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Original Research Article

Effect of Muscle Energy Technique on Pain, Hip Mobility, And Function in Participants with Post Immobilization Hip Stiffness: An Experimental Study

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ABSTRACT

Background and Objective: After a fracture, there is stiffness in the joints due to adhesions within and around the joint. It is vital to regain flexibility and strengthen the muscles affected. Individuals often face hip stiffness after immobilization, impacting their movement and functionality. This research investigates how Muscle Energy Technique might influence pain, range of motion, and function in those experiencing such stiffness.
Design: An Experimental study
Methodology: In this study, 30 patients following post-immobilization hip stiffness were enrolled by convenience sampling. They were randomly divided into two groups, Group A: (n=15) MET (PIR) along with conventional physical therapy and Group B: (n=15) conventional physical therapy. Treatment consisted of 5 sessions/week for 4 weeks. Data was collected and analyzed using SPSS 26.
Result: In a 4-week study, Group A received MET along with conventional physical therapy, exhibiting significant pain reduction (p=0.000), increased hip ROM flexion (p=0.001), abduction (p=0.000), and internal rotation (p=0.000), external rotation (p=0.000), and improved function (p=0.000). Group B, received conventional physical therapy, also experienced improvements. Intergroup analysis favored Group A, indicating its superior effects on pain, hip ROM, and function as compared to Group B.
Conclusion: MET along with conventional physical therapy is more effective in reducing pain, improving hip mobility and function in participants with post immobilization hip stiffness than conventional physical therapy alone.

***Keywords**:* Post-immobilization hip stiffness, Muscle Energy Technique (PIR), pain, range of motion, LEFS

INTRODUCTION

The hip joint, or coxofemoral joint, is the articulation of the acetabulum of the pelvis and the head of the femur. These two segments form a diarthrodial ball-and-socket joint with three degrees of freedom: flexion/extension in the sagittal plane, abduction/adduction in the frontal plane, and medial/ lateral rotation in the transverse plane. The primary function of the hip joint is to support the weight of the head, arms, and trunk (HAT) both in static erect posture and in dynamic posture such as ambulation, running, and stair climbing.[1] Hip fractures

are associated with increased mortality; 12% to 17% of patients with a hip fracture die within the first year, and the long-term increased risk of death is twofold of the patients who survive, only one-half walk independently again, and 20% must move to a long-term care facility. With regard to functional independence, 50% of patients recover prefracture capability of activities of daily living, and 25% recover full capability of their instrumental activities of daily living.[2]Apple and Hayes have observed that over 90% of hip fractures are associated with falls. The study was designed to incorporate details of the nonfatal falls which led to the fragility fracture. In ages more than 50, slipping was the more common cause of fall leading to injury. In a study conducted in the rural Indian population by Dandona et al., home was found to be the most common place of injury in women while in men the farm was a commoner place with slipping being the most common cause of fall.[3] Prevalence of hip fracture in age group of 30-39 years is 25%, 40-60 years 24.84%, and 50-70 years is 25%. The extracapsular and intracapsular fractures were maximum in the age group of 40–50 years in males and 60–70 years in females.[4] Hip fracture classification is of great importance for clinical management, such as treatment options and prognostic factors. Intracapsular fractures refer to femoral neck fractures and extracapsular to the intertrochanteric and subtrochanteric. Patients with displaced femoral neck fractures who are older are best treated with hemiarthroplasty or total hip arthroplasty (THA). Younger patients are treated with internal fixation. With hemiarthroplasty, controversy exists to some degree over the use of cemented or cementless stems, as well as unipolar or bipolar prostheses.[5] For instance, non-operative management is indicated in elderly patients with multiple diseases. Primary management is 6 to 8 weeks of non-weight bearing followed by four weeks of partial weight-bearing to result in union. The non-operative treatment consists of bed rest to manage pain, followed by toe touch weight-bearing, and prevent deep vein thrombosis. Predicting a hip fracture prognosis is a complicated and important task by itself, and many factors need to be considered. Rehabilitation should begin right after the repositioning and stabilization were successful. At first, ROM should be restored and improve both the hip and knee joint. Then muscles that are affected by the fracture must be strengthened. The most important muscle for post-operative stability is the gluteus medius, which abducts the hip and most probably weakened after surgery. The focus should be on hip flexion, hip extension, adduction, knee flexors, and extensors.[6]Joint stiffness from adhesion is common after fractures especially those that are near a joint. Stiffness is caused partly by intra-articular adhesions and partly by peri-articular and intramuscular adhesions.[7] Loss of range of motion, frequently described as “stiffness” is a common clinical presentation.[8] Muscle energy technique (MET) is “a form of osteopathic manipulative treatment in which the patient’s muscles are actively used on request, from a precisely controlled position, in a specific direction, against a distinctly executed counter force” (Goodridge, 1997, p. 692). That could potentially be effective in the treatment of a restriction in ROM. MET utilizes repeated, sub maximal, active resisted isometric contraction of a muscle followed by passive stretch in order to increase its extensibility and the range of motion (ROM) in the joint with which it is associated. Isometric contraction of the target muscle at end range followed by passive stretch to the new barrier is the most frequently used form of MET (Fryer, 2006). MET may also be used to reduce localized oedema and congestion as muscle contraction facilitates lymphatic and venous fluid exchange (Greenman, 1996).[9]MET has as one of its objectives the induced relaxation of hypertonic musculature and, where appropriate the subsequent stretching of the muscle. This objective is shared with a number of

'stretching' systems. A term much used in more recent developments of muscle energy techniques is post isometric relaxation (PIR). The term post isometric relaxation refers to the effect of the subsequent reduction in tone experienced by a muscle, or group of muscles, after brief periods during which an isometric contraction has been performed.[10]

NEED AND SIGNIFICANCE OF STUDY:

Various physiotherapy treatments are given for traumatic or operative hip conditions including free active ROM exercises, progressive strengthening exercises, balance and functional training. Some previous studies suggested that muscle energy technique is effective in relieving pain and improving muscle flexibility. On the contrary, limited data is available in the literature that addresses the reduction in hip stiffness. Therefore, the need of this study is to evaluate the efficacy of muscle energy technique on pain, range of motion & function in participants with post immobilization hip stiffness.

MATERIALS AND METHODOLOGY

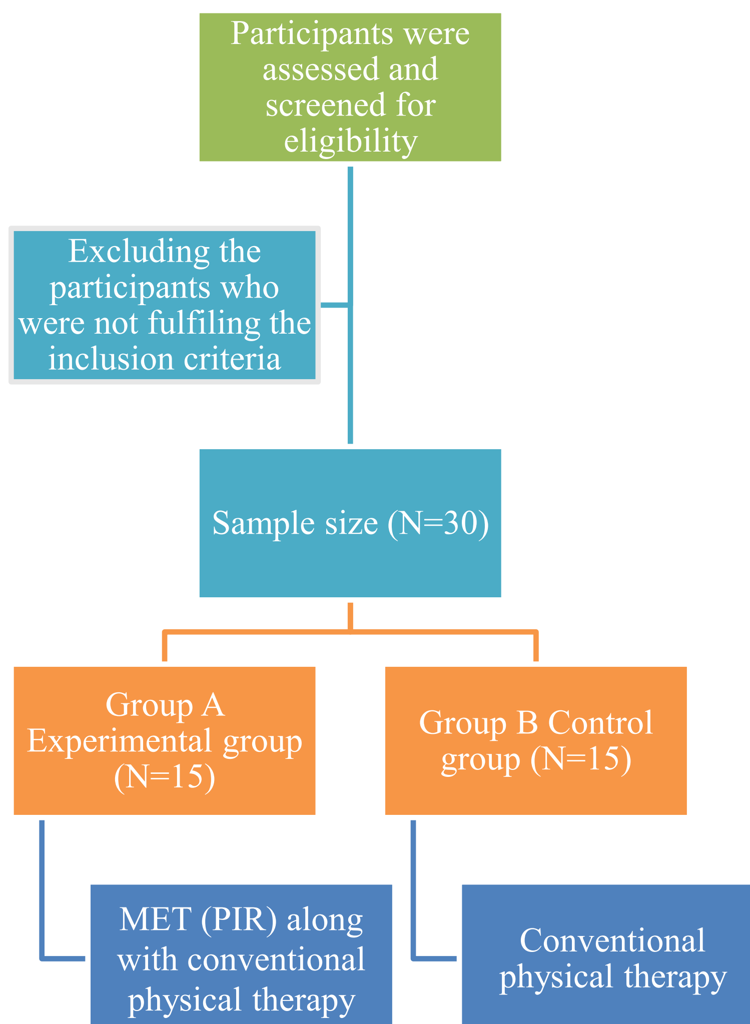
STUDY DESIGN: An Experimental study.
SAMPLING METHOD: Convenience sampling
STUDY POPULATION: Participants with post-immobilization hip stiffness
SAMPLE SIZE: Participants = 30 Group A = [n=15], MET (PIR) along with conventional physical therapy and Group B = [n=15], conventional physical therapy
STUDY SETTING: Institutional Musculoskeletal Physiotherapy Department (O.P.D.)
TREATMENT DURATION: 5 sessions /week for 4 weeks
STUDY DURATION: 1 year

SELECTION CRITERIA
INCLUSION CRITERIA:[4,11]

- Participants with hip stiffness post trauma or operation (Fractures of the proximal femur such as fracture head femur, fracture neck femur, fracture subtrochanteric and intertrochanteric femur, hip dislocations, total hip arthroplasty & hemiarthroplasty).
- Minimum 8 weeks old case of hip trauma/ surgery.
- Age: 20 – 70 years.
- Unilateral involvement.
- Willingness to participate in the study

EXCLUSION CRITERIA:[12,13]

- Pathological fractures, lower limb Poly trauma (knee & ankle injuries), shaft femur fractures
- Other hip joint pathology such as Primary hip osteoarthritis, avascular necrosis, osteomyelitis
- Revision surgeries,
- Sacroiliac dysfunction,
- Hip joint hypermobility syndrome
- Cognitive impairment
- Neurological & vascular conditions affecting lower limb



OUTCOME MEASURES

- **INTENSITY OF PAIN- NUMERICAL PAIN RATING SCALE (NPRS)**
- **HIP ROM -Universal Goniometer**
- **FUNCTION - The lower extremity functional scale (LEFS)**

SAMPLING AND DATA COLLECTION PROCEDURE

After obtaining ethical approval, participants were screened for eligibility. After screening, written informed consent was obtained from all participants. After obtaining consent, participants were divided into two groups: Group A [n=15, Muscle energy technique (PIR) along with Conventional physical therapy] and Group B [n=15, Conventional physical therapy]. No loss to follow up was recorded during the data collection or analysis phase.

TREATMENT PROTOCOL:

GROUP A -TREATMENT PROTOCOL FOR MET (PIR):

MET FOR PSOAS

To increase extension of the hip.

The participants will be in prone position with hip lifted up and knee flexed. Hip being lifted up in extension up to barrier. Next an isometric contraction with inhalation is introduced by the patient using around 20% of available strength of psoas muscle for 7-10 sec with breath hold by attempting to push his leg down towards the table against the resistance of the therapist appropriate breathing instruction was given. Following this, the participants will be asked to relax for 2 sec. The therapist will passively stretch the muscle in new available range. This stretch will be held for 10 sec. This sequence will be repeated 10 times with rest period of 10 seconds

between successive cycle. The treatment will be given 5 times per week for period of 4 weeks.[9,10]

MET FOR HAMSTRING

To increase hip flexion

Have the participants positioned close to the edge of the treatment table. The hip will be in flexed toward the patient's chest to stabilize the pelvis and spine and knee is extended passively to the barrier. Stabilize leg against the participant's chest with one hand, or if possible, have the participants assist by grasping around the thigh and holding it to the chest to prevent an anterior tilt of the pelvis during stretching. Opposite leg is straight on the table. Participant is asked to gently bend the knee against the resistance of therapist. An isometric contraction with inhalation is introduced by the patient using around 20% of available strength of the hamstring muscle for 7-10 sec by attempting to bend the knee against the resistance of the therapist. Following this, the participants will be asked to relax for 2 sec and exhale. The therapist then brings the muscle in new available range. This stretch will be held for 10 sec. This sequence will be repeated 10 times with 10 sec rest between successive cycles. The treatment will be given 5 times per week for period of 4 weeks.[9,10]

MET FOR TFL

To increase adduction and external rotation of the hip

The participant lies supine with the unaffected leg flexed at hip and knee. Therapist stands on the contralateral side. The therapist uses his trunk to stabilize the patient's pelvis by leaning against the flexed (nonaffected side) knee. The therapist's caudad arm supports the affected leg so that the knee is stabilized by the hand. The other hand maintains a stabilizing contact on the affected side ASIS. An isometric contraction with inhalation is introduced to abduct the leg against resistance using 20% of available strength for 7-10 seconds. Following this, the participants will be asked to relax for 2 sec and exhale. The therapist then passively stretches the treated side leg into adduction and held for 10 seconds. This sequence will be repeated 10 times with 10 sec rest between successive cycles. The treatment will be given 5 times per week for period of 4 weeks.[9,10]

MET FOR ADDUCTORS

To increase abduction of the hip.

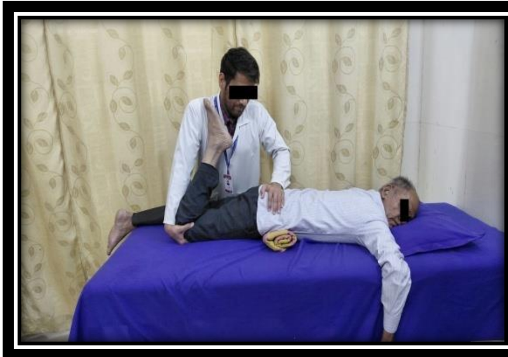
Place the participant in a supine position with the hip in abduction and knee flexed. Therapist stands facing the participant between table and abducted hip. Hip is abducted till the resistance is felt. Next, an isometric contraction with inhalation is introduced by the patient using around 20% of available strength of the adductors (pectineus, adductors brevis, magnus and longus) for 7-10 sec with breath hold by attempting to pull his against the resistance of the investigator. Following this, the participant will be asked to relax for 2 sec and exhale. The therapist then passively stretches the muscle in new available range. This stretch will be held for 10 sec with 10 sec rest between successive cycle. This sequence will be repeated 10 times. The treatment will be given 5 times per week for period of 4 weeks.[9,10]

MET FOR PIRIFORMIS

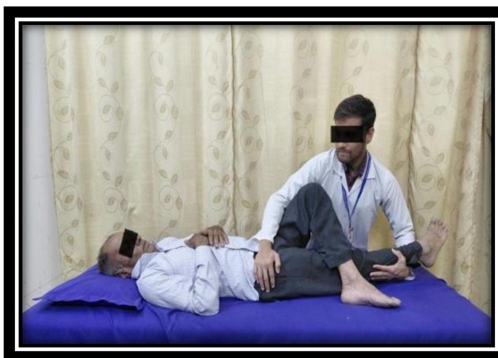
To increase internal rotation of the hip. Place the participant in a supine position, hips flexed and knee flexed so that the foot rests on the table lateral to the contralateral knee (the leg on the side to be treated is crossed over the other, straight leg). The angle of hip flexion should not exceed 60°. The therapist places one hand on the contralateral ASIS to prevent pelvic motion, while an isometric contraction with inhalation is introduced against the lateral flexed knee as this is pushed into resisted abduction to contract piriformis around 20% of available strength for 7-10 seconds. Following this, the participants will be asked to relax for 2 sec and exhale. The therapist then passively stretches the treated side leg into adduction and held for 10

seconds. This sequence will be repeated 10 times with 10 sec rest between successive cycles. The treatment will be given 5 times per week for period of 4 weeks.[9,10]

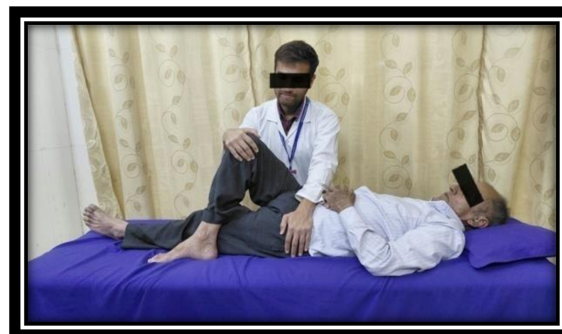
GROUP A: MET



PHOTOGRAPH 1 & 2: PIR FOR PSOAS & PIR FOR HAMSTRINGS



PHOTOGRAPH 3 & 4: PIR FOR TFL & PIR FOR ADDUCTORS



PHOTOGRAPH 5: PIR FOR PIRIFORMIS

GROUP B Conventional protocol:
HIP MUSCLE SETTING EXERCISE

Gluteal setting exercises: (10 repetitions×1 set/day) 10 repetitions of gluteal setting exercises were performed by the participants in supine position. Participants were instructed to "squeeze" (contract) the buttocks to increase awareness of the contracting muscles in a pinching manner and hold the isometric contraction for 10 second. A rest time of 10 seconds was given between each repetition.[14] Hip abductor setting exercises: (10 repetitions×1 set/day). For hip abductor setting exercises low intensity isometric contractions were performed against little to no resistance for hip abductors. The participants were placed in supine position and participants were instructed to perform hip abduction against mild resistance applied by therapist.

ACTIVE -ASSISTED ROM EXERCISES OF HIP:
(10 repetitions×1 set/day) 10 repetitions of active assisted R.O.M of hip flexion and abduction were performed with the participants in supine position. The participants were instructed to perform hip flexion and abduction within available range, with the therapist supporting the participant's thigh and the ankle or foot.

ACTIVE HIP EXERCISES:
STRAIGHT LEG RAISES: (10 repetitions/1 set/day) 10 repetitions of straight leg raise exercise were performed by the participants in supine position. To stabilize the pelvis and low back, the opposite hip and knee were kept flexed, and the foot was placed flat on the exercise table. The participants were then instructed to contract the quadriceps muscle & then lift the leg to about 45 degrees of hip flexion while keeping the knee extended for 10-seconds. A rest time of 10 seconds was given between each repetition. Verbal exercise cue was given for the SLR exercise protocol, "maintain quadriceps contraction throughout the lifting and lowering of the leg"
HIP EXTENSION EXERCISES: (with knee extension) (10 repetitions×1 set/day) 10 repetitions of AROM of hip extension were performed by the participants in prone lying. The participants were instructed to lift the thigh while keeping the knee extended & with the therapist stabilizing the pelvis with the top hand.
HIP ABDUCTION AND ADDUCTION EXERCISE: (10 repetitions×1 set/day) Support the patient's leg with the upper hand under the knee and the lower hand under the ankle. For full range of adduction, the opposite leg needs to be in a partially abducted position. Keep the patient's hip and knee in extension and neutral to rotation abduction and adduction are performed.
HIP MUSCLE STRENGTHENING EXERCISE: Hip flexors, extensors, abductors, and knee extensors (10 repetitions×1 set/day)
BALANCE TRAINING: (10 repetitions×1 set/day) Sit to stand, Unilateral heel raises, Partial knee bends, Balance in single-leg stance.

RESULTS
The present study aimed to evaluate the effect of muscle energy technique on pain, range of motion, and function in participants with post immobilization hip stiffness. The study comprised of total 30 participants with hip stiffness, 15 participants in each group. All data were analysed by using statistical software SPSS version 26. Before applying statistical tests, data were screened for normal distribution using Shapiro-wilk test. All the outcome measures were analysed at baseline and after 4 weeks of the treatment, by using appropriate statistical test. Level of significance was kept at 5%. Within group the data was analysed with paired t test for Range of motion (ROM), Numerical pain rating scale (NPRS) and LEFS. Between group data was analysed with unpaired t test for Range of Motion (ROM), Numerical pain rating scale (NPRS) and LEFS.

TABLE 1: STATISTICALTEST USED IN THE STUDY

OUTCOME MEASURES	STATISTICALTESTS APPLIED		
	WITHIN GROUPA	WITHIN GROUPB	BETWEENGROUP A&B
NPRS	IRED T TEST	AIRED T TEST	UNPAIRED T TEST
ROM FLEXION	PAIRED T TEST	PAIRED T TEST	UNPAIRED T TEST
ROM ABDUCTION	PAIRED T TEST	PAIRED T TEST	UNPAIRED TEST
ROM INTERNAL ROTATION	PAIRED T TEST	PAIRED T TEST	UNPAIRED T TEST
ROM EXTERNAL ROTATION	PAIRED T TEST	PAIRED T TEST	UNPAIRED T TEST
LEFS	PAIRED T TEST	PAIRED T TEST	UNPAIRED T TEST

BASELINE CHARACTERISTICS OF PARTICIPANTS

TABLE 2: GENDER DISTRIBUTION GROUP A&B

Gender	Female	Male	Total
Group A	8	7	15
Group B	7	8	15
Total	15	15	30

TABLE 3: AGE DISTRIBUTION GROUP A&B

AGE	NO.	MEAN AGE	SD	MIN	MAX
GROUP A	15	56	15.946	20	70
GROUPB	15	51.8	14.319	27	70

TABLE 4: MEAN DIFFERENCE IN NPRS WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	6.333	1.83	1.2667	0.593	11.767	0.000
GROUP B	6.666	0.976	4.267	0.704	9.431	0.000

TABLE 5: MEAN DIFFERENCE IN NPRS BETWEEN GROUP A&B

OUTCOME	GROUP A		GROUP B		P VALUE
	MEAN	SD	MEAN	SD	
NPRS	5.0667	1.667	2.400	0.985	0.000

TABLE 6: MEAN DIFFERENCE IN ROM FLEXION WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	79.333	27.442	121	10.810	-8.191	0.000
GROUP B	78.333	31.413	99	22.535	-4.437	0.000

TABLE 7: MEAN DIFFERENCE IN ROM ABDUCTION WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	23.333	7.952	41.800	8.001	-10.403	0.000
GROUP B	25.067	9.83	31.667	9.294	-10.338	0.000

TABLE 8: MEAN DIFFERENCE IN ROM INTERNAL ROTATION WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	16.2	6.338	31.8	4.056	-10.344	0.000
GROUP B	14.866	7.234	22.533	6.116	-10.257	0.000

TABLE 9: MEAN DIFFERENCE IN ROM EXTERNAL ROTATION WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	19.067	5.586	38.067	5.444	-11.374	0.000
GROUP B	19.867	4.998	28.467	5.629	-9.459	0.000

TABLE 10: MEAN DIFFERENCE IN ROM BETWEEN GROUP A&B

OUTCOME ROM	GROUP A		GROUP B		P VALUE
	MEAN	SD	MEAN	SD	
FLEXION	44	20.8	20.6	18.0	0.003
ABDUCTION	18.6	6.905	6.6	2.472	0.000
INTERNAL ROTATION	15.6	5.840	7.666	2.894	0.000
EXTERNAL ROTATION	19	6.469	8.6	3.521	0.000

TABLE 11: MEAN DIFFERENCE IN LEFS WITHIN GROUP A&B

GROUP	PRE TREATMENT		POST TREATMENT		t/Z VALUE	P VALUE
	MEAN	SD	MEAN	SD		
GROUP A	33.667	14.156	62.133	9.738	-8.998	0.000
GROUP B	25.933	12.87	45.533	10.169	-8.284	0.000

TABLE 12: MEAN DIFFERENCE IN LEFS BETWEEN GROUP A&B

OUTCOME	GROUP A		GROUP B		P VALUE
	MEAN	SD	MEAN	SD	
LEFS	28.47	12.25	19.4	9.34	0.031

DISCUSSION

Limited information exists in the literature regarding the impact of Muscle energy technique stretching on post-immobilization hip stiffness. While some past studies indicate the effectiveness of the Muscle energy technique in alleviating pain and enhancing muscle flexibility. Notably, no data is available in the literature that addresses the reduction in hip stiffness. This study was formulated to investigate the influence of Muscle energy technique on pain, range of motion, and function among participants with post immobilization hip stiffness.

Joint stiffness is common post-fracture, caused by intra-articular and peri-articular adhesions. Restoring range of motion (ROM) and strengthening affected muscles are crucial.[8] MET reduces pain and improves range of motion aiding joint movement. This technique is effective, simple, and useful in the post-immobilization period for improving the range of motion.[12]

The study included 30 participants with post-immobilization hip stiffness with mean age of 56 ±15.94 in Group A and 51.8 ± 14.31 in Group B (mean ± SD) and, gender distribution was homogenous with a percentage of 46.66% males and 53.33% females in Group A and 53.33% males and 46.66% females in Group B. The participants were equally distributed into two groups (A=15, B=15) to receive either of two interventions: MET along with conventional physical therapy & conventional physical therapy alone. In the present study, the intensity of pain was assessed by the Numerical Pain Rating Scale, hip function was assessed by the Lower Extremity Functional Scale, and hip range of motion was measured by the Universal Goniometer.

The pretreatment score of NPRS, ROM and LEFS showed that there was no statistically significant difference between group A and B. Hence both groups were homogenous at baseline.

Pre- treatment scores of the groups at baseline shows $p > 0.05$ for NPRS, ROM and LEFS by using Shapiro-wilk test. The intra-group comparison of pre and post treatment scores of NPRS, ROM and LEFS using parametric paired t-test; the inter-group comparison of pre and post treatment scores of NPRS, ROM and LEFS using unpaired t-test. Intra-group and Inter- group analysis revealed $p < 0.05$. Group A participants were given MET along with conventional physical therapy for 4 weeks. After 4 weeks of intervention, results showed a statistically significant decrease in pain intensity (p=0.000), a significant improvement in hip ROM of flexion (p=0.001), abduction (p=0.000), internal rotation (p= 0.000), external rotation (p=0.000), and hip function (p=0.000) in the post-treatment stage compared to the pre-treatment stage. Hence, the null hypothesis (H_o1) is rejected, and the alternate hypothesis (H_11) is accepted based on findings of the current study.

Group B participants were given conventional physical therapy for 4 weeks. After 4 weeks of intervention, results showed a statistically significant decrease in pain intensity (p=0.000), a significant improvement in Hip ROM of flexion (p=0.000), abduction (p=0.000), internal

rotation (p= 0.000), external rotation (p=0.000), and hip function (p=0.000) in the post-treatment stage compared to the pre-treatment stage. Hence, the null hypothesis (H_o2) is rejected, and the alternate hypothesis (H_12) is accepted based on findings of the current study.

After 4 weeks, the intergroup comparison of Group A & B showed a statistically significant decrease in pain intensity (p=0.000), a significant improvement in Hip ROM of flexion (p=0.003), abduction (p=0.000), and internal rotation (p=0.000), external rotation (p=0.000), and LEFS (p=0.031).

Results of the present study showed positive findings with a statistically significant ($p<0.05$) decrease in pain intensity, a significant improvement in hip ROM, and hip function after 4 weeks of intervention in both groups.

Hence, the alternate hypothesis [h_13], “There is statistically significant difference between the effect of muscle energy technique (MET) along with conventional physical therapy and conventional physical therapy alone on pain, hip mobility and function in participants with post immobilization hip stiffness”, holds true.

This is also supported by study of Faqih, Anood I. et al. in 2019, which supports early intervention by MET has effect on pain, range of motion and function in post operative fracture around elbow. This could be because of hypoalgesic effects of MET which is explained by the inhibitory Golgi tendon reflex, activated during the isometric contraction that in turn leads to the reflex relaxation of the muscles. Also, the muscle and joint mechanoreceptors were activated leading to sympatho-excitation evoked by somatic afferents and localized activation of the periaqueductal gray matter. This plays a role in the descending modulation of pain.[12,15] MET can also cause reduction in pro inflammatory cytokines and it may also desensitize the peripheral nociceptors. Blood and lymphatic flow rates may also be affected due to rhythmic muscle contraction and there could be changes in the interstitial pressure and increase in the trans capillary blood flow.[12,16] MET also showed better improvement in elbow ROM. This could be due to a combination of contractions and stretches (as used in MET) might be more effective in producing viscoelastic changes.[12,17,18] MET increases myofascial tissue extensibility that increases viscoelastic and plastic tissue property, and also the autonomic- mediated change in extracellular fluid dynamics and fibroblast mechanotransduction.[12,19]Isometric muscle contraction shows neurophysiological effects, including pain inhibition, thus allowing the muscles to be stretched further.[12,20,21] A study by Ewan Thomas et al.(2019) showed that MET are effective in improving pain, disability and joint range of motion in both asymptomatic subjects and symptomatic patients. This study provided evidence that MET are specifically effective for alleviating chronic pain of the lower back and neck and chronic lateral epicondylitis. There is also evidence supporting MET as a beneficial therapy for reducing acute lower back pain and improving the related disability indexes.[11] A study by Sharma et al.(2016) showed that MET on sacro-iliac joint dysfunction reduced pain which lead to improvement in range and functional ability in such patients.[12,22] MET has helped to reduce disability and improve function in various other conditions.[23,24] A study by Nicholls, Heather K (2011) showed single application of MET along with passive stretch in participants with positive Thomas test. MET along with passive stretch was applied to the participants which showed increased ROM of hip extension. Improved ROM can be explained by increased viscoelastic and plastic tissue property of muscle.[9] A study by Gary Fryer (2010) showed that MET promotes fluid drainage, hypoalgesia, and proprioceptive input. MET applied to the ‘first’ barrier (first sense of increasing resistance to motion) with repeated gentle isometric contractions. Repetitive mid-range articulation may assist trans-synovial flow and lymphatic drainage, and indirect

techniques (techniques that place the joint or tissues in a position of ease or relaxation) had a role in reducing the secretion of pro-inflammatory peptides to minimize pain and inflammation. This reduction in pain increases ROM of affected joint.[25] In summary, these studies highlights positive effect of MET particularly post isometric contraction on various musculoskeletal conditions, providing valuable insights for rehabilitation and improving patient outcomes. Therefore, MET are used to increase joint ROM by performing isometric contraction and promoting viscoelastic and plastic property of muscle which improves ROM of joint. The present study supported that MET along with conventional physical therapy on pain, hip mobility and function in participants with post immobilization hip stiffness was more effective than conventional physical therapy alone.

Limitations:

No long term follow up was taken.
No blinding was done.

Suggestions And Recommendation

Further studies can be done with large sample size.
Study can be done with long term follow up.
Blinding can be done so that validity will have been improved.

CONCLUSION

In conclusion, the study investigating the effects of Muscle energy technique on post-immobilization hip stiffness yielded promising results. Muscle energy technique along with conventional physical therapy was found to be more effective in reducing pain, improving hip mobility and function, than conventional physical therapy alone in participants with post immobilization hip stiffness.

Declaration by Authors

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