Effect of Mulligan Technique on Sacroiliac Dysfunction during Pregnancy

ADLY A.H. SABOUR, Ph.D.*; MOHAMED A. AWAD, Ph.D.*; AMR A. MANSY, PhD.** and MAI I. TOLBA, M.Sc.***
The Department of Physical Therapy for Obstetrics & Gynecology, Faculty of Physical Therapy, Cairo* and Pharos*** Universities and the Department of Obstetrics & Gynecology, Faculty of Medicine, Alexandria University**

Abstract
This study was conducted on forty pregnant women who were selected randomly from El Shatbe University Hospital in Alexandria, Alexandria University, having sacroiliac joint dysfunction and shared in this study. Their ages ranged from 20-35 years old and their BMI didn’t exceed 40kg/m². They were divided into two equal groups: Group A was treated by postural correction exercises, 30 minutes three times per week for two weeks, and Group B was treated by postural correction exercises and mobilization with movement 10 repetitions each session day by day for two weeks. The study was conducted from March 2015 to December 2015. Pain intensity was assessed using pressure algometer and modified Oswestry disability questionnaire. Lumbosacral flexion range of motion (L5, S1) was assessed using universal inclinometer. Results showed that there was highly significant decrease in pain intensity in both groups (A and B) post treatment in pressure algometer and modified Oswestry disability questionnaire. When compared both groups (A and B) post treatment together, there was a significant difference between both groups (more decrease in group B).

There was highly significant increase in lumbosacral flexion ROM in both groups (A and B) post treatment using universal inclinometer. When compared both groups (A and B) post treatment together, there was highly significant difference between both groups (more increase in group B).

It could be concluded that mobilization with movement is valuable and an effective method in decreasing pain, improving lumbosacral flexion ROM and disability for pregnant women suffering from SIJD.

Key Words: Pregnancy – Mobilization with movement – Sacroiliac joint dysfunction.

Introduction
SACROILIAC dysfunction, syndrome of the sacroiliac joint, or mechanical sacroiliac joint, these terminologies are used to characterize an abnormality of the sacroiliac joint where a biomechanical disorder would exist, with no apparent lesion [1]. The pattern of pain from the sacroiliac joint is more frequently, located below the territory of L5 (the most specific area is 10cm caudally and 3cm laterally to the posterior superior iliac spine the so-called, Fortin area) [2] radiating to buttock, thigh, and groin and eventually extending to leg, and sometimes imitating sciatic. Patients with sacroiliac dysfunction described pain that is aggravated by bending, sitting, or riding in an automobile standing or walking can alleviate the pain. The condition can be bilateral, but when unilateral, it more frequently favors the right side [3].

Pregnancy predisposes women to SI joint pain via the combination of increased weight gain, exaggerated lordotic posture, the mechanical trauma of parturition, and hormone induced ligament laxity [4]. For SI joint pain resulting from altered gait mechanics and spine malalignment, physical therapy and osteopathic or chiropractic manipulation have been reported to reduce pain and improve mobility [5].

The lordotic posture taken by the pregnant women causes the line of gravity to be displaced anterior to the center of the acetabula [6] creating a rotational force in extension around the acetabula. If anterior pelvic support from the abdominal muscles is adequate, there is no problem. If, however, support from the abdominal muscles is not adequate, the anterior pelvis rotates downwards around the acetabula. This anterior rotational force tends to rotate the innominate bones anteriorly on the sacrum, but because the sacrum is placed within the innominates and is wider anteriorly than posteriorly, the innominate bones tend to spread on the sacrum. On reaching the limit of their motion, they wedge and lock.
Anatomically and biomechanically, the sacroiliac joint shares all its muscles with the hip joint. Thus, the sacroiliac joint is unable to function in isolation. The sacroiliac joint is subject to unidirectional pelvic shear, repetitive and torsional forces, which can contribute to sacroiliac joint pain as described under etiology [7].

These referral patterns described included lumbar region, buttock, greater trochanteric area, groin, thigh, abdomen, and finally, calf. Early published referral patterns of sacroiliac joint provocation or irritation, were based on patients’ complaints and physical examination [8].

Manual therapy has been advocated commonly as a means of treatment of sacroiliac joint dysfunction and stabilization. Mulligan’s manual therapy technique at peripheral joints, namely mobilization with movement (MWM), has been well documented in research. The efficacy of MWM has been established in the treatment of joint dysfunction and various pathologies. Mulligan’s original theory for the effectiveness of a MWM is based on a mechanical model documented in his first teaching text. This concept is related to minor positional faults that occur secondary to injury and that lead to maltracking of the joint, resulting in symptoms such as pain, stiffness, or weakness [9].

The cause of positional faults has been suggested as changes in the shape of articular surfaces, thickness of cartilage, orientation of fibers of ligaments and capsules, or the direction and pull of muscles and tendons. MWMs correct this by repositioning the joint, causing it to track normally [9,10].

Subsequent research to date also suggests that the mechanisms behind the effectiveness of MWMs are based on mechanical dysfunction and therefore positional fault correction [11,12].

Corrective exercises may be used to position the innominate bone in proper relation to the sacrum. Postural correction and correction of compensatory movements need to be addressed. As symptoms are controlled, therapy should be advanced to activity specific stabilization exercises to facilitate return to function at the patients’ occupation, sport, or vocational activities [13].

The aim of this study was to determine the effect of mobilization with movement on sacroiliac dysfunction during pregnancy.

Subjects and Methods

The study was conducted from March 2015 to December 2015. It was conducted on forty pregnant women who were selected randomly from El Shatbe University Hospital in Alexandria, Alexandria University, having sacroiliac joint dysfunction. Their ages ranged from 20-35 years old and their BMI didn’t exceed 40kg/m². They were primigravida and multigravida (2 or 3 times). All pregnant women were in the second trimester. Patients were excluded if they had: pregnancy induced hypertension, risk of premature labour, persistent second or third trimester bleeding, placenta præevia after 26 week gestation and/or other pathology than sacroiliac dysfunction causing low back pain.

They were divided randomly, according to numbers that were given to patients and those numbers were divided randomly, into two equal groups (A,B). Group A which was treated by postural correction exercises, 30 minutes per session three times per week for two weeks, and group B which was treated by postural correction exercises and mobilization with movement 10 repetitions each session day after day for two weeks.

All patients were given a full explanation of the protocol of the study and consent form was signed by each patient before participating in the study. For all patients, after taking detailed history, weight and height were measured to calculate BMI before treatment.

Pain intensity was assessed using pressure algometer and modified Oswestry disability questionnaire. Lumbosacral flexion range of motion (L5, S1) was assessed using universal inclinometer.

Treatment procedure:

Group A (control group): It consisted of twenty patients who received traditional treatment (postural correction exercises from standing) for 30 minutes per session, three times per week for two weeks.

Group B (exercise group): It consisted of twenty patients who received postural correction exercises from standing 30 minutes per session day after day for two weeks and mobilization with movement while walking.

Mobilization with movement technique:

For patients with sacroiliac joint pain during walking we suspected anterior innominate fault, thus the exercise was performed while walking.

Patient position: Standing and extending her spine.

Therapist position: Standing behind the patient and fixing the sacrum with the border of one hand and placing the fingers of the other hand on
anterior superior iliac spine on the same side of involved SI joint then pulling back on the ilium while the patient takes a step forward and the movement was performed in pain free range.

Set of 10 was performed each session day after day for two weeks.

Comparison between different variables in the two groups was performed using either unpaired t-test or Mann-Whitney U test whenever it was appropriate. Pair-wise comparison (pre-versus post-treatment) within the same group for different variables was performed using either paired t-test or Wilcoxon Signed Ranks test whenever it was appropriate. p-value ≤ 0.05 was considered significant and <0.01 was considered highly significant.

**Results**

1- **General characteristics of patients:**

Results are expressed as mean ± standard deviation (SD). There was statistically non significant difference between mean values of age, height, weight and BMI of group A and those of group B (Table 1).

Table (1): General characteristics of the both Groups (A and B).

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>t-value</th>
<th>p-value</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs.): Min.-max.</td>
<td>20-35</td>
<td>21-35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>27.30±4.31</td>
<td>29.05±4.02</td>
<td>-1.329</td>
<td>0.192</td>
<td>NS</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>164.45±5.59</td>
<td>166.05±5.01</td>
<td>-0.954</td>
<td>0.346</td>
<td>NS</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>70.80±7.98</td>
<td>70.00±6.78</td>
<td>0.342</td>
<td>0.734</td>
<td>NS</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>26.12±2.08</td>
<td>25.35±1.72</td>
<td>1.275</td>
<td>0.210</td>
<td>NS</td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD. N.S. = p>0.05 = Non Significant.

2- **Pressure algometer:**

There was a statistically highly significant increase (p=0.043) in the mean values of pressure algometer measured post-treatment in both groups (A and B) when compared with its corresponding pre-treatment (Table 2; Fig. 2). The percentage of improvement was higher in group B (41.49%) than in group A (20.91%) (Table 2).

There was statistically non significant difference (p=0.622) in the mean values of pressure algometer measured pre treatment in both groups (A and B). On the other hand, post treatment there was a statistically significant difference (p=0.043) in the mean values of pressure algometer of both groups (A and B), more increase in group B (Table 2; Fig. 2).

Table (2): Mean values of pressure algometer measured pre- and post-treatment in the two studied groups.

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>t-value</th>
<th>p-value</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-treatment</td>
<td>7.46±1.62</td>
<td>7.23±1.29</td>
<td>0.497</td>
<td>0.622</td>
<td>NS</td>
</tr>
<tr>
<td>Post-treatment</td>
<td>9.02±1.89</td>
<td>10.23±1.74</td>
<td>-2.095</td>
<td>0.043 *</td>
<td>S</td>
</tr>
<tr>
<td>Mean difference</td>
<td>1.56</td>
<td>3.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% improvement</td>
<td>20.91%</td>
<td>41.49%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-value</td>
<td>-14.291</td>
<td>-20.181</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>p-value</td>
<td>0.001 **</td>
<td>0.001 **</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as mean ± SD. N.S. $p>0.05$: Non Significant. * $p<0.05$: Significant. ** $p<0.01$: Highly Significant.

3- **Modified Oswestry Disability Questionnaire (MODQ):**

There was a statistically highly significant decrease (p=0.042) in the mean values of MODQ measured post-treatment in both groups (A and B) when compared with its corresponding pre-treatment (Table 3; Fig. 3). The percentage of
improvement was higher in group B (42.11\%) than in group A (21.05\%) (Table 3).

There was a statistically non significant difference ($p=0.914$) in the mean values of MODQ measured pre treatment in both groups (A and B). On the other hand, post-treatment there was a statistically significant difference ($p=0.042$) in the mean values of MODQ of both groups (A and B), more decrease in group B (Table 3; Fig. 3).

Table (3): Mean values of MODQ measured pre-and post-treatment in both Groups (A and B).
\[ \begin{array}{cccc}
\text{Group} & \text{Group} & \text{Z-value} & \text{p-value} \\
\text{A} & \text{B} & \text{S} & \\
\hline
\text{Pre-treatment} & 0.38\pm0.13 & 0.38\pm0.10 & -0.108 & 0.914 \text{NS} \\
\text{Post-treatment} & 0.30\pm0.13 & 0.22\pm0.10 & -2.031 & 0.042* \text{S} \\
\text{Mean difference} & 0.08 & 0.16 & \\
\% improvement & 21.05\% & 42.11\% & \\
\text{Z-value} & -3.958 & -3.970 & \\
\text{p-value} & 0.001** & 0.001** & \\
\end{array} \]

Data are expressed as mean ± SD.
\text{NS:} \ p>0.05: \text{Non Significant.}
\text{Z}: \text{Wilcoxon signed ranks test.}
* \ p<0.05: \text{Significant.}
** \ p<0.01: \text{Highly Significant.}

Sacroiliac joint dysfunction is a state of altered mechanics, characterized by an increase or decrease from the expected normal or by the presence of an aberrant motion. This positions SIJD as a pathomechanical rather than pathological diagnosis [3,14].

More than one-third of women experience back and pelvic pain at some stage during pregnancy [15], yet there is a danger amongst health professionals of considering these symptoms as inevitable and unimportant. The intensity and duration of the pain can fluctuate throughout the pregnancy and often from one pregnancy to the next in the same woman. There is also great variation in severity between individuals: One person may complain of minor, transient, stiffness or discomfort, while another may be totally disabled.

The effect of mobilization with movement during pregnancy is of interest not only because (=$p=0.001$) in the mean values of lumbosacral flexion ROM of both groups (A and B), more increase in group B (Table 4; Fig. 4).

Table (4): Mean values of lumbosacral flexion ROM pre-and post-treatment in both Groups (A and B).
\[ \begin{array}{cccc}
\text{Group} & \text{Group} & \text{t-value} & \text{p-value} \\
\text{A} & \text{B} & \text{S} & \\
\hline
\text{Pre-treatment} & 37.50\pm6.18 & 37.25\pm6.97 & 0.120 & 0.905 \text{NS} \\
\text{Post-treatment} & 38.50\pm6.09 & 47.25\pm6.17 & -4.513 & 0.001** \text{HS} \\
\text{Mean difference} & 1.0 & 10.0 & \\
\% improvement & 2.67\% & 26.85\% & \\
\text{t-value} & -2.179 & -10.420 & \\
\text{p-value} & 0.042* & 0.001** & \\
\end{array} \]

Data are expressed as mean ± SD.
\text{NS:} \ p>0.05: \text{Non Significant.}
\text{**:} \ p<0.01: \text{Highly Significant.}

Fig. (3): Mean values of MODQ in both Groups (A and B) measured pre-and post-treatment.

Fig. (4): Mean values of lumbosacral flexion ROM measured pre-and post-treatment in both Groups (A and B).

\textbf{Discussion}

Sacroiliac joint dysfunction is a state of altered mechanics, characterized by an increase or decrease from the expected normal or by the presence of an aberrant motion. This positions SIJD as a pathomechanical rather than pathological diagnosis [3,14].

More than one-third of women experience back and pelvic pain at some stage during pregnancy [15], yet there is a danger amongst health professionals of considering these symptoms as inevitable and unimportant. The intensity and duration of the pain can fluctuate throughout the pregnancy and often from one pregnancy to the next in the same woman. There is also great variation in severity between individuals: One person may complain of minor, transient, stiffness or discomfort, while another may be totally disabled.

The effect of mobilization with movement during pregnancy is of interest not only because
it relieves the pains resulting from sacroiliac dysfunction but also increases the range of lumbosacral flexion. So, this study was conducted to determine the effect of mobilization with movement on sacroiliac dysfunction in women during pregnancy.

Forty pregnant women were selected from El Shatbe University Hospital in Alexandria, Alexandria University, having sacroiliac joint dysfunction shared in this study. Their ages ranged from 20-35 years old and their BMI didn’t exceed 40kg/m². They were primigravida and multigravida (2 or 3 times) and in the second trimester. They were divided randomly, according to numbers that were given to patients and those numbers were divided randomly, into two equal groups: Group A which was treated by postural correction exercises, 30 minutes three times per week for two weeks, and Group B which was treated by postural correction exercises and mobilization with movement 10 repetitions each session day after day for two weeks.

Pain intensity was assessed using pressure algometer and modified Oswestry disability questionnaire. Lumbosacral flexion range of motion (L5, S1) was assessed using universal inclinometer.

Results showed that there was highly significant decrease in pain intensity in both groups (A and B) post treatment in pressure algometer and modified Oswestry disability questionnaire. When comparing both groups together (A and B) post treatment there was a significant difference between both groups (more decrease in group B).

There was highly significant increase in lumbosacral flexion ROM in both groups (A and B) post treatment using universal inclinometer. When comparing both groups together (A and B) post treatment there was highly significant difference between both groups (more increase in group B).

The results of this study agreed with an experiment on cervical mobilization, Sterling et al., [16] who suggested that the mobilization may selectively stimulate a specific descending inhibitory pain pathway.

The results of this study agreed with results of Zelle et al., [17] who discussed the use of mobilizations and corrective exercises as well as modifying overall faulty postures and movement in the treatment of anterior rotation of the iliac bones.

The results of this study agreed with results of De Santis and Hansen [18] who discussed the effect of MWM on shoulder impingement, and stated that during each MWM session there was a decrease in pain scale by 2-3 points, after 4-6 sessions there was improvement in pain, increase in ROM by 30°-45° by last session. MWM was stopped by seventh session as the participant no longer reported pain during active abduction, achieved near full active ROM and had very little pain in over head activities.

The results of this study agreed with results of Teys et al., [19] who studied the initial effects of MWM on shoulder ROM and pressure pain threshold, the results indicated that MWM has an immediate positive effect on both ROM and pain. ROM significant mean improvement was 16°, 4°, 0° for study, placebo and control groups respectively, while pain demonstrated a mean improvement by 63% following the application of MWM compared with 26% for placebo group and 20% for control group.

The results of this study agreed with results of Hubbard and Tricia, [21] who studied the effects of MWM on ankle sprain with limited and painful ROM. They re-evaluated pain free movements after MWM and resulted in marked increase in pain free ROM, on one leg standing test (eyes closed) after MWM and tapping revealed increased balance equal to that of the uninjured side. Gait patterns are substantially improved.

The results of this study was supported by Konstantinou et al., [22] who stated that perhaps in clinical practice, the biomechanical effect of SMT is influenced by a reduction in pain. In this review, we did not take into account changes in level of pain, but rather focused on ROM, which is a less common outcome variable in randomized clinical trials on SMT and back pain. The choice of researchers to avoid measures of ROMs as outcome variables might well be because SMT does not generally produce substantial changes in ROM. Another possibility for this discrepancy between the clinical experience and the results of this review is that ROM may improve gradually as treatment progresses over days or weeks. Our review dealt only with the immediate effects of
In this study, it could be concluded that mobilization with movement techniques (SMT) has shown only a positive effect in the spine when performed in the pelvic spine, while no effect was discerned after pelvic or lumbar treatment. When positive findings were present, they were generally modest. The small improvement in ROM, when an improvement was seen at all, may come as a surprise to those who have clinical experience with SMT.

**Conclusion:**
On the basis of the results obtained in the present study, it could be concluded that mobilization with movement is valuable and an effective method in decreasing pain, increasing lumbosacral flexion ROM and disability for pregnant women who are suffering from sacroiliac joint dysfunction.

**References**