

## ORIGINAL ARTICLE

IJPHY

## EFFICACY OF MULLIGAN MOBILIZATION VERSUS MUSCLE ENERGY TECHNIQUE IN CHRONIC SACROILIAC JOINT DYSFUNCTION

<sup>1</sup>Sabah Mohammed Easa Alkady<sup>2</sup>Ragia Mohammed Kamel. Ph.D.<sup>3</sup>Enas AbuTaleb. Ph.D.<sup>4</sup>Yasser Lasheen. Ph.D.<sup>5</sup>Fatma Anas Alshaarawy. Ph.D

## ABSTRACT

**Background:** Sacroiliac joint dysfunction represents 15% of low back pain conditions. Normal sacroiliac joint works as a safeguard and transmits upper body weight into the pelvis and lower extremities. If the SIJ is hypomobile, it cannot effectively absorb forces and other body parts may be overstressed causing musculoskeletal dysfunction. The study conducted by comparing the effectiveness of Mulligan mobilization versus muscle energy technique in chronic SIJ dysfunction.

**Methods:** 45 patients with chronic sacroiliac joint dysfunction from both genders joined the study. They were divided into three groups 15 in each group. Group A: received Mulligan mobilization with movement using posterior and anterior innominate methods plus conventional treatment program. Group B: received muscle energy technique using a post-isometric relaxation technique to erector spinae, hamstrings, iliopsoas and quadratus lumborum plus conventional treatment program. Group C: control group obtained conventional treatment program only. Doppler imaging of vibration, palpation meter, and the visual analogue scale was utilized for evaluating patients (pre and post-treatment).

**Results:** The study findings revealed a statistical remarkable improvement in post-intervention values for sacroiliac mobility in Mulligan mobilization group ( $p > 0.0001$ ) and a statistically significant decrease of anterior pelvic tilting angle in Mulligan mobilization and muscle energy technique groups ( $p > 0.0001$ ), also a significant decrease of pain in the 3 groups compared with pre-intervention values ( $p > 0.0001$ ), additionally, Mulligan mobilization group showed a statistical high detectable difference in right and left sacroiliac mobility more than muscle energy technique and control groups ( $p > 0.0001$ ).

**Conclusion:** Mulligan mobilization is more effective than muscle energy technique in the treatment of chronic sacroiliac joint dysfunction.

**Keywords:** Mulligan mobilization, Muscle energy technique, Doppler imaging of vibration, sacroiliac joint (SJ).

Received 01<sup>st</sup> May 2017, revised 08<sup>th</sup> August 2017, accepted 11<sup>th</sup> September 2017



www.ijphy.org

10.15621/ijphy/2017/v4i5/159427

<sup>2</sup>Professor in basic science department,  
Faculty of Physical Therapy, Cairo University.

<sup>3</sup>Assistant Professor in basic science department,  
Faculty of Physical Therapy, Cairo University.

<sup>4</sup>Lecturer in basic science department,  
Faculty of Physical Therapy, Cairo University.

<sup>5</sup>Lecturer of radio diagnosis,  
Faculty of medicine, Tanta University.

Clinical trial Reg No: PACTR201604001563277

## CORRESPONDING AUTHOR

<sup>1</sup>Sabah Mohammed Easa Alkady

Assistant lecturer in basic science department,  
Faculty of Physical Therapy,  
Cairo University.  
email: sabahalkady@gmail.com

## INTRODUCTION

The sacroiliac joint is a frequent origin for pain in pelvic girdle and lower back with referred pain to the lower extremity [1]. It affects 10%-25% of population [2]. Sacroiliac dysfunction is a condition of changed mechanics, either an increment or diminishing from the typical normal or the presence of an abnormal movement [3]. It was recognized as a condition causing pain arising from the sacroiliac joint and is caused by the increased or abnormal motion of the ilia around the sacrum and irritation of sacroiliac joint structures (capsule, ligaments or pain receptors located within the joint) [4].

In spite of frequent occurrence of sacroiliac joint dysfunction, its assessment and management were inadequately explained in the published work. The clinical diagnosis of sacroiliac joint dysfunction is based on focused history and physical examination. Treatment of sacroiliac joint dysfunction is still questionable too [5]. Physical therapy approaches ensure correcting sacroiliac joint malalignment manually by emphasizing restoring the normal balance of lumbar and pelvic muscles. Despite that output results after management of sacroiliac joint dysfunction are restricted and there is a need for further studies to compare between various treatments techniques [6]. Different manual therapies such as passive Maitland mobilization and Mulligan's mobilization with movement [7] as well as muscle energy techniques [8] are used routinely in physical therapy practice [9].

The Mulligan concept "Mobilization with movement" (MWM) is a new technique, which is expected to produce an instantaneous improvement in the patient's abilities by simultaneously applying of pain-free accessory glides with active or passive physiological motion. Physiotherapy mobilization of the sacroiliac joint assists in restoring normal joint mechanics so that subjects may have intact sacroiliac Joint for the whole day [9].

Muscle energy techniques (MET) came from early work done by an osteopathic practitioner Fred L. Mitchell in the 1950s. MET is a safe, not invasive and low-cost technique that can be used to relax tight tense musculature, spasm or fibrotic changes due to chronic soft tissue problems and to improve joint mobility by influencing the dysfunctional soft tissues. MET can help increase muscle strength and decrease edema. This technique depends on using low amplitude muscle contractions against resistance to improve vascular circulation and has a positive influence on static and dynamic posture. It was further modified by having patients use their muscles in a controlled position against a counterforce. Later the technique was modified to use muscle contraction to restore motion and to free up areas of segmental dysfunction in extremities and vertebral column [10].

In this study, Doppler imaging of vibrations (DIV) was used for measuring sacroiliac mobility. DIV is a non-invasive, measurable, easy applied, riskless technique, was efficiently and objectively utilized for measuring sacroili-

ac joint mobility in a number of preceding researches. The DIV has been chosen in this study as it crossed the gap between objective invasive techniques such as anesthetic block injections and subjective noninvasive manually applied sacroiliac joint pain provocation tests [11].

In (2003), Matthew et al stated that palpation meter (PALM) is an accurate tool for evaluating skeletal alignment in a clinical setting for both healthy and patient populations. It measures the tilt angle and space between any two marked points in the body. It can give the height discrepancy between the two landmarks palpated [12].

The objective of the study was to investigate and compare the effectiveness of Mulligan mobilization and muscle energy technique on sacroiliac stiffness, anterior pelvic tilting angle and pain level in chronic sacroiliac joint dysfunction patients.

**Methodology:** The study was performed in the outpatient clinic, faculty of medicine, Tanta university through July 2015 to June 2016.

**Subjects:** Power analysis was performed to determine sample size which indicated a number of 45. The survey was done to include all patients with chronic sacroiliac joint dysfunction depending on orthopedist referral. Simple randomization was used to include 45 out of 80 patients taking in our consideration the inclusion criteria. Subjects were assigned to 3 equivalent groups (A, B and C). Each group consisted of 15 subjects. Group A: Received Mulligan mobilization with movement (MWM) that was given 3 sets with 10 repetitions for 12 sessions using posterior and anterior innominate methods to the sacroiliac joint [13] plus conventional treatment program that consisted of ultrasonic, infrared and therapeutic exercise program in the form of sit-up exercise, bridging exercise, back extension from prone, finger to toes, knee to chest exercise and stretching back muscles [14]. Group B: Received muscle energy technique (MET) including post-isometric relaxation technique for posterior spinal stabilizers (erector spinae) and (hamstrings), anterior stabilizers (Iliopsoas muscle) that stabilize the spine anteriorly and control lumbar pelvic rhythm and to (quadratus lumborum muscle) as a lateral stabilizer of the spine [15]. It was done 3 times per session for 12 sessions with a time of hold for each position 7-10 seconds [14] plus previously mentioned conventional treatment program. Group C: Received conventional treatment program only and acted as a control group.

Subjects age ranged between 30 – 50 years, had pain over the sacroiliac joint and had sacroiliac joint hypomobility or intermediate mobility with threshold difference <3 for hypomobility and from 3 to 7 for intermediate mobility [16]. The exclusion criteria were as follows: Acute injury or fracture in the lower limbs, pregnant females, inflammatory pathology, any hip joint pathology, previous hip operations or recently received intra-articular injections, stenosis/spondylolisthesis/disc disease, congenital spinal deformity, previous major lumbar spine surgery, hypermobility of sacroiliac joint (Subjects with threshold difference more

than7) [16]. A written consent was obtained from all the participants. The study was approved by the Research Ethical Committee, Faculty of Physical Therapy, Cairo University, (P.T.REC/012/001031). The Pan African Clinical Trial Registry database accepted the registry of the study under the identification number PACTR201604001563277.

## PROCEDURES

**I- Measurement procedures:** The following measurements were taken for all participants in the first session and four weeks later for sacroiliac joint mobility, anterior pelvic tilting angle, and pain intensity level.

**1-Sacroiliac joint mobility:** measured by Doppler imaging of vibrations. The vibration generator (VG) was held by the researcher, this vibration generator tip was directed to the anterior superior iliac spine (ASIS) of the participant. Vibrations of 60 Hz were applied unilaterally through vibration generator (Thrive 707A Full Body Massager) to the ASIS. The vibrations transmitted in an upward direction up to the sacroiliac joint area. A sonographer evaluated the received vibrations using color Doppler imaging (CDI) apparatus (Toshiba Aplio 500 Platinum Ultrasound Machine). The patient was requested to lie prone at the edge of the treatment table with the ASIS slightly outside the table, with his head moved away from the ASIS receiving vibration, and his arms crossed under his head. The position of each participant was adjusted by the researcher, the VG was held by the researcher that the tip of the VG was directed toward the ASIS of the patient so that a gentle but steady contact was made by the VG applicator tip to the target ASIS. The participant was requested to uncover their lower back and superior buttock region. Pre-warmed ultrasound gel was used over the sacroiliac joint region for effective transmitting of ultrasound from transducer device to the sacroiliac joint. The transducer was used transversely extending over medial and lateral sides of the sacroiliac joint. The sonographer adjusted the scan plane until proper sacral and ilial bony landmarks were distinguished. Image quality was optimized by adjusting depth and focus.



Vibrator tip at anterior superior iliac spine

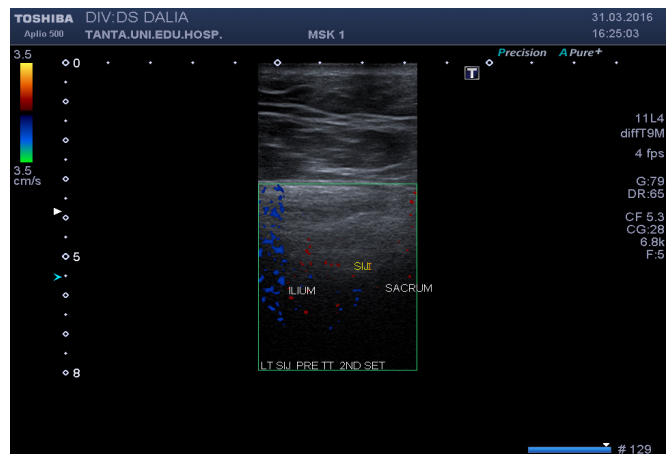
**Figure 1:** Patient position during Doppler imaging of vibration.

The sonographer utilized Doppler mode. Doppler signals obtained from the vibration applied on ilium and sacrum appeared on the color Doppler screen as blue and red coloration. First, the sonographer established the threshold level (TL) for the ilial segment by registering color gain that appeared during the color Doppler image of ilial land-

mark noted receiving vibration (first set measurement) figure (2). Second, another threshold level was set when color Doppler image of the sacral segment receiving vibration was detected across target sacroiliac joint line (second set of measurement) figure (3). The sacral TL was subtracted from the ilial TL, the result pointed to the amount of vibrational loss through the sacroiliac joint.



**Figure 2:** Doppler imaging of vibrations screen capture for left ilial threshold level (first set of measurement).



**Figure 3:** Doppler imaging of vibrations screen capture for left sacral threshold level (second set of measurement).

The recordings were taken in two sets for each unilateral sacroiliac joint, for the ilial and sacral Landmark, starting with the left, to achieve two individual sets of measurements (Session 1, first set left sacroiliac joint; and Session 1, the second set left sacroiliac joint). The same measures were repeated for the right sacroiliac joint that the patient position was altered so that the contralateral right ASIS was placed properly and the patient position was adjusted to be the same as the original one, the same recordings and measurements repeated (Session 1, first set right sacroiliac joint and Session 1, second set right sacroiliac joint).

**2-Anterior pelvic tilting angle:** PALM was used for measuring pelvic tilting angle. A mark was put on a point just inferior to ASIS; another mark was put just inferior to PSIS. The calipers of the PALM were put on these two points. Then inclinometer determined the inclination of degrees between the two points [12].

**3- Pain intensity level assessment** was measured by Visual Analogue Scale (VAS). VAS consisted of a 10 cm horizontal

line. It was used for measuring pain intensity. The patient was asked to put a mark at the point that represented his pain [17].

## II- Treatment procedures:

1-Mulligan mobilization for the group (A) Firstly: The posterior innominate method was performed while the patient in prone lying position and therapist placed the thenar eminence of his hand on the slightly protruding posterior border of the opposite ilium and push it away from him (literally). The patient was asked to do extension in lying provided there is no pain for 10 repetitions per set and up to three sets. Secondly: The anterior innominate method was performed while the patient in prone lying position and therapist fixated the sacrum with the border of one hand and placed the fingers of his other hand under the opposite ASIS. Therapist pulled the ilium up on the sacrum and held this position while the patient did 10 times extension per set and up to three sets, provided these are pain-free [13].

2-Muscle energy technique for group (B): MET was performed in the form of post-isometric relaxation technique for iliopsoas, hamstrings, erector spinae and quadratus lumborum muscles. The restriction barrier (the point at which no more movement appreciated) was detected then the therapist instructed the participants to perform a 20 - 30% of maximum voluntary isometric contraction, hold for 7-10 seconds and relax for 2-3 seconds. Appropriate breathing instructions were given. After that, on an exhalation, the limb was taken very slightly beyond the restriction barrier and was held there for 10-30 seconds, it was done 3 times per session for 12 sessions. For iliopsoas muscle: The supine test position was used in which the patient lied with the buttocks at the edge of the table, nonaffected leg fully flexed at hip and knee and held in that position by the patient. The affected limb was allowed to hang freely. Therapist placed her hand on the anterior lower part of the thigh, the other hand was on the anterior upper part of another leg. After the isometric contraction, the thigh was taken very slightly beyond the restriction barrier, on an exhalation, with a light degree of pressure towards the floor and held there for 10-30 seconds. For hamstrings muscle: The subject was lying in the supine position with his leg hanged over therapist's shoulder. Therapist's hand was on the anterior lower part of the thigh of the unaffected limb; the other hand was on the anterior lower part of another thigh just above knee joint to maintain the knee in the extended position. The therapist flexed the subject's hip and extended the knee. The participant performed a mild knee isometric flexion (20-30% of maximal contraction), by pressing his ankle joint against the top of the therapist's shoulder. Then, after relaxation, the therapist stretched the leg to the new barrier and held the position for 30 seconds. For erector spinae muscle: The subject was sitting on the treatment table, back towards the therapist. The subject was taken into flexion, rotation and side bending. When the subject reached the tolerated limit of flexion, the therapist asked him to perform extension, sidebending and rotation

to the opposite side while holding the breath for 7-10 seconds, then the patient was asked to release the breath. The therapist waited for the patient's full exhalation and then took the patient further in all the directions of restriction, towards the new barrier. For Quadratus lumborum muscle: The subject lied supine with the feet crossed at the ankle. The patient was placed in a side bending, away from the treated side, so that the pelvis was towards that side, and the feet and head away from that side (banana shaped). Therapist put his cephalad hand under the subject's shoulders to grasp treated side axilla. The subject grasped the therapist's cephalad arm at the elbow, with the treated side hand, making the contact more secure. The therapist's caudad hand was placed on the anterior superior iliac spine on the treated side. The patient was instructed to very lightly sideband towards the treated side producing an isometric contraction in quadratus lumborum. After 7 seconds the patient was asked to relax completely, then to sideband towards the non-treated side, as the therapist simultaneously bent backward slightly, in order to sideband the patient [14].

3-Traditional therapeutic exercise program: was performed by the patient under the therapist supervision and consisted of strengthening exercises in the form of bridging exercise, back extension from prone, sit-up exercise. These exercises were performed to strengthen the abdominal and back muscles. They performed from crook lying and prone positions and stretching exercises that consisted of finger to toes, knee to chest exercise and stretching back muscles. Hold time for the stretching force was fixed to 30 seconds for every stretching maneuver followed by 30 seconds rest. Repetitions: 3 times / session [14].

4-Ultrasound treatment: The Chattanooga Intellect ultrasound made in USA. model 2013 was used in this study. Patient was in prone lying position. The sacroiliac area was covered with an ultrasound gel not having any pharmacological substances. The therapist applied US to the right and left sacroiliac joints by moving the ultrasound head in a circular motion at 90 angle. Continuous US waves with 1MHZ frequency and 1,5 watt/cm<sup>2</sup> intensity were performed by a 4cm width head. US treatment time was 8 min.

5- Infrared therapy: Beurer IL 30 Germany infrared lamp was used in the study. Patient was in prone lying position. Infrared lamp was adjusted so the energy stroked the patient at a right angle. Treatment lasted for 10 minutes.

Statistical analysis: Descriptive statistics and ANOVA were used for comparison of the mean age, weight, height, and BMI of the three groups. Two way mixed MANOVA was used to investigate the effective treatment and time on sacroiliac mobility, anterior pelvic tilting angle, and VAS.

## RESULTS

The subjects' general characteristics are shown in Table (1). No significant difference was detected among groups in the mean age, height, weight, BMI ( $p > 0.05$ ).

**Table 1:** Descriptive statistics and ANOVA test for the mean age, height, weight, BMI of the three groups MWM(A), MET(B), control groups(C).

	<i>MWM group</i>	<i>MET group</i>	<i>Control group</i>	F-value	p-value
<b>Age (years)</b>	37.93 ± 3.75	39.73 ± 3.15	38.26 ± 3.59	1.11	0.33
<b>Weight (kg)</b>	80.86 ± 5.84	81.2 ± 4	79.66 ± 2.76	0.5	0.6
<b>Height (cm)</b>	158.93 ± 3.71	159.53 ± 2.79	158.26 ± 2.89	0.6	0.55
<b>BMI (kg/m<sup>2</sup>)</b>	31.96 ± 1.08	31.89 ± 0.95	31.79 ± 0.39	0.14	0.86

The study findings can be summarized as the following, regarding RT sacroiliac mobility: the mean difference of the pretreatment values as compared to post-treatment values was -4.54 threshold units (TU), -0.47 TU and -0.33 TU for group A, B, and C, the mean difference of the post-treatment values was 4.4TU, 4.07TU and -0.33TU for groups A versus B, A versus C, and B versus C respectively. For LT sacroiliac mobility: The mean difference of the pretreatment values as compared to post-treatment values was -5.6 TU, -0.67 TU and -0.47 TU for group A, B, and C, the mean difference of the post-treatment values was 5.53TU, 5.46 TU and -0.07 TU for groups A versus B, A versus C, and B versus C consecutively. As regards to anterior pelvic tilting angle: The mean difference of the pretreatment values as compared to post-treatment values was 3.13 degrees for group A, 2.6 degrees for group B and 0.2 degrees for group C, the mean difference of the post-treatment values was -0.4 degrees for group A versus B, -2.73 degrees for group A versus C and -2.33degrees for group B versus C. Finally concerning **pain intensity level** by visual analogue scale the mean difference of the pretreatment values as compared to post-treatment values was 5.2, 4.14 and 3.2 for group A, B and C, the mean difference of the post-treatment values was -0.33, -1.33 and - for groups A versus B, A versus C and B versus C respectively shown in table (2).

**Table 2:** Alterations in the measured variables in the MWM, MET and control group at baseline and following treatment.

	Baseline	Post-treatment	P value
<b>RT sacroiliac mobility</b>			
<i>MWM group</i>	3.86 ± 1.55 TU	8.4 ± 3.04 TU	p = 0.0001
<i>MET group</i>	3.53 ± 1.92 TU	4 ± 2.2 TU	p = 0.18
<i>Control group</i>	4 ± 1.85 TU	4.33 ± 1.91 TU	p = 0.34
<b>LT sacroiliac mobility</b>			
<i>MWM group</i>	3.46 ± 1.92 TU	9.06 ± 2.46 TU	p = 0.0001
<i>MET group</i>	2.86 ± 1.55 TU	3.53 ± 1.76 TU	p = 0.03
<i>Control group</i>	3.13 ± 1.99 TU	3.6 ± 1.68 TU	p = 0.13
<b>anterior pelvic tilting angle:</b>			
<i>MWM group</i>	4.26 ± 1.22 degrees	1.13 ± 0.99 degrees	p = 0.0001
<i>MET group</i>	4.13 ± 1.24 degrees	1.53 ± 0.83 degrees	p = 0.0001
<i>Control group</i>	4.06 ± 1.86 degrees	3.86 ± 1.72degrees	p = 0.54
<b>Pain intensity level:</b>			
<i>MWM group</i>	5.93 ± 1.38	0.73 ± 0.45	p = 0.0001
<i>MET group</i>	5.2 ± 1.42	1.06 ± 0.25	p = 0.0001
<i>Control group</i>	5.26 ± 1.98	2.06 ± 1.33	p = 0.0001

## DISCUSSION

The purpose of the study was to investigate and compare the effects of Mulligan mobilization versus muscle energy technique in patients with chronic sacroiliac joint dysfunction. The patients participated in this study had symptoms of chronic sacroiliac joint dysfunction with the treatment protocol described before symptoms were improved in 4 weeks. The study findings revealed a statistical remarkable improvement in post-intervention values for sacroiliac mobility in Mulligan mobilization group and a statistically significant decrease of anterior pelvic tilting angle in Mulligan mobilization and muscle energy technique groups also a significant decrease of pain in the 3 groups compared with pre-intervention values, in addition to, Mulligan mobilization group showed a statistical high detectable difference in right and left sacroiliac mobility more than muscle energy technique and control groups also there was a significant difference in anterior pelvic tilting angle and pain level between both Mulligan mobilization and muscle energy technique groups when compared to control group, while no significant difference was detected in anterior pelvic tilting angle and pain level between Mulligan mobilization and muscle energy technique groups.

The main limitation encountered during the study was that tested variables were not all measured in the same day due to the presence of many urgent and critical cases in the doppler unit in the outpatient clinic.

Concerning the clinical effectiveness of MWM techniques, it has been established for improving joint function and this is based on a set of assumptions. The basic theory for Mulligan's efficacy is based on a mechanical model. This theory stated that due to injury minor positional faults occur and that cause joint maltracking, leading to stiffness, pain, and weakness [7]. Main reasons for positional faults were proposed as alterations in joint surfaces configuration, cartilaginous and capsular thickness, orientation and pulling of musculotendinous components. MWMs treat the previous symptoms via realigning the joint and put it on its normal track. Subsequent research also supports that the mechanisms behind the MWMs efficacy were built upon correcting biomechanical malfunction [9]. Chronic musculoskeletal disorder should be a cause of soft tissue shortening and can be long-term adaptive postural changes. Sacroiliac joint mobilization can be used to re-elongate shortened tissues and break adhesion and restore normal position [18]. Our study finding was consistent with the finding of Jeong et al, (2014) [19] who investigated the effect of sacroiliac joint mobilization on obliquity of pelvis, stability control, and pain intensity level. The study of Jeong included sacroiliac joint dysfunction patients who were divided into 2 groups, sacroiliac joint mobilization, and a control group. This study concluded that combining MWM plus function training has been valuable for diminishing pelvic malalignment, enhancing balance abilities as well as diminishing pain level. Also, Anand et al. (2015) [20] agreed with our study findings. Anand measured flexion range of motion of the lumbar spine, back performance

scale score and pain before and immediately after applying mobilization. The study results revealed that modified sustained natural apophyseal glides for the lumbar spine affected immediately on improving lumbar flexion range of motion, back performance, and diminishing pain level. The study results agreed with results of Teys et al. (2006) [21] who studied the initial efficacy of MWM on pressure pain threshold and shoulder range of motion. The results indicated that MWM has an immediate positive effect on both range of motion and pain. The work of Sabour et al. (2016) [22] supported our study findings. They concluded that mobilization with movement is an effective method for improving lumbosacral flexion range of motion, decreasing pain and disability for pregnant women suffering from sacroiliac joint dysfunction. Their study was conducted on 40 pregnant women who were divided into 2 equal groups (postural correction exercises group and mobilization with movement group). On the other hand, our findings contradicted the findings of Richard et al. (1988) [23] who investigated the effects of sacroiliac joint mobilization upon the standing pelvic position. The pelvic position was assessed (pre and post sacroiliac joint mobilization). Richard measured apparent leg lengths (because its discrepancies give a clinical indicator for pelvic asymmetries) and concluded that Richard et al concluded that mobilization did not have any influence upon leg lengths. The difference in finding between our study and Richard's study may be due to single session intervention used that may not be enough to produce changes in pelvis position. Additionally, the findings of the study of Maria et al. (2015) [24] were on the contrary to the finding of our study. The study included 49 asymptomatic subjects that were divided into two groups either sustained natural apophyseal glide mobilization or a sham mobilization. The study revealed that no statistical difference in the range of motion was detected, on the contrary to our study because the study subjects are asymptomatic and this contradicted to Mulligan original theory that depends on correction of positional faults in symptomatic subjects.

As regards to the underlying mechanisms by which MWM produces pain relief are biomechanical and neurophysiological mechanisms [7]. From the biomechanical aspect, it was suggested that MWM achieve correction of joint maltracking as well as mechanical malfunction. Neurophysiologically; stimulation of descending pain control pathways in addition to alterations in central pain mechanism. Additionally, the concentrations of inflammatory mediators were altered by wide range motion performed during applying MWM techniques with the patients and result in inhibition of nociceptors that are stimulated by such inflammatory substances. MWM achieves a pain relief effect and this would be related to the enhancement of disability level. This was supported by the work of Benjamin et al. (2015) [25]. They studied the immediate impacts of lumbar Mulligan sustained natural apophyseal glides in nonspecific low back pain patients. Subjects were randomized to either a real- sustained natural apophyseal glides group

or a sham- sustained natural apophyseal glides group. All outcome measures were significantly different only in the real treatment group. This study showed that sustained natural apophyseal glides for lumbar spine had an immediate effect on reducing pain, improving function and kinematic algorithms in nonspecific low back pain patients. Also, Karthikeyan et al. (2015) [26] agreed with our study findings. Karthikeyan et al compared between the effect of Mulligan sustained natural apophyseal glide technique and slump stretching in spondylogenic referred low back pain patients. Percentage change in pain intensity level and disability index post-intervention in Mulligan group was found to be more significant than the other group. Hagan et al. (2016) [27] agreed with the findings of our study. They investigated the use of MWM for sacroiliac joint in their case report in a patient with sacroiliac joint dysfunction. The patient was tested immediately following the MWM intervention and at discharge. The Numeric Pain Rating Scale scores reduced. Sacroiliac joint pain provocation tests were negative. The patient-specific functional scale improved. The finding of our study contradicts the finding of Collins et al. (2004) [28] who studied the effect of MWM technique in subacute ankle sprains. The study yielded that MWM treatment has a mechanical, not analgesic impact that disagreed with our study and the reason for this difference was due to small sample size in Collin's study that should be considered to have influenced the statistical analysis as pain measures have lower sensitivity to change than mechanical measures (dorsiflexion range of motion).

Concerning to group (B) MET group, our study revealed that MET has no significant effect on sacroiliac mobility, this was matched with the study of Fryer et al. (2011) [29] who concluded that pelvic asymmetry is produced by muscle imbalance and alteration in muscle tone. Muscle energy techniques apply shortening and elongation for muscles and fascial components so; it is probably that MET has an effect on correcting obliquity of the pelvis and asymmetry by affecting muscles and fascial structures more than affecting the sacroiliac joint in a direct way. It has been suggested that MET treats muscle imbalances in the lumbar and pelvic areas e.g. asymmetrical pelvic position. MET can adjust asymmetrical positions of the pelvis by focusing on contracting hip extensors and hip flexors in the affected lower back region and putting the pelvic bones in the right position [30]. The finding of our study was supported by the work of Enas et al. (2015) [31] who investigated the efficacy of muscle energy technique for correcting forward tilting of the pelvis in lumbar spondylosis patients. The two groups of the study showed significant improvement in tilting of the pelvis, pain intensity level, and functional abilities. The group that received MET was better than the other group in all the measured variables. The study results agreed with that of Zelle et al. (2005) [5] who discussed that restoring shortened muscle length and flexibility by mobility and corrective exercises was crucial in treating and modifying overall faulty postures and correcting im-

balances affecting the pelvic ring mobility. The analgesic effect of MET could be explained by both spinal and supraspinal mechanisms; Stimulation of mechanoreceptors in both muscle and joint takes place during an isometric contraction [14]. This results in sympathetic excitation as well as stimulation of the periaqueductal gray area which plays a crucial part in alteration of descending pathway of pain signals. Suppression of nociceptive impulses takes place at the spinal cord level through gate control theory of pain by simultaneous transmission of both painful signals and mechanical receptors activation. MET stimulates joint mechanoreceptors through joint movement. This was supported by the study of Degenhard et al. (2007) [32] who reported that myofascial trigger point suppression was improved by applying different forms of MET. Also, Selkow et al. (2009) [30] agreed with our study findings in their randomized controlled trial that consisted of 20 subjects with lumbopelvic pain, randomized into 2 groups MET and control groups. Subjects in MET group showed a decrease in pain scores in lumbopelvic area than the control group. On the other hand, Ballentyne et al. (2003) [33] still argue and hesitate about the efficacy of MET in form of post-isometric relaxation. They suggested that the post-isometric relaxation theory and its consequent hypoalgesic effects are poorly supported by research.

## CONCLUSION

The data obtained from this study revealed that both Mulligan mobilization with movement and muscle energy technique had significant effect on decreasing anterior pelvic tilting angle and pain level in chronic sacroiliac joint dysfunction patients and no statistically significant difference was detected between both groups in anterior pelvic tilting angle and pain intensity level, while Mulligan mobilization with movement was superior to muscle energy technique in improving sacroiliac mobility. Finally, it could be concluded that Mulligan mobilization with movement is more effective than muscle energy technique in managing patients with chronic sacroiliac joint dysfunction.

## REFERENCES

- [1] Cusi MF. Paradigm for assessment and treatment of sacroiliac joint mechanical dysfunction. *J Bodyw Mov Ther.* 2010 Apr;14(2):152-61.
- [2] Sergio Marcucci. Sacroiliac joint biomechanics and its potential clinical implications. 3rd International Conference and Exhibition on Orthopedics& Rheumatology San Francisco. (2014).
- [3] Peter Huijbregts. Sacroiliac joint dysfunction: Evidence-based diagnosis. *Rehabilitacja Medyczna.* 2004;8(1).
- [4] Goode, A., Hegedus, E. J., Sizer Jr, P., Brismee, J. M., Linberg, A. Cook, C. Three dimensional movements of the sacroiliac joint: a systematic review of the literature and assessment of clinical utility. *J Man Manip Ther.* 2008; 16(1): 25–38.
- [5] Zelle BA, Gruen GS, Brown S. Sacroiliac joint dysfunction: Evaluation and management. *Clin J Pain.* 2005; 21(5):446-455.
- [6] Bindra S: A study on the efficacy of muscle energy technique as compared to conventional therapy on lumbar spine range of motion in chronic low back pain of sacroiliac origin. *Hum Bio Rev.* (2013); 2 (4): 336-349.
- [7] Mulligan B: *Manual Therapy: NAGs, SNAG's MWMS*. 4<sup>th</sup> edition;2004.
- [8] Bautmans I, Arken J, Mecklenburg M. Rehabilitation using manual mobilization for thoracic kyphosis in elderly postmenopausal patients with osteoporosis. *J Rehabil Med.* 2010; 42: 129–135.
- [9] Mulligan BR: *Manual Therapy: "NAGS", "SNAGS", "MWMS", etc*, 6th edition;2010.
- [10] Kumar Ajay, Deepinder Singh. Effect of muscle energy technique on pain and disability in patients with nonspecific low back pain. *Indian journal of physical therapy.*2015;3(2): 40-44.
- [11] Damen, L., Stijnen, T, Roebroek, M. E, Snijders, C. J, Stam, H. J. Reliability of sacroiliac joint laxity measurement with doppler imaging of vibrations. *Ultrasound Med Biol.* 2002 Apr;28(4):407-14.
- [12] Matthew R. Petrone, Jennifer Guinn& Amanda Reddin. The accuracy of the palpation meter (PALM) for measuring pelvic crest height difference and leg length discrepancy. *Journal of orthopedic& sports physical Therapy.* 2003; 33 (6): 319-325.
- [13] Wayne Hing, Renee Bigelow, Toni Bremner. Mulligan's mobilization with movement: A systematic review. *The Journal of Manual & Manipulative Therapy.* 2009;17(2).
- [14] Marzouk A. Ellythy. Efficacy of muscle energy technique versus strain counter strain on low back dysfunction: *Bull. Fac. Ph. Th. Cairo Univ.*2012; 17 (2) :29.
- [15] Ebraheim, N.A., Hassan, A., Lee, M. Functional anatomy at the lumbar Spine. *Seminars in pain medicine.*2004; 2(3): 131-137.
- [16] Buyruk HM, Stam HJ, Snijders CG. The use of color doppler imaging for the assessment of sacroiliac joint stiffness: A study on embalmed human pelvises. *Eur J Radiol.* 1995 Dec 15;21(2):112-6.
- [17] Tosteson A. Preference- based health outcome measure in low back pain. *Spine.* (2000); 25(24):3161-3166.
- [18] Kulyapa Kenkampha, Yodchai Boonprakob. Sacroiliac joint mobilization immediate improved clinical features of non-specific low back pain with sacroiliac joint dysfunction. *KKU Res J (GS).* 2013; 13 (2):71-84.
- [19] Jeong-Hyun Son, Gi Duck Park, Hoo Sung Park. The effect of sacroiliac joint mobilization on pelvic deformation and the static balance ability of female university students with sacroiliac joint dysfunction. *Phys Ther Sci.* 2014 Jun; 26(6): 845–848.
- [20] Anand Heggannavar, Ankita Kale. Immediate effect of modified lumbar SNAGS in nonspecific chronic low back pain. *International Journal of Physiotherapy and Research.* 2015;3(3):1018-23.
- [21] Teys P, Bisset L, Vicenzino B. The initial effects of a

- Mulligan's mobilization with movement technique on range of movement and pressure pain threshold in pain-limited shoulders. *Man Ther.* 2008 Feb;13(1):37-42.
- [22] Sabour A.H Adly, Mohammed A. Awad, Amr A., Mai I. Tolba: Effect of Mulligan technique on sacroiliac dysfunction during pregnancy. *Med. J. Cairo Univ.*2016;84(2):35-41.
- [23] Richard L. Smith, Barbara. Sebastien & Richard L Gajdosik. Effect of sacroiliac joint mobilization on the standing position of the pelvis in healthy men. *JOSPT.*1988;10(3): 77-84.
- [24] Maria Moutzouri, Evdokia Billis, Nikolaos Strimpakos, Polixeni Kottika. The effects of the Mulligan sustained natural apophyseal glide (SNAG) mobilization in the lumbar flexion range of asymptomatic subjects as measured by the Zebris CMS20 3-D motion analysis system. *BMC Musculoskelet Disord.* 2008; 9: 131.
- [25] Benjamin H, Laurent P, Toby H, Christine D, Henri N. Short term effects of Mulligan mobilization with movement on pain and disability and kinematic spinal movements in patients with non-specific low back pain. A randomized placebo controlled trial. *J Manipulative Physiol Ther.* 2015 Jul-Aug;38(6):365-74.
- [26] Karthikeyan T, Moorthy, Pradnya. Efficacy of Mulligan SNAG technique for the management of spondylogenic referred low back pain. *Indian journal of physiotherapy.* 2015;3(2):24-28.
- [27] Hagan. C, Hensley C. Mobilization with movement of the sacroiliac joint for effective management of a patient with sacroiliac joint dysfunction. 2016. <https://bodygears.com/wp-content/uploads/12/Case-Study.pdf>
- [28] Collins, Pamela Teys, Bill Vicenzino. The initial effects of Mulligan's mobilization with movement technique on dorsiflexion and pain in subacute ankle sprains. *Manual Therapy.* 2004; 9(2):77-82.
- [29] Fryer G: Muscle energy technique: An evidence-informed approach *Int J Osteopath Med.* 2011; 14(1):3-9.
- [30] Selkow N. M., T. L. Grindstaff, K. M. Cross, K. Pugh, J. Hertel, S. Saliba. Short-term effect of muscle energy technique on pain in individuals with non-Specific lumbopelvic pain: a pilot study. *The Journal of Manual & Manipulative Therapy.* 2009;17(1): E14-E18.
- [31] Enas Elsayed Abutaleb, Mohamed Taher Eldesoky, Shahenda Abd Elrasol. Effect of muscle energy technique on anterior pelvic tilt in lumbar spondylosis Patients. *International Journal of Medical, Health, Biomedical Bioengineering and Pharmaceutical Engineering.* 2015;9(8):651-655.
- [32] Degenhardt, B., Darmani, N., Johnson, J. Role of osteopathic manipulative treatment in altering pain biomarkers: A Pilot Study. *J Am Osteopath Assoc.* 2007: 107: 387-400.
- [33] Ballantyne, F., Fryer, G. & McLaughlin, P. The effect of muscle energy technique on hamstring extensibility: The mechanism of altered flexibility. *J Osteopath Med.* 2003; 6(2): 59-63.

#### **Citation**

Easa Alkady, S., Kamel, R. M., Taleb, E. A., Lasheen, Y., & Alshaarawy, F. A. (2017). EFFICACY OF MULLIGAN MOBILIZATION VERSUS MUSCLE ENERGY TECHNIQUE IN CHRONIC SACROILIAC JOINT DYSFUNCTION. *International Journal of Physiotherapy*, 4(5), 311-318.