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Efficacy of Muscle Energy Technique Versus Instrument- Assisted Soft Tissue Mobilization on Postnatal Low Back Pain.

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Abstract--*Low back pain (LBP) is more common in the postpartum period. In fact, up to 75% of women who suffer from pregnancy-related back pain may continue to have pain after giving birth. The purpose of this study is to compare effectiveness of muscle energy technique versus instrument- assisted soft tissue mobilization on postnatal low back pain. 40postnatal women participated in this study. They complained from low back pain. They were selected from Said Galal University Hospital in Cairo, Al Azhar University. Their ages ranged from 25 to 35 years old. Their body mass index was not exceeding 30 kg/m^2. All of them were after normal vaginal delivery by 6 weeks. Patients with radiculopathy, previous low back surgery, spondylolisthesis and chronic low back pain were excluded from the study. They were divided randomly into two equal groups (A& B). Group A treated by instrument assisted soft tissue mobilization (IASTM) two times/ week for six weeks. Group B treated by muscle energy technique (MET) two times /week for six weeks. All patients in both groups were evaluated pre- and post-treatment with Visual analogue scale (VAS) was used to measure pain intensity and Modified Schober's test was used to assess ROM for both groups A and B before and after treatment. Statistical analysis using pre and post treatment design indicated that, within groups There was a statistically highly significant decrease (P<0.001) in VAS and a statistically highly significant increase (P<0.001) in lumbar spine ROM in both groups A and B post treatment. Between groups the obtained results showed that there was no statistical significant difference pre treatment, but post treatment there was a statistically highly significant difference in low back pain intensity (more decrease in group A) and lumbar spine ROM (more increase in group A). Instrument assisted soft tissue mobilization technique is more effective than muscle energy technique in reducing postnatal low back pain intensity and improving lumbar spine ROM.*

Key words--*Muscle energy technique, Instrument assisted soft tissue mobilization, Low back pain; Postnatal period.*

I. INTRODUCTION

Low back pain (LBP) and/or pelvic girdle pain (PGP) has a prevalence of 20-90% in the pregnant population, while a small number of women may suffer from a combination of both pains**.** While PGP is typically more common and intense during pregnancy, LBP is more intense and common in the postpartum period. In fact, up to 75% of women who suffer from pregnancy-related back pain may continue to have pain after giving birth [1].

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While the majority of cases resolve within 6 months postpartum, 40% may continue to experience pain beyond 6 months. For those with a history of LBP during pregnancy, LBP seems to decrease over the postpartum period. However, women who experience LBP or PGP at 3 months postpartum were found to be at higher risk for persistent or chronic LBP. Of these women, only 6% recover within 6-18 months after giving birth [1].

Postpartum chronic backache was defined as backache of at least 6 weeks duration beginning within3 months after delivery. It is estimated that 68% of women experienced back pain during their pregnancy [2].

Back pain is very common, as pregnancy hormones relax the joints, ligaments and muscles. And the weight the woman naturally gain in pregnancy can add to the problem. The woman may want to push her bump forwards, but this puts greater strain on her back. Lower back pain is the most common type of back pain. But the woman may also feel discomfort in her upper back, shoulders, between her breasts, and in the ribcage. She may suffer from a sharp, shooting pain down one or both legs (sciatica) [3].

More than 50% of women complain of some degree of low back pain during pregnancy, and many describe pubic, pelvic, hip, knee and various other joint discomforts. Backache often persists after delivery and may last up to one year. While the etiology of low back pain during pregnancy remains theoretical, three mechanisms regularly are described musculoskeletal, hormonal and vascular [4].

Instrument assisted soft tissue mobilization (IASTM) is a popular treatment for myofascial restriction based upon the rationale introduced by James Cyriax [5]. IASTM is applied using specially designed instruments to provide a mobilizing effect to soft tissue (e.g., scar tissue, myofascial adhesion) to decrease pain and improve range of motion (ROM) and function[6].

Instrument assisted soft tissue mobilization is a technique that involves using instruments to address musculoskeletal pathology-related impairments and help heal soft tissues [7].When a stimulus is applied to the injured soft tissue using an instrument, the activity and the number of fibroblasts increase, along with fibronectin, through localized inflammation, which then facilitates the synthesis and realignment of collagen is one of the proteins that makes up the extracellular matrix[8].

Muscle energy technique is a comprehensive manual therapy system for evaluating and treating joint restrictions of the spine (segmental and intervertebral dysfunctions), rib cage(restricted respiratory motions, dislocations, intraosseous deformities of the ribs), pelvis (sacroiliac, inter-in nominate restrictions and dislocations), and extremities (joint restrictions and impairments of muscle length and strength. Muscle energy technique is a system of manual therapy for treatment of movement impairment that combines the precision of passive mobilization with the effectiveness, safety and specificity of reeducation therapist and therapeutic exercises [9].

II. SUBJECTS AND METHODS

Design

The study was designed as a randomized, Pre –post- test trial. It was conducted in Said Galal University Hospital in Cairo, Al Azhar University between February 2018 to January 2019 and the guidelines for the reporting of randomized controlled studies have been followed by consolidated reporting standards.

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Ethical approval

All relevant national laws and institutional policies have been followed up in human use research, followed the principles of the Helsinki Declaration and approved by the Research Ethics Committee of the Faculty of Physical Therapy, University of Cairo (No. P.T.REC/012/001744).

Patients

A sample of 40 postnatal women patients participated in this study. They complained from low back pain (diagnosed by physician), were recruited according to the following criteria: Age 25 to 35years old, all of them were after normal vaginal delivery by six weeks. They did not receive any medical treatment during the research period. The participants were excluded if they had with radiculopathy, previous low back surgery, spondylolisthesis and chronic low back.

Randomization

Informed consent was obtained from all the patients after the detailed explanation of the study. The privacy of all the received data and the right to refuse or leave at any moment were also provided to all participants. The patients were randomly assigned to Two groups; group (A) (*n =20*) and group (B) (*n =20*). Randomization was performed by a blinded and an independent research assistant using a computer-generated randomization cards saved in sealed envelopes.

Interventions

Group (A) treated by Instrument assisted soft tissue mobilization (IASTM) using Edge Mobility Tool, 2 sessions / week for 6 weeks.

Technique

IASTM was applied for posterior fascia, sacrum, and hamstring bilaterally. The posterior fascia IASTM was microtrauma to stimulation lumbar posterior muscle erector spinae (iliocostalis, longissimus), and multifidus.

The IASTM technique was performed for 20 seconds parallel to the muscle fibers followed by 20 seconds perpendicular to the muscle fibers with the instrument held at a 45 º angle to the skin. The Edge Mobility Tool was used beveled side contacting the skin. Pressure was applied lightly at first with a gradual increase due to the woman's initial sensitivity to the treatment. Pressure was increased with woman tolerance to maximal force due to evidence that heavy pressure elicits greater fibroblast proliferation than light or moderate pressure (Fig. 1).

Fig 1: IASTM for posterior fascia.

Group (B) treated by Muscle energy technique 2 sessions / week for 6 weeks.

Technique:

a- Quadratus Lumborum

The therapist stood behind the side lying patient at waist level. The patient had the upper most arm extended over the head to firmly grasp the top of the table and on an inhalation adducted the upper most leg until the therapist palpate strong quadrates activity elevation around 30 usually. The patient was asked to hold the leg in this manner isometrically allowing gravity to provide resistance. After 7 seconds contraction the patient was asked to hang leg slightly behind her over the back of the table. The therapist straddled this and cradling the pelvis with both hands leaning back to take out all the slack and to ease the pelvis away from the lower ribs during an exhalation. The stretch was held for 30 seconds (Fig. 2) [10]**.**

Fig 2: MET for Quadratus Lumborum

Erector Spinae:

Technique applied for tight Lumbar Erector Spinae:

Patient was in prone-lying position with pillow under abdomen. Therapist placed his left hand on lower thoracic spine and right hand on sacrum (cross hand position). Patient was asked to lift their shoulders off the couch to contract the lumbar erector spinae. Hold for 7 seconds and on relaxation, therapist takes his left hand into cephalic position and right into caudal. (Encouraging lengthening of erector spinae) (Fig.3**)**[11]**.**

Fig 3: MET for erector Spinae.

Iliopsoas:

Technique applied for tight Iliopsoas: The patient is asked to lie on her back on the edge of the couch by holding onto their left knee against his chest. (Same position as the test). The therapist now stabilizes patient's right hip by right hand and placing left hand just above the patient's right knee. The patient is asked to

flex the hip against the resistance for 10 seconds. On relaxation, therapist slowly applies a down- ward pressure (Fig.4) [12].

Fig. 4: MET for Iliopsoas

Piriformis:

The patient supine, the treated leg was placed into flexion at the hip and knee, so that the foot rests on the table lateral to the contralateral knee (the leg on the side to be treated is crossed over the other, straight, leg).

The angle of hip flexion should not exceed 60° The practitioner placed on hand on the contralateral ASIS to prevent pelvic motion, while the other hand was placed against the lateral flexed knee as this was pushed into resisted abduction to contract piriformis for 7-10 seconds.

Following the contraction the practitioner eases the treated-side leg into adduction until a sense of resistance is noted; this is held for 1 0-30 seconds (Fig.5) [12].

Fig. 5: MET for Piriformis.

Duration:

Treatment time was (30–60) seconds per session, 2 times / week for 6 weeks.

Outcome measures

1-History taking*:*

A detailed history was taken from each woman in both groups (A & B) to confirm that the only cause of low back pain is pregnancy and to exclude any neuromuscular or neurological disorders before pregnancy that may be the cause of low back pain.

2- BMI measurement:

Weight and height were measured for each woman in both groups (A&B). By using weight-height scale to calculate the body mass index (BMI) according to the following equation: BMI = weight (kg)/height^2 (m^2) kg/m^2 [13].

3- Pain assessment:

Pain was assessed by visual analog scale (VAS) for each woman in both groups (A&B) before and after treatment. VAS allows continuous data analysis by using a 10 cm line with 0 (no pain) written at one end and 10 (worst pain) on the other end [14].

4- Lumbar spine range of movement:

This measured using a Modified Schober's test to measuring flexibility of lumbar spine with the woman bending forward [15].

Modified Schober's test:

The woman was standing with her back towards the examiner. The examiner determines the location of the lumbosacral junction by précising the location of the dimples of Venus. The intersection of the top of the dimples of Venus is marked by drawing a horizontal line. This line acts as the landmark. The second line is marked 10 cm above the first and the third is marked 5 cm below the first line. The difference between the measurements in erect and flexion positions indicates the outcome of the lumbar flexion [16].

Statistical analysis:

Data collected and statistically analyzed using descriptive statistics (mean and stander deviation) for comparing effect for muscle energy technique and assisted soft tissue mobilization on postnatal women low back pain.

Analysis of variance (T -Test) used to determine the effect of muscle energy technique and assisted soft tissue mobilization on postnatal women low back pain with the level of significance fixed to 5% ($P<0.05$).

III. RESULTS

I-General characteristics of patients:

There was no statistical significant difference between mean value of age, height, weight and BMI between group A and group B (Table.1).

Table 1: General characteristics of both groups (A & B).

	Group A	**Group B**	**t**	**P**	**S**
Age (years)					
Min-max	22-38	20-35			
Mean ±S.D	28.42±1.721	25.42±1.07	1.478	0.1536	NS
Weight(kg)	58.25±1.661	53.42±1.88	0.0664	0.9476	NS
Height(cm)	160.5±1.592	157.3	1.484	0.1534	NS
BMI(kg/m^2)	23.91±0.847	23.57±0.79	0.2888	0.7757	NS

Data are expressed as mean ± SD. NS= p> 0.05= not significant.

II-Visual analogue scale (VAS):

A- Within groups:

There was a statistical highly significant decrease of the mean value of VAS measured post-treatment when compared with its corresponding value in pre-treatment in both groups A and B. (Table 2; Fig 6). The percentage of decrease was higher in group A (35.90%) than in group B (27.39%) (Table: 2).

B- Between groups:

Pre-treatment, there was no statistical significant difference between the mean value of VAS of group A and group B. While post-treatment, there was a highly statistical significant difference between the mean value of VAS in group A and group B (more decrease in group A) (Table 2; Fig 7).

Table 2: Mean values of VAS in the two studied groups.

	Group A	**Group B**	**t value**	**p value**	**S**
Pre-treatment	6.545± 0.5285	5.800 ±0.4667	1.627	0.1194	NS
Post- treatment	2.909 ± 0.3303	3.100 ± 0.5667	0.5847	0.0280*	HS
Mean difference	3.6	2.7			
% change	35.90%	27.39%			
t value	4.084	3.678			
p value	0.0006*	0.0017****			

Data are expressed as mean ± SD. NS= p> 0.05= not significant HS=**p< 0.01= highly significant.

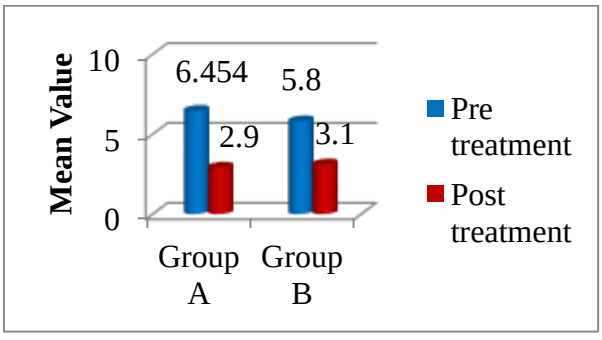

Fig. 6: Mean values of VAS measured pre- and post treatment in both groups (A& B).

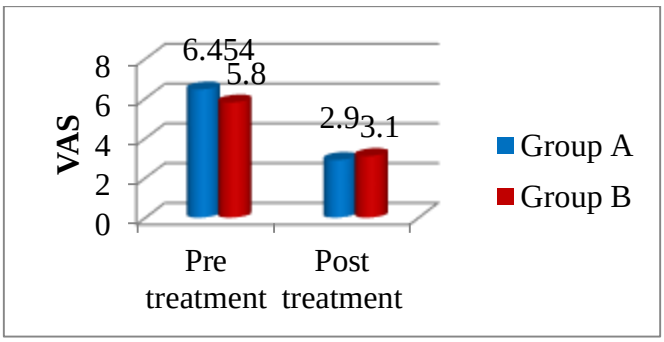

Fig 7: Mean values of VAS between both groups (A &B) pre and post treatment.

III- Lumbar spine ROM:

Within groups:

There was a statistical highly significant increase in the mean value of lumbar spine ROM measured post-treatment when compared with its corresponding value in pre-treatment in both groups A and B. (Table 3; Fig 8). The percentage of increase was higher in group A (9.139%) than in group B (6.111%) (Table: 3).

Between groups:

Pre-treatment, there was no statistical significant difference between the mean value of lumbar spine ROM for group A and group B. While post- treatment there was a statistical highly significant difference in the mean value of lumbar spine ROM for group A and group B (more increase in group A) (Table 3; Fig 9).

Table 3: Mean values of lumbar spine ROM between both groups (A & B) pre- and post-treatment.

	Group A	**Group B**	**t value**	**p value**	**S**
Pre-treatment	16.18 ± 0.3770	16.29 ± 0.4206	0.9511	0.3529	NS
Post- treatment	18.55 ± 0.5110	17.14 ± 0.5084	2.423	0.0250*	HS
Mean difference	-2.37	-0.85			
% change	9.139%	6.111%			
t value	3.722	1.299			
p value	0.0013*	0.2183			

Data are expressed as mean ± SD. NS= p> 0.05= not significant HS=**p< 0.01= highly significant.

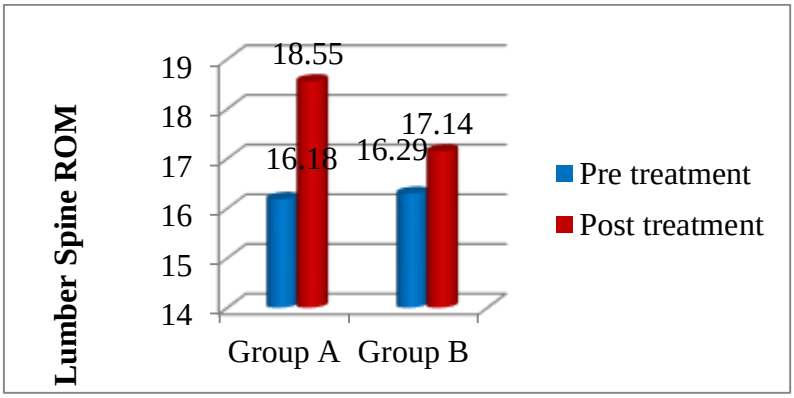

Fig. 8: Mean values of lumbar spine ROM in pre- and post treatment in both groups (A & B).

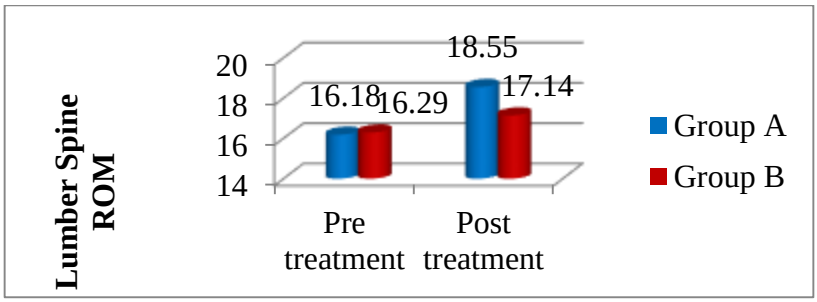

Fig. 9: Mean values of lumbar spine ROM between both groups (A & B) pre- and post-treatment.

IV. DISCUSSION

The prevalence of post-partum low back pain is 35% to 68% in women who experienced low back pain during pregnancy. There are number of causes for post-partum low back, sacroiliac joint and its altered structural make up following pregnancy is one of the cause of postpartum low back pain. The sacroiliac joint normally does not have any movement or little but during pregnancy there occur release of hormones relaxin and elastin around the 19th week of pregnancy which result in increase in motion at sacroiliac joint [17].

A variety of manual therapy techniques were used in the management of low back pain to reduce pain, improve function, and reduce disability. In recent years, muscle energy techniques were increasingly used in clinics to treat low back pain. Muscle energy techniques can be employed to reposition a dysfunctional joint and treat the affected musculature, the patient performs a voluntary muscle contraction "in a precisely controlled direction, against a distinctly executed counter force applied by the operator"[18].

This study was conducted to compare the effect of muscle energy technique versus instrument- assisted soft tissue mobilization on postnatal low back pain. Forty postnatal women participated in this study. They complained from low back pain (diagnosed by physician).

They were divided randomly into two equal groups (A& B). Group A treated by Instrument assisted soft tissue mobilization (IASTM) two times/ week for six weeks. Group B treated by Muscle energy technique (MET) two times /week for six weeks.

Results of this study found that, within groups There was a statistically highly significant decrease ($P<0.001$) in VAS and a statistically highly significant increase ($P<0.001$) in lumbar spine ROM in both groups A and B post treatment. Between groups the obtained results showed that post treatment there was a statistically highly significant difference in low back pain intensity (more decrease in group A) and lumbar spine ROM (more increase in group A).

So, instrument- assisted soft tissue mobilization and muscle energy technique are effective in reducing low back pain intensity but instrument- assisted soft tissue mobilization is more effective.

Regarding to IASTM:

The results of this study agreed with that of Lee et al [19] who stated that The Graston technique (one of IASTM) and general exercise resulted in pain relief and increased ROM. However, the Graston group showed significantly improved VAS and ROM more than control group.

The results also agreed with Baker et al [6] who applied three sessions of IASTM for 1 week on the hamstrings and triceps surae of men who had problems in the lower extremities, such as tightness and pain, which resulted in increased sit and reach (5 cm) and active straight leg raise (7.5°).

The results also agreed with Heinecke et al [20] who mentioned that applying two sessions of IASTM per week for 4 weeks to the shoulder area of collegiate softball, baseball, and volleyball players was helpful in preventing a loss of ROM.

The results also agreed with Kim et al [21] who showed improvement in ROM after a single application of IASTM in the hamstrings of adult men and women.

The results also agreed with Joseph et al [22] who found that IASTM may be effective in acutely improving pain free flexion ROM, decreasing disability, improving function, decreasing pain, and improving patient satisfaction. It may serve as a valuable tool to restore ROM and acutely decrease pain;

The results of the current study also agreed with Laudner et al [23] who found that IASTM can significantly improve ROM. IASTM group (11.1°) showed significantly improved ROM when compared with the control group (-0.12°) and a significant difference in glenohumeral internal rotation ROM was also found between the IASTM (4.8°) and control groups (-0.14°).

Merkle et al [24] found that applying two sessions of IASTM per week for 3 weeks in healthy collegiate baseball players significantly improved their hamstring ROM.

IASTM improves the extensibility of soft tissues by treating their restrictions Heinecke et al [19], and when heat is generated from friction by the instrument, the viscosity of the tissue decreases, making it softer Markovic, [25]. Physiologically, a decrease in the viscosity of tissue improves ROM Ostojic et al [26]. Meanwhile, significant changes in ROM as a result of IASTM can also be explained by hypotheses related to the nervous system. When mechanical stress is exerted on the muscle fascia, intrafascial mechanoreceptors become stimulated. This change alters the proprioceptive input sent to the central nervous system, which in turn changes the tension in tissue-related motor units [27]. Although it is believed that IASTM improves ROM via the mechanisms described in these hypotheses occurring independently or as a combination, scientific proof to support such claims is still lacking.

Regarding to MET:

The result of this study was confirmed with that of Roland, [28] who stated that muscle energy technique is effective in relieving pain, improving range of motion and reducing disability in subjects with recurrent low back pain.

This result was supported by Asmaa et al [29] who found that Muscle energy technique is an effective and safe method in alleviating postnatal low back pain.

The result of this study also supported by Shivangi et al [10] who stated that Muscle Energy Technique was more effective in females with post partum low back pain.

Post isometric relaxation refers to the subsequent reduction in tone of the agonist muscle after isometric contraction. This occurs due to stretch receptors called golgi tendon organ that are located in the tendon of the agonist muscle. These receptors react to over stretching of the muscle by inhibiting the further muscle contraction. In more technical terms, a strong muscle contraction against equal counterforce triggers the golgi tendon organ. The afferent nerve impulse from the golgi tendon organs enters the dorsal root of spinal cord and meets with an inhibitory motor neuron [30].

The results of this study agreed with Noelle et al [31] found that MET caused significant reduction in nonspecific acute lumbopelvic pain. They suggested that MET is a low force isometric contraction in a pain free position and can be accomplished without causing further pain or harm to the patient.

The results of this study also agreed with Patil et al [32] who found that application of MET on quadrates lumborum was effective in reducing disability and increasing spinal range of motion in patients with acute low back pain.

The results of this study also agreed with Shiby [33] who added that muscle Energy Technique was effective as Manipulation in the treatment of low back pain. The treatment was not harmful, but provided as much benefit.

The results of this study also agreed with Shivangi et al [10] who stated that Muscle Energy Technique was found to be more effective in females with postpartum low back pain due to Sacroiliac dysfunction as measured by Numeric Pain Rating Scale and Modified Oswestry Disability.

So, instrument- assisted soft tissue mobilization and muscle energy technique are effective in reducing low back pain intensity but instrument- assisted soft tissue mobilization is more effective.

Limitations

A number of limitations exist within this case report. While the subject did exhibit improvements under the aforementioned IASTM protocol, it is not possible to determine that the intervention solely was responsible for the patient's decrease in symptoms using case report methodology. The potential mechanisms of IASTM are discussed in this paper, but the possibility for neurologic, physiologic, and psychological contributory mechanisms were not taken into consideration. Further research into the mechanisms behind IASTM impacting multiple body systems is needed. Also, this case does not establish the long-term impact of IASTM on SAPS. Further research is needed into the extent of the effects IASTM may exhibit on SAPS patients

V. CONCLUSION

Accordingly, it can be concluded that Instrument assisted soft tissue mobilization technique is more effective in in reducing low back pain postnatal.

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Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

The authors state no conflict of interest.

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