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A STUDY TO COMPARE MULLIGAN MANUAL THERAPY VERSUS NEUROMUSCULAR EXERCISE TRAINING IN REDUCING DISABILITY AND IMPROVING QUALITY OF LIFE IN PATIENTS WITH KNEE OSTEOARTHRITIS

Rama Krishna Sai Aremanda[1]*, Kolli Eswar Reddy[2], Christie Kiran Gotru[3] and Susmita Reddy Marreddy[4]

[1]Internship Student, SIMS College of Physiotherapy, Mangaldas Nagar, Guntur, Andhra Pradesh, India.
[2]Professor, SIMS College of Physiotherapy, Mangaldas Nagar, Guntur, Andhra Pradesh, India.
[3]Principal and Professor, SIMS College of Physiotherapy, Mangaldas Nagar, Guntur, Andhra Pradesh, India.
[4]Tutor, SIMS College of Physiotherapy, Mangaldas Nagar, Guntur, Andhra Pradesh, India.

***Corresponding Author: Rama Krishna Sai Aremanda**

Internship Student, SIMS College of Physiotherapy, Mangaldas Nagar, Guntur, Andhra Pradesh, India.

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ABSTRACT

Background: Both mulligan and neuromuscular exercise training have been proven effective in reducing disability, and improving quality of life in subjects with knee osteoarthritis. There is a lack of literature comparing the efficacy of these two techniques in the female population. Conflicting results and lack of evidence make this research domain more interesting. **Methodology:** 30 subjects with knee osteoarthritis were included and randomly assigned into 2 groups. Group A (n=15) received mulligan mobilization along with a supervised exercise program, and Group B (n=15) received neuromuscular exercise training alone thrice weekly for 6 weeks. **Results:** Significant improvement was found in all two groups for all outcome parameters ($p<0.05$), between group analysis of post-intervention and follow-up data, Group B showed significant improvement in the SF36 and WOMAC groups. **Conclusion:** The study shows that both Group A (Mulligan manual therapy) and Group B (Neuromuscular exercise training) are effective in reducing disability and improving the quality of life. However, group B (NMEXT) is more significant in reducing disability and improving quality of life.

KEYWORDS: Osteoarthritis, Mulligan manual therapy, Neuromuscular exercise training, Disability, Quality of life.

INTRODUCTION

Osteoarthritis (OA) is characterized by the American College of Rheumatology as a diverse set of conditions resulting in joint symptoms and signs linked to the impaired integrity of articular cartilage, with associated changes in the underlying bone at the joint margin.[1] The word "osteoarthritis" is derived from the Greek words "osteo," meaning bone, "arthro," meaning joint, and literally means inflammation.[2] Osteoarthritis corresponds to the majority of cases that one would come across in a musculoskeletal system at a clinical setup; it is the leading cause of disability and socio-economic burden.

Osteoarthritis (OA) is the second most common rheumatological problem and is the most common joint disease, with a prevalence of 22% to 39% in India.[3] It is the 4th leading cause of years lived with disability (YLDs), accounting for 3.0% of total global YLDs, as per World Health Organization (WHO) 2000 estimation. WHO has reported that knee osteoarthritis is the 4th most common cause of disability in women and the 8th in men. OA is frequently observed in females above 45 years of age, while in males, it is more prevalent before the age of 45 years. The prevalence of OA rises with age and is higher in individuals who are overweight, according to the World Health Organization's body mass index criteria.[4]

Mobilization with movement (MWM) represents a modern approach to joint mobilization in which a therapist administers a painless additional gliding force while incorporating active movement. This would relate to the correction of minor positional faults that occur secondary to an injury and lead to mal-tracking of the joint, resulting in symptoms such as pain, stiffness, or weakness.[5]

Mulligan's concept of manual therapy challenges annotation skills because multiple parameters must be recorded for the exact reproduction of each technique. MWMs employ a dual approach involving both therapist force (accessory glides) and patient effort (active physiological or functional movement). These techniques

are typically performed in diverse weight-bearing positions, utilizing treatment belts, and applying additional overpressure by either the, assistant or the patient. The technique involves the following:(NAGS) – natural apophyseal glide;(SNAGS) –sustained natural apophyseal glides; and (MWMS) –movement with mobilizations. The benefits of the technique are the immediate reduction of pain, an improvement in range of motion, and a long-lasting effort. Also known as the PILL response, Pain-free, Instant, and long-lasting.[6]

This muscle strengthening makes up one of the priorities of more traditional knee OA rehabilitation. The goals of NEMEX programs differ, with postural control being the aim of therapy (i.e. the position of the trunk and lower limbs relative to one another) and functional performance (i.e. quality of movement performance) by challenging lower-limb muscles in functional positions. In contrast to traditional strength training, neuromuscular exercise corrects the quality of movement and stresses joint control in all three biomechanical/movement planes.[7]

Neuromuscular exercise significantly influences function, biomechanics at the knee, and the activation patterns of the surrounding knee musculature. Neuromuscular exercise is used effectively for the prevention and rehabilitation of anterior cruciate ligament injury, rehabilitation in patients with a meniscal tear with or without the combination of meniscectomy, and in patients with moderate to severe OA. NMEX mainly works based on functional exercises involving multiple joints and muscle groups, mostly performed in closed kinetic chains in various positions (lying, sitting, standing) to achieve the desired requirement of postural activity. Postural control (postural stability and orientation), proprioception, muscle weakness, muscle activation patterns, coordination, and functional performance. Which improves sensorimotor control and obtains functional joint stabilization.[8]

METHODOLOGY

All subjects diagnosed with Osteoarthritis knee Included grade 1 or 2 knee osteoarthritis confirmed radiologically referred by a clinician, Age group between 50 to 60, Patient must give written informed consent, Both males and females, Both Unilateral/bilateral knee OA (most painful knee nominated by the patient was considered), At least 10 degrees limitation of either knee flexion or extension, B.M.I (Body Mass Index) = 18-30 Kg/m2. These people were excluded grades 3 and 4 radiological changes in the knee joint, Presence of any tumour or any growth around the treatment area, patients who have undergone knee surgery, Any history of trauma to the knees, ligament injuries or neurological impairments, Recent steroid injections in the knee joint (previous 3months), Fracture of the lower extremity.

Procedure: Patients diagnosed with knee osteoarthritis were selected for the research based on recommendations from healthcare providers. These were divided into two groups, Group A and Group B, each comprising 15 individuals, following approval from the SIMS College of Physiotherapy ethics committee, along with the collection of patient-informed consent forms. Their initial and final values were evaluated using WOMAC and SF36 assessments.

Mulligan manual therapy

Group A received Mulligan manual therapy. The technique used was maximal resistance and repeated contractions. A total of 18 treatment sessions were given to each subject, with a frequency of 3 sessions per week for 6 consecutive weeks. Following the therapeutic session, data on the outcome parameters were collected post-intervention, with follow-up data obtained one week after the intervention. In the supervised exercise program, warm-up and cool-down exercises were given for a period of 5 to 10 minutes before starting and after completion of the exercises in all the groups.[9]

Mulligan mobilization consisted of medial glide mobilization with movement, lateral glide mobilization with movement, rotation mobilization with movement, and dorsal glide with active knee flexion depending on the condition of the subject. The gliding force was sustained while the patient performed 3 sets of 10 repetitions.[10]

Fig. 1: Medial glide during semi-knee flexion Mulligan manual therapy.

Neuromuscular exercise training

Subjects in Group B received neuromuscular exercise training [NMEXT]. We have applied neuromuscular training principles in the NEMEX training program as follows: Every training session is divided into three parts: warm-up, circuit program, and cool-down. The warm-up period involves 10 minutes of ergometer cycling. The circuit program consists of four exercise circles, incorporating neuromuscular focusing on core stability/postural function, postural, lower extremity muscle strength, and functional. These exercises are predominantly in closed kinetic chains. Given that muscle weakness in the lower extremities, especially the quadriceps, is prevalent in patients with OA, open kinetic chain exercises are also intended to enhance the muscle strength of the knee and hip muscles. In each exercise

circle, one or two are typically performed. Each exercise consists of 2-3 sets with 10-15 repetitions, interspersed with rest periods equivalent to the duration of a set, between each set and exercise. Both the non-affected and affected legs are engaged in the exercises, with a primary focus on the affected. Progression in difficulty is based on three levels assigned to each. Advancement occurs when the exercise is executed with excellent sensorimotor control, high-quality performance (evaluated visually by the physical therapist), minimal exertion, and smooth movement control (sensed by the patient). The training program concludes with a cooldown segment and stretching for the lower extremity muscles lasting approximately 10 minutes. These exercises are detailed in the additional file provided. The training sessions are conducted in a group setting, overseen by a skilled physical therapist specializing in musculoskeletal disorder training.[11]

On average, approximately 10 patients were present at each training session, with a continuous influx of patients, including both newcomers and those experienced in multiple. Individual monitoring ensured exercises matched each participant's neuromuscular capacity. The training schedule consisted of two 60-minute sessions per week, held in the late morning or before noon to accommodate a common pattern of increase among hip or knee OA patients early in the morning and afternoon. Patients engaged in training until they underwent total joint replacement (TJR), and the duration of training varied based on surgery waiting times. Pain management was integral, through a pain scale provided during training sessions (referenced in an additional file). Patients were instructed that a pain level up to 5 on a 0 to 10 scale was acceptable during and after treatment, with the expectation that pain would return to normal the day after. If pain persisted, the intensity of training was accordingly adjusted[12] Prff.

Fig. 2: Active Assisted-Resisted single limb stance with Tera band.

Data Presentation and Statistical analysis

Table 1: Comparison between pre and post-values for womac in group A.

	Mean	Standard deviation	p-value	t-value
Pre	46.93	8.154	< 0.001	3.765
Post	35.87	7.945		

Table 2: Comparision between pre and post-values for womac in group B.

	Mean	Standard deviation	P -value	T-value
Pre	46.80	6.920	< 0.0001	8.109
Post	27.20	6.304		

Table 3: Comparision of post-WOMAC in Group A versus Group B.

	Mean	Standard deviation	P-value	T-value
Post group a	35.87	7.945	0.0026	3.309
Post group b	27.20	6.304		

Table 4: Comparision between pre and post-values of sf36 in Group A.

	Mean	Standard deviation	P- value	T-value
Pre	22	6.402	< 0.0001	5.243
Post	68.53	5.083		

Table 5: Comparision between pre and post-values of sf36 in Group B.

	Mean	Standard deviation	P-value	T- value
Pre	55.80	5.634	<0.0001	7.380
Post	74.40	7.971		

Table 6: Comparision of post values of sf36 between Group A VERSUS Group B.

	Mean	Standard deviation	P-value	T-value
Group a post	68.53	5.083	0.231	2.403
Group b post	74.40	7.971		

DISCUSSION

Based on the purpose of the current study was to compare the effectiveness of mulligan manual therapy versus neuro-muscular exercise training in reducing disability and improving quality of life in patients with knee osteoarthritis. In this research study, 30 subjects were taken. Group A (n = 15), underwent Mulligan manual therapy. Group B (n = 15), underwent a Neuro muscular exercise training program. Both groups showed improvement in reducing disability and improving quality of life and were assessed using both WOMAC and SF36. Better improvements were seen in Group B, which received neuromuscular exercise training.

The improvement in Group A for pain intensity could be attributed to the rationale that Mulligan's mobilisation with movement sedates an agitated, facilitated nervous system, particularly the dorsal horn, by bombarding it with the painless normality it has been patterned to receive. Although the mechanisms of action for the pain-reducing effectiveness of MWM are yet to be fully elucidated, biomechanical and neurophysiological mechanisms could likely play a role.[13]

Biomechanically, it was initially proposed that MWM may address joint partner bone alignment (i.e., positional fault) and some observations of positional faults have been made however, there is currently insufficient evidence to support the correction of a positional fault as It describes the mechanism of action for pain relief following MWM. While the pain relief afforded by MWM would be associated with improvements in disability level other factors may also contribute to the immediate improvements in disability level following MWM.[14]

The NEMEXKOA program was feasible for people with mild to moderate knee OA. The program demonstrated feasibility in terms of progression, exertion, pain, adverse events, and adherence. Jumping activities were, however, generally not feasible. Those subjects attending a greater number of exercise sessions were able to progress to higher levels of difficulty and reported a larger decrease in pain. There were limited numbers of incidences of a temporary increase in exercise-related pain.[15]

The training method we are discussing is designed to enhance sensorimotor control and improve compensatory functional stability. It is based on biomechanical and neuromuscular principles and is specifically targeted towards people who have functional and sensorimotor deficiencies resulting from knee injuries. However, the same sensorimotor deficiencies and functional instability are present in people with degenerative knee diseases, making neuromuscular training a viable therapy for them as well. Promising results have been observed in middle-aged with degenerative knee disease and older people with established training methods, leading to reduced symptoms.[8]

Significant differences in WOMAC score in Group B could be due to pain relief, reduction in the stiffness and increased extensibility of the tissues, increased lubrication of the joints, and gain In the context of enhancing weak muscle strength, it is essential to incorporate proper mechanical loading and joint stability. This approach can lead to an improved quality of movements, psychological well-being, and heightened self-confidence and motivating factors. It is often recommended that for individuals suffering from knee osteoarthritis, pain management should be combined with improvement. The patient's functional activities improved as the pain decreased and knee ROM increased. In addition, the exercise program aimed to increase individuals' confidence in the use of their knees and overcome the fear of physical activity.[16]

CONCLUSION

The study shows that both Group A (Mulligan manual therapy) and Group B (Neuromuscular exercise training) are effective in reducing disability and improving the quality of life, but Group B (NMEXT) is more significant in reducing disability and improving quality of life.

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