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EFFECTS OF MYOFASCIAL RELEASE ON POPLITEUS MUSCLE VERSUS VASTUS MEDIALIS OBLIQUE (VMO) EXERCISE AMONG PATIENTS WITH KNEE OSTEOARTHRITIS – A QUASI EXPERIMENTAL STUDY

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Background: *Osteoarthritis (OA). It is a chronic degenerative illness with several contributing factors, including obesity, joint damage, senility, and sudden and/or long-term injuries from everyday wear and tear. It is still unclear what pathophysiology exactly causes OA. Arthritis (OA) is characterized by the breakdown of articular cartilage, which alters its biomechanical characteristics and causes localized articular cartilage loss, loss of joint space, osteoporosis, localized joint inflammation, periarticular remodeling, and subchondral changes, which may even cause cysts. Osteoarthritis has been widely recognized as an inability of the body's ability to heal damaged cartilage as a result of biochemical and mechanical alterations to the joint as well as the involvement of several joint tissues.*

Purpose: *To investigate the combined effect of popliteus myofascial release and Vastus Medialis Oblique exercise regarding pain, terminal knee extension, and quality of life on patients with knee osteoarthritis (KOA).*

Method: *The study was a Quasi Experimental study design. 60 patients were allocated based on inclusion and exclusion criteria. The age range was 40 - 60 years old. They received 16 sessions of treatment for 8 weeks. Visual Analogue Scale (VAS), Range of Motion (ROM) and Knee Injury and Osteoarthritis Outcome Score (KOOS) were used in the study to observe the effectiveness in the pre-test and post-test values of pain, terminal knee extension and quality of life.*

Result: *Among 60 participants with knee OA in this study, 30 participants in Group 1 received popliteus myofascial release and Vastus Medialis Oblique exercise along with ultrasound therapy, and another 30 participants in Group 2 received Vastus Medialis Oblique exercise alone with ultrasound therapy. Each participant in both groups scored on the Visual Analogue Scale (VAS), Range of Motion (ROM), Knee Injury, and Osteoarthritis Outcome Score (KOOS) before and after completion of treatment. An independent t test applied to the post-test pain score of the participants in both groups revealed a statistically significant difference at the level of $P < 0.05$. Following the application of treatment, the study found that both groups had a reduced score in pain, terminal knee extension, and quality of life among knee osteoarthritis patients.****Conclusion:*** *Popliteus Myofascial release combine with Vastus Medialis Oblique exercise is highly effective on pain, terminal knee extension and Quality of life.*

Keywords: Knee osteoarthritis, myofascial release, exercise, popliteus muscle

1. INTRODUCTION

The bones of the femur, tibia, and patella are connected at the knee via a synovial joint. The joint between the patellofemoral joint and the joint of the tibia and femur make form the hinge joint. While the joint known as the patellofemoral joint connects between the patella and the femur, the tibiofemoral joint unites the tibia and the

femur. The knee joint was the largest and most used joint in the body. The configuration of the bones in the joint serves as a fulcrum for translating the movements of the knee's extensor and flexor muscles. The extracapsular and intracapsular ligaments, together with the muscle extensions that cross the joint, provide the stability required to balance the biomechanical stress placed on the joint. The flexion and extension movements of the knee are primarily feasible across a single direction in the sagittal plane of motion because the knee joint is hinged. Additionally, it permits some lateral rotation during "unlocking" the knee as well as medial rotation during flexion and the final phase of extension (1). The most common cause of musculoskeletal discomfort and impairment is osteoarthritis (OA). It is a chronic degenerative illness with multiple contributing factors, including obesity, joint damage, senility, and acute and/or chronic injury from everyday

wear and tear. It is still unclear what pathophysiology exactly causes KOA. Articular cartilage degeneration causes changes in its biomechanical properties, which in turn cause localized articular cartilage loss, a reduction in joint space, osteoporosis, localized synovitis, periarticular remodelling, and subchondral changes, which can even result in cysts. Articular cartilage degeneration is what distinguishes knee OA from other joint diseases (2). Osteoarthritis was once thought to be a syndrome that only affected the articular cartilages, but later research revealed that the condition affects the entire knee joint, including the periarterial space. The subchondral bone stiffens, osteophytes form, synovial tissue becomes tender to varying degrees, ligaments deteriorate, and the menisci and joint capsule become hypertrophied(3).Currently, a physical examination is used to diagnose osteoarthritis, and MRI, X-ray, and arthroscopy pictures are also frequently used. However, because of their high degree of sensitivity and dependency on the expertise of the clinician providing the diagnosis, these diagnostic methods have low level of specificity and sensitivity. The chondral anatomical location, as well as the assessing physician, determine the MRI technique's limitations, which include its high cost (4). These variables often lead to an underestimation of the severity of the chondral lesion; only thirty percent of the MRIs indicated enough cartilaginous condition in all anatomic regions. According to the Kellgren and Lawrence (KL) grading system designed for visual inspection of X-ray or MRI images, doctors assess the severity of knee OA (5). Knee OA severity is divided into five grades by the KL system, ranging as grade 0 (normal) - grade 4 (severe). As a result, in MRI, total sensitivity varies from 5% in grade I lesions to 92% in healthy cartilage. Additionally, specificity changes with lesion degree, reaching 96.5 percent for grade IV lesions as well as 38% in normal cartilage. Tight popliteus muscles make it difficult to stretch the knee joint. A small but significant muscle called the popliteus is found near the back of the knee joint. Numerous researches have examined its architecture, function, and function in relation to knee pain and dysfunction (6) .The popliteal muscle, which is situated in the back of the knee, where the knee bends, is one of the muscles in the area of the knee. This muscle's job is to flex the knee joint, minimize tibia ventral translation, and internally rotate the tibia (4) Exercise therapies, electrotherapy, and manual therapy (MT) are among the therapeutic approaches used in the rehabilitation of OA patients. Among these methods, manual therapy (MT) is a hands-on physiotherapeutic strategy that may help patients feel less pain and perform better. The body's musculoskeletal structures, such as the joints, soft tissues, and nerve tissues, can undergo biomechanical, neurophysiological, psychological, and other non-specific changes as a result of manipulation that may improve patients' functionality on a clinical level (7).Z.Lai,(2019) stated that exercise has received substantial research as a crucial rehabilitation treatment that affects illness status (8). Popliteal activity aims to maintain proper knee kinematics. Inconveniences associated with KOA may result from a change in popliteal function, which may play a role in altering knee kinematics. The popliteus muscle's main function is to stabilize the external rotation of the femur in relation to the tibia in closed chain situations and to internally rotate the tibia with respect to the femur in open-chain situations. Tight popliteus muscles make it difficult to stretch the knee joint. A small but significant muscle called the popliteus is found near the back of the knee joint. Further injuries are caused by overworked muscles and poor joint stabilization. Additionally, because the Popliteus muscle is essential for terminal extension during the screw home mechanism and the Vastus Medialis muscle is weak, it frequently overworks(9).Myofascial release (MFR) is a manual technique that has been shown to increase muscular electric activity, increased ROM of the knee and decreased pain in patients after total knee replacement surgery.

OBJECTIVES

The objective was to find out the effectiveness in combination of myofascial release on popliteus muscle and vastus medialis oblique exercise together with ultrasound therapy among patients with knee osteoarthritis. The Specific objective are to compare the effectiveness of MFR on popliteus muscle versus VMO exercise on pain, Terminal knee extension and quality of life among patients with knee OA.

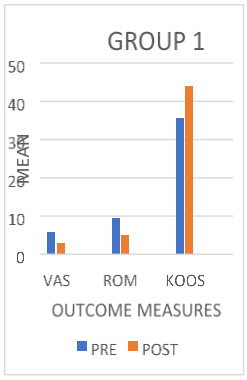
2. METHODS

A Quasi-experimental study design was used in this study to assess the efficacy of popliteus myofascial release (MFR) therapy for the management of knee osteoarthritis. The inclusion selection criteria for the study were adults over the age of 40 – 60 confirmed diagnosis of knee osteoarthritis grade 2&3 (according to Kellgren − Lawrence grade) experiencing symptoms such as pain, reduced mobility, and reduced quality of life, able to engage in exercise and myofascial release interventions, willingness to comply with study requirements and follow the intervention plan and able to provide informed consent. The excluded criteria were rheumatologic conditions and Acute stage (grade 1 Kellgren − Lawrence grade),knee contracture 20 to 30 degree, previous knee surgery or other knee injuries that affect knee function, contraindications for exercise or myofascial release interventions, other health conditions that may affect participation in the study or the interpretation of study outcomes (e.g., cardiovascular disease, neurologic disorders), any treatment for psychological and mental disorder, pregnancy or breastfeeding, participation in other clinical trials or interventions for knee osteoarthritis within a specified timeframe (e.g., six months) prior to the study, and inability to provide informed consent or comply with study requirements. Following fulfilment of the inclusion and exclusion requirements, the data collecting process was carried out using the patient assessment, first recording, treatment, and final recording steps. Patients were evaluated by a graduate physical therapist after being screened at the department. Each subject received therapy over the course of 16 sessions. Pre-tests, interventions, and post-tests were used to collect data. The researcher created a written questionnaire form to collect the data. The Research Ethics Committee, Asian Institute of Medicine, Science and Technology (AIMST) approved the research protocol and notified the scholar via letter no-AUHEC/FAHP/13/07/2023/MPT-PT-B1-003 on 13 July 2023.Committee of centre for Postgraduate Studies (CPS), AIMST University monitored the research progress regularly. Completed two research progress report and submitted to University Participants were divided into two groups to examine the impact of myofascial release on the popliteus muscle. Groups 1 and 2. Group 1 would undergo myofascial release on the popliteus muscle, vastus medialis oblique exercise, and ultrasound therapy, while Group 2 would only receive ultrasound modalities and vastus medialis oblique exercise. After passing the inclusion requirements, subjects will be allocated to the group. The Knee Injury and Osteoarthritis Outcome Score (KOOS), Visual Analog Scale (VAS) and Range of motion were used in the research to evaluate quality of life, pain, and terminal extension of the knee before and the intervention. Participants complete questionnaires about their own perceptions of their knee function (KOOS subgroups QoL, pain (VAS), and measurement of knee terminal extension (ROM,) by the physiotherapist Finally, the differences between the end measurements and the baseline measurements are compared. Everyone represents their own group, which included MFR on the popliteus muscle with VMO exercise and VMO exercise alone. By permitting the participants to provide answers to the questionnaires often, the chance of identifying these factors went up if any intervention was to influence the result (10). The physiotherapist informed and obtained consent from patients who were seen in the outpatient clinic with KOA-related problems. Things to expect in terms of measurements and interventions, how to withdraw the participants at any moment without consequences, and that their identity would be kept entirely confidential. Along with getting the same details from the participants, you also get a participation consent form. The selection of the "good knowledge" inclusion criterion was made to guarantee that there were no significant questions regarding the study's procedures or the questionnaires among the participants. Baseline measures started as soon as the patients chose to participate in the trial and completed the informed consent statement. The participants completed the KOOS and VAS questionnaires, and a physiotherapist assessed the terminal knee extension range of motion. Prior to the intervention, these measures were taken, recorded, and were used as the baseline. After a proper baseline was recorded. The study in charge consulted the participants to make sure that they still met the

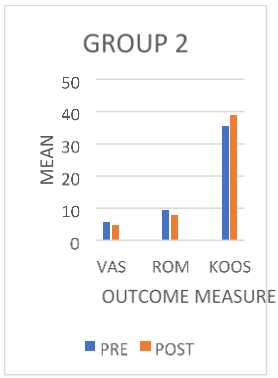
inclusion criteria, and if they were not qualified meet the criteria for this trial, they were evaluated as an outpatient clinic regular patient. The eligible participants will begin to proceed with signed the consent for participation and then start with answered the questionnaire (KOOS, VAS) and ROM measurement. Once the Premeasurement recorded, the split group using convenient be proceeded with intervention. Group 1 received myofascial release on popliteus muscle with VMO exercise and Ultrasound therapy to tackle to pain and group 2 proceeded with vastus medialis oblique exercise with ultrasound therapy to handle the pain. The measurement will be recorded back after two months. Participants completed the treatment with the same therapist for two months with 2 session a week. Final post measurement (KOOS, VAS and ROM) recorded after the last session on exact after 2 month and recorded. Data analysis was conducted using recorded measurement pre and post and kept safely in passwords protected computer and while inform consent form kept safely in locked rooms. The study focused on individual who are diagnosed as Knee Osteoarthritis in Penang island area. Only the individual who meet criteria were selected as participants for the research. To maintain the validity a thorough selection process was implemented. To collect the required data, the selected participants report their symptoms of knee osteoarthritis to the Spine care Physiotherapy Centre, Penang. The period of data collection for this study from 1st May 2023 to 10th July2023.The process include participants recruitment, screening, evaluation, initial measurement, intervention, and final measurement, the data collection phase over an estimated duration of 2months. In this process 60 subject were involved.

3. RESULTS

The results are as follow for VAS; a highly significant difference was found between the groups ($p < 0.001$). Both the tests with equal variances assumed and not assumed yielded the observed ($p = 0.024$), indicating a significant difference between the groups. For pain significant difference was found ($p = 0.128$).From the comparison between the two independent group ,group 1 for VAS is highly significant and means value of group1 VAS 2.8667 seems to be more lesser compare to mean values of group 2 which were higher at 4.8667,that means even though both group had a improvement in term of pain but group 1 that is myofascial release effect more higher more different on improvement on the visual analogue scale(VAS). ROM which was 5.1000 while mean value is higher in group 2 with 7.9667 which indicative the effectiveness in improved terminal knee extension in patient with knee osteoarthritis is clearer, while group 2 is higher mean values even though seems to be significant. at last when look at the KOOS there was no significant noted while the ($p=0.128$) which means it's not lesser then $p<0.005$. Additionally, not a single participant of the treatment group 1 reported experiencing increased pain after the therapy session, so the positive rating is zero.



Graph 3.1



Graph 3.2

4. DISCUSSION

Sixty patients with knee osteoarthritis (OA) were included in the studies. The percentage was 58.3% (n=35) were males and remained 41.7% (n=25) were females. The treatment group 1 consist of 50% from the studies which carried 56.7%(n=17) males and 43.3%(n=13) while treatment group 2 consist of 60%(n=18) and 40%(n=12) of females. The age range was included in the studies from 40 years old to 60 years

old with those suffered from knee osteoarthritis from grade 2 and above. The main objective of the study is to evaluate whether the popliteus muscle myofascial release has effectiveness on patient with knee osteoarthritis with the consideration of pain, range of motion and terminal knee extension. Modifications in tissue structure and tone of muscles, such as VMO weakening and popliteus spasm, are secondary problems linked to anterior knee discomfort. Since the popliteus muscle is essential for terminal extension during the screw home mechanism and the vastus medialis muscle is weak, it is often overloaded (11). However, it was shown that both treatments were effective in treating knee osteoarthritis. This research can be used by physiotherapists to assist in the prevention and rehabilitation more in knee osteoarthritis-related issues.

5. CONCLUSION

Popliteus myofascial release method together with Vastus Medialis oblique exercise and ultrasound therapy is more effective as vastus medialis oblique exercise with ultrasound therapy alone in reducing pain and impairment in people with knee osteoarthritis. 60 participants and both the group 1 and the group 2 each contained 15 individuals each. The group 1 received myofascial release of the popliteus muscle together with Vastus Medialis oblique exercise and ultrasound therapy. On other hand group 2 received vastus medialis oblique exercise with ultrasound therapy. Both groups received comparable reductions in pain, terminal knee extension range of motion and knee related quality of life. The group 1 clearly proven a greater reduction in pain and terminal knee extension range of motion, with highly significant, but in knee related quality of life score both group were not significant but yet no group complain of increase on pain and KOOS outcome measure can be recorded or assumed wrongly if the patients fail to understand the questionnaire or medical professional fail to explain the questionnaires clearly before patient answered. However, it was shown that both treatments were effective in treating knee osteoarthritis. This research can be used by physiotherapists to assist in the prevention and rehabilitation more in knee osteoarthritis-related issues.

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