Original Article

Effectiveness of Muscle Energy Technique and Strengthening Exercises by KOOS in Knee Osteoarthritis Strengthening Exercise in Reducing Pain to Improve Functional Activity Measured by KOOS in Knee Osteoarthritis

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Abstract

Background: According to 2012 data, the prevalence rate of OA in both rural and urban India was ranging from 33% to 46% of the older adult population where females were more affected than men. Participants with knee OA frequently need to perform strengthening exercises since they have weaker muscles due to decreased physical activity and pain tolerance.

Purpose: The Purpose of the study is to find out the efficacy of Muscle energy technique and strengthening exercise in pain management to improve ROM in knee osteoarthritis.

Materials and methods: This study included a sample of 196 between the age group of 45- 60 years were taken from Shri Shakthi's centre for pain relief and rehabilitation according to selection criteria for this experimental study which was divided into two groups, strengthening exercise group (n=98) and muscle energy technique group (n=98) . Interventions were given as 5 sessions a week and continued for 2 weeks.

Study period: March 2023 to July 2023.

Result: The Pre-test and post-test values were analysed, pain score was decreased and functional outcome was improved significantly in strengthening exercise groups when compared to muscle energy technique.

Conclusion: The study shows that strengthening exercise for osteoarthritis of the knee in older adults is more effective than muscle energy technique.

Key Words: Knee Osteoarthritis, Muscle energy technique, Strengthening exercises, Manual therapy.

Introduction

The most prevalent type of chronic pathology of synovial joints is osteoarthritis, commonly known as osteoarthritis or degenerative joint disease.[1] After the age of 40, women are more prone than men to get OA, but the prevalence rises sharply with advancing years. According to the Global Burden of Disease in 2000, Years lived with disability (YLD) are most frequently caused by OA, which ranks fourth

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globally.[2] The primary clinical symptoms of OA are the slow degradation of articular cartilage and the formation of bone at the joint margin.[3] Weakness in the quadriceps muscle is the first sign of osteoarthritis in patients compared to healthy individuals.[4] Data from 2012 showed that OA affected between 33% and 46% of the population of older adults in both rural and urban India, with women being more afflicted than men.[5]

Manual therapy known as the Muscular Energy Technique (MET), involves the patient using their own muscles from a specific location, in a certain way, and in spite of the therapist applying a counter force.[6] The Mulligan Techniques recommend moving in a particular direction or within a range of motion that is pain-free in order to increase hip flexion and knee extension. Osteoarthritis of the knee patients experience significant physiological changes that impact their ability to do daily chores, such as weakness and diminished flexibility, in addition to discomfort.[7] There are numerous therapies available that 8th and 9th place a greater emphasis on pain.[8] Patients with knee osteoarthritis have not been studied to compare the two procedures. The purpose of this study was to compare the efficacy of Mulligan's bent leg raise (BLR) method with the muscular energy technique in treating knee OA.[9] The strength of your muscles, your ability to manage your muscles, your range of motion, the stability of your joints, and your fitness can all be enhanced by a good training regimen. Since their decreased physical activity and pain tolerance have left their muscles weaker, patients with knee OA frequently need to do strengthening activities.[10]

As a result, strengthening activities increase the strength of the quadriceps while also improving clinical outcomes such as pain, physical function, and quality of life. In order to better the quadriceps muscle and patellar tendon's capacity to efficiently unload the knee joint, it is believed that strengthening the quadriceps will increase their force when moving. In addition to exerting more force, the quadriceps would be able to absorb more energy (i.e., perform negative work), which might help to lessen the stress applied to the knee joint surface. This clarifies why it makes sense for the muscles' strength to serve as a shock absorber around the knee joint.[11] The knee joint is stabilized and has less varus-valgus laxity when the extensor and flexor muscles of the knee contract strongly together. Patients with stronger hamstrings and quadriceps walked faster and with less knee joint loading. The pathophysiology of osteoarthritis has been linked to increased articular cartilage loading and cartilage's capacity to withstand loading. Daily walking may put strain on the joints, which could alter how osteoarthritis manifests and advances. Walking places 70% of the strain on the medial compartment of the knee. It has been discovered that a high knee adduction moment is a potent indicator of the presence, severity, and rate of progression of knee osteoarthritis. Weight distribution between the compartments of the knee is changed by the knee's moment of adduction.[12]

It is common practice to diagnose and classify the severity of OA using radiographic evidence of abnormalities in the underlying subchondral bone and attrition of the articular cartilage.

The intra-articular changes have been the main focus of OA research, which has shed a lot of light on the pathophysiologic processes that take place within the articular environment. The periarticular skeletal muscles' alterations, in contrast, have received very little attention from researchers.[13] The neuromuscular skeletal system, which consists of the articulating bones, cartilage, ligaments, capsule, the muscles that control movement, and the nerves that regulate movement, should be seen as a whole, with the synovial joint acting as one of its functional components. However, because muscles are necessary for joint function, the synovial joint should be viewed as a functional component of the neuromuscular skeletal system. The efficient operation of each part of these units is necessary for precise, controlled movement. Joint dysfunction results from any malfunctioning component. A rising body of evidence suggests that muscle dysfunction may play a role in the pathophysiology of OA, despite the fact that very few research studies have been conducted in this field. This is because it is now known how the condition affects muscles.[14]

Aim

To find out the effectiveness of Muscle energy technique and strengthening Exercise in pain management to improve ROM in knee osteoarthritis.

Material and Method

- Couch
- Pillow
- Foot stool
- Bedsheet

The experimental study conducted on 196 subjects with knee osteoarthritis, age between 45-60 years was taken from Shri Shakthi's centre for pain relief and rehabilitation. Convenience sampling method was used in the study.

Study period: March 2023 to July 2023.

Inclusion Criteria

- The subjects diagnosed with OA knee subjects of age 45 to 60 years with ACR (American college of Rheumatology)
- Knee pain duration more than 3 months
- Both genders included

Exclusion Criteria

- History of past or recent surgery in lower limb
- Any deformity in the affected side lower limb
- Any neurological injury in affected lower limb
- Any malignancy in affected lower limb

Outcome Measures

- Knee Injury and Osteoarthritis Outcome Score (KOOS)

A self-report questionnaire known as the Knee Injury and Osteoarthritis Outcome Score

(KOOS) evaluates five outcomes: daily activities, sport and recreation function, pain, symptoms, and knee-related quality of life. The KOOS satisfies the requirements for a basic outcome measure and can be used to determine how well a knee injury has healed. It can be calculated in percentages, with 100 signifying no problems and 0 signifying severe problems.

Procedure

In the comparative study which carried 196 subjects with OA knee chosen in accordance with the inclusion and exclusion criteria from Saveetha medical college and hospital. The detailed procedure for performing the test will be explained to the subjects. The subjects are made to feel comfortable with the procedure after the explanation. 196 subjects are divided into 2 groups where one set of group A (n=98) will be given muscle energy technique which have 2 types, the post isometric relaxation with the sets of 3 and 10 repetitions and the reciprocal inhibition with the set of 3 and 10 repetitions/ per day, 5 days in a week and group B (n=98) will receive strengthening exercise with the following by quadriceps strengthening exercise, hamstring strengthening exercise and calf strengthening exercise with a sets of 3 and 15 repetitions/ per day, 5 days in week will be given respectively.

1. Muscle Energy Technique

This technique is divided into two types

A) Post Isometric Relaxation

B) Reciprocal Inhibition

A) Post Isometric Relaxation (PIR)

The subject will be supine with their hips 90 degrees flexed. The individual will be instructed to flex their knee with 20% more force. The quadriceps, the agonist muscle, will experience resistance for 5 seconds during the contraction. With a 5-second rest interval in between each set, there will be 3 sets of 10 repetitions each.

B) Reciprocal Inhibition

The subject will be positioned in the same 90-degree supine position. The individual will be instructed to flex their knee with 20% more force. While resistance is being given to the quadriceps, the contraction will be sustained for 5 seconds. With a 5-second rest interval in between each set, there will be 3 sets of 10 repetitions each.

2. Strengthening Exercises

i) Quadriceps Strengthening Exercise

The subject will perform this exercise while lying supine with the affected leg straightened and the unaffected leg bent. A towel will be put below the knee and pressure will be applied for 3 sets and 15 repetitions over the course of 5 days.

ii) Hamstring Strengthening Exercise

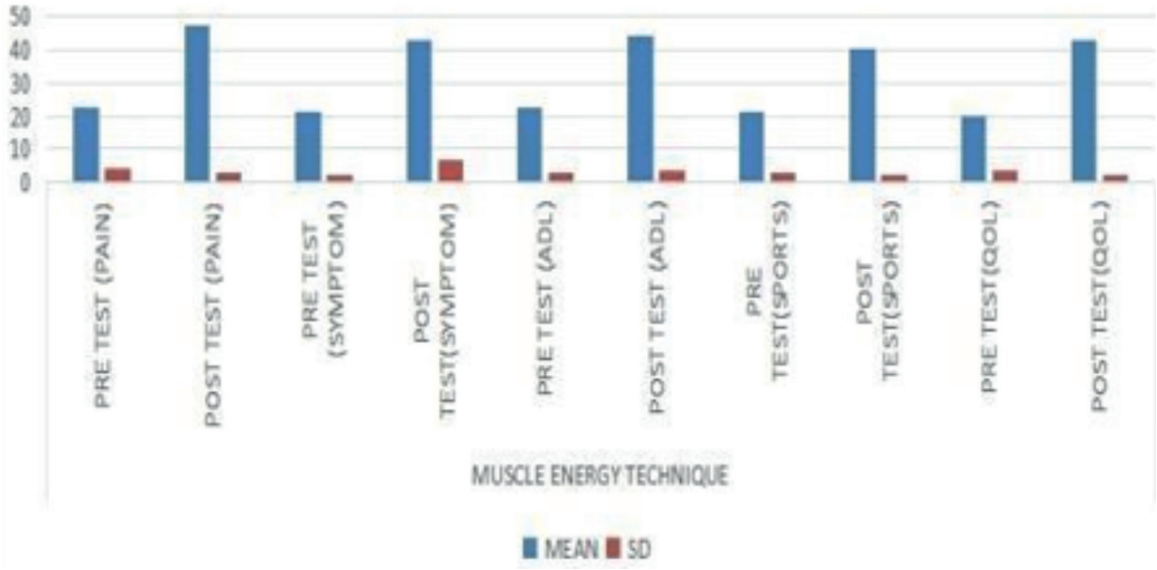
The subject will be in quadripod position, while the affected leg will be raised for 15 repetitions with 3 sets/ per day, 5 days in week will be given.

iii) Calf Raises

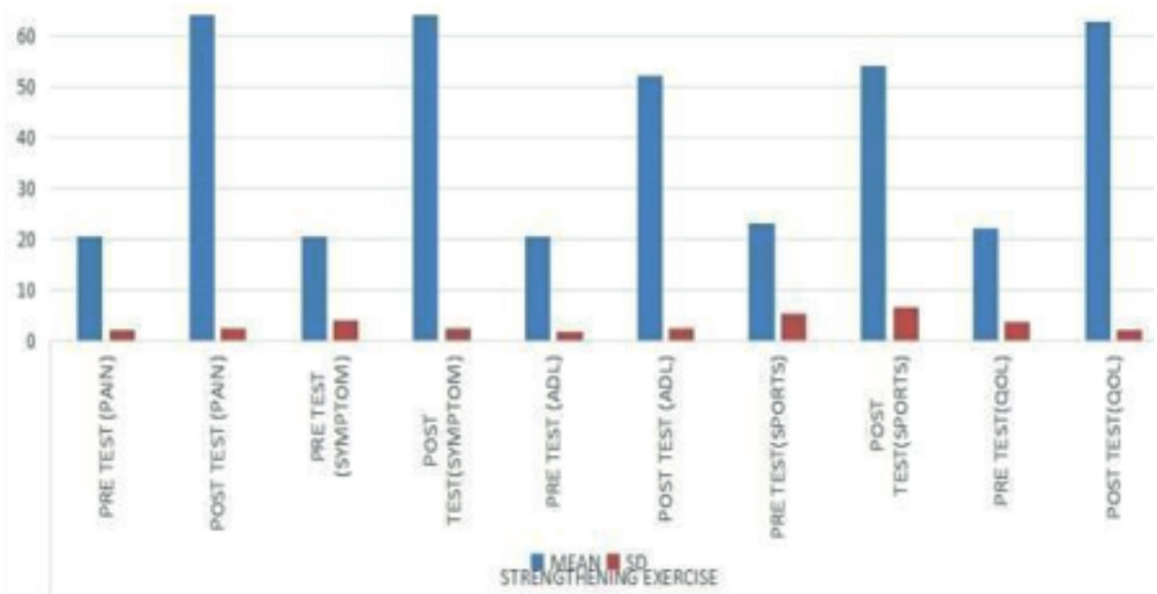
The subject will be instructed to stand on the foot stool or at the stairs and tell them to do calf raises for 3 sets and 15 repetitions per day, 5 days in week will be given.

Data Analysis

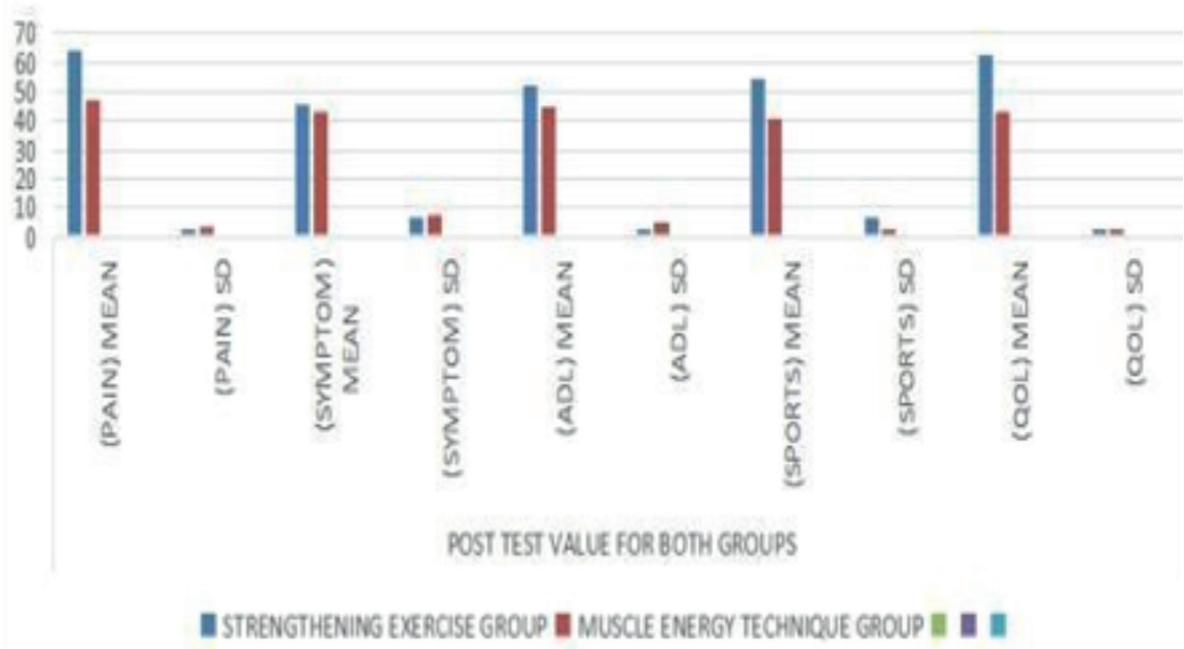
The mean and standard deviation (SD) were applied to all parameters. The significant differences between pre-test and post-test measures of the same group were analysed using a paired t-test and the post-test values of both the group were analysed using the unpaired t-test to examine significant changes between two groups.



Graph- 1: Comparison of the Muscle Energy Technique Group's Pre- and Post-Test Values



Graph-2: Comparison of the Strengthening Exercise Group's Pre- and Post-Test Values



Graph-3: Comparison between Post-test values of Strengthening exercise group and muscle energy technique group

Result

Graph.1. Compare the pre-test and post-test values of muscle energy technique using KOOS scale. The mean value of muscle energy technique in the experimental group using the Koos scale, the value of pain pre-test (22.7) and post-test (47.12) and pain SD pre-test (4.13) and the post test (3.01), symptoms mean pre-test (21.14) and post-test (42.79) and symptom SD pre-test (2.49) and post-test (7.00), ADL mean pre-test (22.83) and post-test (43.97) and ADL SD pre-test (2.89) and post-test (3.50), SR mean pre-test (21.53) and post-test (54.08) and SR SD pre-test (2.73) and post-test (6.52), QOL mean pre-test (20.10) and post-test (43.02) and QOL SD pre-test (3.69) and post-test (2.39). As a result, the findings are considered statistically significant when the p-value is <0.0001.

Graph.2. Compare the pre-test and post-test values of strengthening exercise using KOOS scale. The mean value of strengthening exercise in the experimental group using the Koos scale, the value of pain pre-test (20.29) and post-test (63.96) and pain SD pre-test (1.93) and the post-test (2.48), symptoms mean pre-test (20.49) and post-test (63.96) and symptom SD pre-test (3.80) and post-test (2.46), ADL mean pre-test (20.49) and post-test (52.16) and ADL SD pre-test (1.71) and post-test (2.36), SR mean pre-test (22.86) and post-test (54.08) and SR SD pre-test (5.18) and post-test (6.52), QOL mean pre-test (21.88) and post-test (62.55) and QOL SD pre-test (3.68) and post-test (2.14). As a result, the findings are considered statistically significant when the p-value is <0.0001.

Graph.3. Compare the post-test values of strengthening exercise group and muscle energy technique group, revealing that strengthening exercise group mean of pain pre-test (63.96) and post-test (47.12) and pain SD pre-test (2.46) and post-test (3.01), mean of symptom pre-test (45.85) and post-test (42.79) and symptom SD pre-test value (6.80) and post-test (7.00), mean of ADL pre-test (52.16) and post-test (44.96) and symptom of ADL pre-test (2.36) and post-test (4.83), mean of SR pre-test (54.08) and post-test (40.66) and SR's SD value pre-test (6.52) and post-test (2.65), QOL mean pre-test (62.55) and post-test (43.02) and QOL's SD value pre-test (2.14) and post-test (2.39)

Discussion

Based on the inclusion and exclusion criteria from Saveetha Medical College and Hospital, 196 patients with OA knee will be chosen for the comparative

study. The subjects will be given a thorough explanation of how the exam will be conducted. After the explanation, the individuals are guided through the procedure in a comfortable manner. 196 subjects are divided into two groups. Group A (n=98) will receive muscle energy technique, which consists of two types: post-isometric relaxation with sets of 3 and 10 repetitions and reciprocal inhibition with sets of 3 and 10 repetitions/per day, five days per week. Group B (n=98) will receive strengthening exercise, which includes quadriceps strengthening exercise, hamstring strengthening exercise, and calf strengthening exercise with a set of 3 and 10 repetitions/per day, five days.

In 2018 DeVita P concluded that, while improving symptomatic and functional outcomes, quadriceps strength training does not alter the biomechanics of the quadriceps or the knee joint when a person is walking. Strength training has been shown to enhance knee osteoarthritis patients' health, although the biomechanical mechanism underlying this improvement is yet understood. [11]

In 2011 Foroughi N concluded that, the knee or hip adduction moment did not increase following high intensity resistance training compared to controls. In contrast to expected increases in this parameter, hip adduction moment fell across the board for the whole cohort, regardless of group assignment. When compared to the resistance training group, the sham group's knee extension moment grew greater, while it was also associated with enhanced muscle strength. [12]

In 1997 Slemenda C concluded that, patients with osteoarthritis who do not experience knee discomfort or muscular atrophy may nonetheless have quadriceps weakness, which raises the possibility that the weakness is caused by a dysfunctional muscle. The information supports the hypothesis that quadriceps weakness plays a significant role in knee pain, disability, and the course of joint deterioration in individuals with osteoarthritis of the knee. [14]

Conclusion

The study shows that strengthening exercise for osteoarthritis of the knee in older adults is more effective than muscle energy technique.

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Conflict of Interest: Nil

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