

EFFECT OF TWO DIFFERENT MANUAL THERAPY PROTOCOLS ON OSTEOARTHRITIC KNEE PAIN & FUNCTIONAL DISABILITY: A COMPARATIVE STUDY

EFEKTUL A DOUĂ PROTOCOALE TERAPEUTICE MANUALE DIFERITE ASUPRA DURERII ȘI DISABILITĂȚII FUNCȚIONALE ÎN OSTEOARTRITA DE GENUNCHI: STUDIU COMPARATIV

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Keywords: knee osteoarthritis, Maitland mobilization, myofascial mobilization

Cuvinte cheie: osteoartrita genunchiului, mobilizări Maitland, mobilizări miofasciale

Abstract

Introduction: In patients with Knee Osteoarthritis, the strength of the quadriceps and sagittal range of motion is decreased associated with increased soft tissue contracture. Collectively, these changes produce a clinical picture of joint pain; worsening symptoms with activity and weight bearing and stiffness developing at rest. These facilitate the decline in physical and mental function affecting health related quality of life.

Aim: To compare the effectiveness of Maitland's mobilization and Myofascial mobilization in reducing pain and improving functional disability among patients with knee osteoarthritis.

Method: 68 patients with knee pain, aged between 40-70 years were randomly allocated following a screening procedure in 2 groups as - group A (n=20; 3 males and 17 females, mean age 52.15years) and group B (n=20; 7 males and 13 females, mean age 53.25 years). Patients were evaluated at baseline and after 2 weeks on the basis of VAS and WOMAC.

Result: Patients in both the groups were matched based on age and baseline parameters. Following treatment, both the groups reported extremely significant decrease in pain and disability. In comparison between two groups post interventionally, extremely significant difference ($p=0.0004$) was observed for pain, highly significant for stiffness component of WOMAC.

Conclusion: Both short-term manual therapy knee protocols significantly reduce knee pain & associated disability at second week. On comparison in between the groups Myofascial mobilization presented more beneficial effects on knee OA than Maitland mobilization on a short term basis.

Rezumat

Introducere: La pacienții cu osteoartrita genunchiului, forța cvadricepsului și amplitudinea de mișcare în plan sagital este redusă, fiind asociată cu contractura crescută a țesuturilor moi. În ansamblu, aceste modificări produc tabloul clinic al unei articulații dureroase; amplificarea durerilor la activitate și încărcarea greutății, precum și redoare la repaus. Acestea favorizează declinul funcției fizice și mentale, afectând în același timp și calitatea vieții.

Scop: Compararea eficienței mobilizărilor Maitland și a mobilizărilor miofasciale în reducerea durerii și reducerea disabilității funcționale la pacienții cu osteoartrită de genunchi.

Material și metode: 68 pacienți cu dureri de genunchi, vârstă cuprinse între 40-70 ani au fost împărțiți randomizat în urma unui screening în 2 grupe astfel - grupul A (n=20; 3 bărbați și 17 femei, media de vârstă 52.15) și grupul B (n=20; 7 bărbați și 13 femei, media de vârstă 53.25 ani). Pacienții au fost evaluați inițial și după 2 săptămâni, folosind scalele VAS și WOMAC.

Rezultate: Pacienții din ambele grupuri sunt similare ca vârstă și parametri inițiali. După tratament, ambele grupe de pacienți au înregistrat o reducere semnificativă a durerii și disabilității. La compararea rezultatelor celor două grupuri postintervenție, au apărut diferențe extrem de semnificative ($p=0.0004$) pentru durere, foarte semnificative pentru redoare, conform WOMAC.

Concluzii: Ambele protoacole pentru genunchi, de terapie manuală, pe termen scurt reduc semnificativ durerea de genunchi și disabilitatea asociată, în a doua săptămână de tratament. La compararea grupurilor, pacienții care au urmat mobilizări miofasciale au prezentat pe termen scurt efecte mai benefice asupra osteoartritei de genunchi decât pacienții care au făcut mobilizări Maitland.

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Introduction

Osteoarthritis (OA) is a major cause of musculoskeletal pain, the single relevant cause of disability and handicap from arthritis, and an important community health care burden, in lost time at work and early retirement [1] [2] [3] and [4]. The knee joint is a common site of OA [5] and [6], and subjects with knee OA exhibit a characteristic pattern of decrements in function, generally concerning mobility, transfer from seated or supine position to standing, and activities of daily living (ADLs) involving the lower extremities [1] and [7].

Osteoarthritis (OA) is a complex disease entity that is difficult to diagnose and define. The Subcommittee on Osteoarthritis of the American College of Rheumatology Diagnostic and Therapeutic Criteria Committee defined osteoarthritis (OA) as "A heterogeneous group of conditions that lead to joint symptoms and signs which are associated with the defective integrity of articular cartilage, in addition to related changes in the underlying bone at the joint margins"[8]. Clinically, the condition is characterized by joint pain, tenderness, limitation of movement, crepitus, occasional effusion, and variable degrees of local inflammation. [9]

Osteoarthritis of the knee is more common and a major cause of mobility impairment in women than men, but the prevalence increases dramatically with age. 45% of women over the age of 65 have symptoms while radiological evidence is found in 70% of those over 65. [10] Prevalence of OA in India is reported to be in the range of 17-60.6%. [11]

Pain is the most frequent reason for patients with osteoarthritis knee to seek medical attention and rehabilitation. Physiotherapy is a mainstay of conservative treatment for osteoarthritis of the knee as manual therapy, exercises, patellar taping, thermal modalities and electrical stimulations as a direct or an indirect pain reduction measures. Manual Therapy includes soft tissue manipulation, massage, manual traction; joint mobilization which involves low velocity passive movements within or at the limit of joint range of motion reduces pain by modulating the nervous tissues and increases joint range of motion.

At the knee joint the soft tissue changes can include a decrease in the strength of the quadriceps and sagittal range of motion, as well as increased soft tissue contracture. Collectively, these changes produce the typical clinical picture of joint pain; worsening symptoms with activity and weight bearing and stiffness developing at rest. These facilitate the decline in physical function and progression of the disability. However the Macquarie Injury Management Group (MIMG) knee protocol consists of the technique which is a non-invasive Myofascial mobilization procedure stretches the joint capsule in the sagittal plane, gently mobilizes any restriction to normal movements within the limits of patient tolerance and likely loosens adhesions of patellofemoral articulations. Together, these effects allow the knee greater mobility with less effort, restriction and pain. [12]

Although a randomized clinical trial exists studying the efficacy of Maitland mobilization and Myofascial mobilization technique, there is a lack of evidence regarding the integration of these techniques in individuals with osteoarthritis knee in Indian population. For this reason additional research examining the effectiveness of the regimen is warranted.

Purpose

The purpose of this study is to compare the effectiveness of the two differently used treatment approaches Maitland mobilization and the Myofascial mobilization in treating the patients with osteoarthritis knee as measured by an improvement in pain and functional ability.

Methodology

Type of study: Randomized clinical trial.

Study setting: Physiotherapy OPD MGM hospital.

Study population: 40 patients.

Method of randomization: Systematic random sampling method.

Material used: Hydrocollator packs Unit, Treatment Couch, Weight cuff, WOMAC Index.

Inclusion Criteria: Participants with age > 40 years of both genders, medically diagnosed with knee osteoarthritis Grade I and II according to Kellgren-Lawrence Grading Scale [13] or the participants fulfilling the following criteria of the American College of Rheumatology (ACR).

(ACR): Knee pain during at least one of the following activities: Walking, going up or down stairs, standing upright, or lying in bed at night and at least three of the following 5 criteria:

ACR clinical criteria: 1) Knee pain for most days of the prior month. 2) Crepitus on active joint motion. 3) Morning stiffness 30 min in duration. 4) Age more than 38 years. 5) Bony enlargement of the knee on examination. OA presents if items 1, 2, 3, 4, or 1, 2, 5 or 1, 4, 5 are present.

ACR clinical and radiological criteria: 1) Knee pain for most days of the prior month. 2) Osteophytes at joint margins on X-ray. 3) Synovial fluid typical of osteoarthritis (laboratory). 4) Age 40 years. 5) Morning stiffness 30 min. 6) Crepitus on active joint motion. OA present if items 1, 2 or 1, 3, 5, 6 or 1, 4, 5, 6 are present. [8]

Exclusion Criteria: Participants who had a joint replacement surgery, history of meniscal or other knee surgery in past 6 months, previous history of fractures at knee joint, deformity at lower limb, osteoporosis, neurological deficits, systemic illness & metabolic disorder.

Protocol: An approval from the institutional ethical committee was taken before implementing the study. Patients were explained about the procedure and risk factors related to the study and verbal, written consent was taken.

Method for data collection: Total 68 participants were selected, out of which only 40 completed the study. (14 were dropouts, 11 met with one of the exclusion criteria and remaining 3 not willing to participate). Baseline assessment was done according to an assessment pro forma which includes demographic data and outcome measures. Participants were randomly divided into two intervention groups and were again reassessed after two weeks.

20 patients in group A were allocated to Maitland mobilization technique along with standardized exercise program and moist packs.

20 patients in group B were allocated to Myofascial mobilization technique along with standardized exercise program and moist packs.

Intervention

Myofascial mobilization technique: The patient lies supine near the edge of the couch. The physiotherapist sits on the homolateral side of the couch. The patient's lower hamstring area rests on the physiotherapist thigh with their knee able to rest in 90 degrees of flexion. The physiotherapist has a choice of two contacts: 1) A pincer contact with the thumb and index finger on either side of the medial and lateral superior poles of patella. 2) A reinforced web contact supporting the medial and lateral superior poles of the patella. Later position is recommended for the physiotherapist with a hypermobile thumb. The patient is then instructed to begin actively extending the knee through a pain free range of motion while the physiotherapist maintains contact with patella. This is repeated up to 10 times. [12]

Maitland's mobilization technique: Five posteroanterior glides of tibial plateau on the femoral condyles of grades 2 were given [14] in supine position with knee carefully supported in a few degrees of flexion by a soft pillow.

Intervention in group A and B were given treatment on an alternate day basis for 2 weeks with daily home exercise program. Outcome measures were assessed for pain and disability at baseline assessment i.e. before treatment and reassessed after the treatment period, i.e. after 2 weeks by using VAS and WOMAC score.

Assessment tools

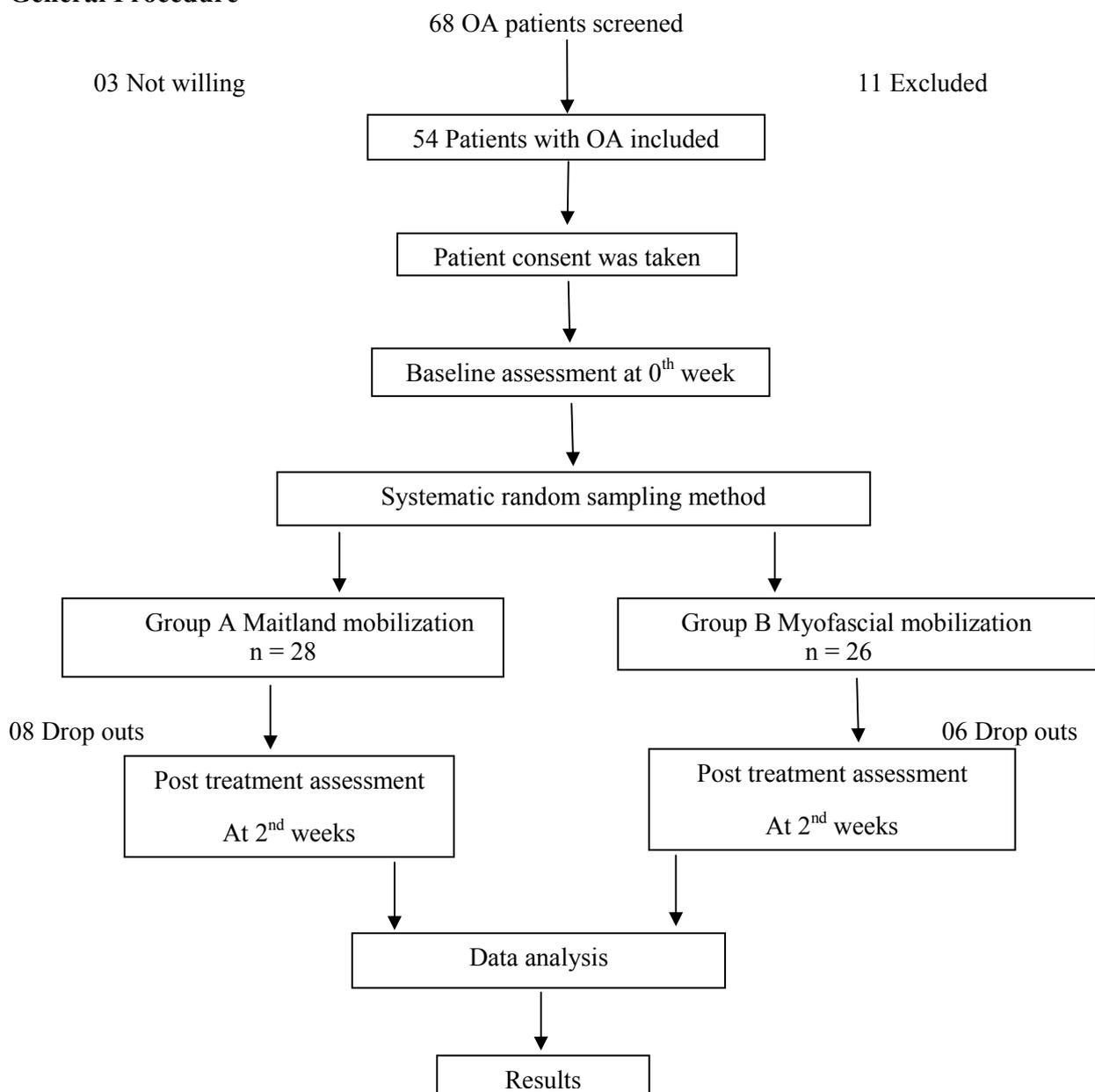
Primary outcome

The Visual Analogue Scale (VAS) is a valid and reliable measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured. For example, the amount of pain that a patient feels ranges across a continuum from none to an extreme amount of pain. [15]

Secondary outcome

The Western Ontario and McMaster Universities (WOMAC) index. It is a disease-specific self-report multidimensional questionnaire assessing pain, stiffness, and physical functional disability. This index has gained growing acceptance in OA assessment since its introduction in 1986. The pain dimension or scale includes five items asking pain at an activity or rest. The stiffness dimension includes two questions. The function dimension explores the degree of difficulty in 17 activities [16] and [17], which is recommended by the Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT) [18] and [19].

General Procedure



Data analysis and results: SPSS version V14 was used for statistical analysis.

Data Table-1. Demographic data & gender Distribution**Table-1. Comparison of mean values, standard deviation of baseline assessment values of age and various outcome measures between Group A and Group B using unpaired t test.**

Outcome measures	Group-A	Group-B	t value	Df	95% CI Upper – Lower	p value	Inference
	Baseline Mean ± SD	Baseline Mean ± SD					
Age	52.15 ± 6.12	53.25 ± 8.14	0.4833	38	-5.71 to 3.51	0.6316	Not significant
VAS	6.635 ± 1.408	5.915 ± 1.526	1.5512	38	0.220 to 1.660	0.1292	Not significant
WOMAC: Pain	8.25 ± 2.24	7.55 ± 2.28	0.9779	38	-0.75 to 2.15	0.3343	Not significant
Stiffness	3.55 ± 0.89	3.20 ± 0.83	1.2859	38	-0.20 to 0.90	0.2062	Not significant
Physical function	32.60 ± 5.04	31.75 ± 4.17	0.5813	38	-2.11 to 3.81	0.5645	Not significant
WOMAC Total	43.50 ± 8.02	42.50 ± 6.65	0.4295	38	-3.71 to 5.71	0.6700	Not significant

P < 0.01* shows a statistically significant difference.

Table-2. Intra group-A Comparison (Maitland mobilization)

Outcome measures	Pre	Post	t value	Df	95% CI Upper – Lower	p value	Inference
	Mean ± SD	Mean ± SD					
VAS	6.635 ± 1.408	4.005 ± 1.449	27.0132	19	2.426 - 2.834	< 0.0001*	Extremely significant
WOMAC: Pain	8.25 ± 2.24	3.90 ± 0.85	11.4811	19	3.56 - 5.14	< 0.0001*	Extremely significant
Stiffness	3.55 ± 0.89	1.85 ± 0.49	10.3763	19	1.36 - 2.04	< 0.0001*	Extremely significant
Physical function	32.60 ± 5.04	21.80 ± 3.19	16.1851	19	9.40 - 12.20	< 0.0001*	Extremely significant
WOMAC Total	43.50 ± 8.02	27.55 ± 4.05	13.0581	19	13.39 - 18.51	< 0.0001*	Extremely significant

P < 0.01* shows a statistically significant difference.

The intra group-A comparison of pre and post intervention period was done using paired t test on the basis of various outcome measures. And a statistical extremely significant difference (p < 0.0001) was found for all the parameters.

Table-3. Intra group-B Comparison (Myofascial mobilization)

Outcome measures	Pre	Post	T value	Df	95% CI Upper - Lower	P value	Inference
	Mean \pm SD	Mean \pm SD					
VAS	5.915 \pm 1.526	2.820 \pm 1.002	10.6175	19	2.485 - 3.705	< 0.0001*	Extremely significant
WOMAC Pain	7.55 \pm 2.28	2.85 \pm 0.88	10.7825	19	3.79 - 5.61	< 0.0001*	Extremely significant
Stiffness	3.20 \pm 0.83	1.35 \pm 0.49	12.3333	19	1.54 - 2.16	< 0.0001*	Extremely significant
Physical function	31.75 \pm 4.17	19.75 \pm 3.43	24.3882	19	10.97 - 13.3	< 0.0001*	Extremely significant
WOMAC Total	42.50 \pm 6.65	23.95 \pm 4.32	21.4216	19	16.74 - 20.36	< 0.0001*	Extremely significant

P < 0.01* shows a statistically significant difference.

The intra group-B comparison of pre and post intervention values was done using paired t test on the basis of various outcome measures. And a statistical extremely significant difference ($p < 0.0001$) was found for all the parameters.

Table-4. Intergroup Comparison between Group-A and Group-B of post intervention, assessment based on outcome measures using an unpaired t test.

Outcome measures	Group-A	Group-B	T value	Df	95% CI Upper - Lower	P value	Inference
	After t/t Mean \pm SD	After t/t Mean \pm SD					
VAS	4.005 \pm 1.449	2.820 \pm 1.002	3.0088	38	0.388 to 1.982	0.0046*	Highly significant
WOMAC: Pain	3.90 \pm 0.85	2.85 \pm 0.88	3.8442	38	0.50 to 1.60	0.0004*	Extremely significant
Stiffness	1.85 \pm 0.49	1.35 \pm 0.49	3.2310	38	0.91 to 0.81	0.0025*	Highly significant
Physical function	21.80 \pm 3.19	19.75 \pm 3.43	1.9571	38	-0.07 to 4.17	0.0577*	Not significant
WOMAC Total	27.55 \pm 4.05	23.95 \pm 4.32	2.7195	38	0.92 to 6.28	0.0098*	Highly significant

P < 0.01* shows a statistically significant difference.

The intergroup comparison of post versus post Interventional values was done using the unpaired t test on the basis of various outcome measures. And a statistical extremely significant difference ($p=0.0004$) was found for pain, highly significant for stiffness component of

WOMAC and VAS. Not significant difference between physical function components of WOMAC.

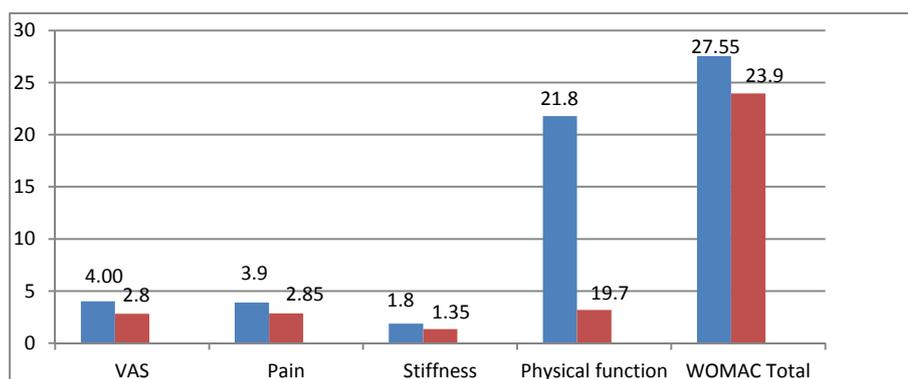


Chart: A. Intergroup Comparison between Group-A and Group-B of post intervention, assessment based on outcome measures using an unpaired t test.

VAS: A highly significant difference was found in difference VAS scores between Group A and Group B after intervention ($t=3.0088$, 95% CI=0.388 to 1.982, $p=0.0046^*$) using an unpaired t test.

WOMAC: The comparison of percentage WOMAC scores at post intervention, assessment was found to be highly significant ($t=2.7195$, 95% CI=0.92 to 6.28, $p=0.0098^*$) using an unpaired t test. The intergroup comparison of post versus post Interventional values have shown an extremely significant difference ($p=0.0004$) in pain, highly significant for stiffness component of WOMAC and VAS. No significant difference found between physical function components of WOMAC.

Discussion

This study was designed to compare the effectiveness of Maitland's mobilization and Myofascial mobilization in reducing pain and improving functional disability of the patients with osteoarthritis of the knee. This study proves the efficacy of Myofascial mobilization at knee joint in reducing pain and disability associated with knee OA. In addition, this study provides the evidence for the short term effectiveness of the Maitland mobilization technique at the knee joint in the management of knee OA along with the exercise program. In comparison, of both these techniques for their effectiveness, it was found that Myofascial mobilization was more effective than Maitland mobilization along with an exercise program in reducing pain and improving functional activity in osteoarthritis of the knee.

The results in this study were incongruous with the randomized controlled trial carried out by Henry Pollard et al. [12] on the effect of a manual therapy knee protocol on osteoarthritis knee pain: a randomized controlled trial, they investigate that, a short-term manual therapy knee protocol significantly reduced pain suffered by participants with osteoarthritis knee pain and resulted in improvements in self-reported knee function immediately after the end of the two week treatment.

In another study done by Nor Azlin & K. Sue Lyn (2011) [20] declared the effect of passive joint mobilization in osteoarthritis of knee on pain reduction by 44%, whereas in our study the pain reduction of 51.347% was observed in Myofascial group and 48.0354% for Maitland group.

Further, the results of the present study go in favor of the study done by G Deyle et al. in (2000) [21] in regards to disability who demonstrated 56% of improvement in total WOMAC scores after administrating manual physical therapy and exercise in osteoarthritis of the knee. However, in this study, 56.35% and 52% improvement in WOMAC scores was noted in the Myofascial mobilization group and Maitland group respectively.

For comparing the effectiveness of both treatment protocols first we proved the efficacy of each treatment protocol. Our study demonstrated a significant short term efficacy of Maitland mobilization in reducing pain by 52.32% and improving functional disability by 48.03% associated with knee OA.

Rational for the effectiveness of two treatment protocols may be because of the mechanical force during mobilization may include breaking up of adhesions, realigning collagen, or increasing fiber glide when specific movements stress the specific parts of the capsule. [22] Furthermore, these mobilization techniques are supposed to increase or maintain joint mobility by inducing biological changes in the synovial fluid, enhanced exchange. Maitland's mobilization mainly consists of rhythmic oscillatory movements which stimulate the type-2 dynamic mechanoreceptors and by this way can inhibit the type-4 nociceptive receptors and hence pain. [23] Maitland's rhythmic oscillations also have an effect on circulatory perfusion. The ongoing circulatory stasis may lead to ischemia and the potential for intraneural edema, inflammation, and fibrosis. Mobilization has an effect on fluid flow as blood flow in the vessels supplying the nerve fibers and synovial fluid flow surrounding the avascular articular cartilage. This by a pressure gradient, is generated which helps in facilitating exchange of fluid, that is, increased venous drainage and dispersing the chemical irritants. This causes a reversal of the ischemia, edema, and inflammation cycle and reduces joint effusion and relieves pain by reducing the pressure over the nerve endings. [24]

Also the present study explains the short term efficacy of the Myofascial mobilization technique derived from Macquaire Injury Management Group Knee Protocol (MIMG) in reducing pain by 52% and improving disability in patients with osteoarthritis knee.

MIMG consisted of a non-invasive Myofascial mobilization. This mobilization procedure stretches the joint capsule in the sagittal plane, gently mobilizes any restriction to normal movement within the limits of patient tolerance and likely loosens adhesions within the joint. In addition, it may be used on anterior thigh musculature to effectively mobilize tight Myofascial thigh structures.

Together, these effects allow the knee greater mobility with less effort, restriction and pain.

An important aspect of the procedure is that participants are able to cease participation at any point during the application of the procedure or at any time during the experimentation, meaning it is performed voluntarily within their tolerance levels. This is an important first step in determining the limit to which force is used in the application of the manual therapy. It provides direct feedback to the practitioner about the degree of stiffness, limitation and pain present in the afflicted knee. It has become a useful addition to many techniques often used to treat knee dysfunction. [12]

The second part of the MIMG technique, including Myofascial thrust manipulation was not included in the current study because it requires clinical expertise.

Our study describes the effectiveness of Myofascial mobilization when compared to Maitland mobilization in the management of knee OA on a short term basis, i.e. after the end of 2 weeks of intervention including standardized exercise program. Further research can be incorporated to investigate the long term results of such an intervention for osteoarthritis, which is chronic in nature and uncertain.

On intergroup comparisons between group-A and group-B showed statistically significant difference ($p=0.004$) was found in pain, stiffness component of WOMAC and VAS. A non-significant difference exists between physical function components of WOMAC at post intervention.

As this study proved the efficacy of each technique separately on a short term basis, the combination therapy along with supervised exercises can be employed to demonstrate short term and long term effects to manage the OA symptoms to delay or prevent the need for surgical intervention.

Similarly, both mobilization techniques used in this research demonstrated significant short-term relief of self-reported pain and dysfunction in participants with knee osteoarthritis. In

addition, no participants in either group reported adverse effects/discomfort with intervention. In light of these findings, it is recommended that further research be conducted to determine the utility of this protocol in patients not achieving satisfactory pain management with the traditional approaches of exercises and medication for knee osteoarthritis.

Moreover, it is difficult to generalize the populations because the population in itself is a heterogeneous group and most of the available literatures of studies on similar treatment method or comparison types always face the problem in maintaining the homogeneity of the population. Therefore, studies can have higher or lower ranges.

This is also to prove that the current study cannot be generalized because of the relatively different life style, living standard, and work pattern and differing activity of daily living.

Conclusion

This study has demonstrated the effectiveness of both Maitland mobilization and myofascial mobilization techniques in the treatment of knee osteoarthritis. The study also concluded that Myofascial mobilization group presented more beneficial effects in reducing pain and functional disability associated with knee OA than the Maitland mobilization group on a short term basis.

Limitation

The outcomes of this study were assessed immediately following a 2 week intervention period. It outlines the short-term effects of two different techniques used in the study. Only the Myofascial part of the Macquarie Injury Management Group knee protocol (MIMG) was used in the current study. Any objective functional test such as 6 minutes' walk test, timed get up and go test, step test, etc. was not taken as one of the outcome measures.

Suggestions

Future studies are suggested to carry out the study for longer periods. Also to add objective functional tests one of the outcome measures with larger sample size.

Conflict of interest: There is no conflict of interest.

Finance: It was self-finance study.

Acknowledgements: The authors thank the management of MGM Medical College and Hospital, Aurangabad, Maharashtra State, India for permitting us to conduct the study. We would also like to thank the staff of the MGM School of Physiotherapy for their support during the study. We are very grateful to all the patients who willingly gave part of their time to complete this study.

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