Comparing the effects of manual therapy versus electrophysical agents in the management of knee osteoarthritis

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Abstract: To evaluate the effectiveness of Manual Therapy in comparison to Electrophysical agents in Knee Osteoarthritis. Total 50 patients with knee osteoarthritis were recruited from OPD of orthopedics civil hospital and Institute Of Physical Medicine & Rehabilitation, Dow University of Health Sciences Karachi. All those patients who fulfilled inclusion criteria were selected on voluntary basis. Selected patients were equally divided and randomly assigned into two groups with age and gender matching. The Manual therapy group received program of Maitland joint mobilization whereas Electrophysical Agent group received a program of TENS and cold pack. Both group received a program of exercise therapy as well. Patients received 3 treatment sessions per week for 4 successive weeks. Clinical assessment was performed using WOMAC index at baseline and on 12th treatment session. Both study groups showed clinically and statistically considerable improvements in WOMAC index. However, Related 2 sample t-test showed better clinical results in Manual Therapy group ($p = 0.000$) than Electrophysical Agents group ($p = 0.008$). The mean improvement in total WOMAC index was relatively higher in Manual Therapy group (22.36 ± 13.91) than Electrophysical Agent group (9.72 ± 6.10). This study concluded that manual therapy is clinically more effective in decreasing pain, stiffness and improving physical function in knee osteoarthritis.

Keywords: Knee osteoarthritis, manual therapy, electrophysical agents, exercise therapy.

INTRODUCTION

Knee osteoarthritis is a major health problem worldwide as well as in Pakistan. The burden of disease increases with the advancement of age. WHO report highlights the burden of osteoarthritis as 10th leading cause among non-fatal burdens in the world (Symmons *et al.,* 2003).

Knee osteoarthritis prevalence in Asia-Pacific region was found significantly higher in Pakistan than India, Bangladesh, China and other countries (De Filippis *et al.,* 2004). In Pakistan among different rheumatologic condition, the knee osteoarthritis is a disorder with significantly high prevalence 25% of rural population and 28% of urban population (Lanes *et al.,* 1997). In another studies, it was reported that the prevalence of osteoarthritis of knee is higher in the North Pakistan than in the Southern Pakistan (Farooqi & Gobson, 1998).

In Pakistan advancing age and female gender was found to be highly prevalent for knee osteoarthritis. Iqbal *et al.* (2011) conduct a study in Pakistan reporting that prevalence of knee osteoarthritis was higher in age greater than 56 years and found 74% females and 26% males population was affected by the disease.

According to WHO six percent of Pakistani population is over 60 years of age with probability of doubling by the year 2025 (Jalal *et al.,* 2012). The burden of knee osteoarthritis is expected to be increases with this increase in elderly population, which is responsible for high risk of morbidity, disabilities and consequently significant economical burden. The burden of OA relates not only to its prevalence but also to the costs of the disease to individuals. Studies revealed that, osteoarthritis has a great economic impact (Maetzel*et al.,* 2004). This drives the imperative demand of efficient as well as cost-effective treatment strategies that limits the pain, disability and associated deterioration of quality of life. Osteoarthritisis a clinical disorder characterized by chronic degeneration of articular cartilage. The etiology of disorder is multifactorial. Usual clinical presentation includes pain on weight bearing and after prolonged physical activity and stiffness of joints after certain period of inactivity (Woolf *et al.,*2003). In Pakistan, the commonly use treatment approach for knee osteoarthritis involves the use of electrophysical agents as the mainline of treatment. The aim of study was to explore and identify effectiveness of manual physical therapy techniques in comparison to electrophysical agents in knee osteoarthritis. Additionally to identify beneficial and cost-effective physical therapy treatment approach for knee osteoarthritis.

MATERIALS AND METHODS

All patients fulfilling inclusion criteria were selected, from Outpatient Department of Orthopedic Civil Hospital, Rabia Moon Trust and Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences,

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Karachi Pakistan. An inclusion criterion was all male and female patients aged between 40-60 years, mild & moderate Radiographic Knee osteoarthritis, fulfilling Knee OA ACR Clinical Classification Criteria for Osteoarthritis of the knee. Exclusion criteria was severe knee osteoarthritis, rheumatoid arthritis, knee Infection, neoplastic disorder, knee arthroplasty, advanced osteoporosis/ fracture, severe cardiopulmonary disease, joint deformity, intra-articular injection for pain within 4 weeks, altered skin sensation, skin disease around knee, Patient who ca not comprehend the effects of electrical stimulation.

Informed consent was taken from all 50 studies participants then they were randomly assigned to two groups with age and gender matching. The Manual Therapy group (25 participants) received program of Maitland joint mobilization with distraction on tibiofemoral joint and patellofemoral joint. EPA group (25 participants) received a program of Transcutaneous Electrical Nerve Stimulation with cold pack. Both groups received program of exercise therapy included, strengthening exercises for quadriceps femoris and gluteal muscles and stretching exercises for hamstring and calf muscles. Total 12 treatment sessions were given to each subject with the frequency of 3 sessions per week for 4 consecutive weeks. Each session lasted for 30 minutes. Patients were assessed using WOMAC Index (Urdu version) at the baseline and at the 12th treatment session. All patients who have difficulty in self-administration of WOMAC assessment questionnaire due to limited literacy were helped by their caregiver or by person who was blinded to the purpose WOMAC questionnaire.

STATISTICAL ANALYSIS

The data analysis was done using SPSS version 16. Statistical results are expressed as mean ± standard deviation (S.D) for quantitative data. The P-value < 0.05 is taken as significant. Assumptions of normality were checked using Kolmogorov and Simrnov test and then non parametric test were used, as normality assumption was failed. Wilcoxon signed rank test was used to compare the overall difference in pre and post treatment of all the study participants. Mann Whitney U Test was used to compare Manual Therapy group and EPA group for their pre and post treatment effects. Related 2 samples t-test was used to determine the mean difference in pre and post treatment of both manual therapy group and EPA group separately.

RESULTS

This study included 50 patients with age (50.5±4.6) and gender distribution were (n=24) 48 % males and (n=26) 52% were females were enrolled in the study, 25 subjects in Manual therapy (Mx) group and 25 in Electrophysical agents (EPA) group. The reduction in the pain and stiffness and improvement in functional abilities was indicated in terms of reduction in WOMAC score. For that initial and final score was noted on 1st and 12th treatment session of all the subjects. However the difference between two scores was considered for analysis of the difference between Manual Therapy group and EPA group. In the Manual therapy group, the average WOMAC score on 1st day was 74.80, which was reduced to 52.92 on the 12th day of treatment. Mean difference between 1st and 12th day score was (22.36±13.91). The

Table 1: Evaluation of womac score manual therapy and electrophysical agent group

Intervention group	Parameters	Mean ±SD		P-value
		Baseline	12th Session	
Manual Therapy Group	Pain	16.64 ± 3.12	10.84 ± 3.24	≤ 0.0001*
	Stiffness	5.84 ± 1.59	3.28 ± 1.17	≤ 0.0001*
	Physical Function	52.32 ± 11.19	38.8 ± 13.25	≤ 0.0001*
	Total WOMAC Score	74.80 ± 15.39	52.92 ± 16.70	0.0000
Electrophysical Agent	Pain	14.72 ± 3.79	13.00 ± 3.66	0.031*
	Stiffness	5.56 ± 1.85	4.32 ± 1.43	0.003*
	Physical Function	55.44 ± 10.84	48.68 ± 11.67	≤ 0.0001*
	Total WOMAC Score	75.72 ± 15.95	66 ± 15.23	0.008

P-values were obtained employing Wilcoxon signed rank test. (*P-value ≤ 0.05 is consider as significant)

Table 2: Evaluation of mean improvement between manual therapy and electrophyiscal agent group

Parameters	Manual Therapy Group	Electrophysical Agent
Sub Score Pain	5.80 ± 3.02	1.72 ± 3.91
Sub Score Stiffness	2.64 ± 1.22	1.24 ± 1.61
Sub Score Physical Function	11.16 ± 9.06	6.7 ± 3.00
Total WOMAC Score	22.36 ± 13.91	9.72 ± 6.10

difference was found to be statistically significant (P=0.000) using Related 2 sample t-test. In the EPA group, the average WOMAC score on 1st day (75.72) and 12th day (66). Mean difference between 1st and 12th day of treatment was 9.72. The difference was found to be statistically significant (P=0.008). The mean improvement found statistically significant in both group, however Manual Therapy group shown greater improvement than Electrophysical Agent group.

DISCUSSION

This study aimed to evaluate the effectiveness of manual therapy in comparison to electrophysical agents for knee osteoarthritis. The results of this study revealed that symptomatic knee osteoarthritis developed in 96% females who were obese. This is supported by another study which concluded that development of knee osteoarthritis is significantly associated with obesity (Sarah *et al.,* 2012). Therefore, the author anticipates that study participants with age more than 55 years may have some association with increased BMI that might be a reason for insignificant improvement in WOMAC scale.

The intra group comparison of both study groups showed considerable mean improvements in pain, stiffness and physical function sub-scores of WOMAC index. However, the study notifies that WOMAC index significantly reduced in the subjects treated with manual therapy and exercises. Among the manual therapy group, subjects treated with Tibio-femoral and patella-femoral joint mobilization techniques in addition to therapeutic exercises. This could result in reduce pain, stiffness and increased extensibility of the tissues by increased joint lubrication and improved proprioception. Correct mechanical loading and improved joint stability, improvement in strength of weak muscles therefore increased quality of movement, psychological effects, increased self-confidence and motivating factor all contributes to significant improvement in manual therapy group. Fewer studies reports similar findings as in the current study.

Deyle *et al.* (2000) has suggested that manual physical therapy and exercise are an effective strategy in reducing pain, stiffness and improvement in physical function ability. In the same stud**y,** the total improvement in WOMAC score averaged 56%; subscale improvements were 60% for pain, 54% for stiffness, and 54% for functional ability. In the current study, mean improvement in sub-score of pain is significantly higher than subscore of stiffness and physical function. Mean improvement and standard deviation found to be 5.80 (3.02), 2.6 (1.22) and 11.16(9.06) respectively. Another study showed that reduction in pain subscore was higher than stifness and physical function in patients having knee osteoarthritis (Perrot *et al,* 2009).

Pietrosimone *et al* (2011) RCT evaluated the effectiveness of TENS and exercises, exercises alone and placebo in patients with knee osteoarthritis. They used quadriceps activation and WOMAC as an outcome tool and after four weeks of intervention they found greatest improvement in group treated with TENS and exercises. Moreover, they also suggested the use of exercises in conjunction with TENS is more effective than using TENS or exercises alone.

Another study conducted by Altay *et al* (2010) evaluated the efficacy of Transcutaneous Electrical Nerve Stimulation in the treatment of knee osteoarthritis. After three weeks of treatment, they found active TENS group in comparison to placebo TENS group shows significant improvement in pain, stiffness and physical function sub-scores of WOMAC index. They suggested the use of TENS in the treatment of knee osteoarthritis to decrease knee pain and related disability and improving QOL in patients with knee OA. Moreover, in a systemic review conducted by Osiri *et al.* (2009).on effectiveness of Transcutaneous electrical nerve stimulation in knee osteoarthritis concluded that TENS and acupuncture like-TENS are shown to be effective in pain control over placebo in patients with knee osteoarthritis More evident and significant results have been seen in pain control by TENS however further improvements in other parameters by TENS are still not clear. In contrast, Pearl *et al* (2004) conducted a randomized control trial on effectiveness of TENS in knee osteoarthritis. After 10 days of intervention, they reported insignificant improvement in pain and physical function outcomes measures. The current study also used cold pack as physical agent along with TENS to decrease pain and swelling regarding knee OA. Another study determined the efficacy of hot, cold and contrast therapy in knee osteoarthritis using visual analog scale and knee injury and osteoarthritis outcome score as outcome measures after seven days of follow up. The authors found reduction in pain intensity on VAS and improvement in knee injury and osteoarthritis outcome score. Hence, they recommended the use of hot, cold and contrast therapy as effective treatment strategy in patients with knee osteoarthritis (Denegar *et al,* 2010).

According to authors, there is no such study to compare the effects of manual therapy and TENS. Both treatments are beneficial in improving pain, stiffness and physical function as defined by earlier studies but current study highlights manual therapy to be superior over TENS and prove that osteoarthritis patients may benefit by manual therapy more significantly in comparison to TENS.

Despite the effective results of manual therapy, further studies need to be conducted to see the long-term effects

of manual therapy hence it is anticipated that long-term follow up is required to expect more improvement in physical functioning subscore in addition to pain and stiffness. Furthermore, WOMAC tool is the only outcome tool used in the current study because of its strong reliability and validity; however, studies supporting the same results have also used other outcome tools as KOOS, VAS and 3-minute walk test. Further studies should confirm the effective findings of manual therapy on variable tools and long-term effects.

CONCLUSION

This study found manual therapy significantly effective in reducing self-reported pain and stiffness and improvement in physical function related to knee osteoarthritis. Furthermore, no adverse effects or any increase in pain intensity was reported. The study concluded that the subjects treated with manual therapy showed an additional benefit as compared to electrophysical agent demonstrating improvement in WOMAC score, which was used as outcome measure. Hence, manual therapy can be a better choice of modality option in the context of physiotherapy treatment approach for the treatment of knee osteoarthritis.

LIMITATIONS

This study took no measures to assess or control the daily activities, duration and frequency of standing, walking and stairs. Outcome other than WOMAC also could have been used. Single investigator; primary investigator collected the data in the study hence not blinded.

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