



GRADE 1-2 OSTEOARTHRITIS OF KNEE JOINT; OUTCOME OF COMBINATION OF GRADE 1-2 KNEE JOINT MOBILIZATION WITH QUADRICEPS ISOMETRICS IN PATIENTS

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ABSTRACT... Objectives: To determine the outcome of isometric exercises (Quadriceps) alone and in combination with grade 1-2 Knee joint mobilizations to manage pain and to improve physical functioning in patients of knee Osteoarthritis. **Study Design:** A Quasi experimental study on 80 freshly diagnosed Osteoarthritis patients. **Setting:** Physiotherapy Department of Fatima Memorial Hospital Shadman. **Methods:** Those patients were divided in two groups (Mobilization group and Combination group). There was no significant difference between age, education, co-morbidities and initial WOMAC score in different domains (pain, stiffness, physical function) and total WOMAC score of the two treatment groups before treatment. WOMAC scale was used as an assessment tool to measure the outcome of treatment in different groups before and after treatment (follow up 2weeks). **Results:** There was significant improvement seen in all 3 domains of WOMAC scale (pain, stiffness and physical activity) in Combination group in Grade 1-2 knee Osteoarthritis. According to Paired t test mean difference between post-Pre values of both groups was highly significant ($p=0.000$) in all domains. **Conclusion:** Combination of (Grade1- 2 Maitland and Isometric of Quadriceps) was seen more effective in terms of improvement in pain, stiffness and physical activity in Grade 1- 2 Osteoarthritis than the quadriceps isometrics alone.

Key words: Quadriceps strengthening, Manual therapy, Isometrics, Maitland.

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INTRODUCTION

Knee joint is largest, complex and most important weight bearing joint of human body which is made up from distal part of Femur and proximal part of Tibia. It also consist of some other joints i.e. Superior Tibio-fibular joint and Patellofemoral joint. It also have complex anatomical features i.e. ligaments, synovial fluid, 2 menisci and muscles etc. Ligaments prevents excessive translation of bones, muscles are responsible in producing and controlling the movement, two C-shaped cartilaginous menisci act as shock absorber and uniform weight distribution during different activities whereas synovial fluid along with fluid filled bursae helps to move knee smoothly. These structures provide stability against stress of normal daily activities running walking jumping etc. without causing any injury.¹

Increase aging causes different structural changes

in this joint which ultimately results in decrease efficacy in function of knee, pain and discomfort during different activities. Most effected structure during age related degeneration is knee joint cartilage. Increase age also causes decrease efficiency in muscular function because they had to compensate the cartilage function by increasing its functional output. All above age related wear and tear results in a degenerative condition of knee joint called Osteoarthritis (OA).²

Cartilage damage results in decrease joint space, osteophyte formation along joint margins along with sub-chondral bone sclerosis due to increase and direct load on bony surfaces of joint severity of all above things depends on the condition of knee joint cartilage. All above features are easily visible on X-Rays. X-rays play a major role in diagnosis of OA of knee. OA of Knee is thought to be 4th leading cause of disability with mean age

between 30-39 years.³

Osteoarthritis knee pain could be managed by different pain killers i.e. NSAIDs, long term use of different painkillers are responsible for gastrointestinal complications.⁴ Self-management educational programs along with reduction of weight and Physiotherapy (Quadriceps strengthening) is effective in symptomatic arthritic knee joint.⁵ Mobilization in arthritic knee joint is very effective in reducing pain.⁶ Manual therapy is very effective in pain and ADLs improvement in OA patients.⁷

In my practice I saw combination of manual therapy was effective along with strengthening exercises in some patients; this made me to conduct a study to see either manual therapy or strengthening exercises alone are effective or combination of treatment is more effective. Previous studies although show the significance of mobilization and exercises but according to mobilization Grades, their effectiveness still need research work along with severity /grade of knee arthritis.

Hypothesis

Combination of Maitland Grade 1-2 with Quadriceps isometric exercises is more effective than Quadriceps isometric exercises alone in the improvement of pain and physical functioning in patients with Grade 1-2 Knee Osteoarthritis.

MATERIALS AND METHODS

Study Design

Quasi-experimental study.

Settings

Data was collected from Fatima Memorial Hospital Department of Physiotherapy Shadman, Lahore.

Duration of Study

Completion time of study was 4 months after the approval of synopsis.

Sampling Technique

Convenience non probability sampling

Target Population

Patients who presented with diagnosis of Grade 1-2 Knee OA and having medial knee

Sample Size

80 patients were taken and equally divided into two groups

Study Group

Group I: In this group only Quadriceps Isometrics were given

Group II: In this group Grade I, II mobilizations were given along with Quadriceps Isometrics

SAMPLE SELECTION

Inclusion Criteria

Patient having Grade 1-2 OA of knee, medial and anterior knee pain with morning stiffness < 30 minutes, X-ray findings showing possible narrowing of joint space but no definite osteophyte formation were included. Patients of both genders with age limit between 40-60 years were included having SLR 70-80 degree.

Exclusion Criteria

Patient having acute inflammation and any other serious pathology (e.g. infection, inflammatory disorder, fracture or history of previous fracture) at knee joint, any associated systematic disease e.g. RA, SLE or tumor, patient having any trauma or ligament injury of knee, patient on any analgesics, patients having severe hamstring or calf spasm and patients with Grade 3 or 4 OA were excluded.

METHODOLOGY

Data Collection Procedure

After taking consent from patients, patients were assigned groups. Fresh X Rays (taken in standing), clinical examination and WOMAC scale was used to assess the patients before treatment. After assessment patients were distributed in Group A and Group B.

In group A only Quadriceps isometric exercises was given (1 set of 10 with 5 second hold) in a OA patient who was lie straight with face towards ceiling (supine position) with towel roll under knee joint.

In group B along with isometric exercises grade 1-2 mobilization techniques (Maitland) at Knee joint complex (Tibio-femoral joint, patellar joint) were applied. All mobilizations were given in resting position of knee joint with 5 sec oscillation and every oscillation was repeated 10 times in one treatment session.

After 2 weeks of follow up for each group, improvement was noted on WOMAC scale

Data collection tools (Performa /Questionnaire)

Standardized WOMAC scale was used to collect information from the subjects about the pain, stiffness and physical functioning.

Data Analysis

The data was analyzed by using the SPSS 18.0 statistical software. Baseline characteristics including means and standard deviations (SD) were described. The mean differences with SD for the outcome measures in terms of pain on WOMAC scale were describe. Shapiro-Wilk test was used to assess whether the dependent variables conformed to normal distribution, or not. According to Shapiro-Wilk test of normality there was no significant difference (p=0.599) between pretreatment total WOMAC score of two groups therefore showing the normal distribution. As the distribution is normal, parametric test of significance (paired t- test) is used to assess the differences for outcome measures (pain intensity, WOMAC scale) at each follow-up period. According to paired t-test, significant difference is seen between the two groups, post treatment total WOMAC score was p=0.000, showing that improvement in group B is significant than Group A.

RESULTS

The result showed that in group A, pain scores before the treatment was 13.8 ± 1.46 and after the treatment it improved up to 11.42± 2.45, stiffness improvement was 4.97 ± 1.20 from 6.35 ± 0.89, physical activity was 43.80 ± 3.43 from 47.27 ± 3.25 to and Total WOMAC score improvement was 61.22± 5.33 from 67.45± 4.30.

In group B pain scores before the treatment was 15.5 ± 1.13 and after the treatment it improved up to 3.35± 1.87 stiffness improvement was 1.52± 1.06 from 6.75 ± 0.63, physical activity was 26.40 ± 11.09 from 48.35 ± 3.20 and Total WOMAC score improvement was 31.27± 10.95 from 70.35± 4.40.

According to Shapiro-Wilk test of normality there was no significant difference (p=0.599) between pretreatment total WOMAC score of two groups therefore showing the normal distribution. In paired t-test significant difference was seen between the pre and post treatment Total WOMAC scores in both groups, p=0.000 showing the improvement in group B was significant than Group A.

Group A Pre and Post Treatment Scores on WOMAC Scale

Group A	Pretreatment scores	Post treatment scores
Pain Scores	13.8 ± 1.46	11.42 ± 2.45
Stiffness Scores	6.35 ± 0.89	4.97 ± 1.20
Physical Activity Scores	47.27 ± 3.25	43.80 ± 3.43
Total WOMAC scores	67.45 ± 4.30	61.22 ± 5.33

Group B Pre and Post Treatment Scores on WOMAC scale

Group B	Pretreatment	Post treatment
Pain score	15.5 ± 1.13	3.35 ± 1.87
Stiffness score	6.75 ± 0.63	1.52 ± 1.06
Physical activity score	48.35 ± 3.20	26.40 ± 11.09
Total WOMAC score	70.35 ± 4.40	31.27 ± 10.95

Tests of Normality

Tests of Normality						
	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
groupA3	.090	40	.200*	.978	40	.599
groupB3	.128	40	.095	.969	40	.328
a. Lilliefors Significance Correction						
*. This is a lower bound of the true significance.						

Paired sample T-test (test of significance) Total WOMAC score									
Paired Samples Test									
Paired Differences									
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	PostpreA - postpreB	3.27750E1	11.30575	1.78760	29.15925	36.39075	18.335	39	.000

DISCUSSION

Knee joint degenerative disease is no doubt progressive with age but different conservative management could decrease the progression of disease and may help in improving the quality of life of such patients.

Ike RW et al and his co researchers in a randomized control trial concluded that conservative management was seen effective in improving pain and stiffness of Knee arthritic patient. In this study researchers were unable to explain the type of conservative management.⁸ Conservative management includes patient education, NASIDs and other analgesics, intra articular corticosteroids injections and Physiotherapy interventions. Previous literature had proved the significance of Physiotherapy as an effective management in the management of Osteoarthritis, still there was lack of literature seen supporting the effectiveness of different Physiotherapy interventions with their doses in association with Stage /Grade of Osteoarthritis. The aim of this study was to see the outcome of combination of grade 1-2 Maitland knee joint mobilizations with Quadriceps Isometrics in patients of Grade 1-2 OA of knee joint.

Michael D et al said that in symptomatic arthritic knee joint Quadriceps muscle weakness is major cause due to which working on strengthening of this muscles in rehabilitation would reduce symptoms in arthritic knee joint.⁴ Above two studies recommend that research work is required to see the efficacy of individual intervention/exercises on arthritic Knee joint patients.

In Isometric exercise group total score of pain domain before treatment was 13.8 ± 1.46 and after

treatment it was 11.42 ± 2.45 , whereas marked improvement was seen in combination group (Grade 1-2 Maitland and isometric exercises) i.e. before treatment score was 15.5 ± 1.13 and after treatment it was 3.35 ± 1.87 . According to Paired T test mean difference between post-Pre values of both groups was highly significant ($p=0.000$). Current study results were consistent with a systematic review done by Jansen MJ et al in which researchers found significant improvement in pain in Combination group (mobilization and exercise)($p=0.03$). Researchers concluded in this study that manual mobilization should be the part of treatment option for better results.⁹

Moss P et al and his co-researches have done a study on 38 Knee OA patients to find out the efficacy of Anterior Posterior Knee mobilizations in mild to moderate Knee pain relief. Pressure Pain Threshold (PPT) and 6 min walk test was used as an assess tool to measure the outcomes of the intervention. Researchers found significant improvement $p<0.05$ after intervention. This study proves the evidence of Knee Anterior Posterior mobilization in reducing pain of Knee. Above study only focus on Mobilization efficacy in pain relief which were found significant but in my study mobilizations alone were not significant because of longer follow up time which was of 2 weeks. Moss P et al follow up was small than my study, in that study researchers focusing only on short term relief of pain.⁶

In terms of Physical activity, Isometric exercise group before treatment was 47.27 ± 3.25 and after treatment it was 43.80 ± 3.43 and Combination group i.e. before treatment score was 48.35 ± 3.20 after treatment score was 26.40 ± 11.09 . According to Paired T test mean difference between post-Pre values of both groups was highly significant

($p=0.000$). Further research work is required to see the effective intervention to improve this like progressive quads strengthening, mobilization along with flexibility exercises etc.

However in total WOMAC scale marked improvement was seen in Combination group only i.e. before treatment score was 70.35 ± 4.40 after treatment score was 31.27 ± 10.95 . In Exercise group total score of WOMAC scale before treatment was 67.45 ± 4.30 and after treatment it was 61.22 ± 5.33 which clearly showed that combination of exercises is really effective in getting desired outcomes in case of OA patients.

Hurley M et al and his co researchers did a clinical trial on 60 knee OA patients to see the efficacy of Quadriceps strengthening exercises in improving disability. Researches compare the experimental group with a control group which didn't receive any treatment. After 6 months follow up there was significant improvement seen in experimental group $p < 0.05$. Researches didn't explain the stage of disease along with the type, criteria of progression and frequency of Quadriceps strengthening exercises.¹⁰

Henry Pollard et al in a study compare the manual treatment with control group not having any treatment and found that after 2 weeks there was significant improvement in experimental group (pain mean = 1.9) than in control group (pain mean 3.1). Clinical symptoms i.e. crepitus, morning stiffness etc. were also significantly reduced in experimental group. In this study researchers didn't explain the frequency or hold during manual therapy treatment.¹¹

Above results and discussion show that Combination of (Grade 1-2 Maitland and Quadriceps Isometric exercises) was seen more effective in terms of pain, stiffness and physical function improvement in Grade 1-2 Osteoarthritis.

CONCLUSION

Combination of (Grade 1-2 Maitland and Isometric of Quadriceps) was seen more effective in terms of improvement in pain, stiffness and physical

activity in Grade 1-2 knees Osteoarthritis than the quadriceps isometrics alone

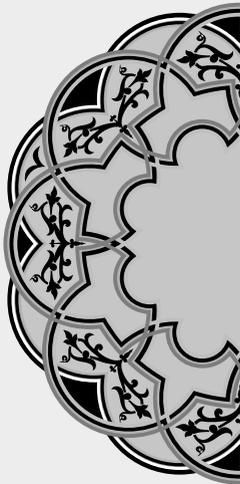
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*“Worry often gives a small thing
 a great shadow.”*

Swedish Proverb

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	M. Saleem Nawaz	Desing of the work, data collection, analysis & interpretation	
2	Noreen Amer	Drafting the article & critical revision of article	
3	Hafiz Muhammad Asim	Final approval of the version to be published	