

Effects of muscle energy technique and static stretching of piriformis and iliopsoas in females with coccydynia

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Abstract-

Objective: To find out the effects of Muscle Energy Technique of piriformis and iliopsoas improve pain, disability, and pain free sitting duration in females with coccydynia.

Materials and Methods: It was a single blinded, randomized clinical trial on females with coccydynia.

Fifty-two participants were randomly allocated into two group i.e. METs= 26 and Static stretching group = 26, by simple random sampling. METs group received post isometric relaxation of piriformis and iliopsoas and static stretching group received stretching for 10 sessions. Participants were assessed at baseline and after 2 weeks for 10 sessions (5 days per week). Outcome measures were taken on NPRS, Modified Dallas Pain Questionnaire and pain free sitting duration.

Results: Data was analyzed via SPSS. The mean difference of NPRS between groups was 2.36 (95% CI). There was greater reduction in pain (6.84>4.48) in METs. The mean difference was 1.26 (95% CI) on DPQ. There was marked improvement in pain free sitting duration from 49.68mintues to 87.04. (95% CI) between METs and Static stretching group.

Conclusion: Muscle energy technique is more effective as compared to static stretching method in reducing pain and improving pain free sitting duration and effects of METs are long lasting in improving pain free sitting duration.

Index Terms- Piriformis, Iliopsoas, Coccydynia, METs.

I. INTRODUCTION

Coccydynia is a one of most challenging pain disorder of the lower most part of the spine which aggravated by pressure or

weight bearing positions in sitting. Coccyx anatomy is well depicted at imaging with a triangular arrangement of bone at the terminal end of spine below sacrum and management is often dictated by what structures are involved. It has limited mobility, it usually moves forward and backward with the movement of pelvis, hip, and legs (1-3) It acts as a tripod with right and left ischial tuberosities and coccyx at the center, it supports weight in sitting position. It also provides support to anus and pressure increases in leaning position. (4, 5)

It is identified to be more common approximately 5 times in females as compared to males. Wider Pelvis in females may decrease the pelvis rotation and expose the coccyx more towards injury. Risk factors attributed for coccydynia are injury of the coccyx, pelvic floor muscles spasm or tightness, decrease coccygeal mobility, sprain of coccygeal muscles and ligaments, coccygeal disc pathologies, hypermobility of coccyx, subluxation, and childbirth trauma. (6)It is of unknown Aetiology, but it is five times more common in females as compared to males. It makes it impossible to carry out the activities of daily life, its affects can be both physical and psychosocial health of females and causes great maternal morbidity. About 37.7% cases of coccydynia are reported after first trauma due to delivery. Obesity is also one of the major risk

factor in these females. (7, 8) In non-traumatic cases, biomechanical imbalance is of factor which can be the cause of pain. Pelvic floor is considered as one major culprit, but the surrounding hip muscles cannot be neglected.(9) These are hip rotator and hips flexors respectively, but both are also playing integral role in sacral rotation. When ipsilateral gluteus maximus contracts, it anteriorly tilts and rotate the sacrum to the opposite side by the help of Piriformis muscle. Tightness of piriformis may cause sacral rotation which may lead to coccydynia. While iliopsoas is a major hip flexor, lateral rotator of thigh and also plays an important role in stabilization and movement of pelvis. It has tendency to shorten that results into not only lumber lordosis but also leads to sacrum counter nutation and puts abnormal load not only on sacrum but also on coccyx.(10)

In spite of advances in treatment approaches of physical therapy, coccydynia is still debatable. Most of literature of treatment of coccydynia is on manipulation and surgical removal of coccyx. Some small case studies and observational studies support injection-based therapies like steroid, nerve block method, radiofrequency ablations and prolotherapy, (11) Muscle energy technique (MET) has been widely used for reducing pain, enhancing range of motion and to correct asymmetry by inducing muscle relaxation through low intensity isotonic contractions of the antagonistic and agonistic muscles aiming at the maintenance or recovery of the free mobility of joints.(12)

The aim of the study was to find a better physical therapy treatment for this problem with relation to sacrum by conventional stretching method and newly introduced Muscle energy techniques of piriformis and iliopsoas muscles. Therefore, this study purpose of the study was to find out that either one technique is superior or other one or both the techniques showed comparable outcomes, which one should be the choice of therapy.

II. MATERIAL AND METHODS

Study design and participants characteristics

The study was a randomized Clinical Trial, registered in one of the approved registry of World health organization (WHO) named, Iranian Registry of Clinical Trials (IRCT) having reference no # IRCT20191117045462N1. It was conducted after

getting approval from ethical committee. The study was conducted at Al-Khumeinie Trust hospital, Lahore between 20-01-2020 to 20-04-2020. The sample size was measured by using G-power Analysis Software calculator (Version 3.1.9.2). Calculated sample size was of 46 with 0.80 power of study, with 0.5 margin of error and 95% confidence interval. But 52 participants were included in the study by assuming 13% attrition rate.

Participants were recruited from outpatient department of physiotherapy of private hospital. An assessor physiotherapist, who was blinded, assessed all the participants by physical examination as per the eligibility criteria. Only female participants were recruited between the age group of 18 years to 40 years, having painful coccyx by palpation during physical examination and they were unable to sit on any hard surface for longer duration. Patient having pregnancy, any history of recent trauma, history fall on buttocks, coccyx dislocation on radiograph, rectal abscess or cysts and tumors of lumbo-pelvic region, cauda-equina syndrome and participant underwent through any surgical procedure of lumbar spine and pelvic region were excluded. (10)

All the participants were informed about their participation in the study, oral explanation was given to them, but treatment program and existence of another group was hidden from them. Written informed consent was filled by all the participants along with basic socio-demographic details i.e., age, weight, height, and BMI. After completion of thorough case history, physical assessment, and examination of lumbo-sacral region by assessor physiotherapist. Participants were randomly allocated to parallel group with ratio of 1:1 (26 participants in each group) by draw method performed by a researcher not involved with the study. For draw method, fifty-two envelopes were made with sequentially numbered chits from one to fifty-two. Odd no's were assigned to group A and even no. to group B. Allocation was concealed by placing the random allocation in opaque sealed envelopes that were located in the central location. Each participant's random allocation was revealed just before the application of intervention. Assessor physiotherapist was blinded by not knowing the study aim and hypothesis. Assessment and

examination of participants was done before and after the application of interventions by assessor physiotherapist.

Interventions

restrictive barrier and asked the participants to provide an isometric muscle contraction against the provider. Following the isometric contraction, the muscle is relaxed, and the provider takes the dysfunction further into the restrictive barrier.(12, 13)

Post isometric relaxation method of METs was used for Piriformis and iliopsoas. For Piriformis's METs participant was asked to lie on the back with legs straight. After that right foot was placed across the other leg at the level of knee with one hand and other hand was used to stabilize the ilium of opposite side. After that researcher took the leg into new muscle length. (14) For iliopsoas, patient was asked to lie on his back with legs hanging off the bed. He was asked to grasp his left knee with his both hands and stretch was applied to opposite leg at knee, after that participant was asked to lift his right leg. And researcher will take the leg into new muscle length. (15, 16)

Static stretching group

Static stretching (SS) was given to Group B. For Piriformis stretching participant was asked to lie on the back and placed both feet flat on the couch with bent knees. Put the ankle of the right leg over left knee and push the left thigh toward the chest and stretch was maintained for 20 to 30 seconds. For iliopsoas, participant was asked to lie on back with legs hanging off the bed, then grasp his left knee with both hands and stretch was applied to opposite leg at knee.(17-19)

Outcome measures

All outcomes measures were assessed and measured by blinded assessor at pre-treatment and post treatment levels. Pain was measured by Numeric Pain Rating Scale (NPRS), disability index for daily and work- leisure activities, anxiety-depression, and social interest of participants was by Modified Dallas Pain Questionnaire (DPQ) and pain free sitting duration was taken.

Primary outcome: NPRS is self-reported single dimensional 11point scale between 0 and 10 with test-retest reliability of $r = 0.96$ and validity correlations of 0.86 to 0.95. (20)

Secondary outcome: Modified Dallas Pain Questionnaire (DPQ) measures 4 aspects (daily and work- leisure activities, anxiety-

Muscle energy technique group

MET is a direct technique where the muscle is taken into a depression, and social interest) of the participant's lives for coccygeal pain (Sections VIII–XVI; each with a maximum score of 10 points) was used in this study with Validity of 0.89 to 0.9. Pain free sitting duration was measured by stopwatch before the start of intervention and the termination of intervention.

III. RESULTS

Data was checked for normality by Shapiro–Wilk's test with the help of SPSS version 22 for Windows software. Both groups were similar at baseline measurement of demographic (age, weight, height, and BMI) and clinical characteristics (NPRS, DPQ, and PFS) with $p > 0.05$. As the data was normally distributed parametric test were applied to determine the pre-treatment and post treatment changes within the groups and between the groups. Paired sample t-test was applied to determine the changes within the group at two levels (Pre-treatment and post treatment). To investigate and compare mean changes between groups, independent t-test was used. Significance level was set at 0.05.

Flow of participants

Out of 58 participants, who were physically screened, 52 participants were recruited into the trial. 4 participants were excluded because of they could not meet the inclusion criteria and 2 were not willing for physiotherapy treatment as per consort flow diagram. (22) All selected participants were divided into two groups by random allocation. METs and Static stretching interventions were received by 26 participants in each allocated group.

Both groups were treated by base line treatment of Phonophoresis with 0.2% diclofenac sodium.(23) One participant was dropped from METs group due to personal reason of inability to continue and one participant was dropped from static stretching group due to some medical issue. Data analysis was done on 50 participants, 25 in each group. Baseline characteristics are given in Table 1. Both groups were similar at baseline measurements.

Table 1: Baseline characteristics of participants

Characteristic	Randomised (n = 50)	
	METs group (n = 25)	Static Stretching group (n = 25)
Age (yr.), mean (SD)	36.76 (2.63)	35.28 (2.60)
Height (m), mean (SD)	1.58 (0.04)	1.60 (0.30)
Weight (kg), mean (SD)	64.44 (5.79)	67.04 (4.25)
BMI (kg/m), mean (SD)	25.70 (2.34)	26.20 (2.36)
NPRS, mean (SD)	8.40 (0.70)	8.44 (0.58)
DPQ, mean (SD)	81.8 (6.98)	82.5 (6.21)
PFS, mean (SD)	5.36 (2.43)	5.32 ± 1.72

METs= Muscle Energy Techniques group, SS = Static Stretching group

The mean difference of pain between groups was 2.36 on NPRS. Although pain was reduced in both group but in METs group there was greater reduction in pain. The mean difference of disability between groups was measured on DPQ. Both groups were almost equal in improvement in 4 aspects (daily and work-leisure activities, anxiety-depression, and social interest) but METs was greater than another group. Although both were equal but effects of METs were long lasting as the pain free sitting was improved to 87.04 minutes as compared to 49.68mintues. As shown in Table-2.

Table-2: Within Group Outcome Variable Differences

Variables		METs	SS	p-value
		Mean ± SD	Mean ± SD	
NPRS	Pre-treatment	8.40±0.70	8.44±0.58	0.82
	Post-treatment	1.56±1.75	3.96±1.01	0.001
DPQ	Pre-treatment	81.8±6.98	82.5±6.21	0.68
	Post-treatment	12.44±2.55	14.48±3.26	0.01
PFS	Pre-treatment	5.36±2.4	5.32±1.72	0.94
	Post-treatment	92.40±34.55	55.00±30.20	0.001

IV. DISCUSSION

The aim of study was to determine the effects of METs and static stretching of piriformis and iliopsoas in coccydynia in female participants in terms of pain, Dallas Pain Questionnaire (DPQ) measures four different aspects of daily, work- leisure activities, anxiety-depression, and social interest by DPQ and pain free sitting duration. Different factors are responsible for it but one of them is angulation of coaxial articulation, which can be affected by due to tightness of piriformis and iliopsoas muscle. Tightness of piriformis can lead to abnormal load on coccyx and sacrum due to increase in anterior pelvic tilt.(10, 24) While the piriformis muscle is responsible for anterior pelvic tilt along with same side gluteus maximus. So change in angulation of sacrum and coccyx helps to get relived of pressure.(24)

The results of current study showed that within group analysis using paired sample t-test there was statistically significant results across METs and static stretching group in terms of NPRS, DPQ and pain free sitting duration. However, mean change in values of METs group are more improved as compared to static starching group. In current study results showed that there was significant statistically difference between two groups with p value < 0.05. Pain reduction is significant with p value< 0.05 but more change in METs group. Pain free sitting duration improved more in (METs) with mean values 92.40±34.55mintues as compared to static stretching group with mean values 55.00±30.20mintues. This result is similar with a pervious study which shows difference in improvement in physiotherapy group as compared to conventional therapy on the basis of pain thresh hold and pain free sitting duration. (10) The results of another study came into agreement with our findings which showed statistically significant results between Physical therapy treatment and pharmacological treatment. The study done on 129 patients suffering with coccydynia. There was significant decreased from 8.81 to 4.75 (P < .001) on NPRS in both group analysis. The results are similar to current study with decrease from 8.40 to 1.56 (P < .001) on NPRS in both group analysis.(25)

A recent study was conducted on to determine the role of manual therapy role in comparison to surgery. The conclusion of study was that Manual therapy combined is better and easy method

before surgery. In manual therapy group, manipulation along with physiotherapy was used as treatment method. And there was 61.9% improvement on VAS, while there was 17.4% in group 2. There was 56.6% relapse rate in surgical group. So, physiotherapy treatment must be first priority in coccydynia. The current study is on two physiotherapy treatments with statistically significant results of both interventions.(26) The study concluded that both Muscle Energy Techniques group and static stretching methods were effective. But mean difference was greater in METs group.

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V. CONCLUSION

The study concluded that both Muscle Energy Techniques group and static stretching methods were effective in reducing pain on Numeric Pain Rating Scale and improve Dallas Pain Questionnaire with marked increment in pain free sitting duration. The results were statistically significant for both groups, though the Muscle Energy Techniques group found better than static stretching group in terms of mentioned outcome measures on the basis of mean difference.

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