

THE EFFECT OF MWM WITH CONSERVATIVE PHYSICAL THERAPY IN MANAGEMENT OF SECONDARY OSTEOARTHRITIS ANTERIOR KNEE PAIN: A CASE STUDY

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Abstract-

Background/Purpose: The most frequent type of arthritis in elderly adults is knee osteoarthritis (OA). This case study explains a conservative physical therapy and manual therapy strategy to symptomatic knee OA pain relief and functional benefits.

Case description: The patient, a female 50-year-old with a complicated medical history, complained of anterior-medial knee pain. The patient's objective in physical therapy and some manual treatment techniques was to resume functional activities like walking for more than 60 minutes and climbing stairs without experiencing any pain.

Outcome: After completing physical therapy and manual therapy, the patient showed slight improvements in knee strength, flexion range of motion that was still below functional limitations, and the six-minute walk test (6 MWT) executing a home exercise programme (HEP) with independence.

Discussion: This case study has demonstrated how conservative physical therapy, manual therapy, and the use of electrotherapy can be used to treat symptomatic arthritis knee pain in a 50-year-old female patient. Improvements in muscle strength, active range of motion (AROM), and the 6MWT with fewer reports of symptomatic knee discomfort served as evidence for this.

Key words: conservative physical therapy, electrotherapy, knee-osteoarthritis, movement with mobilization, anterior knee pain.

INTRODUCTION

The most frequent type of arthritis in elderly adults is knee osteoarthritis (OA). It was discovered that two out of three people with obesity and one out of every two people with knee injuries have an increased risk of getting symptomatic knee OA in at least one knee by the age of 85. Reduced has been associated with knee OA and associated pain syndrome. Patient seeking healthcare has poor quality of life and physical functionality.¹² The age at which men or women have greater incidence rates of OA differs depending on the source. Men are more likely than women to have OA in people aged 50 to 65, although this trend changes after that age. Knee osteoarthritis has an incidence rate of 240 per 100,000 person-years and is more common in women, especially after the age of 50. Men have a 45% lower incidence rate than women do beyond the age of fifty. Miller and Block discovered that patients with advanced knee OA had a satisfactory prognosis without resorting to surgical intervention with a multimodal conservative treatment programme including low impact aerobic exercise, muscle strengthening, functional training, patient education, and hyaluronic injection. Osteoarthritis (OA) is an often progressive condition that affects the bones themselves as well as the synovial capsule, ligaments, periarticular musculature, and cartilage protecting the articulating surfaces of bones in joints. The most common type of arthritis, particularly in people over forty, is osteoarthritis.¹ About 27 million Americans over the age of 25 have clinical OA in some joints, or about 12% of the population.⁷

The age at which men or women have greater incidence rates of OA differs depending on the source. Men are more likely than women to have OA in people aged 50 to 65, although this trend changes after that age. Knee osteoarthritis has an incidence rate of 240 per 100,000 person-years and is more common in women, especially after the age of 50. Men have a 45% lower incidence rate than women do beyond the age of fifty. Age-related increases in incidence rates peak around the age of 80. Numerous systemic and local variables are known to affect the development of OA in general. Among the systemic factors are age, gender, and race. Obesity that is hereditary or develops over time can be caused by genetics, metabolic and endocrine variables, excessive bone density, and dietary condition (such as vitamin D deficiency).⁶

Local factors that can impact the knee include inherited obesity, significant joint trauma, occupational repetitive stress, muscular weakness, changed joint biomechanics, joint malalignment, and proprioceptive deficits. Obesity, leg length disparities, varus malalignment of the knee, and frequent kneeling and/or heavy lifting are specific risk factors for OA in the knee.⁹ In India, urban areas had a greater crude prevalence of clinically diagnosed knee OA (5.5%) than rural areas (3.3%). Articular cartilage deterioration, which changes the material's biomechanical characteristics, is a hallmark of OA.⁶ As a result, there is a focal loss of articular cartilage, loss of joint space, formation of osteophytes, focal synovitis, remodeling of the periarticular bone, and subchondral cysts. Knee pain, joint stiffness, proprioception-deficiencies, and decreased muscle strength (force-generating capacity) are common in people with knee OA.¹¹ Patient education regarding OA and its care, including pain control, choices to enhance function, lessen impairment, and stop or slow the disease's progression, should all be a part of an evidence-based therapy strategy.⁵

A modern method of joint mobilisation known as Mulligan's notion of mobilisation with movement (MWM) combines active movement with a painless supplementary gliding force applied by the therapist. Mulligan's Mobilization-With-Movement (MWM) places a strong emphasis on the idea that pain should always be diminished or even eliminated while being applied. Applying pain-free overpressure at the limit of the permissible range during the MWM may result in additional benefits in pain alleviation.²¹ Regarding the use of physical modalities, such as transcutaneous electrical nerve stimulation (TENS) and interferential current therapy (IFC), as well as acetaminophen/paracetamol, topical and oral NSAIDs, tramadol, and intra-articular steroid injection in knee osteoarthritis, they made a conditional recommendation. Since the 1950s, IFCs have been employed in therapeutic settings, with the major clinical indications being pain management, edema reduction, and muscle strengthening.^{3,16} TENS and IFC are electroanalgesic techniques based on Melzack and Wall's gate control theory of pain perception. The fundamental idea of IFC is that skin impedances are inversely correlated to applied current frequency; as a result, skin resistance to a frequency of 2000Hz is lower than that to a frequency of 200Hz.^{3,5,16} The care of OA of the knee is greatly aided by therapeutic exercise, which has been shown to reduce pain and improve function. It is a highly advised non-pharmacologic intervention with a high degree of evidence and has been accepted as the standard of care in the treatment of osteoarthritis.^{2,17,18}

Although the studies available to date cannot give evidence as to whether manual therapy may improve the overall success of rehabilitation for lowering pain and disability in individuals with knee OA, it is an intervention that is frequently used with therapeutic exercise in clinical practise.^{5,6,8}

This study's goal is to determine the impact of manual therapy in conjunction with traditional physical therapy on knee osteoarthritis with anterior knee-pain.

METHODOLOGY

Research Design: In order to accomplish the goals of this project, a single case study design was employed.

Subjects: At the time of her initial evaluation, a 50-year-old female patient had a history of antero-medial knee pain, trouble extending the knee joint, and difficulty walking.

PHYSICAL EXAMINATION

- ✓ History of pain in both knees joint.
- ✓ Crepitus present
- ✓ Restricted range of motion.
- ✓ Decrease muscle strength
- ✓ On A-P View and lateral view X-ray of both kneejoint,
- ✓ Subject was selected for the study on the basis of this clinical presentation which is usually recognized as both the knee joint osteoarthritis.

Table 1 Manual Muscle testing score

KNEE	T0		T1		T2	
	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT
Flexion	4	4	4	4	4	4
Extension	4	3	4	3	4	4

MANUAL MUSCLE TESTING- The patient is placed in the supine position while the manual muscle testing is conducted. According to the table's findings, there was an improvement in knee muscular extensor-strength of left knee, going from a score of 3 MMT to a score of 4 MMT in the final therapy session. The key is that the left knee, which at first could only bend against no resistance, gradually gained enough strength to bend against the therapist's extra resistance.

Table 2 conventional exercises

Exercises	Duration	Repetition
Quadriceps setting	6 weeks on daily basis	10
Passive hamstring stretch	Same as above	3
Patellar mobilization	Same as above	20

Table 3 Physiotherapy devices and their parameters

Device	Parameter
TENS	Alternatively for 6 weeks Frequency-100 Hz Duration-20 minutes Intensity-25 mA
IFT	Frequency: 40-100 Hz Duration-25 minutes

Table 4 Range of Motion measured by goniometer

KNEE	LEFT	RIGHT
T0	0°-0°-17°	0°-0°-22°
T1	0°-0°-79°	0°-0°-87°
T3	0°-0°-116°	0°-0°-127°

The table above shows the improved ROM of the knee joints in the left and right side. Finally, substantial improvement in ROM on both sides had been noted.

Table 5 Numeric Pain Rating Scale score

Item	T0	T1	T2
Initial status of pain	0	0	0
Tenderness	0	0	0
Motion pain	9	6	2

Using the NPRS measurement device, the patient will be asked how much pain he feels when he is motionless, when the painful location is pressed, and when he moves his knee. The findings showed that there was no motion pain or tenderness in the problematic knee. results did not find any silent pain and tenderness in the knee that had problems and the motion pain was discovered in the knee, although the pain's intensity was downgraded from 9 to 2 NPRS values at the last therapy session, a difference of 7 score.

Table 6 Six minutes walking test with pre and post outcome

Time	Pre Steps	Post	Grade
1 minute	56	75	Excellent
2 minute	50	68	Very good
3 minute	44	57	Good
4 minute	39	49	Above average
5 minute	35	44	Average
6 minute	31	39	Poor

Measurement Procedure/ Pre-treatment Assessment (A)

Knee flexors and extenders are manually tested, and results are graded using a system developed by the Manual Research Council. A universal goniometer is used to quantify knee range of motion. (0-180 degrees) ¹⁴ The Time Up and Go test is used to measure walking time. ¹³

Procedure of Technique/ Intervention Phase (B) –

Treatment for the patient's osteoarthritis in the knee lasted for 6 weeks. A programme for exercising was offered during the posterior glide of the mulligan.

Mulligan mobilization

Posterior glide was given 10 repetitions with 3 sets for 6 weeks.

Supine; take hold of the patient's proximal tibia and fibula, and do a posterior glide. Maintain this glide before asking the patient to bend and extend their knee Mulligan mobilization for posterior glide- The injured knee is flexed while the patient is laying.

Physiotherapy Protocol consisted of:

Interferential Therapy ¹⁹ given with frequency of 80Hz for 15 minutes, 42 sessions in 6 weeks.

Exercises included

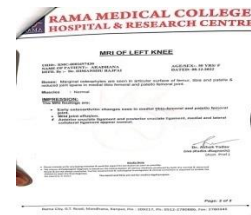
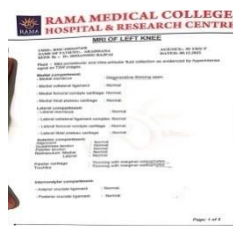
- Static Quadriceps: ¹²
- Static Hamstrings-⁷
- Vastus medialis obliques-strengthening. ¹⁰
- All exercises were repeated 10 times.
- After exercises Gait training given on parallel bar in front of the mirror. ¹⁸

Outcome Measure: Functional capacity significantly improved from the evaluation phase to the post-treatment assessment, which revealed improvement. From the pre-treatment evaluation to the post-treatment assessment, knee flexion range of motion increased. From the pre-treatment assessment (A) (Grade III) to the post-treatment exam (A) (Grade IV+), knee muscular strength on the left side. Walking time (59:06 seconds) dropped significantly from pre-assessment phase (A) to the post-treatment assessment score (60:00 seconds), indicating alleviation.

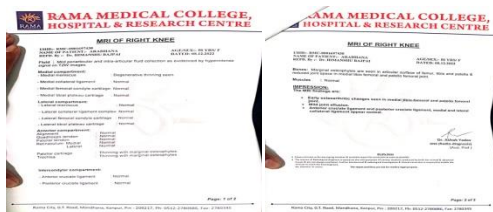
Radiological examination-



X-ray



MRI LEFT KNEE



MRI RIGHT KNEE

Pics- interventional programs-



Strengthening hamstring



Quadriceps isometric



Vastus medialis obliques strengthening

Rom Measurement with goniometer-



Parallel Bar gait training Six-minute walking test

RESULTS-

Scale score-pre and post

Scale Score	Pre	Post
NPRS	9	2

Above table shows pain relief through NPRS-score, which has been reduced to 2?

ROM	Pre –Left /Right	Post-Left/Right
	0-17°/0-22°	0-116°/0-127°

This table refers to increased ROM on the both side (left & right); right ROM improved more than left ROM.

DISCUSSION-

This study had focused on status of pain(Pre treatment 9,Post treatment stage 2), knee joint ROM (Pre treatment Left 0-17,Right 0-22 Post treatment right 127 left 116). A study by Gidey Gomera Weleslassie, (2021) is consistent with my study, they emphasized that most of the published study with reference to MWM is effective to relive pain, enhance knee joint ROM and resultant function in osteoarthritic cases. It has been seen that maximus studies have utilized the visual analogue (VAS) and WOMAC scales to measure the results regarding pain and range of movement along with functional status of the patients. Possible cause behind these improvements may be beneficial effects on joint nutrition. This nutrition is due to squeezing and imbibing effects during knee joint movement²⁰

Another study by **Dr Priyanka Mehendale, (2021)** had supported this current study by evaluating that Mulligan rotation with movement in patient with medial compartment osteoarthritis of knee caused substantial improvement in connection with pain, range and lower limb functions after the treatment with this approach along with taping²¹ This could be out of stretching impacts on passive structures of knee joint along with active as well; therefore better joint-kinematics was the outcome which caused this positive impact over the osteoarthritic condition. So, repeated movement during the treatment session inhibits the painful stimulus activity and change the density of the inflammatory substances at the site of knee joint, all these determinants could be the causative elements in the management of the osteoarthritis related-issues. Further, **Ling-Ling Li, (2022)** backed up my present study by stating that cases with knee osteoarthritis was found to have significant improvement following Mulligan mobilization course.²² However, high variability in treatment methods definitely will reduce the effectiveness of the therapy in connection with reliability. So, more studies can be carried out to increase validity of the current intervention. Despite this substantial efficacy of treatment of MWM cannot be ignored regarding betterment of osteoarthritic condition of the knee. Positive effects of MWM could be in order that of biomechanical and neurophysiological processes.

This current study analyzed how traditional approach can be utilized to manage knee issues caused by degeneration of knee cartilage in a female patient; disease progression continuum is different for different subjects. Research continuity is the solution to gain

more accuracy about degenerative factors which will be the results of better selection of techniques.¹⁴ The patient was found to have better life style and functional status following therapeutic procedure. Study's integration and progression of patient education, range of motion exercises, isometric exercises, therapeutic exercises, and neuromuscular reeducation, was reported to be better criteria to face the consequences after the osteoarthritis knee. These outcomes were in line with studies that looked at using conservative treatment strategies to reduce knee OA symptoms.^{2,9,17} present study was able to show the huge positive outcomes following the administration of the MWM with the 6 week time frame. In this study, the use of mulligan mobilisation in conjunction with traditional physiotherapy significantly improved functional activities of daily living and knee range of motion while reducing discomfort. The results of this current study are comparable to those of a study by **Hiroshi Takasaki et al.**, who claimed that using mulligan mobilisation to treat knee osteoarthritis improved ADL and knee ROM and reduced discomfort.^{4,21} **Vicenzion et al.** and Mulligan hypothesized that although the biomechanical and neurophysiological mechanisms by which MWM relieves pain are not fully understood. MWM was first thought to treat joint partner bone alignment (also known as a position fault) from a biomechanical perspective, and positional problems have been observed in some cases. A shift in the descending pain inhibitory circuits is one of the possible neurophysiological explanations.²⁰

After 6 weeks of treatment, the use of Interferential therapy in conjunction with MWM decreased pain in individuals with knee osteoarthritis. This result is in line with a previous study by Buenavente et al., who discovered that using painkillers during physical therapy helped those with knee OA. It was also suggested that the therapeutic regimen of IFC with beat frequency of 80-100Hz for 20 minutes, two to five times a week, be used with exercise to help patients with knee osteoarthritis manage pain and enhance function.⁵ Interferential current should ideally have pulse duration of 10 microseconds and frequency of about 100 Hz in order to specifically stimulate big diameter afferent axons using the pain gate mechanism. A stimulus with these characteristics can specifically activate the large diameter afferent fibres, activating the pain gating system for pain relief.³ According to Hafez et al., the hamstring muscle is more adversely affected by knee OA than the quadriceps. The quadriceps-to-hamstring muscle strength ratio affects the knee's stability and resistance to overexertion. Therefore, it is more important to strengthen the quadriceps muscle in management than the hamstrings. There are 46 isometric exercises that develop strength. This finding is in line with earlier work by Da-Hon et al., which shown that strength training was more effective in boosting knee extension strength and functional abilities, such as climbing stairs.¹⁸ The time up and go test was used to assess the improvement in walking ability. The results are in line with a prior study that discovered that performing functional exercises three times per week, such as squats and step-ups, knee extension/flexion, and hip abduction/adduction, can decrease pain by 43% while also boosting leg strength, stair climbing time, and repeated chair standing.^{2,5} According to a study by Mu ndermann et al., patients with knee OA may employ changes in the loading pattern as a gait compensation approach to shorten the mediolateral distance between the centre of mass and the knee joint centre. This is intended to lessen both the moment arm of the ground response force and the knee adduction moment later in the stance phase. Even yet, gait retraining has been shown to reduce KAM and has the potential to be a non-surgical treatment for knee OA.^{2,14} TENS uses a range of tiny devices to deliver electrical pulses to the nerves responsible for producing pain. Electrodes are positioned or fastened to the skin in the trigger point (pain-affected area) during the TENS stimulation procedure. The electrodes are wired to an electrically powered equipment, such as an electricity generator. To suppress pain impulses, some TENS devices stimulate big nerve fibres. By inducing the release of endorphins, which are neurochemicals made naturally in the brain and have pain-relieving characteristics, another type of TENS relieves pain. TENS can also diminish knee pain by preventing nociceptor cells in the dorsal horn, which are in charge of pain perception, from engaging in pre- and post-synaptic activity (Kuntono et al., 2013).¹⁶

CONCLUSION-

MWM with conventional physiotherapy used in this study; including electrotherapy, created a substantial alteration in the daily activities and life style of the patients having knee osteoarthritis. This combined approach caused improvement in the muscular strength, range of motion, functional status and also deteriorated the pain complaint regarding knee joint

LIMITATIONS-

This study has focused on a specific combination of approaches; MWM and conventional physical method with electrotherapy, however different outcomes could be found with various applications of approaches. Thus, further study can be executed with others combined approaches. Another limitation is single subject only on the basis of that not any conclusion can be made related to the efficacy of this study's method; however, effectiveness of this combination could not be deselected. Others factors like subject-specific-response has not been analyzed in this study.

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