

## ORIGINAL ARTICLE

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## MULLIGAN MOBILIZATION VERSUS STRETCHING ON THE MANAGEMENT OF PIRIFORMIS SYNDROME A COMPARATIVE STUDY

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## ABSTRACT

**Background:** Piriformis syndrome is a commonly overlooked specific cause of low back pain. Apart from mimicking the sciatica-like symptoms, unilateral piriformis tightness can cause rotational dysfunction and pain in the lumbar region. This could lead to low back pain which is a common musculo skeletal problem and a major reason for activity limitation. Stretching the piriformis tightened muscle is a preferred choice of treatment against surgical intervention to release the muscle. Mulligan's mobilization is based on movement with mobilization which is proven to be effective in many musculo skeletal dysfunctions including the lumbar spine. The purpose of this study is to explore and compare the two treatment methods in relieving the low back pain in clinical conditions with piriformis syndrome.

**Method:** In this experimental study, 40 patients with piriformis syndrome were selected and divided into two groups. One group was given only piriformis 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:** There was 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.

**Conclusion:** Even as the piriformis syndrome is caused by the tightness of the muscle, the consequence in the lower back and lumbar spine mobility can be improved by a Mulligan mobilization as a single mode of intervention .

**Keywords:** piriformis syndrome, lower limb functional scale, low back pain, Mulligan's mobilization

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## INTRODUCTION

Low back pain is a leading cause of disability. It occurs in similar proportions in all cultures, interferes with quality of life and work performance, and is the most common reason for medical consultations. Only a few cases of back pain are due to specific causes; most cases are non-specific [1]. Low back pain may result from trauma, osteoporotic fractures, infection, neoplasms and other mechanical derangements [2].

More than 16% of all adult work disability evaluations and examinations are performed to rate the patient's partial or total disability associated with chronic low back pain. Approximately 6% of lower back pain and sciatica cases seen in a general practice may be caused by piriformis syndrome [3].

According to recent studies, this percentage of piriformis associated with low back pain is found to be much higher. The modified FAIR test along with Lasegue's sign shows that 17.2% of low back pain is linked to piriformis syndrome [4].

The association of piriformis syndrome to back pain varies among different studies. It ranges between 5 to 36%, but all of them have reported certain degree of relationship. Piriformis syndrome is a common cause of low back pain. It is often not included in the differential diagnosis of back, buttock, and leg pain [5].

Piriformis syndrome is a peripheral neuritis of the sciatic nerve caused by an abnormal condition of the piriformis muscle. It is arising due to the entrapment and irritation of the nerve in the greater sciatic notch as a result of inflammation, hypertrophy or anatomical anomaly of the muscle [6].

The occurrence in women is greater than in men. One possible explanation of this could be the wider pelvis in women, leading to coxa vara. This must be imposing additional strain to the piriformis muscle even on single leg stance when the muscle stabilizes the hip. Piriformis syndrome is characterized by radiating pain from the sacro-lumbar region to the buttocks and down to the lower limb. The causes of sciatica usually relate to degenerative changes in the spine and lesions to the inter vertebral discs [7].

There are two types of piriformis syndrome—primary and secondary. Primary piriformis syndrome has an anatomic cause, such as a split piriformis muscle, split sciatic nerve, or an anomalous sciatic nerve path. Secondary piriformis syndrome occurs as a result of a precipitating cause, including macrotrauma, microtrauma, ischemic mass effect, and local ischemia. Among patients with piriformis syndrome, fewer than 15% of cases have primary causes [4].

Piriformis syndrome occurs most frequently during the fourth and fifth decades of life and affects individuals of all occupations and activity levels [8].

In most cases of (unilateral) piriformis syndrome, the sacrum is anteriorly rotated toward the ipsilateral side on a contra lateral oblique axis, resulting in compensatory rotation of the lower lumbar vertebrae in the opposite direction [9].

Contracted piriformis muscle also causes ipsilateral external hip rotation. When a patient with piriformis syndrome is relaxed in the supine position, the ipsilateral foot is externally rotated, a feature referred to as a positive piriformis sign. Active efforts to bring the foot to midline result in pain [10].

Piriformis syndrome can “masquerade” as other common somatic dysfunctions, such as intervertebral discitis, lumbar radiculopathy, primary sacral dysfunction, sacroiliitis, sciatica, and trochanteric bursitis [4].

Piriformis syndrome is characterized by pain and paresthesias in the unilateral gluteal region radiating to the hip and posterior thigh in a sciatic radicular distribution. It frequently goes unrecognized or is misdiagnosed in clinical settings [11].

The relationship of the sacro iliac joint dysfunction to piriformis syndrome is not well established whether it is a causative factor or a resultant. However, the most logical explanation could be that the muscle shortening/tightening unilaterally causes imbalance in the pelvic stability and results in the pulling of the sacrum. It is noted that when there is irritation in the muscle, it tends to shorten and hence bring the attachments closer eventually causing anterior rotation of sacrum and compensatory lumbar rotation to the contralateral side.

Certain case studies and reports indicate the dangers and ineffectiveness of surgical interventions like the decompression techniques. This mainly is due to the difficulty in the precise diagnosis of piriformis syndrome and the position of the sciatic nerve in relationship to the piriformis muscle [12]. Systematic reviews in exploring the treatment, especially non-surgical interventions guarantee the need of further studies. Clinical trials of the effectiveness of non-surgical measures in the management of this syndrome are indicated.

Joint mobilization to the lumbar spine, sacroiliac joint, and hip as indicated to restore normal joint mobility, range of motion, and function [13].

Mulligan's therapy is a manual therapy technique which was developed by Brian Mulligan, for the treatment of musculoskeletal dysfunction. It involves performing a sustained force (accessory glide) while a previously painful (problematic) movement is performed [14].

There have been reports of clinical cases and case series which have described the success of MWMs (Movement with mobilisation) in the management of various musculoskeletal conditions including lumbar spinal dysfunctions [15].

Manual and self-stretching activities to improve trunk and lower extremity flexibility, and range of motion [16].

Many studies have shown improved effect of stretching on piriformis syndrome but there is no much literatures to know the effect of mulligan on piriformis syndrome.

So this study is aimed not only to know the effect of mulligan and also to compare the effect of stretching with mulligan mobilization.

## MATERIALS & METHODS

All procedures were approved by institutional ethical committee, Padmashree Institute of Physiotherapy, Bangalore, 40 subjects with unilateral piriformis syndrome 20 subject were in group A and 20 in group B with duration between 6-18 months, age between 40-60 years both male and female. People with secondary piriformis syndrome and sciatic neuritis due to Macro trauma and Micro trauma to piriformis muscle, Ischemic mass effect and local ischemia to piriformis muscle, Anatomical anomaly of sciatic nerve and piriformis muscle, Associated lumbar (rotational) dysfunctions were included

Any hip joint (articular) pathology including pain, fracture, instability, Lumbar Disc herniation, Lumbar Spondylosis, Lumbar Ankylosing spondylitis, Lumbar Spinal stenosis and Bilateral piriformis syndrome were excluded

materials Required were Treatment table, lower limb functional scale, VAS scale and Mulligan belt.

Forty subjects were selected based on inclusion and exclusion criteria. Informed consent was obtained and base line data was collected. A written informed consent was taken from all subjects prior to participation. Purpose and procedure was explained prior to participation in the study. Pre intervention evaluation of pain intensity using Visual Analogue Scale and LLFT was obtained for all the subjects. Then the subjects were randomly allotted into two groups.

Group A: stretching of piriformis muscle

Group B: Mulligan mobilization of lumbo-sacral joint

An attendance sheet was used to document compliance with the program. If a subject missed a scheduled session, he made up the session on another day during the same week or during the next week.

- Subjects in both the groups assessed for following parameters before starting treatment.

Pain level using VAS

Functional deficit using lower limb functional index

And the measurements were taken after 4 weeks following treatment.

GROUP 1(n=20)

In this group the subjects received piriformis stretching. As starting, the patient was put in supine lying position. The involved limb's hip and knee are flexed and the foot placed firmly on the treatment table crossing over the contra lateral side. The pressure is applied over the knee for the hold-relax technique with a slack in the restricted ROM of adduction and flexion. Following which, passive stretching is provided for 20 – 30 seconds hold.

GROUP 2 (n=20)

In this group, the subjects received lower lumbar and sacro iliac mobilisations. There are different methods to mobilise the lumbar spine. The following technique is used in this study:

Starting Position:

Patient in sitting, facing away from therapist.

The pelvis is stabilised via a belt being placed around the patients ASIS's and around the therapist's ischial tuberosity. Therapist to palpate between adjacent spinous processes of the targeted lumbar spinal segments.

The patient actively flexes the lumbar spine and extends to a neutral position.

The therapist maintains the tension on the belt throughout the movement.

The problematic level is palpated and when the patient actively moves into flexion, a sustained PA force is applied throughout the whole movement of flexion to the spinous process.

This is repeated for three to four times per session as the pain free movement is noticed to improve the maximum range of movement in the lumbar spine

The outcome measures were taken after 4 weeks of therapy with a frequency of two times per week.

Outcome measures used were VAS for the improvement of pain and lower limb functional index for the improved function.

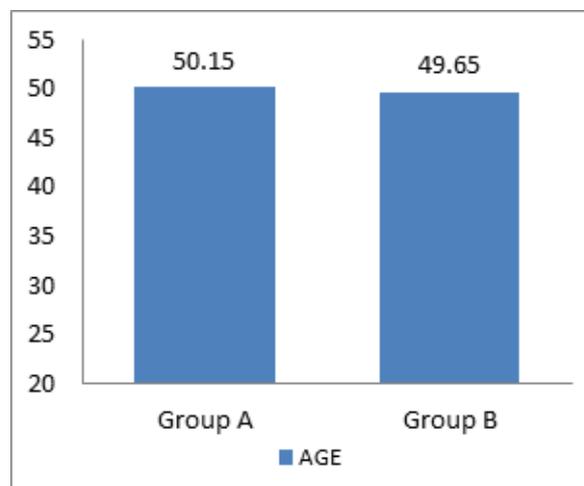
## RESULTS

Group A – Stretching group. Group B-Mulligan mobilization group

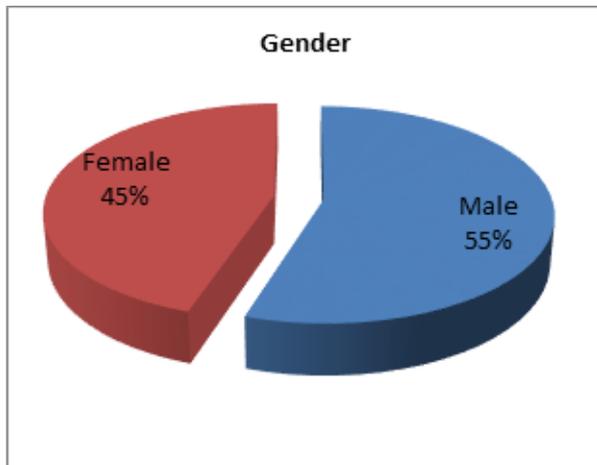
**Table 1:** Descriptive statistics for demographic variables

Variable	Group A	Group B	p-value
Age	50.15±7.35	49.65±5.98	>.598
Gender (M/F)	11/9	6/14	>.110

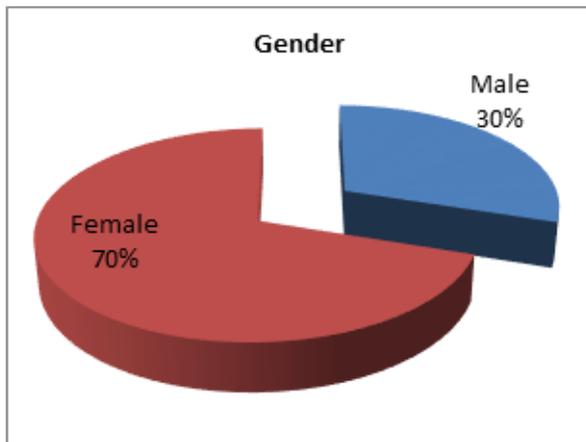
Data are mean ± standard deviation (sd). In group A the mean age is 50.15 with sd of ±7.35 and in group B the mean age is 49.65 ± 5.98 sd. The difference in mean age of group A and group B was not statistically significant. In group A, there were 11 male subjects and 9 female subjects. Similarly, in group B, there were 6 male subjects and 14 female subjects. Thus the demographic variables are homogenous in nature



**Graph 1:** Age difference in group A and B



**Graph 2:** Gender distribution of subjects in group A

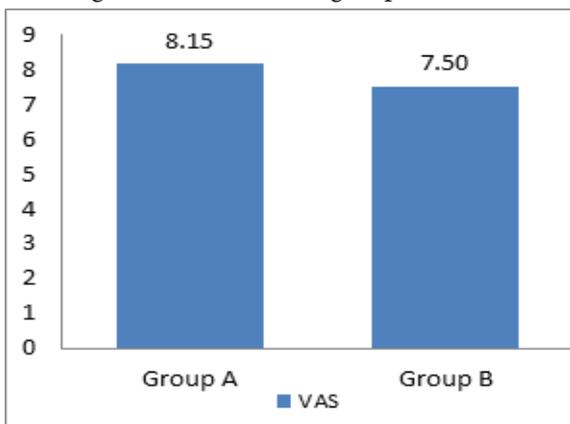


**Graph 3:** Gender distribution of subjects in group B

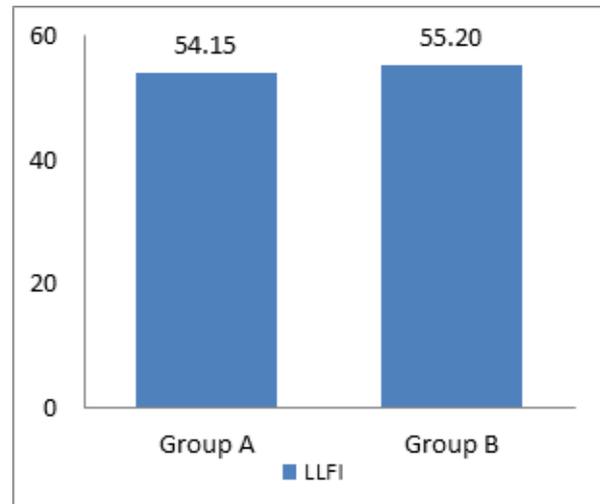
**Table 2:** Descriptive statistics for the outcome variable

Variable	Group A	Group B	p-value
VAS	8.15±1.14	7.50±1.47	>.211
LLFI	54.15±7.49	55.20±6.75	>.583

Data are in mean ± standard deviation (sd). In group A the mean of total VAS score was 8.15 with standard deviation of 1.14. In group B, the mean of total VAS score was 7.50 with sd of 1.47 which did not reach statistical significance when compared with group A. Also, in group A the mean of LLFI score was 54.15 with sd of 7.49 and in group B the mean of LLFI score was 55.20 with sd of 6.75 which did not show statistically significant difference when compared between groups. Hence, the outcome variables measurements were homogenous between the groups before the study.



**Graph 4:** Baseline data for VAS score



**Graph 5:** Baseline data for LLFI score

**Table 3:** Pre-post differences within group A

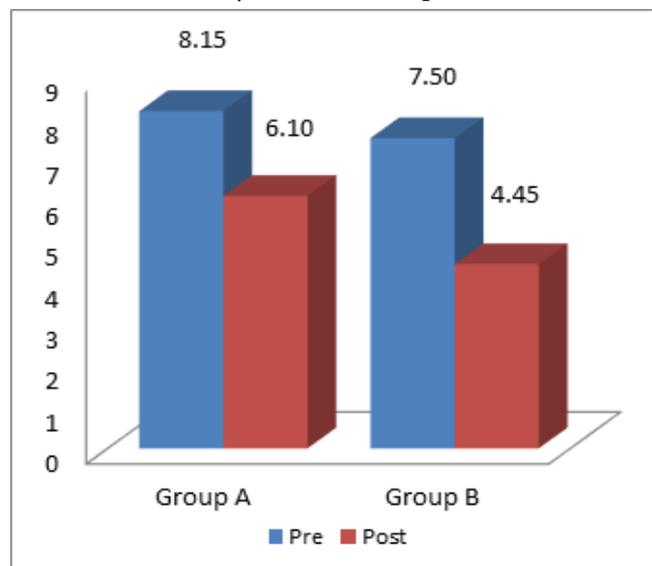
Variable	Pre	Post	p-value
VAS	8.15±1.14	6.10±1.52	<.0001
LLFI	54.15±7.49	64.30±5.80	<.0001

In group A, the pre score for VAS (total) was 8.15 with sd of 1.14 and the post score for VAS (total) was 6.10 with sd of 1.52. When pre and post values were compared it showed significant improvement. Also the LLFI pre score was improved from 54.15 with sd of 7.49 to 64.30 with sd of 5.80 which was statistically different with p value <.0001

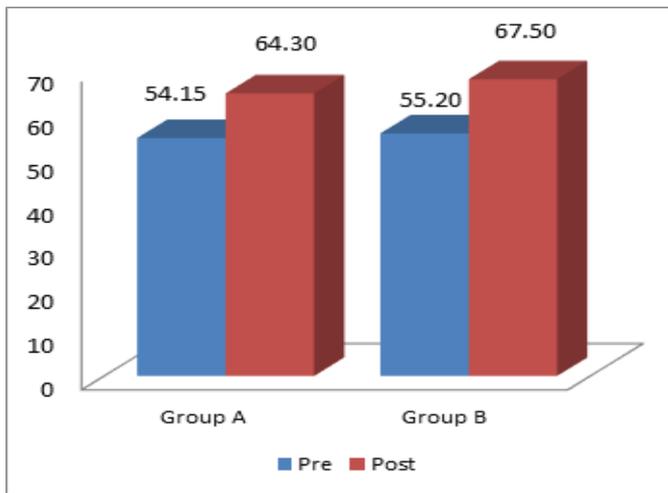
**Table IV:** Pre-Post differences within group B

Variable	Pre	Post	p-value
VAS	7.50±1.47	4.45±1.32	<.0001
LLFI	55.20±6.75	67.50±4.74	<.0001

In group B, the pre score for VAS (total) was 7.50 with sd of 1.47 and the post score for VAS (total) was 4.45 with sd of 1.32. When pre and post values were compared it showed significant improvement. Also the LLFI pre score was improved from 55.20 with sd of 6.75 to 67.50 with sd of 4.74 which was statistically different with p value <.001



**Graph 6:** pre-post differences within group A and within group B (VAS)

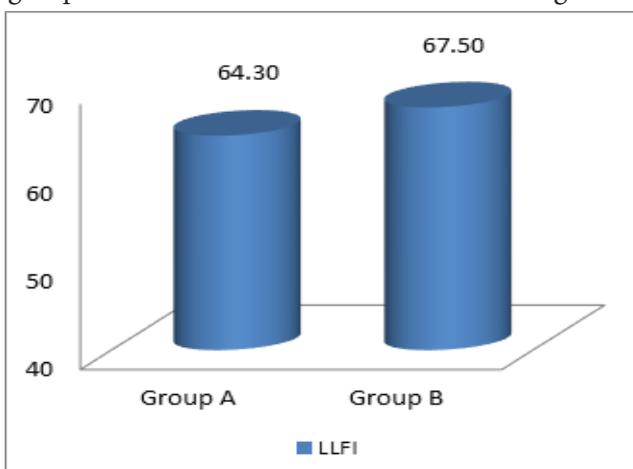


**Graph 7:** LLFI scores pre-post differences within group A and within group B

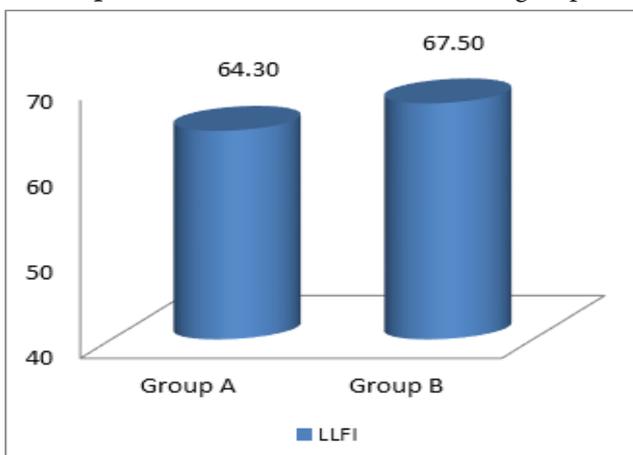
**Table V:** Difference between the groups.

Variable	Group A	Group B	p-value
VAS	6.10±1.52	4.45±1.32	<.001
LLFI	64.30±5.80	67.50±4.74	>.035

The mean difference in VAS score in group A was 6.10 with sd of 1.52 and the mean difference of VAS score in group B was 4.45 with sd of 1.32 which was statistically significant difference. The mean difference in LLFI score in Group A was 64.30 with sd of 5.80 and the mean difference of LLFI in group B was 67.50 and sd of 4.74 which is not significant.



**Graph 8:** VAS score difference between groups



**Graph 9 :** LLFI score difference between groups

## DISCUSSION

In this study the effect mulligan mobilization and the effect of stretching of piriformis muscle were studied and the results compared. Piriformis syndrome is characterized by pain and dysfunction. The symptoms resemble the sciatica like clinical picture. Apart from the pain in the gluteal region and in the distal sciatic distribution, unilateral piriformis tightness can lead to anterior rotation of the sacrum and a compensatory lumbar counter rotation on the affected side.

The conventional treatment method of stretching the piriformis muscle should be the straight forward approach to this problem. However, the consequence and effect of the muscle tightness leading to joint dysfunction is often ignored. Joint mobilization using Mulligan's approach is another established treatment method to deal with this issue.

The objective of this study is to compare the above-mentioned two measures in the management of pain relief and movement dysfunction in unilateral piriformis syndrome. Unlike the bilateral tightness of the muscle, the one sided shortening can cause dysfunctions either in hip rotation or lumbo sacral movements or both.

Hence among the two groups of patients taken, one group is treated with only piriformis stretching targeting the tightened structure and the other group received lumbo sacral mobilization with movement (Mulligan's) targeting the effect of the tightness in the proximal attachment.

We can find from the results that there is no marked difference in the baseline values of both pain (VAS) and LLFI between the two groups\*.

When compared within the same group pre and post interventions (time difference of 16 weeks), there is considerable improvement in both groups regarding pain relief 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 piriformis stretching group, there is no statistically significant difference in means of Visual analogue score for pain and LLFT score for functional disability pre intervention to post intervention means. Therefore, neither group showed a statistically greater difference when comparison was made between the group.

When pre intervention mean was compared for VAS score, it was found that there was no statistically significant difference in means of Visual analogue score for pain when pre-intervention means were compared between groups.

When pre intervention mean was compared for LLFT score, it was found that there was no statistically significant difference in means of LLFT score when pre-intervention means were compared between groups.

This leads to few assumptions regarding the cause of pain and dysfunction and how both treatment methods target-

ing different tissues worked well.

In group A, which underwent only piriformis stretching, the possible effect of shortening of the muscle and pain were the chief factors that caused limitation of functions. Due to pain, the lower limb functions were inhibited before the treatment sessions. Since, the muscle regained its length and pain obviously relieved as shown in the (VAS) chart, after the intervention, the patients' lower limb functions improved which is demonstrated by the post intervention LLFI score chart\*. For this group of patients, the lumbo sacral dysfunction might still be remaining untreated and that may be the reason for achieving only a limited improvement in both pain and dysfunction scores.

In group B, which underwent only mobilization, the lumbo sacral dysfunction is the only issue targeted. Due to the dysfunction in the sacro iliac and lumbo sacral joints could lead to limited functions as well, the patients demonstrated a poor LLFI score and high VAS score before treatment\*. Since the Mulligan's mobilization improved the range of movement of the dysfunctional joints of lower lumbar and sacro iliac joints, the patients scored higher LLFI score after treatment and lesser in the pain scale. However, it should be kept in mind that the tightness of piriformis for these patients could still be remaining untreated.

**A follow up study of the two groups is warranted to evaluate the mid to long term effects of the treatment methods.**

That might throw some light of the unanswered questions that are discussed above. First, to know whether the untreated piroformis muscle tightness of group B again effected in a relapsing lumbo sacral dysfunction and secondly to know whether the lumbo sacral dysfunction of the group A patients resolved by itself since the original cause (piriformis tightness) has been addressed.

## CONCLUSION

Mulligan mobilization has recently received increased interest as an inexpensive treatment for piriformis syndrome due to its ability to reduce pain and improve physical function, The novelty of this study was to compare the two known treatment program for piriformis syndrome and find out which is superior.

The present study concluded that both piriformis stretching and mulligan mobilization were found to be effective as an exercise program for patient with piriformis syndrome to provide additional benefits and better outcomes.

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