



Effect of muscle energy technique in combination with gluteal activation exercises in patients with Piriformis Syndrome

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ABSTRACT

The objective of the study was to see the combined effect of Gluteal Activation Exercises (GAE) and Muscle energy technique (MET) in patients with Piriformis Syndrome. The study was done at Physiotherapy OPD of SGT medical College and Hospital. A total of 30 subjects of both genders (age range of 25-45 years) were included in the study. Subjects were randomly assigned into three groups. Group A (Subjects receiving GET exercises and MET along with Conventional Therapy), Group B (Subjects receiving MET along with Conventional Therapy) and Group C (Subjects receiving Conventional Therapy). The assessment for Pain was done by NPRS, Range of Motion assessed via Goniometer, Strength was assessed via MICROFET2 Dynamometer and Motor Control was assessed via Patient specific functional scale. All were measured at baseline and last day of 4th week. Pain, ROM, Strength and Motor control showed significant difference within the groups as well as between the groups except for External Rotators and PSFS which showed non-significant result in between the groups at the end of 4th week. GAE along with MET is more effective in reduction of pain and improvement of ROM, Strength and Motor Control as compare to other groups.

Key words: Gluteal Activation Exercises, Muscle Energy Technique, MicroFET2 Dynamometer.

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INTRODUCTION

Piriformis syndrome (PS) is a painful Orthopedic condition that causes pain due to entrapment of the sciatic nerve by piriformis muscle at the level of ischial tuberosity¹. It occurs as a result of shortening of piriformis muscle. Its reported worldwide prevalence rate is 5-36% and in India, its incidence rate is 6.25%. The mainly Young population experienced a significant prevalence of PS in the age group from 30-40 years. Females are found to be more prone to PS than males (6:1) due to biomechanical fault associated with wider pelvis and Increased Q angle¹. Causes of PS are injury to hip and buttock region which contributes to the main cause such as Hypertrophy of piriformis muscle, prolonged sitting in a single position for long duration, Anatomical dysfunction such as Bipartite piriformis muscle. Clinical Presentation which is usually Seen in patients with PS are complaints of persistent buttock pain, inability to sit for prolong duration, pain during getting out of bed and prolonged standing and also the pain is found to be deteriorating in gluteal region during hip movements¹. Few special tests such as FAIR test, FREIBERG'S test, LASEGUE test, PACE² test is found to show a positive result for diagnosis of Piriformis syndrome.¹ Available researches highlight the effectiveness of Gluteal Strengthening Exercises and Muscle Energy Technique but to the best of our knowledge till now no study has been determined to see the combined effect of Gluteal Activation Exercises along with Muscle Energy Technique for combating Pain and improving Range of Motion, strength and Motor Control in patients with Piriformis syndrome. Although Piriformis syndrome is a clinical entity which normally get undiagnosed despite of its high prevalence of 5-36% worldwide, numerous researches have been done in managing Piriformis syndrome but there is still, a lack of evidences for Gluteal Activation Exercises for piriformis syndrome patients. Several researches reported that physical therapy plays an important role in the treatment of PS, Various modalities such as heat therapy, cold therapy, ultrasound along with manual therapy such as piriformis stretches along with muscle energy technique, soft tissue release, biomechanical fault corrections. Till date Piriformis stretching and Electrical Modalities are being used for treating Piriformis syndrome but no emphasis is given on Gluteal Activation Exercises so it is aimed to see the efficacy of Gluteal Activation Exercises in piriformis syndrome so that it can be used clinically by the Physical Therapist.

MATERIAL AND METHODS

This Pretest-Post-test Control Group experimental study was conducted at the SGT medical College Hospital & Research Institute, Gurugram, Haryana. The institutional ethical clearance of SGT University Faculty of Physiotherapy was priorly obtained for the study (Ethical Number Ref No. SGTU/FOP/220/36) and was conducted according to norms of declaration of Helsinki of 1975 that was revised in 2000. The informed consent was signed by all the participants those were included in the study.

Sample Size Calculation: A sample of 30 subjects was calculated with the G -power software with 10% power and 95% confidence interval.

Inclusion^{4,5} and Exclusion criteria The inclusion criteria were both male and female having Piriformis syndrome with age group 25- 45 years, pain intensity within 3-10, Out of these 3 test Fair Test, Piriformis Stretch test and Lasegue test one must be positive were included in the study and the participants having Pelvis fracture, SI joint dysfunction, hip joint dislocation recent pathology around hip were excluded from the study.

Outcome Measures

- NPRS
- Goniometer
- MICROFET2 Dynamometer⁶(Fig 1a & 1b)
- Patient specific functional scale.⁷

FIG: FLOWCHART

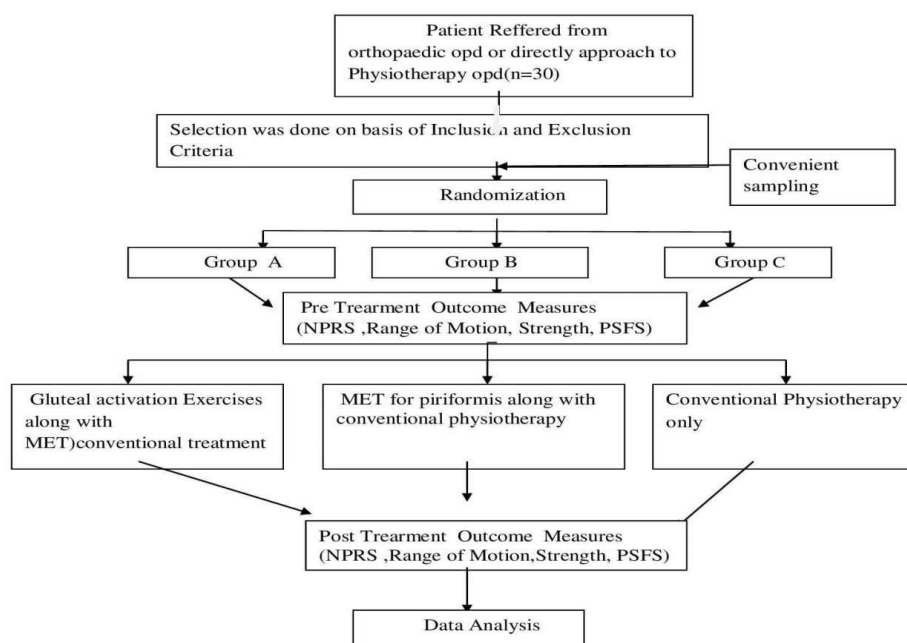


Fig 1- Protocol of study

PROTOCOL PROCEDURE

In this study 30 subjects with Piriformis syndrome were selected based on the inclusion and exclusion criteria. The entire procedure and the nature of the protocol was explained to all the subjects participating in the study and also informed consent was obtained prior to the start of the study. This study was a 4-week study in which Group A received Gluteal Activation Exercises (Table 1 and Figure 3) along with Muscle Energy Technique for Piriformis Muscle and conventional treatment, Group B received Muscle Energy technique (Figure 4) along with conventional treatment and Group C received conventional treatment. Assessment was done at baseline and after 4 weeks of the study. Gluteal Activation Exercises that were used to activate or strengthen the gluteus muscles group (2- 3 sets 10 reps for every set, 3 days a week⁸. These exercises were given in 2 phases. **1st phase** is normal phase in which strengthening exercises were given to the patients (2-3 sets 10 reps for every set, 3 days a week). **2nd phase** which is the progression phase in which therabands were used along with strengthening Exercises for further improvement of strength of gluteus muscle group.¹⁰ Gluteal Activation Exercises along with therabands are used in the progression phase for improvement and enhancement of strength of the gluteal muscle group. Gluteal Activation exercises using therabands (3 sets 20-25 repetitions) firstly started with red if patient able to complete repetitions with red then progresses to green and finally to blue patient able to perform exercises.

Type of Exercise	Position of Exercise Performance	No of Sets and repetitions	Hold
Side-lying hip abduction	The subject was in a side-lying position with the bottom leg was bent for maintaining the body from rotation and the top leg was Abducted 25* and adduct the leg to starting position.	10 reps in a single set (3 sets)	10-sec hold
Clam with 30° hip flexion	The subject was in a side-lying position with the hip flexed to 30* and knees flexed at 90* upper leg was abducted while keeping the feet together and the patient should avoid trunk rotation in the transverse plane and abduct as far as possible	10 reps in a single set (3 sets)	2-3 sec hold
Clam with 60° hip flexion	The subject was in a side-lying position with the hip flexed to 30* and knees flexed at 90* upper leg was abducted while keeping the feet together and the patient should avoid trunk rotation in the transverse plane and abduct as far as possible without any compensation	10 reps in a single set (3 sets)	2-3 sec hold
Lunge	The patient was in a standing position and asked to step forward in front of the other leg and keeping the knees behind the front of the foot and to a depth of 90* hip and knee flexion.	10 reps in a single set (3 sets)	2-3 sec hold
Unilateral Bridge	The patient lied in a supine lying position with one limb is bent to 90* and another leg was brought over the contralateral leg for restricting the compensatory movement of iliopsoas (it can also be performed when one leg is bent and the contralateral leg had to straightly taken toward the ceiling and then return to the original position.	10 reps in a single set (3 sets)	2-3 sec hold
Bilateral bridge	The patient was in a supine lying position and both the legs were bent to 90*and the patient lifted the hips to the neutral hip position.	10 reps in a single set (3 sets)	2-3 sec hold
Buttock squeezing exercise	The patient was in a prone lying position and patients both legs were to be together and the patient was asked to clench the buttock together.	10 reps in a single set(3 sets)	10 sec
Prone Extension with knee flex to 90*	The patient was in a prone lying position and was asked to bend the affected side to 90* and the patient was asked to take the bent leg toward the ceiling and then return to starting position	10 reps in a single set (3 sets)	10 sec

Table1: Gluteal Activation Exercises⁸



A

B

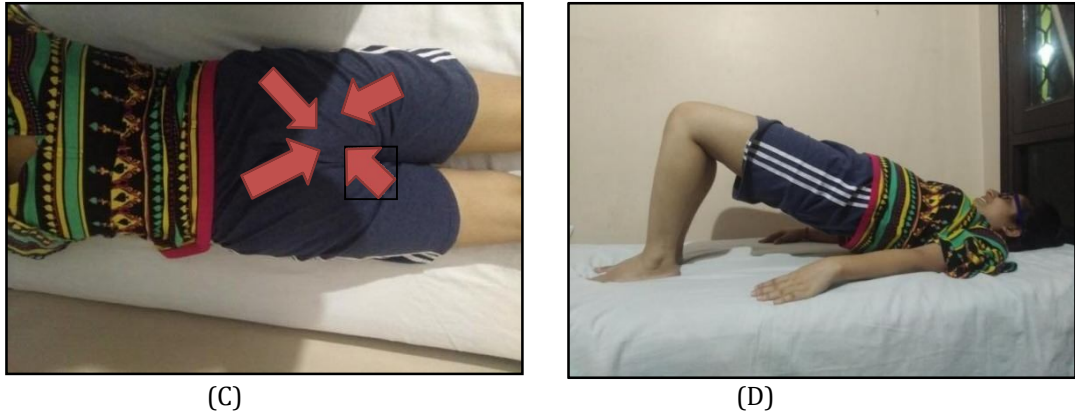


Fig 3: Gluteal Activation Exercise- (A) Unilateral Bridge, (B) Prone Extension with Knee 90° Flexed, (C) Buttock Squeezing Exercises, (D) Bilateral Bridge



Fig 4: MET for piriformis muscle (Arrows signifies Resistance applied by the therapist against the motion of the patient and other arrows signifies the isometric contraction applied by the patient against therapist resistance.

STATISTICAL ANALYSIS

All statistical analysis was done using version 21 (SPSS) software for windows, Descriptive Analysis was obtained by Mean and Standard deviation, Non parametric Test (Wilcoxon signed ranked test) was used for Pain and motor control and Parametric Test (Paired T test) was used for analyzing and compare the difference within the groups for Strength and ROM at baseline and last day of 4th week, One way ANOVA followed by Post hoc test were used to analyze difference between the groups for variables (Pain, Rom, strength and Motor control) at baseline and last day of 4th week. The significant level was set at 95.

RESULT

Table 1 shows the difference in the Mean and Standard deviation for demographic data in Group A, B, and C which showed no significant result for all the 3 groups viz age, height, weight, and Body mass index. Graphical Representation of demographic of all the three groups showed in Table 1.

Mean±SD			
Variables	Group A	Group B	Group C
Age	31.5±4.88365	28.8±4.23792	29.6±4.2
Weight	64±3.80657	67±2.28035	67.4±2.2891
Height	162±4.06079	164.8±3.91918	165±3.80657
BMI	24.38±2.10798	24.71±1.48943	24.71±1.34048

Table 1- Demographic Details

Table 2 shows the difference in mean and standard deviation by Wilcoxon signed ranked test within groups A, B, and C of NPRS which shows the statistically significant result for Group A (0.005), Group B (0.005), and Group C (0.006). Wilcoxon signed ranked test was used to see the change score for PSFS

which shows the statistically significant result for Group A (0.005), Group B(0.007), and Group C(0.009). Graphical Representation of Mean comparison of within groups shown in Table 2 and graph 1a and 1 b and graph 2a and 2b

Variables		Mean ± SD		Z Value	p-value
		Pre	Post		
NPRS	Group A	7.10±0.73	1.70±1.41	2.827	0.005
	Group B	6.40±1.074	3.20±1.54	2.680	0.005
	Group C	5.60±0.84	3.70±1.05	2.754	0.006
PSFS	Group A	6.30±1.25	4.10±1.19	2.831	0.005
	Group B	5.70±0.94	3.40±1.34	2.680	0.007
	Group C	6.30±1.33	4.40±1.17	2.598	0.009

Table 2- Wilcoxon Signed Rank Test for all 3 groups for pain and PSFS

Table 3 shows Paired T-Test was used within groups A, B, and C for hip ROM of Internal Rotation, Abduction, and Extension which shows the statistically significant result for Internal Rotation Group A (0.0001), Group B (0.0001), and non-significant for Group C (0.285), Abduction Group A(0.002), Group B(0.001)and Group C(0.001). Extension Group A (0.0001), Group B(0.001) and GroupC(0.001). Paired T Test was used for within-group A, B, and C of Strength of External Rotators, Abductors and Extensors which shows the statistically significant result for Group External Rotators Group A (0.0001), Group B (0.0001), and Group C (0.002), Abductors Group A(0.001), Group B(0.013)and Group C(0.0001). Extensors Group A (0.0001), Group B(0.002) and Group C(0.001).

Variables		Groups	Mean ±SD		t-value	p-value
			Pre	Post		
Rom	Internal. Rotation	Group A	21.10±3.47	29.70±3.16	21.5	0.0001
		Group B	21.00±4.03	25.20±3.55	6.874	0.0001
		Group C	23.90±3.51	25.00±3.92	1.137	0.285
	Abduction	Group A	26.20±2.52	36.30±3.62	12.75	0.002
		Group B	25.80±3.04	31.80±3.80	8.216	0.0001
		Group C	28.60±1.95	31.20±2.65	5.212	0.001
	Extension	Group A	10.00±1.24	16.80±1.93	12.702	0.0001
		Group B	11.00±3.20	14.00±2.84	5.118	0.001
		Group C	12.60±2.95	14.00±2.46	4.993	0.001
Strength	External rotators	Group A	15.58±1.82	22.72±2.78	6.857	0.0001
		Group B	17.82±2.35	21.04±3.38	5.557	0.0001
		Group C	18.36±1.45	20.37±2.20	4.317	0.002
	Abductors	Group A	24.40±1.80	30.20±2.31	8.84	0.001
		Group B	25.97±2.02	27.16±1.89	3.102	0.013
		Group C	26.61±1.77	28.00±1.67	6.264	0.0001
	Extensors	Group A	26.57±2.15	31.25±2.72	10.3	0.0001
		Group B	25±0.70	27.74±1.90	4.309	0.002
		Group C	25.03±0.68	26.68±1.10	4.959	0.001

Table 3 - Within group comparison of Range of Motion and Strength at baseline and 4th week by Paired t test

Table 4 shows One way ANOVA test was used of pre and post ROM values for Group A, B, and C which shows Insignificant result for Prevalue of internal rotation(0.135)and statistically significant for Post value of internal rotation (0.007)in between group, There is a statistically significant result for Pre value of Abduction (0.010),and post value of Abduction(0.004)in between groups and shows the insignificant result for Pre value of PSFS(0.513) and Post value of PSFS(0.200) in between groups.

One way ANOVA test was used to find the difference between the pre and post strength values for Group A, B, and C which shows the significant result for Prevalue of external rotation(0.08)and statistically non-significant for Post value of external rotation (0.162) in between group,There is a statistically non-significant result for Prevalue of Abduction (0.055),and shows the significant result for post value of Abduction(0.007)in between groups and shows the significant result for Pre value of (0.023) and shows the significant result for Post value of(0.0001) in between groups.

Variables			Groups	Mean±SD	f-value	p- value
ROM	Internal rotation	Pre	Group A	21.10±3.47	2.159	0.135
			Group B	21.00±4.03		
			Group C	23.90±3.51		
		Post	Group A	29.70±3.16	1.016	0.007
			Group B	25.20±3.55		
			Group C	25.00±3.92		
	Abduction	Pre	Group A	26.20±2.52	5.449	0.01
			Group B	25.80±3.04		
			Group C	28.60±1.95		
		Post	Group A	36.30±3.62	3.442	0.004
			Group B	31.80±3.80		
			Group C	31.20±2.65		
Extension	Pre	Group A	10.00±1.24	3.687	0.038	
		Group B	11.00±3.20			
		Group C	12.60±2.95			
	Post	Group A	16.80±1.93	2.413	0.013	
		Group B	14.00±2.84			
		Group C	14.00±2.46			
Strength	External Rotators	Pre	Group A	15.58±1.82	6	0.008
			Group B	17.82±2.35		
			Group C	18.36±1.45		
		Post	Group A	22.72±2.78	1.1016	
			Group B	21.04±3.38		
			Group C	20.37±2.20		
	Abductors	Pre	Group A	24.40±1.80	3.34	0.055
			Group B	25.97±2.02		
			Group C	26.61±1.77		
		Post	Group A	30.20±2.31	3.442	0.007
			Group B	27.16±1.89		
			Group C	28±1.64		
	Extensors	Pre	Group A	26.57±2.15	4.336	0.023
			Group B	25±0.70		
			Group C	25.03±0.68		
		Post	Group A	31.25±2.72	6.954	0.0001
			Group B	27.74±1.90		
			Group C	26.68±1.10		

Table 4 Between group comparison of Range of Motion and Strength at baseline and 4th week

Table 5 shows Post hoc analysis using multiple comparisons for NPRS showed the statistically non-significant result for Pre NPRS Group A v/s B (0.123), and statistically non-significant for Group B v/s C (0.055), and statistically significant for Group C v/s A(0.001).In Post, NPRS shows the significant result for Group A v/s B(0.022), statistically non-significant for Group B v/s C(0.505), and significant for Group C v/s A(0.003).Post hoc analysis using multiple comparisons for PSFS which shows the non-significant result for Pre PSFS Group A v/s B (0.714),and Group B v/s C(0.697), and non-significant for Group C v/s A(0.468). In Post PSFS shows non-significant result for Group A v/s B (0.289),and Group B v/s C (0.885)and Group C v/s A(0.366)

Variables	Groups	Mean Difference	Std Error of mean	p-value
NPRS (Pre)	A v/s B	-0.8	0.402	0.123
	B v/s C	1.46	0.391	0.055
	C v/s A	-0.65556	0.4116	0.001
NPRS (Post)	A v/s B	0.411	0.612	0.022
	B v/s C	-1.93	0.595	0.505
	C v/s A	1.52222	0.70746	0.003
PSFS(Pre)	A v/s B	0.20202	0.54638	0.714
	B v/s C	0.20909	0.53114	0.697
	A v/s B	0.62626	0.56256	0.289
PSFS(Post)	B v/s C	0.08182	0.56256	0.885
	C v/s A	-0.54444	0.59158	0.366

Table 5: Post Hoc test using Multiple Comparison (LSD) of NPRS and PSFS

Table 6 shows Post hoc test analysis using multiple comparisons for Internal Rotation ROM which showed non-significant results for PreInternal Rotation ROM Group A v/s B(0.850), Group B v/s C(0.76), Group C v/s A(0.101). Post Internal Rotation ROM showed significant result for Group A v/s B(0.009), and non-significant for Group Bv/s C(0.812) and statistically significant for Group C v/s A(0.004)Post hoc test using multiple comparisons for ROM(Extension) which showed statistically non-significant results for Pre Extension Group A v/s B(0.636), statistically significant for Group B v/s C(0.017), and non-significant for Group C v/s A(0.056). Post Extension ROM shows the significant result for Group A v/s B(0.005), statistically non-significant for Group B v/s C(0.453) and Group C v/s A(0.024)Post hoc test using multiple comparisons of groups for Abduction ROM which showed statistically non-significant result for Pre Abduction Group A v/s B(0.442) and statistically significant for Group C v/s A(0.024), Post Abduction ROM showed significant result for Group A v/s B(0.007), statistically non-significant result for Group B v/s C(0.743) and statistically significant for Group C v/s A(0.002)

Variables Range of Motion	Groups	Mean Difference	Std Error of Mean	p-value
Internal Rotation (Pre)	A v/s B	3.0404	1.64598	0.85
	B v/s C	-2.71818	1.60008	0.76
	C v/s A	-0.32222	1.68261	0.101
Internal Rotation (Post)	A v/s B	-0.38384	1.6024	0.009
	B v/s C	4.58889	1.63806	0.812
	C v/s A	-4.58889	1.63806	0.004
Extension(Pre)	A v/s B	2.26263	1.13397	0.636
	B v/s C	-2.81818	1.10234	0.017
	C v/s A	0.55556	1.592	0.056
Extension (Post)	A v/s B	0.82828	1.0873	0.005
	B v/s C	2.52727	1.05698	0.453
	C v/s A	-2.52727	1.05698	0.024
Abduction (pre)	A v/s B	3.0404	1.08654	0.442
	B v/s C	-2.71818	1.05623	0.004
	C v/s A	-0.32222	1.68261	0.024
Abduction (post)	A v/s B	-0.50505	1.52749	0.007
	B v/s C	5.02727	1.48489	0.743
	C v/s A	-4.52222	1.56148	0.002

Table 6: Post Hoc test using Multiple Comparison (LSD) of ROM (Internal Rotation, Abduction And Extension)

Table 7 shows Post hoc test using multiple comparisons of groups for Strength (External Rotators)which shows the non-significant result for Pre External Rotators Group A v/s B(0.016), shows statistically non-significant for Group B v/s C(0.609), and statistically significant for Group C v/s A(0.003)Post External Rotators strength showed non-significant result for Group A v/s B(0.252), and Group B v/s C(0.484) and Group C v/s A(0.060).

Post hoc test using multiple comparisons of groups for Strength (Abductors) which showed non-significant results for Pre Abduction Group A v/s B(0.954),shows statistical significance for Group B v/s C(0.027), and Group C v/s A(0.043)In Post Abduction showed significant results for Group A v/s B(0.004), statistically significant for Group B v/s C(0.689), and statistically significant for Group C v/s A(0.008)

Post hoc test using multiple comparisons of groups for Strength (Extensors) which showed significant results for Pre Extensors Group A v/s B(0.015),shows statistically non-significant for Group B v/s C(0.836), and statistically significant for Group C v/s A(0.018)Post Extensors strength showed significant result for Group A v/s B(0.0001), statistically non-significant for Group B v/s C(0.189), and statistically significant for Group C v/s A(0.001).

Variable Strength	Groups	Mean Difference	Stnd Error of Mean	P value
External Rotators (Pre)	A v/s B	0.44646	0.86165	0.016
	B v/s C	-2.71091	0.83762	0.609
	C v/s A	2.26444	0.88082	0.003
External Rotators (Post)	A v/s B	-0.9	1.26933	0.252
	B v/s C	2.42	1.23393	0.484
	C v/s A	-1.52	1.29757	0.06
Abductors (Pre)	A v/s B	0.08283	0.84922	0.954
	B v/s C	-1.92727	0.82553	0.027
	C v/s A	1.84444	0.86811	0.043
Abductors (Post)	A v/s B	0.36465	0.90054	0.004
	B v/s C	2.49091	0.9035	0.689
	C v/s A	-2.85556	0.97307	0.008
Extensors (Pre)	A v/s B	0.12828	0.61436	0.015
	B v/s C	1.49727	0.59723	0.836
	C v/s A	-1.62556	0.62803	0.018
Extensors (Post)	A v/s B	-1.21414	0.90054	0.0001
	B v/s C	4.56368	0.87542	0.189
	C v/s A	-3.37222	0.92058	0.001

Table7: Post Hoc test using Multiple Comparison (LSD) of Strength (External Rotation, Abduction and Extension).

DISCUSSION

The current study demonstrated the effectiveness of Gluteal Activation Exercises (GAE) along with MET on pain, ROM, Strength and Motor Control in patients with Piriformis syndrome (PS). In order to achieve the result of the study 30 participants were included according to selection criteria. One-month interventional study reveals that both the treatments are effective in improving Pain Range of Motion, Strength and Motor Control in Piriformis Syndrome patients.

Effect of Gluteal Activation Exercises and Muscle energy technique on Pain

Pain intensity was reduced in all the 3 groups that showed statistically significant difference, A previous study done by Marco Aurelio et al., 2018⁸ supported our study by showing similar results that there is reduction in pain by applying Gluteal Strengthening Exercises in SI joint Dysfunction. Another study that supported our study was done by Dusad et al in 2018⁴, in which they found that application of PIR and RI in Piriformis syndrome patients this study supported our research in improving Pain. The decrease in pain level in all the groups attributed to hypoalgesic outcome of MET that is proved by Golgi tendon reflex which occurs during isometric contraction which ultimately leads to reflex relaxation of muscle, Muscle spindles also get activated which helps in proprioception and ultimately leads to sympatho-excitation reflex which occurs due to somatic afferents and activation of Periaqueductal grey matter locally which plays an important role in downward modulation of pain.^{9,15}

Effect of Muscle Energy Technique on Range of Motion

Another outcome measure i.e. ROM which revealed that there was significant improvement in Hip ROM – Internal Rotation, Abduction and Extension in all the groups including Experimental group as well as control group except for Internal Rotation. A similar study done by Dusad Gopal showed significant improvement in Internal Rotation and abduction ROM by application of PIR in piriformis syndrome patients. There was improvement in Hip ROM, which could be explained by Taylor, et al 1997¹⁰, They suggested that combination of contractions along with stretches (as given in MET) might be efficient in producing viscoelastic changes then stretching alone. It occurs because of greater power production which increases the viscoelastic changes and passive extensibility told by Phadke A. et al, 2016 and Taylor DC, 1997¹⁰. The post intervention analysis of hip ROM between the groups in this present study showed significant difference in A and B & A and C group the result of Group A and B (0.009) and Group A and B (0.004) which correlates with the study result of Dusad Gopal⁴ in 2018 and Binneesh CP in 2020³ that there is improvement of ROM in both MET and DFM group and Control groups.

Effect of Gluteal Activation Exercises and Muscle energy technique on Motor Control

There was significant improvement in PSFS score which was used for evaluating motor control for within groups A, B and C shows the significant result. It occurs due to the facilitation in the recruitment of sensory afferent response and modulating plasticity to improve sensory motor control and pain. O.P. Costa, et al. 2011¹¹ showed that PSFS is more effective in assessing function in Low back pain patients. There is no significant improvement in PSFS scores in between the groups. It is explained by Alarie-Hmasse et al.,¹²

explained that maladaptive plasticity in chronic low back pain could be associated with disorder of voluntary recruitment of pelvis muscle and changes of anticipatory motor pattern for posture and balance control, voluntary recruitment of abdominals and pelvis muscle is very difficult in low back pain patients. So, MET and Gluteal Activation Exercises were not effective treatment for improving Motor control.

Effect of Gluteal Activation Exercises and Muscle energy technique on Strength

There is Improvement of strength as explained by Hakkinen et al¹³ that two processes appeared to be involved during strength training (a) Hypertrophy and (b) Neural adaptation that improve nerve-muscle interaction. While doing strengthening exercises there is increased muscle protein synthesis and increase of myofibril size and combination of muscle protein into muscle cells and leads to hypertrophy. The neural basis of muscle strength improvement occurs due to synchronous activation.¹⁴ Some of the Limitations of this study were Sample size was small, duration of study was short, PSFS was not an appropriate tool for evaluating motor control, Further Research is needed using larger sample size with larger Study Duration and a longer follow up period. Both the extremities will be used so that results become comparable. This study will help the physiotherapist to use Gluteal Activation Exercises along with Muscle Energy Technique for patients with Piriformis syndrome as Rehabilitative intervention in clinical setting. This present study concluded that Group A which was receiving Gluteal Activation Exercises along with Muscle energy Technique demonstrated effective improvement in pain, ROM, strength and motor control in patients with piriformis syndrome as compare to other groups (Band C) which received MET along with conventional physiotherapy and conventional physiotherapy alone, so this research helps the physical therapy to provide Gluteal activation exercises along with met to improve strength, Pain and ROM in patients with Piriformis syndrome.

CONFLICT OF INTEREST

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