept under continuous stress and stretch with repetitive overuse. The numbness, tightness of muscle as well as fascia, weakness and even aching or in some cases tingling can be caused by these adhesions. So, in order to breakdown these adhesions, the active release technique is found to be effective as it

strengthens the muscle by breaking down the adhesions as well as by improving the blood circulation (7). It's a deep anatomical area located in the pelvic region posteriorly in the hip and bordered by gluteus maximus muscle. Various nerves like sciatic, inferior, pudendal and femoral cutaneous nerves pass through the deep gluteal space. It is important to understand the anatomical structure for the evaluation of pain, physical examination, diagnosis and the treatment. The signs and symptoms sometimes mimic the other issues of hip, pelvis and lumbar spine so it is important to rule out other pathologies by carefully observing the signs and symptoms like the Trendelenburg sign and by patients' gait. Some imaging techniques are also used in the diagnosis of the deep gluteal syndrome like MRI and MRN. The study concluded that posterior hip pain is a very common complaint even in sports medicine but still DGS is a rare entity. While diagnosing buttock pain, focus should be on pathology of regionally associated muscles, nerves and tendons and should be clinically evaluated. Deep understanding of anatomic structures and their kinematic in deep gluteal space is necessary in making accurate diagnosis and providing proper treatment. Precise physical examination is essential to obtain accurate diagnosis. Focused rehabilitation with adjunctive therapies should be considered for treatment (8). A total number of thirty participants who met the inclusion criteria were selected for the study. The participants

included both male and female and were randomly divided into groups. Group A was the experimental group received the sciatic nerve neural mobilization technique along with ultrasonic therapy and piriformis muscle stretching. The group B that was control group received ultrasonic therapy with piriformis muscle stretching. The duration of treatment was of forty-five minutes, received by both groups five times in a week for about two months. The outcome variables were pain measured by visual analog scale, functional disability by Roland Morris Back Questionnaire and the nerve root irritation measured by straight leg raise. The data was recorded and analyzed in the SPSS and to compare the results between intergroup and intra group the paired and unpaired t test were used and after analyzing the study showed that the improvement in pain, functional disability and neural structure irritation was more significant in the experimental group i.e. group A which received the sciatic nerve neural mobilization technique along with ultrasonic therapy and piriformis muscle stretching. The study concluded the addition of neural tissue mobilization will benefit in treating the deep gluteal syndrome (9). For gathering the information from the literature four electronic databases were used that were; PubMed, Google Scholar, Medline and Embase. The inclusion criterion was the patient diagnosed by DGS. A total number of three fifty-nine articles were found similar but only fourteen

studies fulfill the eligibility criteria, having eight fifty-three participants suffering from DGS. According to this systematic review, the DGS comprises three parts that are; i. sciatic nerve, ii. Pain that is not discogenic and iii. Irritation and/or compression of nerves. The review further suggested that for the diagnosis of DGS following procedures were taken into consideration; i. a detail history of patient's signs and symptoms, ii. a through physical examination of the patient, iii. Diagnostic imaging like MRI, iv. injections and v. specific physical tests for nerves to check their compression and/or irritation. The study concluded that the definition of DGS is a non-discogenic sciatic nerve disorder that entraps in the deep gluteal space. History taking (radicular buttock pain and difficult sitting for 30 min), physical examination (deep gluteal space tenderness, positive seated piriformis test and positive pace test) and imaging tests if needed are diagnostic pathway for DGS (8).

METHODOLOGY

This study was conducted at Department of Physiotherapy and DHQ Hospital in Layyah. This was a randomized control trial study design employed to compare the results of the study with a Non-Probability convenient Sampling Technique

was utilized to select the participants. The study included participants of both genders. A total of 24 participants were included in this study.

The following inclusion criteria were applied:

- Subjects with age group between 18-50 years
- Both genders
- A prior medical diagnosis for deep gluteal syndrome by an orthopedic.
- Having pain and tenderness in gluteal space
- Gluteal pain radiating through the posterior of thigh and lower limb

The following exclusion criteria were considered:

- Degenerative spine disorders like lumbar spondylosis, canal stenosis, spondylolisthesis, neural compressions due to intervertebral disc lesions
- Any vertebral or hip fracture
- Any other lower extremity musculoskeletal disorder.
- History of spinal surgery, TB spine, osteoarthritis, rheumatoid disease

Data Collection Procedure

All patients signed written informed consent form and an approval sought from Ethics Committee of University of Lahore.

Screening: The subjects who met the inclusion/exclusion criteria were allocated into the two groups.

Blinding: The study was single blinded. Assessor was blinded

Randomization: Subjects were randomized into two groups using computer generated random numbers.

Assessment: Baseline data was collected, then at 6th session (2nd week) and at 12th session (4th week).

Method for data collection: The data was collected by using questionnaire and goniometer

Intervention: A total number of twenty-four subjects suffering from deep gluteal syndrome, fulfilling the inclusion criteria were recruited to volunteer in this randomized controlled trial. Selected patients were divided into two groups by random allocation method.

Group A: Twelve participants were received active release technique with conventional physical therapy

Group B: Twelve participants were received mulligan with mobilization technique at L5 and S1 and conventional physical therapy

All the participants were receive conventional physical therapy that include patient education, stretching exercises, strengthening exercises, and electrotherapy. The active release technique was done on gluteal muscle group as this muscle groups is affected most in deep gluteal syndrome. Mulligan technique was applied on L5-S1.

Active Release Technique

The gluteal muscle is taken from a shortened position to a fully lengthened position while

the physiotherapist's contact hand holds tension longitudinally along the soft tissue fibers.(10)

Mulligan Technique:

Mulligan technique was applied on L5-S1, the sacroiliac joint and the hip joint.(11)

The treatment protocol was given to the participants for four weeks (12 sessions on alternate days, 3 sessions per week). The data was collected at the baseline, at 6th session (2nd week) and at 12th session (4th week). After collecting the data, pain and functional disability were compared.

Outcome Measures

Pain: The Numeric Pain Rating Scale (NPRS) is the simplest and most commonly used numeric scale in which the patient rates the pain from 0 (no pain) to 10 (worst pain) (annexure-I).

Functional disability: Functional disability of hip joint was recorded using Lower Extremity Functional Scale (LEFS). (Annexure-II)

Ethical Consideration

The rules and regulations set by the ethical committee of The University of Lahore were followed while conducting the research and the rights of the research participants was respected.

- Written informed consent (attached) was taken from all the participants.
- All information and data collection was be kept confidential.

- Participants remained anonymous throughout the study
- The subjects were informed that there are no disadvantages or risks on the procedure of the study.
- They were also informed that they will be free to withdraw at any time during the process of the study.
- There were no risks associated with this research.
- Participants were getting awareness and treatment.
- Participants identity was protected. Their identity was be revealed in any publication resulting from this study.
- Participation in this research study is voluntary. Participants may choose not to participate and may withdraw their consent to participate any time.

RESULTS

Table 1: Age of Participants

Group	Mean±SD. Deviation
Active Release	30.58 ± 5.64
Mulligan	34.75± 5.77

The mean age of the participants of the active release group was 30.58 ± 5.64 and of Mulligan group 34.75± 5.77

Table 2: Gender Distribution

Groups	Gender	Frequency
Active Release	Male	7
	Female	5
Mulligan	Male	6
	Female	6

Out of 24 participants, 5 were females and 7 were males in the active release group and Mulligan there were 6 females and 6 males

Table 3: Normality Test

Variables	Kolmogorov-Samirnov		Shapiro-Wilk	
	Statistic	Sig.	Statistic	Sig
Pain Baseline	0.35	0.001	0.637	0.000
Pain 6 th Session	0.44	0.004	0.573	0.000
Pain 12 th Session	0.37	0.000	0.629	0.000
LEFS Baseline	0.18	0.038	0.882	0.009
LEFS 6 th Session	0.13	0.020	0.888	0.012
LEFS 12 th Session	0.22	0.002	0.918	0.025

The p-value is less than 0.05 so the data was not normally distributed.

Table 4: Clinical and Descriptive Statistics of Active Release Technique Group

Variable	Mean	Std.Deviation	Maximum	Minimum
Baseline NPRS	2.50	0.52	3	2
Baseline LEFS	96.25	5.47	90	110
6 TH Session NPRS	1.66	0.49	2	1
6 TH Session LEFS	115.0	3.97	110	120
12 TH Session NPRS	1.41	0.51	2	1
12 TH Session LEFS	127.0	4.9	120	135

The baseline NPRS had a mean±SD is of 2.50 ± 0.52. At 6th session NPRS had mean±SD, 1.66±0.49 and 12th session NPRS had 1.41±0.51 mean±SD. The mean±SD at the baseline for LEFS was 96.25±5.47, at the 6th session 115 ±3.97 and at the 12th session the mean±SD was 127±4.9.

4.1: Clinical and Descriptive Statistics of Mulligan Group

The baseline NPRS had a mean±SD is of 2.41±0.51. At 6th session NPRS had mean±SD 1.75±0.45 and 12th session NPRS had 1.37±0.5 mean±SD. The mean±SD at the baseline for LEFS was 97.08 ±3.14, at the 6th session 117.66±1.72 and at the 12th session the mean±SD was 128.83 ±3.29.

4.2: Within-group comparison using Friedman for Active Release Technique Group

Non-parametric Friedman test was used for comparison within the active release technique group based on NPRS, ROM and LEFS. The p-value was 0.00 when NPRS compared within group for baseline, 6th and 12th session. For the LEFS when compared at baseline, 6th and 12th session the p-value was

4.3: Within-group comparison using Friedman for Mulligan Group

Non-parametric Friedman test was used for comparison within the Mulligan group based on NPRS, ROM and LEFS. The p-value was 0.00 when NPRS compared within group for baseline, 6th and 12th session. For the LEFS when compared at baseline, 6th and 12th session the p-value was

4.4: Between Groups Comparison for NPRS using Mann Whitney Test

Non-parametric Mann Whitney U test was applied for comparison between active release group and Mulligan based on NPRS. The mean rank of NPRS baseline reading of active release group was and for Mulligan group was with, p-value 0. The mean rank for NPRS 6th session was for the active release group and for the Mulligan group with, p-value 0. The mean rank for NPRS 12th session was for the active release group and for the Mulligan group with, p-value 0. The results show that there was not any statistically significant difference between the groups with the p-value <0.05. According to the results, the active release group and Mulligan group have equal

effects in decreasing pain among individuals with deep gluteal syndrome

4.5: Between Groups Comparison for LEFS using Mann Whitney Test

Non-parametric Mann Whitney U test was applied for comparison between active release group and Mulligan based on LEFS. The mean rank of LEFS baseline reading of active release group was and for Mulligan group was with, p-value 0. The mean rank for LEFS 6th session was for the active release group and for the Mulligan group with, p-value 0. The mean rank for LEFS 12th session was for the active release group and for the Mulligan group with, p-value 0. The results show that there was not any statistically significant difference between the groups with the p-value <0.05. According to the results, the active release group and Mulligan group have equal effects on function among individuals with deep gluteal syndrome.

DISCUSSION

This study compared the effects of active release technique versus mulligan technique in patients with deep gluteal syndrome which has little evidence available so far. Results showed that there was not any statistically significant difference between the groups getting both treatments. According to the results, the active release group and Mulligan group have equal effects on pain, range of motion and function among individuals suffering from deep gluteal syndrome. Patients in both groups showed equally significant improvement to both treatments individually. According to previous studies, hip pathologies were found more prevalent in housewives and office workers. This is mainly

because of poor posture, cross legged and prolonged sitting habits imposing excessive stress on deep gluteal structures. Attiq Ur Rehman et al (2021) compared the effects of ART and post isometric technique in patients suffering from piriformis syndrome. 30 patients were treated with mean age of 41.30 ± 4.99 . Group A (active release technique) and Group B (post isometric relaxation) showed significant improvement within groups in all outcome measures. ART and PIR were equally effective in improving pain, hip internal rotation and functional disability. However, ART compared to PIR is more effective in improving functional disability in piriformis syndrome

A Review was conducted by Neha Chitale Jr. et al (2022) on treatment approaches for Chronic low back pain via Mulligan movement with mobilization and physical therapy. She explained Mulligan as a technique in which arthrokinematics and osteokinematics of the joint can be brought to normal by performing mobilization with movement, as sometimes the issue cannot be corrected just by mobilization in a still position. Mulligan's concept says that pain is due to a minor positional fault to the joint which leads to the restriction. Postural fault leads to biomechanical changes leading to pain. The principles of Mulligan mobilization are that the movement should be pain-free. In this review, she found that Mulligan mobilization is a better treatment approach over other manual therapy techniques to reduce chronic LBP. Pain stiffness and disability were the points considered while concluding the review. Most studies have shown improvement with stretching on different regions of body but there is no much literature to know the

effect of mulligan on gluteal region. In 2016 Samahir Abuaraki Elbkheet et al conducted a comparative study to know the effectiveness of mulligan with movement versus stretching in patients with piriformis syndrome. The objective of this study was to compare the above mentioned two measures in the management of pain relief and movement dysfunction in unilateral piriformis syndrome. In this experimental study, 40 patients with piriformis syndrome were selected and divided into two groups. One group was given only stretching for the tightened muscle and the other group given Mulligan mobilization for lumbo sacral joints. VAS and lower limb functional index were taken to compare before and after the treatment regime of 4 weeks. Results showed no significant difference between the two groups in both pain scale and lower limb mobility and function. But there was significant improvement in pain relief and LLFI after the treatment regime in both groups compared to the pre-treatment status. Unlike the bilateral tightness of the muscle, the one sided shortening can cause dysfunctions either in hip mechanics or lumbo-sacral movements or both. Hence, in this study between the two groups of patients taken, one group is treated with active release technique targeting the tightened structure and the other group received lumbo sacral mobilization with movement (Mulligan's). We can find from the results that there is no marked difference in the baseline values of pain (VAS), ROM (universal goniometer) and LEFS between the two groups. When compared within the same group pre and post interventions, there is considerable improvement in both groups regarding pain relief, range of motion and functional

improvement. However, the table of comparison between the two groups shows that there is no statistically significant difference between either of the treatment approaches. Analysis from the results found that when means was compared between the mulligan mobilization group and active release group, there is no statistically significant difference in means of Visual analogue score for pain, ROM on Goniometer and LEFS score for functional disability pre intervention to post intervention means. Therefore, neither group showed a statistically greater difference when comparison was made between the groups.

CONCLUSION

The novelty of this study was to compare the two known treatment programs for deep gluteal syndrome and to find out which is superior. The present study concluded that both ART and mulligan mobilization were found to be effective as an exercise program for patient with deep gluteal syndrome to provide additional benefits and better outcomes. A decrease in pain and increases in functional performance and mobility were noted in both cases at the end of 12th sessions.

Detailed analysis showed that ART and MWM are equally effective in improving pain and functional disability. Additional studies should be conducted with similar treatment along-with advanced technological and radiological considerations in individuals with deep gluteal syndrome.

LIMITATIONS

- Sample size is small

- This review included only articles written in English and published in peer review journals.
- This might have limited the evidence by not including article written in other languages that may have been eligible for inclusion

RECOMMENDATION

- Systematic review must be done
- Further studies should be conducted with large sample size

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