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ORIGINAL ARTICLE

Comparison of Gluteal Muscle Strengthening versus Conventional Isometrics in Pain Management of Piriformis Syndrome

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ABSTRACT

Aim: To analyze the effectiveness of gluteal muscles strengthening in piriformis syndrome.
Study design: Experimental study
Place and duration of study: Department of Physiotherapy, Mayo Hospital, Lahore from 1st February 2019 to 31st July 2019.
Methodology: Fifty patients presenting with piriformis syndrome were enrolled. They were divided in two groups. Control group received piriformis stretching, ultrasound and conventional isometrics. Experimental group received piriformis stretching, ultrasound and a gluteal strengthening program. The baseline parameters were assessed using the Visual Analogue Scale (VAS) and Manual Muscle Testing (MMT). Patients were treated for 40 minutes 3 times a week for 4weeks.
Results: Reduction in intensity of pain as well as improvement in ROM was seen in both groups. There was significant improvement in lateral rotation of hip in experimental group, and as piriformis is also a lateral rotator of hip joint, hence improvement in range of lateral rotation shows that a gluteal strengthening program has significant in increasing ROM of joint. There was significant improvement in MMT grade of gluteal muscles comparatively in the experimental group.
Conclusion: Experimental group showed improvements in decreasing pain and improvements in strength, with a significant improvement in lateral rotation shows that gluteal strengthening program can be used to treat pts with piriformis syndrome.
Key words: Manual Muscle Testing, Visual analog scale

INTRODUCTION

Piriformis syndrome is a neuromuscular disorder that occurs when the sciatic nerve is compressed or otherwise irritated by the piriformis muscle causing pain, tingling and numbness in the buttocks along the path of the sciatic nerve descending down the lower thigh and into the leg[1].

This muscle holds a pivotal role in lower body movement as it is involved in the stabilization of the hip joint and rotates the thigh away from the body. This allows us to walk, shift our weight from one foot to another, and thus helps in maintaining our balance. In a nutshell, it regulates every motion of the hips and legs[2]. The sacral plexus lies in close approximation with the anterior surface of the piriformis muscle. The lumbosacral trunk and the ventral rami of the first 3 sacral nerves form the sacralplexus[3].

More often than not, the piriformis syndrome is sometimes confused with sciatica of lumbar origin. This is especially true, when considering the fact that both diseases mimic the pain pattern of sciatica[4]. The main difference is then attributed to the nature or cause of the pathology. Sciatica of lumbar origin occurs when the disc pathology or protrusion, compresses the sciatic nerve roots, whereas piriformis syndrome is the compression of the nerve due to a tight piriformis muscle[5].

An intrinsic pathology which is most probably a primary factor for causing pain in the piriformis muscle includes pathologies like myositis ossificans or myo-facial, can be due to trauma. Pathologies leading to piriformis syndrome which is secondary in origin frequently involve hip related pain and pathology of structures that lie just adjacent to sciaticnotch[6].

Trauma, in itself, is an important factor related to piriformis syndrome pathology. 50% of patients have a history of trauma.[7] Though, symptoms may appear years after the emergence of symptoms. Total hip replacement can also lead to this pathology.[8]

Various techniques used for the management of piriformis syndrome included numerous techniques from a local injection of an anesthetic, steroid and even botulinum toxin.[9] Injecting a local anesthetic or even steroid around the site near sciatic nerve has also proven to show some effectiveness.[5] Muscle electro-myography or computed tomography (CT) induced identification of the piriformis muscle is some recently approved strategy[10].

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Many authors have admitted that hip abductor weakness as an associated finding with piriformis syndrome. Yet only two of the mentioned reports included hip abduction strengthening as part of the treatment regime, with one author observed that hip abduction exercises seemed to hasten recovery[10,11].

Tonley et al[11] describes various applicable physical therapy used treatment techniques like ultrasound, stretch the piriformis muscle, mobilization of soft tissues, hot packs and spinal treatments. Interestingly, Tonley et al[11] also describes a fairly new treatment approach for piriformis syndrome. This mainly involves using function and exercise techniques involving hip musculature like gluteal muscles. Weakness of the gluteal muscles were leading to development of abnormal patterns of movement at the hip joint, evidently leading to excessive lengthening or eccentric loading of the piriformis during functional activities. Hence strengthening these muscles should improve the patient condition[12].

MATERIALS AND METHODS

This experimental study was conducted at Department of Physiotherapy, Mayo Hospital Lahore from 1st February 2019 to 31st July 2019 after Ethical Committee permission. Fifty patients presenting with piriformis syndrome were enrolled. After assessing patient using FAIR test and determining that the patient had piriformis syndrome. Individuals having age 40 to 65 without systemic spinal cord pathology, no history of substance abuse, no primarily spine related pathologies like disc hernia and spinal stenosis were included. Patients having spinal pathologies, negative FAIR test, individuals having cognitive dysfunctions were excluded. They were divided in two groups. Control group was given piriformis stretching, ultrasound and conventional isometrics (e.g. hip flexor, adductor isometrics) and experimental group received piriformis stretching, ultrasound and a gluteal strengthening program. Hip strength was assessed using MMT as described by Kendall et al[13]. The baseline parameters were assessed using the VAS for pain and MMT for strength. Patients were treated for 40 minutes 3 times a week for 4 weeks[14].

All patients had a chronic history of piriformis syndrome. They were asked to lie prone on a wooden couch and ultrasound was applied over the region of the buttocks. The intensity was set at 2.25 W/cm^2 for 10 minutes[15]. After that, he was asked to lie supine lying. And his hip joint was externally rotated and his knee

was moved to approximate as close as possible to the opposite shoulder i.e. “piriformis stretching”. The stretching manoeuvre was performed for 20 seconds with 10 times repetition per treatment session[16].

For control group, conventional gluteal strength exercises were given that involved resisting hip abductors and extensors for 3 sets of 15 repetitions each. For the experimental group, along with piriformis stretching, ultrasound, hip musculature strengthening was started. The plan was divided into three phases: **Phase 1 (1st week):** For the first week, isolated muscle recruitment was performed which consisted of (a) bridging exercises and (b) side-lying clam exercises. These were performed for 3 sets of 15 repetitions each. These were non-weight bearing exercises[11]. **Phase 2 (2nd week):** For the second week, weight bearing strengthening were performed which consisted of: (a) squatting exercises (b) side – stepping (c) single limb sit to stand and (d) step-up/Step-down exercises. These were performed for 3 sets of 15 repetitions each.[11] **Phase 3(3rd week):** For the third week and fourth week, functional exercises were performed which consisted of (a) forward lunge and (b) double limb jump/land position. These were performed for 3 sets of 15 repetitions each[11].

Exercise plan was made that concentrated on hip abductors, extensors. Assessment was made by the author on the first week, then on the second week and up to 4 weeks. A final assessment for checking the condition of the patient was made by the author after 6 weeks to assess final condition and post VAS and MMT values were taken. The data was entered and analyzed through SPSS-25.

RESULTS

The mean age of control group participants was 50.4±5.79 years. The mean age of experimental group participants was 45.31±7.08 years (Table 1).There was significant improvement in lateral rotation, abduction, VAS score and MMT of gluteal muscles of pre- and post-treatment in control group (Table 2). There was significant improvement in lateral rotation, abduction, VAS score and MMT grade of gluteal muscles of pre- and post-treatment in experimental group (Table 3). There was significant improvement in lateral rotation, abduction, VAS score and MMT grade of gluteal muscles in control and experimental groups (Table 4).

Table 1: Descriptive statistics for age, weight and height (ft)

Variable	Control group	Experimental group
Age (years)	50.4±5.79	45.31±7.08
Weight (kg)	68.64±19.98	72.60±11.74
Height (ft)	5.45±0.62	5.58±0.45

Table 2: Comparison of pre-treatment and post-treatment in control group

Variable	Pre-treatment	Post-treatment	P value
Lateral rotation	30.8±3.61	40.2±1.99	0.0001
Abduction	40.08±0.9	43.4±5.67	0.0001
VAS	7.30±0.85	5.3±1.57	0.0001
MMT (G. max)	3.721±.69	4.48±0.5	0.001
MMT (G. medius)	3.2±1.68	4.56±0.5	0.001

Table 3: Comparison of pre-treatment and post-treatment in experimental group

Variable	Pre-treatment	Post-treatment	P value
Lateral rotation	31.04±5.67	42.5±3.77	0.0001
Abduction	41.5±1.00	43.8±0.77	0.0001
VAS	7.34±1.18	4.0±1.25	0.0001
MMT (G. max)	3.8±.1.9	4.6±0.3	0.03
MMT (G. medius)	3.1±.1.7	4.5±0.2	0.0001

Table 4: Comparison of variables in control and experimental group

Variable	Control group	Experimental group	P value
Lateral rotation	40.2±1.99	42.5±3.77	0.002
Abduction	43.4±5.67	43.8±0.77	0.876
VAS	5.3±1.57	4.0±1.25	0.142
MMT (G. max)	4.48±0.5	4.6±0.3	0.005
MMT (G. medius)	4.56±0.5	4.5±0.2	0.0001

DISCUSSION

The most frequent occurrence of piriformis syndrome is either during the fourth or fifth decades of life and its scope of effect includes individuals of all ranges of work and activities.[15] There was a significant reduction in VAS score in experimental group as compared to control group.

The results of the present study showed that although both interventions are effective in improving the patient’s symptoms, there was significant improvement in gluteal muscles strengthening 4.6±0.3, 4.5±0.2 in experimental group and 4.48±0.5, 4.56±0.5 in control. There was significant improvement in lateral rotation, 42.5±3.77 in the experimental group and 40.2±1.99 in control. As piriformis is mainly a lateral rotator of hip, improvement in strength shows that piriformis syndrome can show improvement by focusing of a strengthening program focused on hip abductors.

Han et al5 showed that surgical and conservative management are both viable options for management of piriformis syndrome. In this study, the improvement in VAS and lateral rotation was seen in the experimental group as compared to control group.

Tonley et al[11] showed that the strength assessment of the patient with piriformis syndrome had weakness in hip abductors and lateral rotators and significant improvement was seen in the patient after strengthening the gluteal muscles. In this study, both weakness in gluteal muscles and restriction in lateral rotation were seen and were significantly improved in experimental group.

An interventional study by Gondal et al[15] compared the physiotherapy management of patients with piriformis syndrome with medicine only. In the study lateral rotation of the hip was significantly improved after physiotherapy management. Similarly, this study showed that lateral rotation was improved in both groups, but in comparison, it was significantly better in experimental group as compared to control (p=0.001).

Morimoto et al[17] determined the electromyographic activity of piriformis syndrome during hip movements and concluded that the activity was highest during prone hip extension in external rotation and hence, showed that piriformis has a role in influencing the role of gluteal muscles. In this study, improvement was seen in gluteal muscles strength and improvement in lateral rotation was seen in the experimental group.

The results show that a targeted gluteal strengthening program is more effective in reducing pain in individuals with piriformis syndromes as compared to conventional isometrics and therefore, should be considered as part of treatment.

CONCLUSION

The experimental group showed improvements in terms of decreasing pain and improvements in strength, with a significant improvement in lateral rotation shows that gluteal strengthening program can be used to treat patients with piriformis syndrome.

Conflict of interest: Nil

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