

# A Study to Determine the Effectiveness of Mobilization with Movement Techniques in Knee Osteoarthritis Pain

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## ABSTRACT

**Background & Objectives:** In India, Osteoarthritis (OA) knee is the most prevalent form of arthritis and it is estimated that about 15 million people in the country are affected with it. The present study was undertaken to determine the effectiveness of mulligan's mobilization with movement techniques on pain in knee osteoarthritis.

**Methods:** 30 patients (males and females) who attended BSTR hospital, Pune, India falling under the inclusion criteria were selected with the informed consent. Subjects were randomly divided into two groups: Control Group (15 subjects) and Experimental Group (15 subjects). On the first day, each patient was subjected to 6-minute walk test and VAS (pain) and distance covered was noted. Control group received conventional treatment (TENS and exercise program). Experimental group received conventional treatment along with Mulligan's mobilization with movement technique.

**Result:** At the end of 3 days treatment sessions, both the groups obtained successful outcomes, as measured by significant reductions in VAS ( $p < 0.05$ ) and improvement in 6-minute walk test distance over a 3 days period. However post treatment distance covered in the experimental group (mean =37, SD=16.882) was markedly better than the post treatment distance covered in control group (mean =35, SD=23.146)

**Conclusion:** The study concluded that Mulligan's Mobilization with Movement (MWM) technique is effective in reducing pain in patients with knee osteoarthritis. Statistically significant reduction in VAS (pain) and marked improvement in the distance covered by the subjects was observed in the experimental group post treatment.

**Key Words:** Osteoarthritis knee, Mulligan Mobilization with Movement, TENS, six minute walk test.

## INTRODUCTION

The knee joint is formed by fusion of lateral tibio-femoral, medial tibio-femoral and patello-femoral joints. The joint allows for flexion and extension (and a small degree of medial and lateral rotation).<sup>(1)</sup> The knee joint consists of two articulations: Tibio-femoral - The medial and lateral condyles of the femur articulating with the

tibia. Patello-femoral – The anterior and distal part of the femur articulating with the patella. The tibio-femoral joint is the weight-bearing joint of the knee.<sup>(2)</sup>

Osteoarthritis (OA) is the most common arthritis in worldwide and approximately 10% of world's population who are 60 years or older have symptomatic OA. In India, it is the most prevalent form

of arthritis and it is estimated that about 15 million people in the country are afflicted with OA. <sup>(3)</sup> OA is a degenerative joint disease. The chances of developing OA goes up after age 45 years with the knee being the most commonly affected site in the lower limb.

There are three compartments of the knee. The compartments are: medial (inside) tibio-femoral compartment, lateral (outside) tibio-femoral compartment & patella-femoral compartment. Osteoarthritis can affect one, two, or three compartments of the knee. The most common place to get arthritis is in the medial compartment. Hence if one compartment is affected it is termed as unicompartmental osteoarthritis. Degeneration on both the inside and outside of the knee is termed as bicompartamental osteoarthritis. When all the three compartments are affected it is said to be tricompartmental osteoarthritis of knee joint. <sup>(4)</sup>

Pain is the earliest symptom. It occurs intermittently in the beginning, but becomes constant over months or years. A coarse crepitus may be complaint by some patients. Swelling of joint is usually a late feature, and is due to effusion caused by inflammation of the synovial tissues. Stiffness is initially due to pain and muscle spasm but later capsular contracture and incongruity of the joint surface contribute to it. Other symptoms are, a feeling of instability of the joint, and locking resulting from loose bodies and frayed menisci. <sup>(5)</sup>

Transcutaneous electrical nerve stimulation (TENS) is a widely used physical therapy modality for pain relief. There are a few theories related to its mechanism of effect as follows: inhibition of nociceptors, blockage of pain transmission in afferent nerves, sympathetic blockage, gate control theory and increase in release of endogen opiates. Therapeutic exercise protocol includes stretching exercises and isometric exercises for entire lower limb. Knee OA is also associated with inhibition of the quadriceps, which leads to poor knee extensor strength. Adding TENS

to a therapeutic exercise program for knee osteoarthritis can be more effective at increasing quadriceps muscle activation by reducing pain during exercise. <sup>(6)</sup>

Mulligan's concept allows us to safely apply end range techniques that are under the full control of the patient, remain at end range for several seconds with no pain and provide a unique mechano-receptive afferent impulse to the central nervous system. <sup>(7)</sup> Mulligan's mobilization with movement (MWM) is a contemporary form of joint mobilisation consisting of a therapist-applied pain free accessory gliding force combined with active movement. <sup>(8)</sup>

A plethora of studies have investigated several aspects related to muscle function such as strength, aerobic capacity as well as pain, stiffness and ROM in patients with OA. Despite these important advances, to our knowledge, few studies have investigated the effects of different types of mobilization technique on pain and functional capacity of patients with OA knee. So this study aims to find the efficacy of mulligan's mobilization with movement techniques on pain in knee osteoarthritis.

#### **Aims and Objectives:**

**Aim:** To assess the efficacy of mulligan's mobilization with movement techniques on pain in knee osteoarthritis.

#### **Objectives:**

- To find out effect of mulligan's MWM along with conventional treatment.
- To compare effect of MWM and conventional treatment on pain in knee osteoarthritis.

## **MATERIALS AND METHODS**

### **MATERIALS:**

Stop watch, two small cones to mark the turnaround points, pen, worksheets on a clipboard, mulligan belt, stepper, TENS machine.

### **METHODOLOGY:**

- Study design – experimental pre-post.
- Type of sampling- simple random sampling.

- Place of study – Bhausaheb Sardesai Talegaon rural hospital, Pune.
- Sample size-30.
- Outcome measure – 6 minute walk test, <sup>(9)</sup> (Visual analogue scale and distance).

**INCLUSION CRITERIA:**

- Unilateral Tibio-femoral (medial and lateral compartment) OA knee.
- American College of Rheumatology (ACR) criteria to diagnose OA knee. <sup>(10)</sup>

**EXCLUSION CRITERIA:**

Inflammatory conditions like rheumatoid arthritis, contra-indications to 6 minute walk test (unstable angina or myocardial infarction during the previous month), traumatic injury to knee joint (ligamentous or meniscal injuries), active infection around knee (infection of the bursa), patients who underwent knee surgery (total knee replacement and reconstruction surgery), psychological problems.

**PROCEDURE:**

30 patients (males and females) falling under the inclusion criteria were selected with the informed consent. Subjects were randomly divided into two groups namely: Control group (15 patients) and Experimental group (15 patients). Patients were treated with one session per day for 3 consecutive days. On the first day each patient was subjected to 6-minute walk test and VAS (pain) and distance covered was noted.

Protocol:

**Control group (conventional group-TENS and exercise program):**

TENS: Conventional 2 pole TENS with frequency of 100 Hz was given for 15-20 minutes for 3 days from day 1. <sup>(11)</sup> Patients were treated in supine position with roll under their affected knee.



Figure 1: method of application of TENS

Exercise: The exercise programme consisting of isometric exercises and stretching exercises was taught to the patients. Isometrics were given from the first day for all the three days and stretching was added on the second and third day for entire lower limb.

The isometric exercises consisted of three exercises using a towel roll. The participants were instructed to perform a total of 10 repetitions. Each repetition lasted 6 seconds with an interval of approximately 3 seconds.

In the first exercise using the towel roll, the patients were placed in a supine position with knees flexed. The towel roll was positioned between the patient's knees, and the patient was instructed to press the knees against the roll to perform a maximal contraction. This exercise aimed to strengthen the hip adductor muscles.

In the second exercise, the patients were placed in a supine position with legs straight. With the towel roll placed under the ankle of the affected limb, the patients performed a maximal contractions. This exercise strengthened the hamstrings muscle.

In the third exercise, patients were in supine position with legs straight. With the towel roll placed under the knee, patients were asked to press the knee on the roll. This exercise aimed to strengthen quadriceps muscle.

The stretching exercises were performed actively and included the following muscles and in order: the calf (standing), quadriceps (standing knee bent) and the hamstring muscles (long sitting with

both the knees extended, ankle dorsiflexion with the help of towel) the patients were instructed to perform these exercise thrice/day for 2 days.

**Experimental group:** This group received whole conventional treatment (as explained above) along with Mulligan's mobilization with movement technique. Procedure for

Mulligan's MWM: Mobilization technique was selected based upon patient's complaint. There are two techniques which were performed: the first is the medial or lateral glide MWM depending on site of pain (medial glide with medial knee pain and lateral glide with lateral knee pain).



Figure 2: Application of medial glide starting position and movement for knee flexion



Figure 3: Application of lateral glide starting position and movement for knee flexion

The second mobilization technique was the "rotation" MWM: for patients with knee pain in weight bearing position rotation MWM was given. (Rotation MWM

was given as medial or lateral glide did not relieve patient's pain in weight bearing position).



Figure 4: Application of rotation MWM for knee flexion in weight bearing position

Rule of three was followed for all the mobilization techniques that is on day 1 three repetitions were given, on day 2, six repetitions and so on day 3, nine repetitions were given. At the end of the treatment, that is, on the third day, patients were re-assessed by 6-minute walk test thus noting the change in the VAS and the distance.

**Statistical Analysis:** All the participants completed 3 day treatment sessions. The following table represents data with respect to VAS and distance of the control and experimental groups. Descriptive statistics including p-value, standard deviation, mean and t-value were calculated.

Comparison of VAS within the groups was assessed using Wilcoxon signed rank test and that of distance within the groups were done using paired t-test.

Comparison between VAS of two groups was done using Mann-Whitney U test and that of distance was done using Unpaired t-test.

## RESULT

Table 1. Showing VAS pre and post treatment

CONTROL		EXPERIMENTAL	
PRE	POST	PRE	POST
5	4.13	5.8	4.13

Table 2. Showing distance walked in meters pre and post treatment

CONTROL		EXPERIMENTAL	
PRE	POST	PRE	POST
349	384	363	400

Table 3: Showing P value, t value, mean, standard deviation of control & experimental groups

	GROUPS	P-VALUE	SIGNIFI-CANCE	STANDARD DEVIATION		MEAN		t-VALUE
				PRE	POST	PRE	POST	
V A S	EXPER	0.0002	Extremely significant	0.9411	1.246	5.800	4.133	-
	CONT.	0.0039	Very significant	1.069	0.7432	5.000	4.133	-
	COMP.	0.0304	Significant	Exp. 0.9759	Cont. 0.8338	Exp. 1.667	Cont. 0.8667	-
DISTANCE	EXPER	<0.0001	Extremely significant	59.245	66.036	363	400	8.488
	CONT.	<0.0001	Extremely significant	57.947	59.408	349	384	5.857
	COMP.	0.7888	Not significant	Exp. 16.882	Cont. 23.146	Exp. 37	Cont. 35	0.2704

## DISCUSSION

OA knee is a cause of disability and is responsible for deterioration of quality of life and functional capacity. (11) The current study was undertaken to assess the efficacy of Mulligan's MWM techniques on pain in knee osteoarthritis.

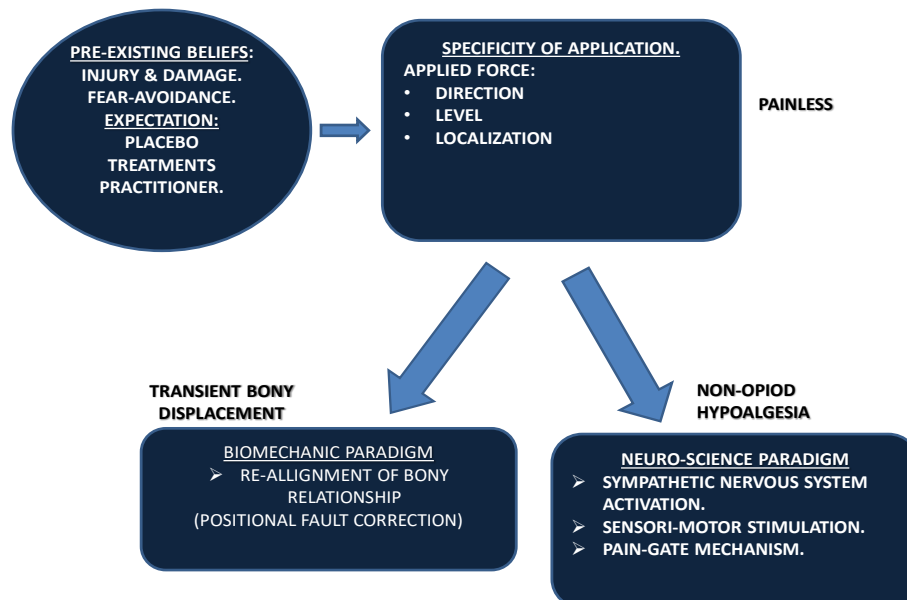
The study revealed that both treatment groups obtained successful outcomes, as measured by significant reductions in VAS ( $p < 0.05$ ) and improvement in 6-minute walk test distance over a 3 days period. However, the post treatment VAS in both the groups was equal, that is, there was significant reduction in VAS. Unlike the post treatment distance covered in the group which received Mulligan's MWM along with conventional treatment for 3 days were markedly better than the post treatment distance seen in conventional group.

Patients in the experimental group appeared to be more satisfied with the overall outcome of their rehabilitative treatment than patients in the control group. These results suggest that clinical intervention consisting of Mulligan's MWM as a form of manual therapy along with TENS and exercise program was more effective for decreasing pain in over a three days period in patients with OA knee.

The mechanism(s) by which the MWM exerts its ameliorative effects in clinical practice remains somewhat of an enigma. It has been proposed that the MWM treatment technique produces its effects by correcting positional faults of joints. (12) Positional fault theory (Mulligan, 1995) (13) says that joint alignment alteration occurs due to injury or chronic/poor arthokinematics which causes inconsistent bony congruencies that occur after strain or injury. This results in movement restrictions

& pain. MWM relocates joint in correct alignment therefore immediate pain relief occurs. This explains hypothetical mechanism for first successful Mulligan MWM. (12)

The difference between groups is likely attributable to the additional effects of clinical intervention consisting of Mulligan's MWM techniques.



The rationale for the mobilization approach to OA is that the reduced pain and stiffness associated with mobilization intervention allows patients to participate more successfully in the exercise program and activities of daily living.

Pollard H, Chiro GD et al (14) studied the effect of a manual therapy knee protocol (MWM) on osteoarthritis knee pain. They investigated that, a short-term manual therapy knee protocol significantly reduced pain suffered by participants with osteoarthritis knee pain and resulted in improvements in self-reported knee function immediately after the end of the 2 weeks treatment period. Dimitrova E et al (15) studied on efficacy of mobilizations with movement in patients with knee osteoarthritis; He concluded that, MWM is feasible and efficacious in reducing pain and improving function in individuals with knee osteoarthritis.

## CONCLUSION AND CLINICAL IMPLICATIONS

The study concluded that Mulligan's Mobilisation with Movement (MWM)

techniques is effective in reducing pain in patients with knee osteoarthritis. The study also reveals that there was clinically significant reduction in pain in both control as well as experimental groups but there was statistically significant reduction in VAS (pain) in the experimental group. However, there was marked improvement in the distance covered post treatment in the experimental group. Hence, with this outcome taken into consideration, Mulligan's MWM techniques can be implemented as an adjunct to the treatment in patients with OA knee pain.

### Limitations:

There is no long term follow-up for the treatment groups in order to check them magnitude of improvement. The study was conducted in a small group of population so cannot be generalised to whole population. Hence a larger group is required.

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