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To Compare the Effect of Muscle Energy Technique and Mckenzie Exercises on Pain, Range of Motion and Disability Among Patients with Sacroiliac Joint Dysfunction

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ABSTRACT

Sacroiliac joint dysfunction is a state of malalignment position of pelvic bone. Prolonged asymmetrical weight bearing, produce abnormal load on the lumbar and thoracic spine, which gradually become the source of increasing pain in low back area. Various manual techniques and therapeutic modalities are effective in the treatment of sacroiliac joint dysfunction. However, more sophisticated studies are still required, which justify the result and treatment.

Methodology: Total 45 subjects were selected, between the age group of 18-45 years of and divided into 3 groups. Group A subjects received therapeutic ultrasound, Hot moist pack and static stretching. Group B subjects received Muscle energy technique, therapeutic ultrasound, Hot moist pack and static stretching. Group C subjects received McKenzie exercises, therapeutic ultrasound, Hot moist pack and static stretching. A total 10 treatment sessions will be given to the subjects for 2 weeks that is 5 treatment sessions in each week. The data was recorded at baseline and subsequently at the end of 5th treatment session and the 10th treatment session.

Result: The result of the study showed that Group A, B and C were found statistically significant within group analysis of pain, range of motion and disability. The result of intergroup analysis found significant improvement in all three groups A, B and C in terms of pain, lumbar range of motion and functional disability.

Conclusion: The result of the study concluded that both techniques were equally effective in decreasing pain, functional disability and improving lumbar range of motion among patients with sacroiliac joint dysfunction.

Data analysis: Data analysis was done by using the SPSS.

Keyword: Sacroiliac joint dysfunction, Muscle energy technique, McKenzie exercises.

INTRODUCTION

An improper pelvic bone alignment is known as sacroiliac joint dysfunction (SIJD).[1]The lumbar and thoracic spine experience aberrant load as a result of prolonged asymmetrical weight bearing, which may result in minor discomfort and impairment.[2]

however, this excessive loading continues to influence these structures over an extended period of time, it eventually results in decreased mobility of the structure and becomes the cause of escalating low back pain. Pain in the groin, buttocks, hamstrings, or lower back may therefore be a result of SIJ dysfunction.[1] One of the primary causes of low back pain is dysfunction of the sacroiliac joint.[3,4] Low back pain associated with the sacroiliac joint was first reported by Osgood and Coldwarth in 1905.[5]

It occurs frequently in 10% to 30% of individuals with back pain. SIJ dysfunction is the term used to describe aberrant joint function, such as hypo- or hypermobility and laxity, that exerts load on the surrounding or internal tissues and ultimately results in joint dysfunction.[6]

Types of Pelvic malalignment:

In terms of the direction of movement of the upper section of the innominate (such as the iliac crest, anterior superior iliac spine, or posterior superior iliac spine), rotational malalignment is defined as the anterior and posterior rotation of an innominate situated in the sagital plane.[7]

A. Two mechanisms are used to identify anterior malfunction. The innominate rotates anteriorly and downward and fixes on the sacrum in the first method, known as forward trunk flexion. When returning, if the abdominal muscles provide insufficient support, the extra weight causes the sacroiliac joint to lock when the sacrum descends vertically. The thinner anterior ligament is stressed when the innominate moves anteriorly, silking the posterior SI ligament. The second mechanism is a hard, abrupt fall onto the buttocks known as a misstep down. This abrupt statement is combined with a moment on the sacrum, causing the sacrum to drop vertically. [8]

B. It is also more frequent to have posterior dysfunction or locking of the innominate posteriorly on the sacrum. A few observations support the posterior innominate, iliac crests higher on the affected side, and a lower and posterior PSIS level on the affected side in contrast to the opposing side. Consequently, locking the innominate into the posterior direction during the swing phase of gait may be a potential cause for posterior dysfunction.[9]

On the basis of the findings of the physical examination and history, the incidence of SIJD discomfort has been reported to be 45% on the right side, 35% on the left side, and 20% on both sides.[10] It's also found in 33% of pregnant women and 18.9% of post-partum women suffer from serious pelvic girdle pain. 18 Furthermore a research prove that all around 12% of dancer. Experience low back pain due to sacroiliac joint dysfunction.[11]

Etiology • True and apparent leg length discrepancy • Inflammatory arthritis • Older age • Previous spine surgery[12] • Pregnancy • Trauma (Fall on the buttock directly, Direct injury to the side of the pelvis, due to motor vehicular accident)[13] • Osteoarthritis • Psoriatic arthritis (20%–30% of the patients, mostly asymmetric) • Inflammatory arthritis • Ankylosing spondylitis (AS) (almost universal in these patients, symmetric or alternating).[14]Reiter's syndrome[15] • spondyloarthopathy.[16] Any type lumbar surgery in past leading to mechanical disturbances in musculoligamentous support system. • Misjudge height while jumping down.[14]

Examination of sacroiliac joint dysfunction

The gold standard to diagnose LBP and any other associated cause is not generally acknowledged. SIJD has been neglected despite its connection to LBP.[12] Due to the fact that the exact pathology of the SI joint is difficult to determine and the etiology is broad.[17]

MDT assessment

Using the principles of McKenzie, the assessment of SIJD is carried out by performing the active anterior or posterior rotation of the innominate on the painful side.

Treatment of Sacroiliac joint pain

Sacroiliac joint can be treated with surgical and conservatively intervention.

Conservative options

Conservative interventions includes pharmacological and physiotherapy.

(a) Pharmacological Medication such as nonsteroidal anti-inflammatory drugs and muscle relaxants provide pain relief from sacroiliac joint dysfunction.[17]

Prolotherapy Prolotherapy is the injection of platelet-rich plasma (PRP) or hyperosmolar dextrose which is inserted in the desired area. The injection is given in the intra-articular joint space. Radiofrequency denervation Radiofrequency denervation (RFD) shown improvement in pain. [18] The RFD is given to decrease pain by administering radiofrequency waves that heat the nerve fibers resulting in decreasing sensory pain signaling.[17] SIJ corticosteroids injection An MRI- guided corticosteroid injection very effective treatment for sacroiliac joint pain. The high cost of this treatment makes the treatment difficult to be performed in routine practice.

Physiotherapy Physiotherapists have a wide range of therapeutic intervention to managing SIJD that include manual therapy, electrotherapy, massage, aerobic exercises, bracing, manipulation, mobilization, patient education, and kinesiotaping. [19] The main principles of the PT exercises loop around the strengthening of the core muscles and stabilizing the pelvis and spinal joints. There are not any specific exercises program to correct the SIJD

Among the above mentioned manual techniques, MET is a popular manual therapy used amongst physiotherapists. Muscle energy techniques can be utilized to strengthen a physiologically weak muscle or set of muscles, improve shortened, contractured, or spastic muscles, relieve passive congestion, lessen localized edema, and mobilize an articulation with limited motion. MET has also been used for many years to treat lumbopelvic muscular imbalances, such as maintaining pelvic asymmetry, by correcting the altered innominate by moving it in the right way and directing a contraction of the hip flexors or hamstrings on the side of the lower back that is painful. Initially developed for the treatment of disorders associated to the spine, Mechanical Diagnosis and Therapy (MDT), often known as McKenzie exercise, is a well-known manual therapy approach. Two scenarios exist that lead to dysfunction. First of all, the patient will be aware of the onset of dysfunction, which arises from trauma . But the suffering brought on by trauma or will cease to exist, and Later on, it manifests as decreased function and movement. Second, the patient won't be aware of the start of the dysfunction if it is due to spondylosis or bad posture.

Repeated end-range motions have been shown by Hortona SJ et al to be fairly helpful in reducing derangement of the SI joint; however, the effectiveness of repeated end-range loading frequently depends on the patient's capacity to adapt to these exercises. The patient can resume the movement on a regular basis once a positive response has been observed.

SI joint dysfunction can be effectively treated using a variety of techniques found in the literature, including manipulation, myofascial dry needling, stretching, physiotherapy exercises, and MET.

Nevertheless, there is a dearth of research demonstrating the consequences of MET and McKenzie. There are currently no exercises for sacroiliac joint problems. Prior research has predominantly concentrated on the general discomfort, impairment, and tenderness surrounding the PSIS resulting from SIJD. except

from lumbar ROM reduction. The current study set out to see if the patients with sacroiliac joint dysfunction responded well to MET and MDT.

METHODOLOGY

The 45 subjects with SI joint dysfunction with age group of 18-45 years participated in the study. The inclusion criteria were: Patients who gave written informed consent.

- Both male and female patients were included.
- Asymmetric level of the iliac crest.
- Pain provocation tests:-

Subjects with positive Transverse anterior stress test
Subject with positive Gaenslen's test
Subject with positive Approximation test
Subject with positive Sacral thrust test
Subject with positive Sacroiliac rocking test
Any two out of three positive tests of pain provocation indicated that SI joint dysfunction.

The exclusion criteria were: Subjects who had lumbar radiculopathy

- Subjects who were pre-diagnosed with inflammatory conditions like ankylosing spondylitis, rheumatoid arthritis.
- Subjects with pre - diagnosed avascular necrosis of the hip.
- Subjects who were pre-diagnosed infectious condition such as Tuberculosis of the spine and hip.
- Subjects with pre-diagnosed tumor of hip and spine.
- Subjects with pre-diagnosed severe osteoarthritis of hip and knee.
- Pregnancy to 6 week of postpartum phase.
- Subjects with any history of recent trauma involving lower limb
  Subjects with recent spinal, Hip, and Knee surgery.
- Subjects Pre-diagnosed cardiorespiratory conditions like asthma, chronic obstructive pulmonary diseases.

PROCEDURE

All the necessary precautions for the covid-19 was taken, before beginning the study. After explaining the procedure of the study, a written consent was taken from the subjects. All the subjects were selected according inclusion and exclusion criteria. Followed that subjects were examined by performing 5 pain provocation tests and Mechanical diagnosis and treatment (MDT) assessment. Any three positive tests out of five pain provocation tests indicated that it is a sacroiliac joint dysfunction. A total of 45 subjects were selected and divided them into three groups by conveniently sampling technique. Group-A, Group-B, Group-C, and each group had minimum of 15 subjects. Total number of 10 treatment sessions were given to the patients i.e. 5 in each week for two weeks. The subjects were assessed for SI joint pain by using a Numeric pain rating scale, lumbar range of motions with the help of a Universal Goniometer and Modified schober's test, and disability was with the help of the Modified Oswestry Disability Index. All the reading were recorded carefully. First reading was recorded at the baseline i.e. pretreatment session, and the second reading was on the 5th sessions and third or final reading was on the 10th sessions recorded i.e. after the treatment session.

GROUP-A (Control group)

Hot moist pack: Hot moist pack was given on lower back region in the prone position for 10 minutes. Ultrasound: Ultrasound was applied with 1MHz frequency for 5 min, at 1w/cm2 intensity on involved sacroiliac joint in the prone lying position.

Static Stretching: Static stretching was given by the therapist to correct the anterior or posterior innominate. Two repetitions for a 30-second hold were given to the patients.

Static Stretching for the correction of anterior innominate

Iliopsoas muscle stretching

Patient position: The subject was positioned close to the edge of the treatment table, so that the hip was stretched or extended beyond neutral range. The opposite hip and knee was flexed toward the subject's chest to stabilize the pelvis and spine.

Therapist position and procedure: the opposite leg of the subject stabilized against the chest with one hand. Another hand was placed on the anterior aspect of the distal thigh to further stretch downward. Then the pressure was applied to the hip which leads it into extension or hyperextension.

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Static Stretching for posterior innominate:

Gluteus maximums stretching: Patient position: the patient was in supine lying. Therapist position and procedure: Flexed the subject hip and knee simultaneously. Stabilize the opposite femur in extension with the help of a belt or by a volunteer to prevent posterior movement of the pelvis. Further take the flexed hip and knee to new range, to lengthen the hip joint extensor muscles.

Hamstring stretching: Patient position: The patient was in supine lying. Therapist position and procedure: Took the subject affected knee and hip into flexion position while maintaining the limb into fully extended position. Support the patient's lower leg with your arm or shoulder. Stabilize the opposite extremity along the anterior aspect of the thigh with your other hand. Keep the knee at full extension and the hip in neutral rotation, flexed the hip as far as possible the hold there for few second and then relax.

GROUP- B (Experimental Group-1)

The patients received Muscle energy technique for anterior or posterior rotated innominate followed by the hot moist pack, therapeutic ultrasound, and static stretching.

Technique for anterior innominate:

Patient position: The Patient was lying in the supine position.

Therapist position: stood on the side of the couch of anteriorly rotated innominate SI joint. The subject effect side hip and knee in flexed position and took rest on the therapist's shoulder then passively flex the hip and knee until the barrier was not felt. The patient was instructed to inhale, hold their breath, and then attempt to straighten his/her leg against unyielding resistance, for 10 seconds using no more than 30% of available strength. After that exhale and take 5-sec rest. 3-5 repetitions of 3 set with one minute of the gap was carried out.

Technique for posterior innominate:

Patient position: The patient was lying in the prone position. Effected leg was flexed at 90 degree . Therapist position: Stood on the side of the posteriorly rotated innominate SI joint. Therapist one hand was placed on the affected side PSIS and the other hand was on the anterior aspect of the distal thigh. Took the patient's hip into maximum extension until the first barrier was not found. The practitioner holed the joint at its restriction barrier, the patient were instructed to flexed his /her hip by applying no more than 30% of their strength, hold the hip against resistance for 10 seconds while holding the breath. After that exhale and take 5-sec rest. 3-5 repetitions of 3 set with one minute of the gap was carried out.

GROUP-C: - (Experimental Group-2) The patients in the McKenzie exercises group received exercises to correct the anterior or posterior innominate followed by hot moist pack, and therapeutic ultrasound and stretching exercises. To take the posterior rotated innominate into anterior direction: The patient was instructed to maintain lunge position with the painful side's knee on the ground, and the other leg placed forward. The patient is then instructed to shift the bodyweight forward on the front (non symptomatic) leg and try to reach the end-range of the hip extension on the painful side. •Patient perform ten continuous repetitions, 3 sets with a one-minute gap.

To take the anterior rotated innominate into posterior direction: • Patient were instructed to position in supine lying. • Patient was instructed to flex their hip and knee of the symptomatic side actively. Used both hands to pull the symptomatic side knee toward the chest to reach out the end-range of hip flexion. • Patient perform ten continuous repetitions, 3 sets with one minute gap.

TABLE COMPRISON BETWEEN THE GROUPS OF NPRS

NPRS		MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	6.73	1.100	15	0.041	0.960	NON SIGNIFICANT
	B	6.67	1.345	15			
	C	6.60	1.352	15			
DAY5	A	4.73	1.668	15	1.568	0.220	NON SIGNIFICANT
	B	3.87	1.302	15			
	C	4.27	1.961	15			
DAY10	A	3.20	1.935	15	6.967	0.002	SIGNIFICANT
	B	1.40	1.121	15			
	C	1.67	1.047	15			

TABLE COMPRISON BETWEEN THE GROUPS OF FLEXION

FLEXION	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	4.467	0.8641	15	0.976	0.385	NON SIGNIFICANT
	B	4.553	1.1513	15			
	C	7.860	2.0585	15			
DAY5	A	4.820	0.9321	15	1.230	0.303	NON SIGNIFICANT
	B	5.273	0.7639	15			

	C	5	0.6740	15			
DAY10	A	5.167	0.9796	15	3.804	0.030	SIGNIFICANT
	B	5.913	0.4688	15			
	C	5.633	0.7098	15			

TABLE COMPRISON BETWEEN THE GROUPS OF EXTENSION

EXTENSION	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	1.453	0.4422	15	2.167	0.127	NON SIGNIFICANT
	B	1.773	0.4399	15			
	C	1.540	0.4239	15			
DAY5	A	1.73	0.4746	15	4.051	0.025	SIGNIFICANT
	B	2.267	0.4972	15			
	C	1.960	0.4626	15			
DAY10	A	1.947	0.5263	15	6.889	0.003	SIGNIFICANT
	B	2.773	0.7842	15			
	C	2.320	0.4754	15			

TABLE COMPRISON BETWEEN THE GROUPS OF LUMBAR ROTATIONRIGHT

ROR	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	28.93	6.181	15	1.233	0.302	NON SIGNIFICANT
	B	29.6	5.767	15			
	C	26.27	6.486	15			
DAY5	A	31.47	6.357	15	1.001	0.376	NON SIGNIFICANT
	B	33.07	4.992	15			
	C	29.93	6.713	15			
DAY10	A	34.40	6.727	15	1.553	0.223	NON SIGNIFICANT
	B	37.27	4.574	15			
	C	3373	5.994	15			

TABLE COMPRISON BETWEEN THE GROUPS OF LUMBAR ROTATIONLEFT

ROL	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	28.40	7.039	15	1.609	0.212	NON SIGNIFICANT
	B	27.73	7.833	15			
	C	24.13	6.034	15			
DAY5	A	31.07	7.343	15	0.940	0.399	NON SIGNIFICANT
	B	31.87	7.120	15			
	C	28.53	6.357	15			
DAY10	A	34.13	7.150	15	0.733	0.486	NON SIGNIFICANT
	B	35.80	6.085	15			

	C	33	5.794	15			

TABLE COMPRISON BETWEEN THE GROUPS OF LUMBAR SIDEFLEXION RIGHT

SFR	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	2253	3.980	15	2.771	0.074	NOT SIGNIFICANT
	B	22.73	4.743	15			
	C	25.93	4.559	15			
DAY5	A	25.33	3.792	15	2.598	0.086	NON SIGNIFICAN
	B	27.07	4.682	15			
	C	28.80	3.968	15			
DAY10	A	27.93	3.751	15	3.409	0.042	SIGNIFICANT
	B	31.27	3.955	15			
	C	31.53	4.838	15			

TABLE COMPRISON BETWEEN THE GROUPS OF LUMBAR SIDE FLEXIONLEF

SFL	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	22.53	4.734	15	1.355	0.269	NOT SIGNIFICANT
	B	23.60	5.207	15			
	C	25.33	4.100	15			
DAY5	A	25	6.176	15	1.919	0.159	NON SIGNIFICANT
	B	27.73	4.301	15			
	C	28.33	4.169	15			
DAY10	A	28.13	4.533	15	2.826	0.071	NON SIGNIFICANT
	B	31	3.742	15			
	C	31.53	4.324	15			

TABLE COMPRISON BETWEEN THE GROUPS OF MODI

MODI	GROUP	MEAN	SD	N	F	P-VALUE	RESULT
DAY1	A	48.60	16.344	15	0.591	0.558	NOT SIGNIFICANT
	B	42.67	12.298	15			
	C	45.20	16.014	15			
DAY5	A	36.07	16.180	15	3.769	0.031	SIGNIFICANT
	B	25.47	7.190	15			
	C	25.60	11.319	15			
DAY10	A	26	16.036	15	14.190	0	SIGNIFICANT
	B	7.47	6.781	15			
	C	8.53	6.346	15			

Discussion

The result of intergroup analysis found significant improvement in all the three groups that is group A, B, and C in terms of pain, lumbar ROM, and functional disability. The subjects of group-A which were treated with hot moist pack, ultrasound and static stretching showed more significant improvement in terms of pain, functional disability andlumbar extension. In comparison of lumbar flexion ROM, Group A showed better result than Group B, whereas the subjects who received MET and MDT treatment in addition to the hot moist pack, ultrasound and static stretching showed similar improvement in pain, Lumbar ROM and disability. However, all the three groups showed a statistically non- significant improvement in right and left rotation ROM, right and left side flexion ROM when between groups comparison was analyzed. The reason why McKenzie exercises not showed much improvement in lumbar range of motion, because McKenzie had statedthat, for the treatment of dysfunction it is essential to lengthen the shortened tissue. Which further help to reduce the symptoms and to gain limited range. He purposed thatto achieve that goal the procedure should be followed for four to six weeks. A similar study conducted by Kayani S et al had shown that McKenzie exercises would-be alleviate pain within short span of time but to get improvement in active lumbar range of motion more treatment session is required.[73]

CONCLUSION

To know the effects of two different treatment approaches, the pre-intervention and post- intervention outcomes measures were compared between the control group and the two experimental groups. Within the group analysis was done with the help of repeated measures and between the groups analysis was performed with the help of one-way ANOVA. The results revealed that there was statistically significant difference found inthe means of NPRS for pain intensity, MODI for the functional disability and LumbarROM when analysis was done within the group. All the outcomes measures were statistically non-significant, when analysis was done between the groups. On the other side, between the group analysis had shown that there is no significant difference between the effects of MET and MDT techniques. It indicates that both of the techniques were equally effective in reducing the pain, improving lumbar ROM, and functional disability among the subjects with SIJD.

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