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Effects Of Positional Release Technique and Proprioceptive Neuromuscular Facilitation in Managing Piriformis Syndrome

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ABSTRACT

Piriformis syndrome is referred to the piriformis muscle abnormality that further compress the sciatic nerve. Given the growing number of piriformis syndrome cases, whose exact course of therapy is still unclear despite several studies and efforts, an effective treatment is still up for debate. Therefore, this study is to ascertain how well proprioceptive neuromuscular facilitation and positional release technique work for piriformis syndrome. Following the inclusion and exclusion criteria, 74 piriformis syndrome individuals were selected and into two groups: the positional release therapy group and the proprioceptive neuromuscular facilitation group. Hip range of motion, lower extremity functional scale, and numerical pain rating scale values were recorded before and after the intervention. For a total of four weeks, both groups received treatment three times a week. After then, the data were tallied and statistically examined. According to the findings of the Paired-t-test, both groups significantly improved their range of motion, LEFS, and pain reduction ($p<0.01$). The PNF group is more effective than the PRT group at reducing pain, increasing range of motion, and LEFS, according to the independent "t"test for post values between the groups in all variables except hip external rotation ($p>0.5$). Although both groups had a decrease in discomfort and an improvement in function, proprioceptive neuromuscular facilitation is a more effective treatment for piriformis syndrome compared to positional release approach.

Keywords: *Piriformis Syndrome, Positional Release Technique, Proprioceptive Neuromuscular Facilitator and Sciatica.*

1. INTRODUCTION

A rare and unpleasant ailment of the piriformis muscle is called Piriformis Syndrome (PS). The person typically complains of leg and buttock pain, which is brought on by piriformis muscle inflammation, muscular spasms, hypertrophied muscles, and muscle shortening. Sciatic nerve compression is resulted from any anatomical variation of the muscle structure. Myofascial discomfort, muscular hypertrophy, myositis ossificans, and structural variations and pathological changes in the muscle are the main symptoms of piriformis syndrome. However, it can also occasionally be brought on by trauma to the pelvis or buttocks. Other etiological causes of piriformis syndrome include facet joint syndrome, bursitis of the trochanter, disc herniation, dysfunction of sacroiliac joint, and impingement of sciatic nerve [1, 2].

When the hip flexion angle reaches 60 degrees, external rotation of the hip is done by the piriformis muscle. Type-I fibre makes up the majority of the piriformis muscle. When a muscle is under excessive stress, type 1 muscular fibres typically have a tendency to shorten or constrict. Because of where it is placed, it was found that the piriformis muscle's breadth rises as it shortens. 80% of the population found to have sciatica, sciatic nerve is compressed as it travels beneath the piriformis muscle [3]. The delay in diagnosing piriformis syndrome led to pathologic alterations such as chronic somatic dysfunction, which in turn caused compensatory modifications that resulted in discomfort, muscular weakness, hyperaesthesia, and paraesthesia. The most frequently misdiagnosed condition in cases of sciatica-related back pain is intervertebral disc prolapse. In severe circumstances, intervertebral disc prolapse frequently results in surgery.

Among chronic low back pain individuals, the piriformis syndrome prevalently ranged from 5% to 36%. Low back discomfort has been associated with a larger percentage of piriformis syndrome, according to recent studies. Research indicates that piriformis syndrome, which is detected by combining lasegue's sign with a modified FAIR test, accounts for

17.2% of cases of low back pain [6,7]. Discomfort radiating from sacro-lumbar region to gluteal region and radiating further down to the thigh and leg is a hallmark of piriformis syndrome. A lesion in the intervertebral disc and degenerative changes in the spine can also cause sciatica [8].

A form of manual therapy called positional release technique (PRT) can be used to treat both acute and chronic muscular spasms, as well as the pain and impairment that are frequently brought on by them. In order to normalize the tissue linked to dysfunction and lessen the irritation of the tender point, Positional release, often referred to as spontaneous release by positioning and subsequently strain and counter-strain, is achieved by placing the affected tissue in the most comfortable possible position [9,10].

Stretching that incorporates both muscle contraction and relaxation is referred as PNF. The term "contract relax" and "hold relax" relate to passively stretching the target muscle. The target muscle then contracts statically. It is then passively shifted into a position that is more stretched. A technique similar to contract- relax and hold- relax is referred to contract- relax-agonist contract. The distinction is that the opposing muscle is contracted to shorten the target muscle after it has been contracted, putting the target muscle in a stretch position that produces more passive stretch [11,12].

Although many studies have shown that stretching helps with piriformis syndrome, little is known about how well positional release and neuromuscular facilitation work to treat the problem. Therefore, this study intends to evaluate the efficacy of the positional release strategy compared with proprioceptive neuromuscular facilitation

2. METHODS & MEASURES

At, Physiotherapy OPD, Saveetha medical college hospital, quasi-experimental study was conducted. 74 individuals with piriformis syndrome were included, study involved both the gender, age between 25-60 years, those individuals with onset of pain- more than 2 weeks, individuals were selected based on the diagnostic criteria - Any 3 positive sign in the following test (decreased medial rotation of hip in knee extension, lasegue's sign, FAIR test, freiberg sign, Pace sign). Individuals was excluded if any recent injury around hip, knee and SI, Fracture of hip or femur, Limb length discrepancy, Lower limb deformity, Lumbar instability, Lumbar spondylolisthesis, IVDP lumbar spine.

Individuals were randomly allocated into 2 groups using closed envelope method, Positional release group and PNF stretching group. Both the group consists of 37 participants each and they were commonly treated with short wave diathermy. Participants were explained about the procedure. For a total of four weeks, the intervention was administered three days a week. Pretest at the beginning of the study and a post-test at the end of the fourth week of the intervention the outcome measures were analysed. Hip range of motion measured using goniometer, the lower extremity functional scale (LEFS) to determine the functional level of the individual and pain score recorded with numerical pain rating scale (NPRS).

In position release group, all the participants were treated with positional release technique, individual is positioned in prone lying, affected side knee flexed and the thigh moved over the edge of the table, knee supported by therapist's one hand and the other hand palpate the involved tissue. Flex the hip while also abducting and external rotating as needed until tenderness is relieved. This position is maintained for 90 sec with 3 repetitions i.e., a total of 270 sec PRT program performed 3 sessions per week for 4 weeks [13,14].

PNF group were treated with PNF stretching exercises, patient was positioned in supine posture with their hips and knees flexed. They then move their knees towards the opposite shoulder to stretch the muscle, holding the position for ten seconds. The participant were instructed to contract the muscle without moving—for example, by gently pushing against the stretch without moving—and hold the contraction for three seconds. Both the stretch and the contraction should be relaxed. Start the second stretch, which ought to be more profound than the first. For four weeks, this is performed three times a week for ten repetitions (until the soft tissue feels a discernible release) [15]. Both the groups were treated with shortwave electrodes with a frequency of about 27.12 MHz are placed on the thigh in lateral aspect and in gluteal region of the individual for the duration of ten minutes. [16, 17].

3. STATISTICAL ANALYSIS

Descriptive and inferential statistics were employed to analyse the gathered data, with the mean and standard deviation (SD) applied to each parameter. Within a group pre-test and post-test variables were examined using the paired t-test and shows significant changes. Comparison among the two groups were examined with unpaired t-test and significance was found. A p-value less than 0.5 was established as the threshold for statistical significance.

Table 1: Demographic variables

Characteristics	Positional release group	PNF group	t-value	p value
Age	36.4± 8.66	38.13±9.01	-0.536	0.595
BMI	28.84±0.75	27.55±.0.32	-1.507	0.142

Table 2: Pre-Post differences within positional release group

PRT	Pre-test		Post-test		t value	p value
	Mean	SD	Mean	SD		
NPRS	6.533	0.833	4.066	0.883	-7.667	0.0001
HIP IR	21.133	4.421	27.66	8.82	14.0	0.0001
HIP ER	24.86	2.996	27.26	2.218	3.450	0.0039
LEFS	44.33	7.037	80.73	5.909	19.291	0.0001

Table 3: Pre-Post differences within PNF stretching group

PNF	Pre-test		Post-test		t value	p value
	Mean	SD	Mean	SD		
NPRS	6.8	1.01	2.6	0.736	-18.873	0.0001
HIP IR	20.86	3.02	31.06	3.08	11.323	0.0001
HIP ER	26.33	2.535	28.06	2.987	5.772	0.0005
LEFS	45.53	6.243	87.33	6.778	45.607	0.0001

Table 4: Post-test difference between PRT & PNF group.

Variable	PRT post-test		PNF post-test		t value	p value
	Mean	SD	Mean	SD		
NPRS	4.066	0.883	2.6	0.736	4.937	.0001
HIP IR	27.66	8.82	31.06	3.08	2.678	.0122
HIP ER	27.26	2.218	28.06	2.987	0.832	.412

LEFS	80.73	5.909	87.33	6.778	2.842	.008

4. RESULTS

The study included seventy four participants who fulfilled the selection criteria. Seven participants stopped participating for a variety of reasons, whereas sixty-seven participants finished the study according to the protocol. The baseline and demographic data for the individuals in the two intervention groups are shown in Table 1. Subjects' AGE mean and standard deviation are compared between the PNF and positional release groups. The mean age of positional release group was 36.4 ± 8.66 and that of PNF group was 38.13 ± 9.01. The unpaired t-test was -0.536 and the p value is 0.595. The AGE parameter did not differ much. Subjects' BMI mean and standard deviation are compared between the PNF and positional release groups. The PNF group's mean age was 27.55 ±.0.32, while the positional release group's was 28.84 ± 0.75.The unpaired t-test was -1.507. The BMI parameter did not alter much. Table 2 shows within positional release group, pre and post values that is significant difference in each variable with ($p<0.05$). The positional group's P values were as follows: NPRS ($P < 0.05$), LEFS ($p<0.05$), and hip internal and external rotations ($p<0.05$).

Table 3 shows within PNF stretching group, pre and post values that is significant difference in each variable with ($p<0.05$). The positional group P values for NPRS ($P < 0.05$), LEFS ($p<0.05$), and hip internal and external rotation ($p<0.05$)

The pre-test results for the PNF stretching group and the positional release group do not significantly differ in any of the variables. Every variable, with the exception of hip external rotation, indicates a significant difference between the PNF stretching group and the release group post values (Table 4). Hip internal rotation ($p<0.05$), hip external rotation ($p>0.05$), and LEFS ($p<0.05$) all had post-test P values of NPRS ($P<0.05$).

5. DISCUSSION

There are different treatment approaches that can be used for the condition piriformis syndrome. Whereas, positional release (PRT) and proprioceptive neuromuscular facilitation (PNF) are the treatment approaches to full fill the aim of the study, both treatments were compared to find the effectiveness in piriformis syndrome.

A numerical pain rating scale is used to quantify the pain that piriformis syndrome causes in the gluteal and back regions of the leg. When walking and standing, the piriformis muscle serves as the hip's weak flexor, weak abductor, and external rotator, all of which contribute to postural stability [18]. Shortening of piriformis muscle may affect the internal Rotation, hence internal and external rotations were measured in this study. Then lower limb activities were analyzed by lower extremity functional scale. Data was noted at baseline and after intervention duration of four weeks, evaluation were done to identify the changes in the mentioned parameters. According to the study's findings, PRT and PNF significantly reduced pain, increased hip internal and external rotation range of motion and also enhanced functional ability in each group. At the fourth week of the program, all parameters, with the exception of hip external rotation, revealed a difference significantly among the groups. However, in comparison between the groups both the groups were different from each other significantly.

By automatically resetting the muscle spindles, the positional release technique helps to change the affected muscles' length and tone [19]. In their study, A. Kumaresan et al. discovered a significant difference in pain levels in groups that used the positional release strategy and the conventional treatment on the final day of the treatment regimen. The soreness was lessened more in the positional release group [20]. By treating gluteus medius trigger points, Soumik Basu et al. (2017) found that the Positional Release Technique is a better option for treating mechanical low back pain [17]. Proprioceptive systems, nociceptive pathways, the facilitated segment, and fascial dysfunction are some of the neuromuscular pathophysiological mechanisms that could account for PRT's therapeutic efficacy [21].

Proprioceptive neuromuscular facilitation is a highly popular approach among researchers and clinicians since it is thought to be even more effective than static stretching to increase range of motion [22]. According to Yuktasir Kaya (2009), electromyography in muscles is more active than static stretching methods to increase range of motion, followed by PNF techniques [23]. Hold-relax strategies used by therapists and self-applied techniques were compared by Schuback, Hooper, and Salisburg (2004). Both are important for improving range of motion [24]. Rowlands, Marginson, and Lee (2003) looked into how long relaxing techniques' contractions lasted. Range of motion was shown to increase with longer contraction timing [25]. One of the study's limitations is the potential for short-term gains. There was no patient follow-up after treatment. This study did not monitor the long-term consequences of the therapeutic strategy. More study can be conducted with an emphasis on gender-specific studies to observe the effect of the intervention regimen. Other hip activities can be utilised to test the result of hip range of motion, and electromyography can also be employed to examine the improvement.

6. CONCLUSION

This research indicates that "positional release technique" and "proprioceptive neuromuscular facilitation" both are effective treatment for piriformis syndrome. The patient's symptoms dramatically improved, including a decrease in discomfort and an increase in lower limb activities and hip range of motion. Additionally, among piriformis syndrome this study showed

PNF to be more beneficial than the positional release technique.

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