

Comparative Effects Of Muscle Energy Technique Versus Hip Muscle Strengthening Exercise In Patient With Low Back Pain.

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Abstract: Low back pain occurs in people with a wide variety of professions. Including those involving heavy labor, repetitive work activities, and extended sedentary of the population will have experienced a significant incident of low back pain by age 30. ⁽¹²⁾ Factor associated with LBP, including poor muscle endurance, altered muscle firing rates, muscular imbalance, reduced flexibility of the lower extremities.⁽¹³⁾ Currently, a large variety of both manual and non-manual interventions exist for reducing low back pain.. Our study aims to compare the Effectiveness of Muscle Energy Technique and Hip muscle strengthening in patients with low back pain. This study was conducted in subjects with low back pain who presented to the physiotherapy OPD in department of physiotherapy between August 2017 to February 2018. A total of 40 patients were included in the study. The low back pain was significantly reduced after treatment of four weeks.

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I. Introduction

Low back pain occurs in people with a wide variety of professions. Including those involving heavy labor, repetitive work activities, and extended sedentary of the population will have experienced a significant incident of low back pain by age 30. ⁽¹²⁾ MET is an active technique supplies the corrective forces. MET involves the voluntary contraction of patient muscle in a precisely controlled direction, at varying levels of intensity. MET can be used to lengthen and strengthen muscles, to Increase fluid mechanics and decrease local edema, and to mobilize a restricted articulation.⁽¹²⁾ Factor associated with LBP, including poor muscle endurance, altered muscle firing rates, muscular imbalance, reduced flexibility of the lower extremities. The hip musculature plays a significant role in transferring forces from the lower extremity up toward the spine during upright activities and thus theoretically may influence the development of LBP. Poor endurance and delayed firing of the hip extensor and hip abductor muscle leads to LBP. ⁽¹³⁾The main emphasis of core strengthening is focused on muscular stabilization of the abdominal, paraspinal, and gluteal muscles to provide better stability. Resistance exercise training with pelvic stabilization improved development of lumbar extension strength. LBP may be decreased by strengthening the back, legs and abdomen to improve muscular stabilization. ⁽¹³⁾Humans are unique compared to other primates in the way we walk and stand. The alteration made in the spine and pelvis gives us stability while we walk and stand but left us vulnerable to low back strains and sprains. Low back pain is neither a disease nor a diagnostic entity of any sort. The term refers to pain of variable duration in an area of the anatomy afflicted so often that it is has become a paradigm of responses to external and internal stimuli. Low back pain affects the quality of life, interferes with work performance and is a common cause of disability. ⁽¹⁾Low back pain is one of the most prevalent condition. Pain in the lower back can originate from various structures like spine, muscles, nerves or other structures in the low back. The causes of low back pain are numerous and range from the extreme like lifting a heavy object or being involved in an accident, to the very ordinary, like moving too quickly or sitting too long in one position. A number of medical conditions contribute to low back pain, such as; small fractures of the spine from osteoporosis, muscle spasms (very tense muscles that remain contracted). Ruptured, herniated or degenerating disc, Poor alignment of the vertebrae, Spinal stenosis (narrowing of the spinal canal), strains or tears of the muscles or ligaments that support the back, curvature of the spine and other medical conditions.⁽³⁾MET is not particularly a mobilization or manipulation technique. MET is an active technique in which subjects rather than therapist provides corrective force. MET is a versatile technique traditionally used to address muscular strain, pain, local edema and joint dysfunction. MET has shown improvements in range of motion, reducing pain relieving muscle tension & spasm, & increased strength of the muscle. ⁽⁴⁾The Sedentary nature of modern existence and lack of physical fitness makes humans so liable to back trouble. Low back pain has been, and continues to be, one of the enigmas of modern medicine. ⁽¹⁰⁾

II. Material and Methods

The prospective comparative study was carried out on subjects in MVP'S Dr Vasant Rao Pawar Medical College, Hospital and Research Centre, Physiotherapy OPD from August 2017 to February 2018. A total 40 subjects (both males and females) of aged 20-40 years were included in this study.

Study Design: Comparative study

Study Location: MVP'S Dr Pawar Medical College, Hospital and Research Centre, Physiotherapy OPD Nashik

Study Duration: 6 months

Sample Size: 40. Group A: 20 Groups B: 20

Inclusion criteria:

1. Mechanical low back pain.^(1,10)
2. Both male and female.^(2,10)
3. Age range of 20-40.⁽¹⁰⁾
4. Duration of pain of not more than 12 weeks.⁽¹²⁾
5. Moderate pain intensity and above (VAS ≥ 5).⁽¹⁰⁾
6. Low back pain without radiating symptoms.⁽¹²⁾
7. Lumbar flexion restriction.⁽¹²⁾

Exclusion criteria

1. Radiating pain.^(12,1)
2. Paresthesia or numbness into the buttocks or lower extremities.⁽¹²⁾
3. Motor weakness.⁽¹²⁾
4. Spondylolisthesis.^(12,1)
5. Chronic low back pain of more than 12 weeks.⁽¹²⁾
6. Intervertebral disc prolapse.⁽²⁾
7. Uncooperative patients.⁽³⁾
8. Previous spinal fracture.⁽¹⁾

Procedure methodology

Participants were selected according to inclusion and exclusion criteria and asked to fill in the written consent form and were randomly assigned into two groups 20 in each group. Group A subjects were treated with MET and home exercise programme. Group B subjects were treated with Hip strengthening exercises. Both the groups received IFT. The subjects in both the group were measured for VAS score, ODI, Schober's test, and lumbar flexion test on day 1 prior to treatment and on day 8 after the treatment.

Group A: MET and home exercise program:

Patient was taken in side lying, on the side opposite of their flexion and side-bending restriction (e.g. if the patient had a right flexion restriction, he or she would be placed in left sidelying) Patient lies on right side. Examiner palpates L3 spinous process and extends patient's legs until motion is palpated at L3. Patient was made to lie on left side as shown in figure 1. (A) Examiner palpated L3 spinous process and extended patient's legs until motion was palpated at L3. (B) Examiner then flexed patient's trunk superiorly until motion was palpated at L3. (C) Examiner then flexed the trunk inferiorly until motion was palpated at L3. (D) Then the examiner rotated patient trunk until motion was palpated at L3. (E) Then the examiner had sidebended the patient's trunk until motion was palpated at L3. On command, patient pushed his legs onto the examiner's hand and holds for 5 sec (isometric contraction). Entire process was performed for 5 sec isometric contraction with 4 repetitions.

Home Exercise Programme: If a patient was diagnosed with a flexion and side-bending left restriction, the patient was instructed to place the left foot on a stool or chair (hip and knee angles of 90 and 90, respectively) and slowly bend forward and rotate to the left (Figure 2). Patients were instructed to stretch as far as possible in a pain-free range and hold the stretch for 5-7 sec.⁽¹²⁾



Fig. MET for right side flexion restriction



A. Starting position



B. Stretch position

Fig 2. MET Home exercise [flexion and side bending left restriction]

Group B: Hip Extensor and Hip abductor strengthening with Bridging and IFT-

Resistance band exercise for hip extensor and hip abductor were performed. Participants were asked to perform 10 RM with the heaviest band tolerable. If patient was unable to do so then the resistance band with less resistance was used. Once the prescribed RM of given exercises were completed without difficulty the next level of resistance band was used.⁽⁸⁾ Bridging: 3 times, 10 repetition, rest time: 30-90sec was prescribed as a home exercise. Both group received the selected treatment 8 times over a 4 week period (2 times per week).⁽¹²⁾ IFT:

The patient was made to lie in prone position on the couch. Treatment area was exposed by maintaining privacy of patients. Four channel electrode was placed on the area to be treated. An appropriate treatment frequency was selected i.e., 80-100 Hz. for 15 min duration.⁽²⁾ The intensity of IFT was adjusted according to patient tolerance. This is continued for a period of 1 month after which the exercise programme started.

THERA BAND EXERCISES



Hip extension



Hip abduction



Bridging

Statistical Analysis:

The study comprised of 40 subjects with mechanical low back pain, presenting with forward flexion and lateral side flexion restriction. Data was analysed using Graphpad Quickcals in this study. To compare pre and post treatment values paired t test was done within the groups. To compare the difference between two groups unpaired t test was done. The level $P < 0.05$ was considered as the cut-off value or significance.

III. Result

As the p-value < 0.0001 in group A for VAS, ODI, Shober's test and Lateral flexion test, result is extremely statistically significant. Thus Muscle Energy Technique with IFT showed improvement in scores of VAS, ODI, Shober's test and Lateral flexion test.

As the p-value < 0.0001 in group B for VAS, ODI, Shober's test and Lateral flexion test, result is extremely statistically significant. Thus Hip Muscle Strengthening with IFT showed improvement in scores of VAS, ODI, Shober's test and Lateral flexion test.

The VAS p value = 0.4175, result is statistically not significant. Thus, both MET with IFT and Hip Muscle Strengthening with IFT showed improvement in VAS in Mechanical low back pain patients.

The ODI p value = 0.0050, result is statistically very significant. Thus, both MET with IFT and Hip Muscle Strengthening with IFT showed improvement in ODI in Mechanical low back pain patients.

The Shober's test p value = 0.8475, result is statistically not significant. Thus, both MET with IFT and Hip Muscle Strengthening with IFT showed improvement in Shober's test in Mechanical low back pain patients.

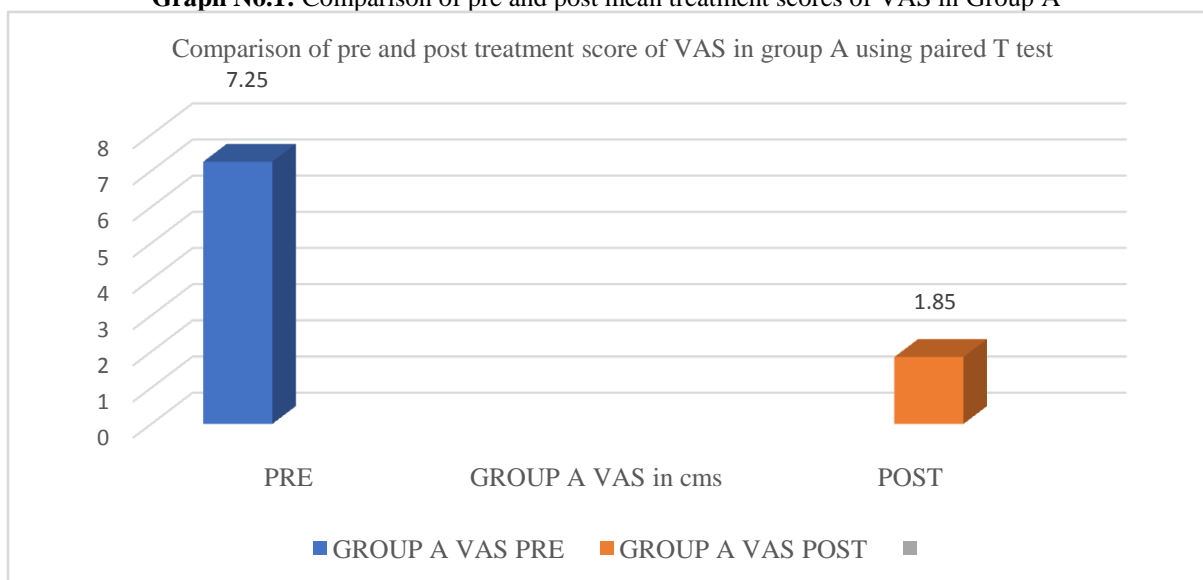
The Lateral flexion test P value = 0.0315, result is statistically significant. Thus, both MET with IFT and Hip Muscle Strengthening with IFT showed improvement in Lateral flexion test in Mechanical low back pain patients.

Table No.s- 1 Group A MET

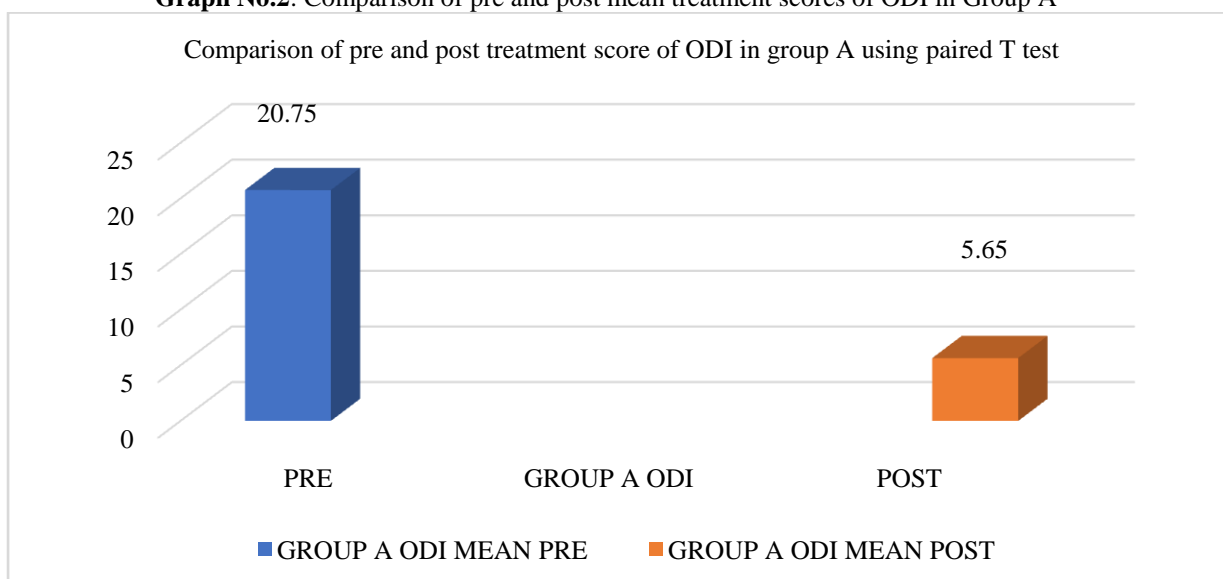
Comparison of pre and post mean treatment scores of VAS, ODI and SHOBER test and lateral flexion test in group A.

PAIRED t- TEST	VAS		ODI		SHOBER TEST		LATERAL FLEXION TEST	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
MEAN	7.25	1.85	20.75	5.65	17.15	20.55	32.65	27.60
SD	0.91	0.93	2.75	1.79	2.03	1.88	11.33	10.43
P- VALUE	<0.0001		<0.0001		<0.0001		<0.0001	
t	23.0810		25.4472		18.5253		10.5572	
SIGNIFICANE	EXTREMELY SIGNIFICANT		EXTREMELY SIGNIFICANT		EXTREMELY SIGNIFICANT		EXTREMELY SIGNIFICANT	

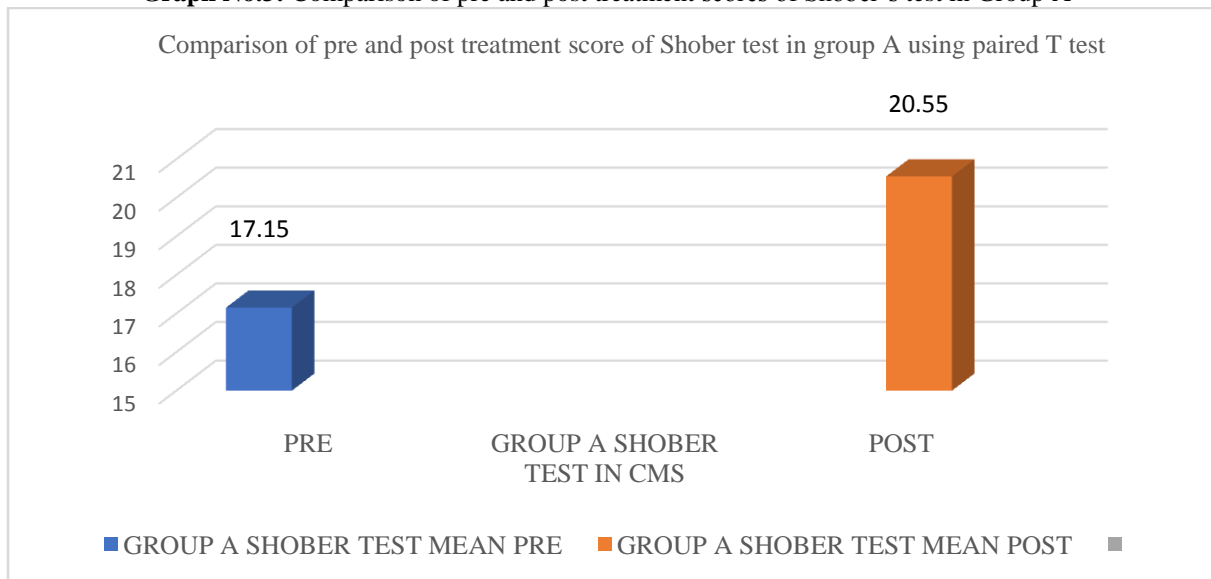
Graph No.1: Comparison of pre and post mean treatment scores of VAS in Group A



Graph No.2: Comparison of pre and post mean treatment scores of ODI in Group A



Graph No.3: Comparison of pre and post treatment scores of Shober’s test in Group A



Graph no.4: Comparison of pre and post treatment scores of lateral flexion test in Group A.

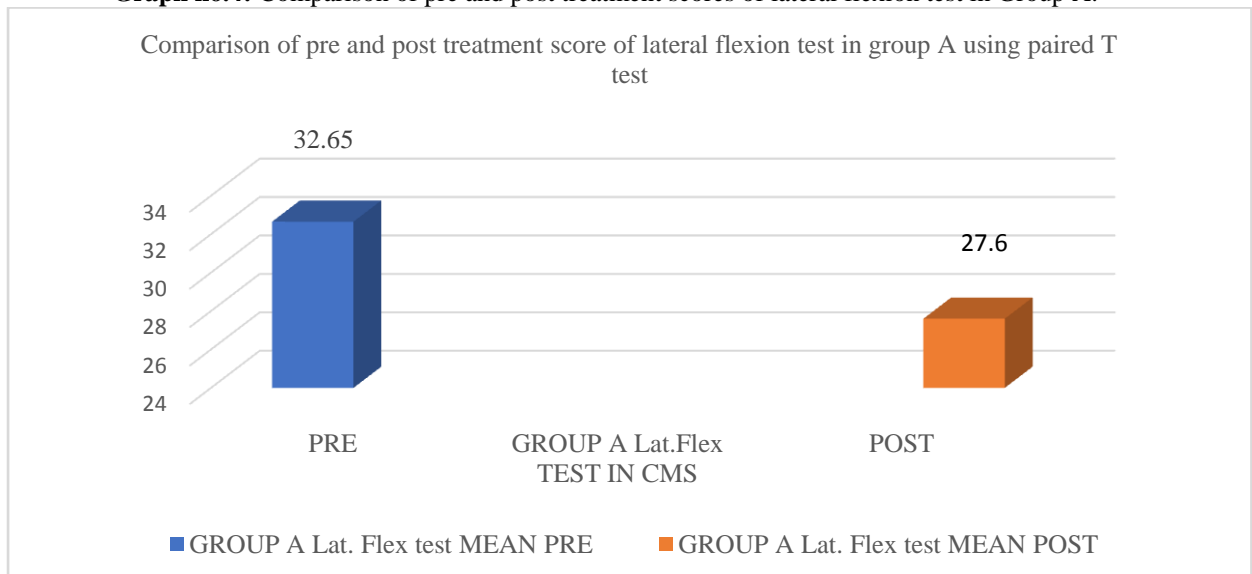
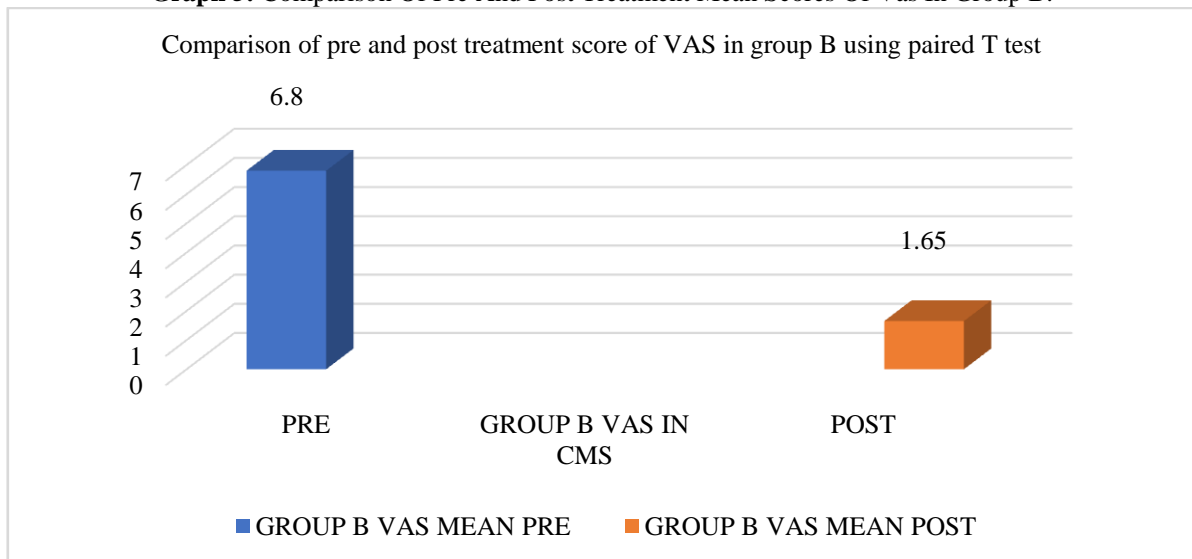


Table No. S– 2 Group B Hip Strengthening Exercise

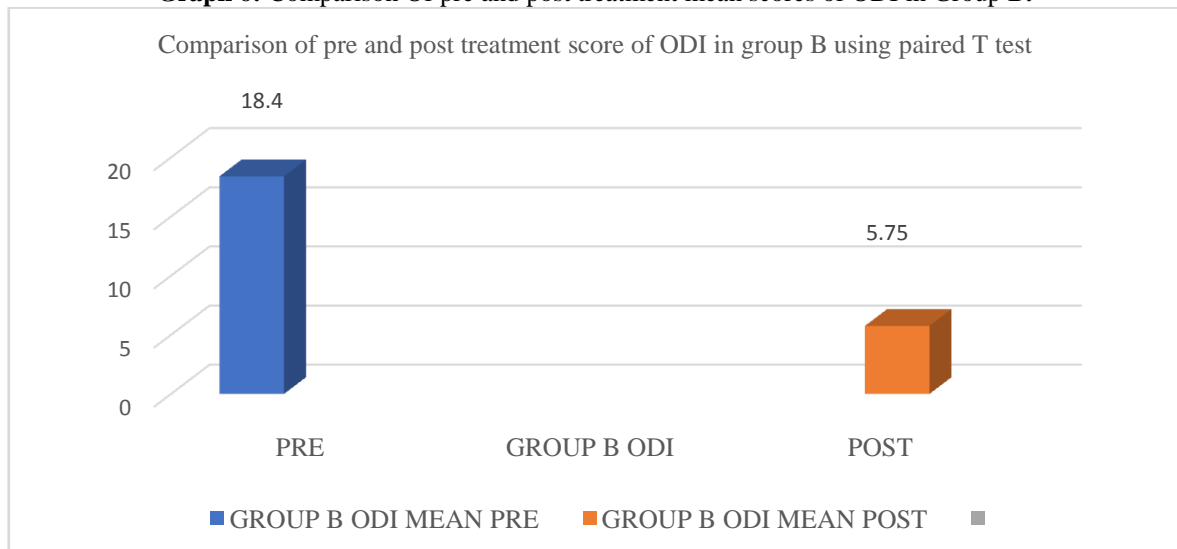
Comparison of pre and post mean treatment scores of VAS, ODI and Shober’s Test and Lateral Flexion Test in Group B.

PAIRED T- TEST	VAS		ODI		SHOBER TEST		LATERAL FLEXION TEST	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Mean	6.80	1.65	18.40	5.75	17.425	20.775	41.15	37.25
SD	1.11	0.67	4.10	1.65	2.047	1.963	3.41	3.54
P- Value	<0.0001		<0.0001		<0.0001		<0.0001	
T-Value	26.3189		20.2323		18.4338		20.4652	
Significance	Extremely Significant		Extremely Significant		Extremely Significant		Extremely Significant	

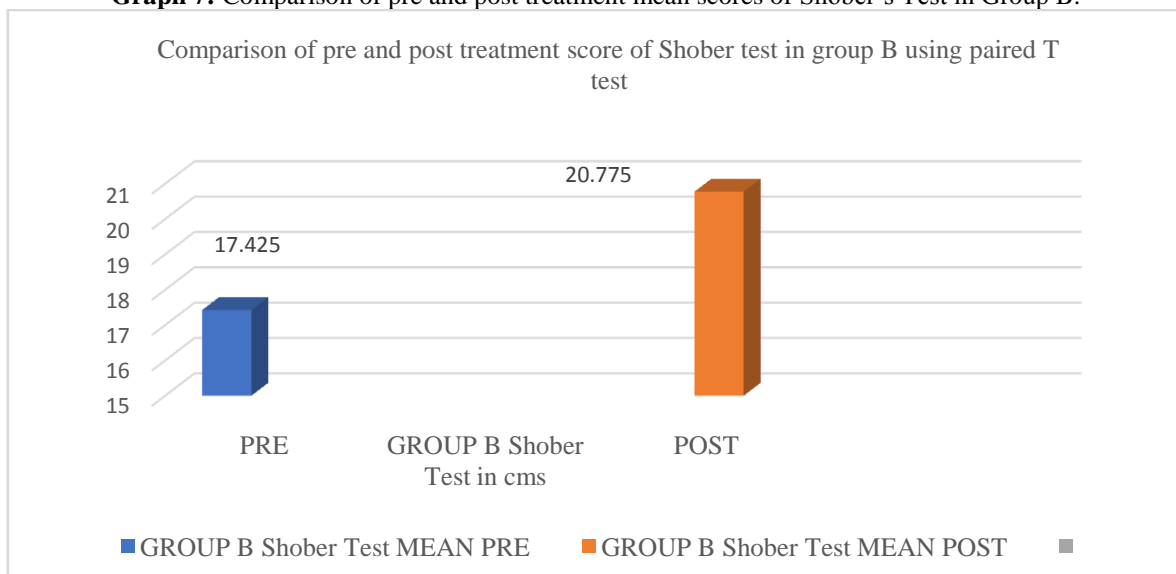
Graph 5: Comparison Of Pre And Post Treatment Mean Scores Of Vas In Group B.



Graph 6: Comparison Of pre and post treatment mean scores of ODI in Group B.



Graph 7: Comparison of pre and post treatment mean scores of Shober's Test in Group B.



Graph 8: Comparison of pre and post treatment mean scores of Lateral Flexion Test in Group B.

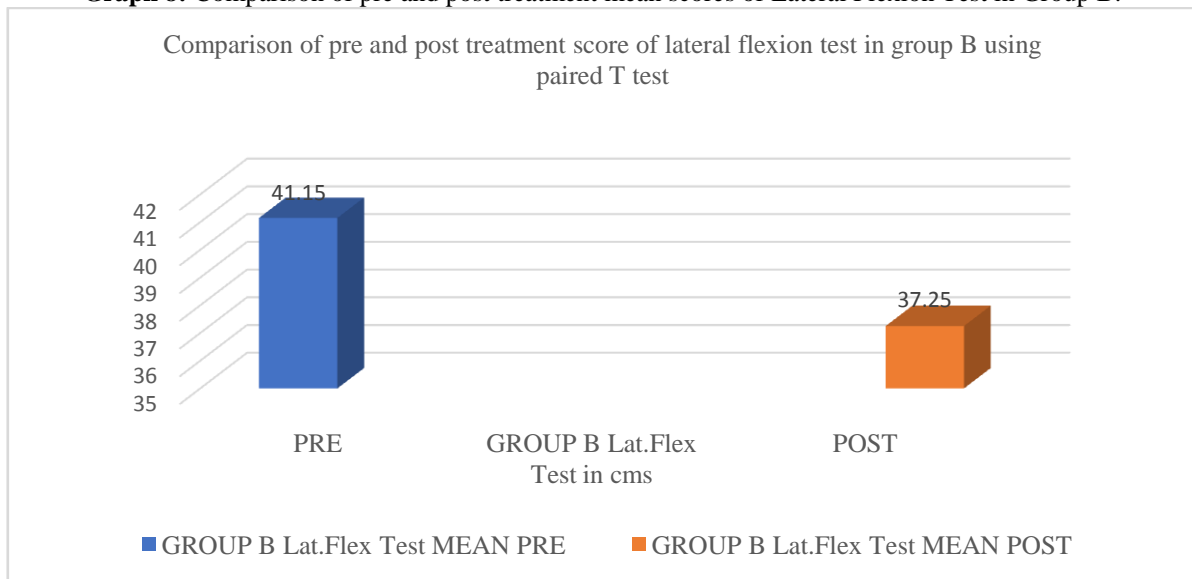
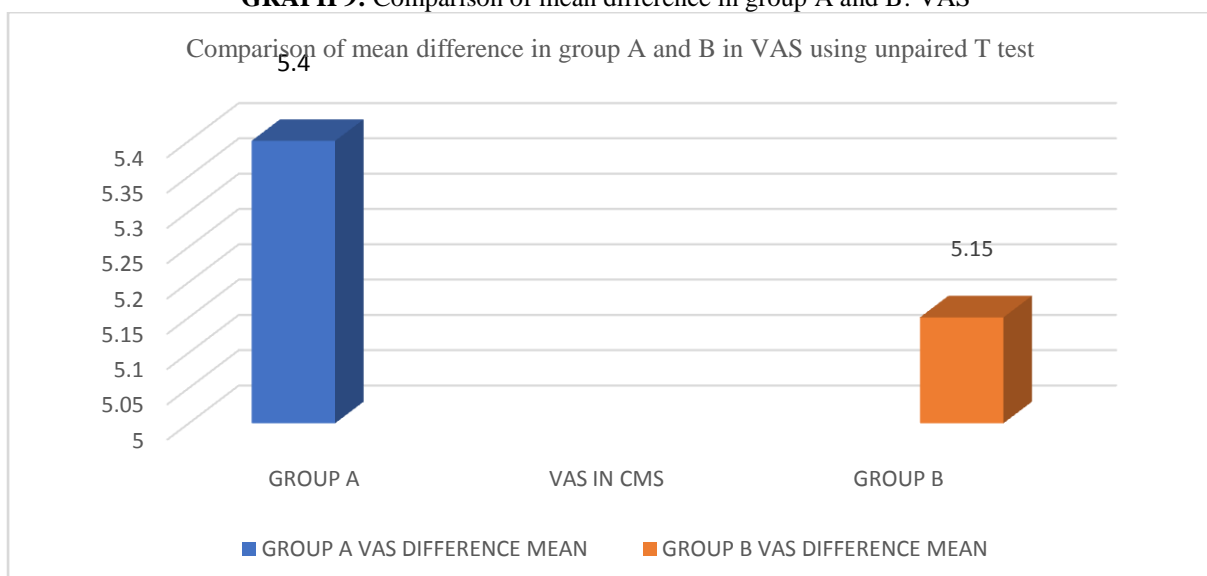


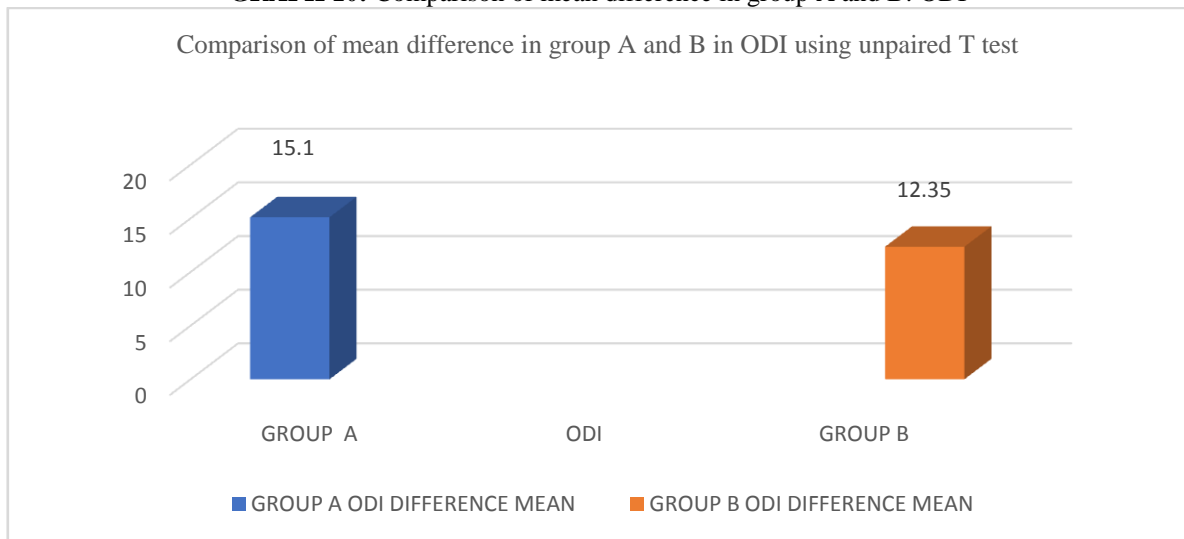
TABLE – 3 Comparison of mean difference in group A and B

UNPAIRED t TEST	VAS		ODI		SHOBER TEST		LATERAL FLEXION TEST	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
MEAN DIFFERENCE	5.40	5.15	15.10	12.35	3.40	3.35	5.05	3.90
SD	1.05	0.88	2.65	3.17	0.82	0.81	2.14	0.85
SEM	0.23	0.20	0.59	0.71	0.18	0.18	0.48	0.19
N	20	20	20	20	20	20	20	20
T	0.8197		2.9766		0.1936		2.2334	
P	=0.4175		=0.0050		=0.8475		=0.0315	
SIGNIFICANCE	Not Significant		Very Statistically Significant		Not Significant		Statistically Significant	

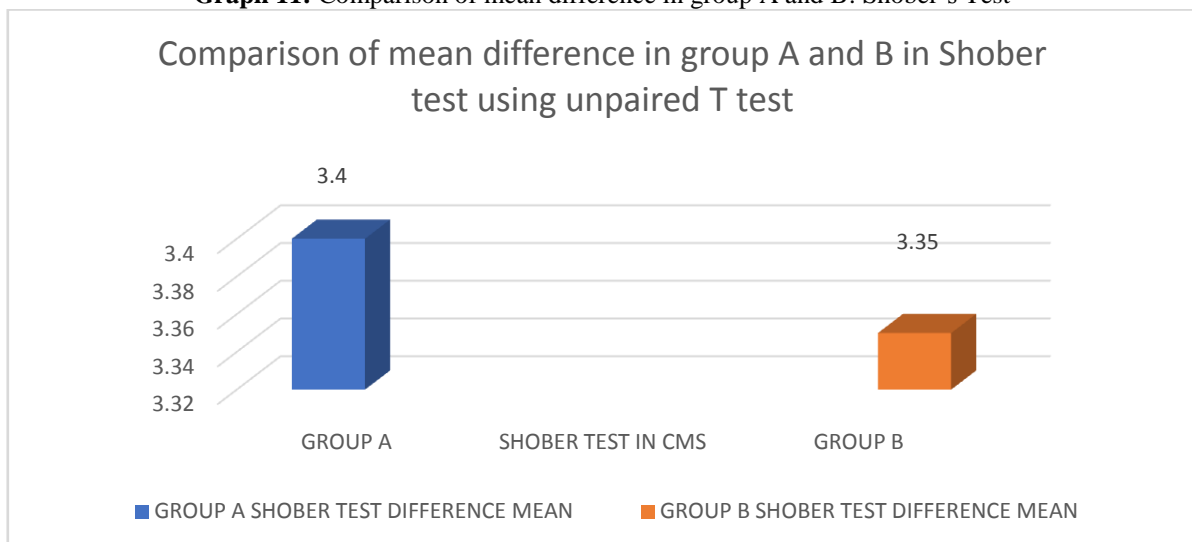
GRAPH 9: Comparison of mean difference in group A and B: VAS



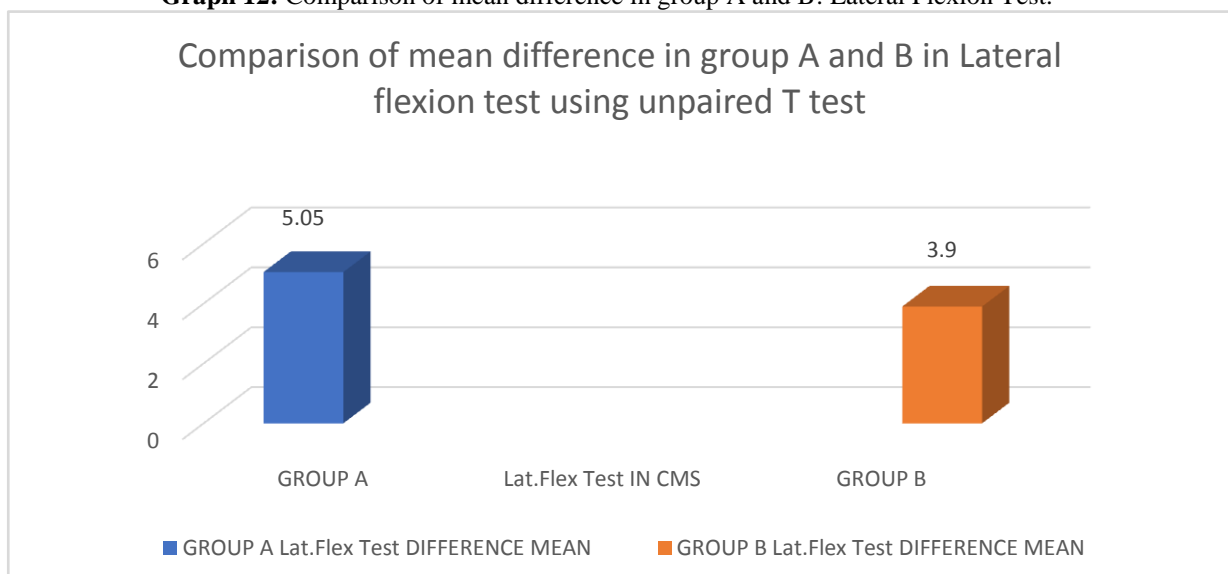
GRAPH 10: Comparison of mean difference in group A and B: ODI



Graph 11: Comparison of mean difference in group A and B: Shober's Test



Graph 12: Comparison of mean difference in group A and B: Lateral Flexion Test.



IV. Discussion

The purpose of this study was to determine the comparative effect of MET and Hip Muscle Strengthening with combination of IFT in patients with Mechanical Low Back Pain.

In my study, 40 patients suffering from MLBP were included. These were divided into two groups. Each group contained 20 patients. The first group received MET and IFT; while the other received Hip Muscle Strengthening and IFT. Both group received treatment for 4 week, twice a week i.e. 8 sessions.

The outcome was measured by VAS, ODI, Shober's test and Lateral flexion test.

In group A paired t- test was applied which showed p value < 0.0001 for VAS, ODI, Shober's test and lateral flexion test which is statistically extremely significant. Hence, significant changes were noted in group A by this treatment technique.

In the study conducted by *Capt. Eric Wilson, et.al* (2003). under the title "Muscle Energy Technique in patient with acute low back pain" in his study reported that Muscle Energy Technique along with IFT helps to decrease pain and increase in lumbar range of motion especially forward flexion and lateral side flexion in low back pain patient. The finding also suggest that Muscle Energy Technique help to lengthen and strengthen muscle, to increase fluid mechanics and decrease local edema and to mobilized restricted articulations.⁽¹²⁾

According to a study by *Johnson and Kurtz, et .al.* (Johnson 2003), under the title "Muscle energy technique for non-specific low-back pain" revealed that together with the soft-tissue technique and high-velocity low-amplitude thrusts, MET is one of the three most commonly used techniques applied by American osteopaths in a treatment. From the field of manual therapy, some studies (Cassidy 1992; Salvador 2005; Selkow 2009; Wilson 2003) have researched the effectiveness of MET and reported promising results.⁽⁶⁾

In the study conducted by *Franke H, Fryer G, Ostelo RWJG, Resch KL, et.al* (2012). Under the title "Muscle energy technique for non-specific low-back pain" revealed that the physiological mechanisms underlying the therapeutic effects of MET are unclear and may involve a variety of neurological and biomechanical mechanisms, including hypoalgesia, altered proprioception, motor programming and control, and changes in tissue fluid (Fryer 2010a). Lasting biomechanical changes to muscle property following MET have not been demonstrated, and changes to muscle.

Extensibility and spinal range of motion may be related to mechanisms promoting hypoalgesia and an increase in stretch tolerance. Clinical studies suggest MET and related post-isometric technique reduce pain and discomfort when applied to the spine (Wilson 2003) or muscles (*Ballantyne* 2003; *Magnusson* 1996). MET may have physiological effects regardless of the presence or absence of dysfunction (*Fryer* 2004).⁽⁶⁾

In the study conducted by *Kravitz et al.*, (1981) under the title "A Study On The Effectiveness Of Muscle Energy Technique (Met) As Compared To Manuplation therapy In Chronic Low Back Pain" found that there were high levels of paralumbar muscle tension in patients with low back pain. The way in which muscles tend to react, either by over activation and tightness or by inhibition and weakness, appears to be fairly consistent for the particular muscle concerned (*Twomey & Taylor*, 1987: 257). Muscles which have a tendency to become tight are usually those that span more than one joint namely, quadratus lumborum and erector spinae (especially lumbar and thoracolumbar segments). Any acute pain in the lumbar motion segment can initiate muscle responses which, if they persist, can alter the patients pattern of movement and in turn perpetuate adverse strains on the lumbar spine (*Twomey & Taylor*, 1987: 257). The results showed that Muscle Energy Technique is as effective as Manipulation (an already researched treatment tool) in the treatment of low back pain.⁽⁴⁾

In group B, paired t- test was applied which showed p- value < 0.0001 for VAS,ODI, Shober's test and Lateral flexion test which is statistically extremely significant. Hence, significant changes were noted in group B by this treatment technique.

Scott F. Nadler, et.al(2001) under the title "Hip muscle imbalance and low back pain in athletes: influence of low back pain" proposed that Hip Strengthening Exercise along with IFT helps to reduce pain and stabilizing the pelvis during trunk rotation and strengthen hip extensor and hip abductor muscle. Hip extensor (Gluteus Maximus) and Hip Abductor play a major role in stabilizing the pelvis during rotation, or when the centre of gravity was shift. *Kankaanpaa et al.* demonstrated increased fatigability of the gluteus maximus .in individuals with chronic LBP. *Leinonen et al.* also demonstrated the gluteus maximus to be more easily fatigued in those with nonspecific chronic LBP, but noted improvement in the latency offiring in the gluteus maximus after rehabilitation. *Kollmitzer, et.al* demonstrated that the hip abductor helps to maintain postural stability during midstance, the study focused extensor training to result in decreased postural stability.⁽¹³⁾

IFT was common in both group which was produced by intersecting two medium frequency currents causes increase in local circulation which may be produced by either the local pumping effect of stimulated muscles or the effect on autonomic nerves and therefore, blood vessel, may help remove chemicals from the area which was stimulating nociceptors. Short duration pulses at a frequency of 100 Hz may stimulate large diameter nerve fibers which have effect on pain gate in posterior horn and inhibit transmission of small diameter nociceptive traffic.

The study conducted by *Dr.Pradip Kumar Ghosh,et.al, Dr.Utpal Kumar Mitra,et.al,(2015)*. Interferential therapy used in the treatment of (CLBP) has a quite a no. of evidences. Zambito did a study on IFT in CLBP patients showed its clinical Usefulness⁶. Anuprita Ashok did a study of horizontal therapies and interferential therapy in CLBP and showed its effectiveness. Two medium frequency currents are passed through the skin to produce a low frequency current where they intersect. This is known as "Beat Frequency". This frequency causes increased blood supply, contraction of surrounding muscles and bone healing and is used for treating musculoskeletal disorder.⁽²⁾

The unpaired t test was applied between the 2 groups, the difference of mean values for VAS in groups A and B is 5.4 and 5.15, p value = 0.4175 which is statistically not significant.

The unpaired t test for ODI in groups A and B is 15.10 and 12.35 and p value = 0.0050 which is very statistically significant.

The study conducted by *Elvis Luke Fernandez,et.al, Gopalswami A D,et.al (2015)* Oswestry Disability Index scores were statistically significant when compared to the baseline in both intervention and control group, however there was statistically no significant difference in between the groups post intervention. Meade et al cites 4 points as the minimum difference in mean scores between the groups which showed clinical significance⁽¹⁾

The unpaired t test for Shober's test in groups A and B is 3.4 and 3.35 and p value = 0.8475 which is statistically not significant.

The unpaired t test for Lateral flexion test in groups A and B is 5.05 and 3.9. p value=0.0315 which is statistically significant. Hence, both the groups are effective.

V. Conclusion

Muscle Energy Technique and Hip muscle Strengthening along with IFT as a common protocol have similar efficiencies in improving forward flexion and lateral flexion in patient with mechanical low back pain.

But MET with IFT seems to be more efficient than Hip muscle strengthening exercise with IFT in improving forward flexion and lateral flexion in patient with mechanical low back pain.

But Hip muscle strengthening exercise with IFT seems to be more efficient than MET with IFT in improving forward flexion and lateral flexion in patient with mechanical low back pain.

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