Effect of Mobilization with Movement vs. Rigid Taping on Pain and Functional Impairments in Knee Osteoarthritis Patients

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Abstract
OA of the knee is a major pain generator and disability creator. This study compares the effects of Mulligan Mobilization with Movement (MWM) and rigid taping on pain and functional impairments in knee OA patients. A Power of 80% and alpha level equal to 0.05 resulted in a sample size of 33 to be randomized to three groups: convention physiotherapy (Group A), MWM (Group B), and rigid taping (Group C). After four weeks, Group B had the best pain (NPRS: 8.72 ↓4.54) and ROM (37.72° ↑114.54°) improvement ($p < 0.0001$). The performance of MWM was found to be significantly greater than rigid taping or conventional therapy and thus appears superior for managing knee OA.

Keywords
Knee osteoarthritis, Mulligan mobilization, rigid taping, pain management, range of motion

Introduction

One very common degenerative joint disorder is knee osteoarthritis that is present in millions around the world and causes pain, stiffness and limitation of functions. Mostly arises from the progressive degradation of cartilage, inflammation of symposium and biomechanical misalignment leading to decreased joint mobility and increased disability. Around 30% people over 40 years in India are affected with OA, more in women & people with sedentary lifestyle.

Treatment of OA comprises of conservative managements strategies including physiotherapy, exercise, and biomechanical corrections. Of all these Mulligan Mobilisation with Movement (MWM) and rigid taping are the most commonly used interventions. Rigid taping is employed to regain the mechanical support of the patella and realign, while MWM allows the vertebrae to passively glide alongside actively moving the vertebrae to restore joint alignment and improve function. Although each technique has benefit in isolation, the literature contains only limited direct comparison between these techniques.

The goal of this study was to determine if MWM and rigid taping are equally effective in helping OA patients with pain and knee function. This research provides evidence that optimization of rehabilitation strategies for knee OA management can be achieved by identifying the superior intervention.

Methods

Study Design and Setting

This was an experimental study conducted in Pravara Rural Hospital and in Dr. A.P.J. Abdul Kalam College of Physiotherapy. The Institutional Ethical Committee (IEC) gave a green light for the ethical clearance, and all the participants gave an informed consent before their participation.

Participants

Thirty three subjects with knee osteoarthritis (Kellgren and Lawrence stage 1–2) were recruited. The inclusion criteria were individuals older than 40 years, who were clinically and radiologically diagnosed with knee OA and were willing to participate. Exclusion criteria included cardiovascular disease, neuromuscular disorders, vascular conditions such as varicose veins and Raynaud's disease, uncontrolled hypertension or diabetes.

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Study Groups and Interventions

These participants were divided into three groups (n = 11 per group).

In group A (Conventional Physiotherapy): it received a protocol of structured static and dynamic quadriceps exercises, straight leg raises, side lying leg raises and stretching exercises.

Group B (MWM + Conventional Physiotherapy): The MWM techniques medial, lateral, and anterior glides were performed by trained therapist as well as the conventional protocol.

Group C (Rigid taping + conventional physiotherapy): The conventional therapy was administered along with rigid taping techniques, such as patellar offloading and tibial internal rotation taping using non elastic adhesive tape.

All interventions were given for four weeks.

Outcome Measures

0–10 scale (Numerical Pain Rating Scale NPRS): the patient rates the intensity of the pain, 0 meaning no pain, 10 the worst possible pain.

Knee flexion ROM was determined using a universal goniometer.

Data Collection and Statistical Analysis

A blinded evaluator conducted baseline and post their intervention assessments of NPRS and ROM. Within group comparison was done by using the paired t-tests and intergroup analysis was carried out by using one way ANOVA. Statistically significant was taken as $p < 0.05$.

Results

Participant Characteristics

In all, 33 participants (54.11 mean age) were included. Mean age of Group A (conventional physiotherapy) was 53.36 years, Group B (MWM) 54.90 years and Group C (rigid taping) 54.09 years. In Groups A and B gender distribution was nearly equal; however, Group C included more female participants (72.72%).

Pain Reduction (NPRS Scores)

Group B and C had statistically significant reduction in pain compared to Group A which only had minimal improvement.

In Group A, the NPRS decreased from 8.36 ± 7.00 to 7.00 ± 1.09 ($p = 0.12$) (ns).

Group B: From 8.72 ± 0.46 to 4.54 ± 1.21 ($p < 0.0001$, very significant).

Group C: NPRS decreased from 8.27 ± 0.90 to 6.54 ± 1.12 ($p < 0.0001$ highly significant).

Range of Motion (Knee Flexion ROM)

ROM improved in all groups but was greatest in Group B.

The results for the group A were as follows: ROM improved from 56.36° ± 15.66 to 80.00° ± 14.66 ($p < 0.0001$).

ROM (group B, 37.72° ± 8.17 to 114.54° ± 15.72, $p < 0.0001$).

ROM changed from 54.54° ± 19.67 to 84.54° ± 23.39 degrees ($p < 0.0001$) in Group C.

Intergroup Comparison

Both NPRS and ROM outcomes were statistically significantly different between groups as one-way ANOVA showed ($p<0.0001$). MWM turned out as having achieved significantly better results than both Groups C ('rigid taping') and Group A ('conventional physiotherapy') in post-hoc analysis.

Table 1: Comparison of Pre- and Post-Intervention Outcomes for NPRS and ROM

Outcome Measure	Group A (conventional)	Group B (MWM)	Group C (Rigid Taping)	Significance Level (p)
NPRS (Pre-Post)	8.36 - 7.00	8.72 - 4.54	8.27 - 6.54	< 0.0001
ROM (Pre-Post)	56.36 - 80.00	37.72 - 114.54	54.54 - 84.54	< 0.0001

Discussion

The results from this study suggest that Mulligan Mobilization with Movement (MWM) actually diminishes pain and improves knee flexion range of movement (ROM) versus rigid taping as well as conventional physiotherapy alone in patients with osteoarthritis (OA). This also reflects a known body of re-

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search that MWM is effective in musculoskeletal rehabilitation.

Interpretation of Results

The NPRS and ROM scores of MWM (Group B) improved more than those of the other two groups. Although MWM did not correct all of the joint malalignment and differing HMAs, substantial pain reduction ($p < 0.0001$) and increased ROM suggest that MWM is effective in restoring joint mobility by biomechanical corrections (in addition) and neuromuscular facilitation. Utilizing MWM techniques promotes pain free accessory gliding motions during repositioning of the joint surfaces, and thus improves proprioception to promote better functional outcomes.

Evidence of significant pain reduction and ROM improvements was seen in rigid taping (Group C) however less so than MWM. The findings are consistent with previous findings in demonstrated the structural support provided by taping and kinematic alteration to moderate symptom relief. Nevertheless, as MWM implies active mobilization, taping appears less effective.

Less improvement was seen in Group A (conventional physiotherapy alone) compared to other groups, wherein passive interventions may not be the optimal strategy in improving knee function. It indicates that it is essential to incorporate manual therapy techniques such as MWM into rehabilitation protocols of knee OA.

Comparison with Literature

This is consistent with studies by Takasaki et al. and Altmış et al. who reported that MWM immediately and for a short time relieves knee OA patients' pain. As Tsokanos et al. did, likewise, they showed that MWM of the knee has a positive effect on knee function by improving joint alignment and neuromuscular control.

Ouyang et al reported that non elastic taping for rigid taping showed that taping improves OA symptoms of the knee but not as much as manual mobilization techniques. These observations are supported by the findings of this study, which add support to the notion that MWM rather then rigid taping should be used for rehabilitation of knee OA.

Clinical Implications

Results of the MWM group demonstrated that the superior outcomes make MWM a drug to be included in routine clinical practice as a therapeutic measure in knee OA. The MWM results in restoration of movement patterns, reduction of pain, and improvement of functional independence and thus can be considered as first line manual therapy intervention for OA patients.

While MWM is usually effective and well tolerated, rigid taping may still be useful in cases where it cannot or cannot be applied for short term pain relief. Nevertheless, its effect is quite less than that of MWM, making it a better supplement than a first control application.

Limitations and Future Research

This study has certain limitations. The sample was small ($n = 33$), and the duration was limited to four weeks, rendering it could not be examined long term. Future research can include larger sample size, longer follow up and other outcomes measures such as WOMAC scale as well as functional mobility tests to confirm these results.

Conclusion

Pre-treatment for knee osteoarthritis (OA) patients were compared to determine the effectiveness of Mulligan Mobilisation with Movement (MWM) and rigid taping in reducing pain and improving functional outcomes. The results further show that knee flexion range of motion improvement and pain reduction are improved significantly by MWM compared to rigid taping and conventional physiotherapy alone.

Given its superior clinical outcomes, MWM should be considered as the first manual therapy intervention to manage knee OA. While beneficial, rigid taping is less effective than MWM and can be considered as a supplementary intervention. The implication of these findings on reliable and patient focused approach to the rehabilitation of knee OA is fur-

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ther reinforced from the evidence on the need for the manual therapy.

Further studies are needed to study long term effects, larger sample sizes and other outcome measures to support the intervention that has been made.

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