

Exercises versus Manual Therapy in Elderly Patients with Knee Osteoarthritis

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Abstract –

Study Objective: *Exercises versus Manual Therapy in Elderly Patients with Knee Osteoarthritis.*

Design: *Randomized clinical trial.*

Method and Measurements: *40 male patients with osteoarthritis of the knee who were randomly assigned to one of two groups that received exercises alone (n = 20; mean age, 60 years) or manual therapy and exercises (n = 20; mean age, 61 years). Both groups were received their programs for 4 weeks; two sessions per week. Sum of the function, pain, and stiffness subscore of the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), VAS and ROM of knee. An assessment was made for each group at the initial visit (before initiation of treatment) and at end of program.*

Results: *Both groups showed significant improvement in WOMAC score, VAS and ROM of knee. There were no statistical significant difference between the two groups except the ROM of knee which is significantly different.*

Conclusion: *Manual therapy improves the effectiveness of the treatment program of exercises in treating symptoms of knee OA and improves function in elderly people with knee OA.*

Keywords: *Knee Osteoarthritis, Exercises, Manual Therapy.*

INTRODUCTION

Osteoarthritis (OA) is a degenerative articular disease which is slowly evolving that appears to originate in the cartilage by breaking down and affects the underlying bone, soft tissues, and synovial fluid ⁽¹⁾. OA is characterized by degradation of the articular cartilage, resulting in an alteration of its biomechanical properties ⁽²⁾. There are alternations of the tensile, compressive, shear properties and hydraulic permeability of the cartilage, thus increased stiffness of the subchondral bone ⁽³⁾. Individuals with knee OA must often overcome a variety of problems, such as joint pain, tenderness, limitation of movement, crepitus, occasional effusion, swelling and local inflammation ⁽³⁾. Physical disability arising from pain and loss of functional capacity reduces quality of life and increases the risks of further morbidity and mortality ⁽⁴⁾.

Age is the strongest determinant of osteoarthritis in the weight-bearing joint as the population ages. The number of persons suffering from OA is expected to

increase and the prevalence of OA increase after the age of 40 in women and 50 in men ^(5, 6). The knee joint is most commonly affected and the individuals with knee OA have functional limitations, such as inability to perform Activities of Daily Living (ADL) or Instrumental Activities of Daily Living (IADL) due to knee OA ⁽⁷⁾.

The mechanism by which OA develops in the knee is not fully understood. It has been hypothesized that weakness of the shock-absorbing and weight-bearing muscles may lead to structural damage of the articular cartilage and subchondral bone, as well as decrease joint stability, which is a risk factor for knee OA progression ⁽⁸⁾. The joint damage and chronic pain from knee OA could lead to muscle atrophy, decreased mobility, poor balance, and eventual disability ⁽⁹⁾.

Current recommendations for managing osteoarthritis, including guidelines published by the American College of Rheumatology and European

League of Associations of Rheumatology, focus on relieving pain, stiffness and maintaining or improving physical function as important goals of therapy^(10, 11)

Slemenda et al. showed that the patients with knee OA have weak lower-extremity muscles, particularly the quadriceps muscle group, and that the degree of quadriceps muscle weakness correlates with the degree of knee pain and the degree of physical disability⁽¹²⁾. However, patients with knee OA have a significant decrease in knee muscle control as well as a decrease in velocity during gait in comparison to normal older subjects⁽¹³⁾. There is evidence to suggest that stronger quadriceps muscles play an important protective role in the progression of knee OA, hamstring strength has been recently suggested to be more important in the context of self-efficacy and performance^(13, 14).

Exercise helps in decreasing pain, improving strength and endurance, improving range of motion and connective tissue elasticity as well as exercise decreases functional limitation by improving walking speed, gait, physical activity and decreasing depression and anxiety⁽¹⁵⁾. Exercise may be an effective strategy for preventing ADL disability and, consequently, may prolong older persons' autonomy⁽¹⁶⁾. However, older disabled persons with osteoarthritis of the knee had modest improvements in measurement of disability, physical performance, and pain from participating in either an aerobic or a resistance exercise program. These data suggest that exercise should be prescribed as part of the treatment for knee osteoarthritis⁽¹⁷⁾.

A short-term manual therapy knee protocol (myofascial mobilization technique) significantly reduced pain suffered by participants with osteoarthritic knee pain and resulted in improvements in self-reported knee function immediately after the end of the 2-week treatment period⁽¹⁸⁾. Deyle et al, demonstrated that manual therapy techniques and exercises produced a 52% improvement in self-reports of function, stiffness, and pain compared with placebo. However, manual therapy and exercise is shown to increase quadriceps strength, while decreasing disability⁽¹⁹⁾.

MATERIALS AND METHODS

Subjects: 40 knee osteoarthritis male patients with age between 55 and 65 years old and all individuals were informed about the program. The participants were divided into two groups randomly (20 participants for each group). This study had approval from the Research and Ethics Committee to conducted this study at the physical therapy department at Riyadh Military Hospital (RMH).

Design: randomized clinical trial.

Equipment's & Measuring Tools: WOMAC, VAS, Goniometer, and beds.

Inclusion criteria:

- Male patients.
- Age between 55 and 65 years old.
- Diagnosed as knee osteoarthritis with 2 or 3 according to Kellgren-Lawrence radiographic grading scale of knee osteoarthritis.
- Self-report of knee pain longer than last 6 months.
- No history of any surgical procedure on either lower extremity in past 6 months.

Exclusion criteria:

- Musculoskeletal diseases.
- Neurological diseases.
- Heart problems.
- Acute myocardial infarction.
- Unstable angina.
- Chronic liver and kidney diseases.
- Patient who are receiving cortisone injection for knee OA.
- Uncontrolled Diabetic Mellitus.
- Deep Venous Thrombosis (DVT).
- History of knee arthroplasty
- Stroke patients.

Interventions: The rehabilitation program took four weeks, two sessions per week.

Procedure:

- The patients were referred from orthopedic clinic with diagnosis of knee osteoarthritis.
- All participants were informed about the study "purpose, groups, treatment intervention and benefits". Upon patient acceptance, the patient must sign up the consent form.
- Participants in both groups, were received health education on knee OA by researcher, including joint protection, appropriate behavior changes to enhance functional

outcomes, adjust to the environment to accommodate functional deficit and manage their status at home.

- All participants had baseline assessment.
- The participants were divided into two groups randomly and neither group was aware of the treatment that the other group was receiving:
 - Group I: they were received the strengthening exercises alone.
 - Group II: they were received both strengthening exercises and manual therapy.

The strengthening exercises program consist of:

- Static (Isometric) quad sets exercise; from long sitting with knee extended but not hyperextended by putting pillow under knee joint. The subject contract the quadriceps isometrically and dorsiflex the ankle, causing the patella glide proximally; then hold for 10 seconds. The patient was performed exercise 3 sets, every set had 10 repetitions within holding for 10 seconds with few seconds of rest in between. After 4 sessions the number of sets was increased to 5 with 10 repetitions and holding for 20 seconds. The verbal encouragement and visual feedback were used.
- Straight leg raising (SLR) exercise. The patient was lying on their back with the affected leg was straight and the opposite knee were flexed, and the foot was placed on the bed. Then, the quadriceps muscle is contracted, and the leg raised straight about 45° , no higher than the thigh of opposite leg and held the leg in the position for 10 seconds with attention paid to feeling quadriceps muscle contraction and then slowly lowered to the bed. The patients performed 3 sets with 10 repetitions and held in the position for 10 seconds with few seconds of rest in between. As the subject progresses after 4 sessions, the subject lift to 30° of hip flexion⁽²⁰⁾.
- Flexion to extension exercise. The patient was sat in chair, with feet resting on the floor. The knee was then extended and held in as full extension as possible for 10 seconds and then gently lowered to the floor. Repetition was 3 sets of 10 repetitions with few seconds of rest in between. After 4 sessions, the number of sets was increased to 5 with 10 repetitions and held for 15 seconds.

- Terminal knee extension exercise, figure (3). Patient was in supine lying position with small cushion placed beneath the affected knee. The quadriceps muscle was contracted, and the heel was lifted from the floor in a short arc range of motion. 3 sets of 10 repetitions was performed with few seconds of rest in between. After 4 sessions the number of sets was increased to 5 sets with 20 repetitions.
- Hip abduction exercise. The patient was positioned side lying with affected knee up and unaffected knee down with flexed to 90° and hip flexed at 45° . The affected leg is straight and body weight is shifted forward. The leg is lifted and held for 10 seconds and gently lowered back to starting position. The patients had 3 sets of 10 repetitions with few second of rest in between. After 4 sessions the exercises sets was increased to 5 with 20 repetitions and held for 10 seconds.
- Hip adduction exercise. The patient in side lying position with unaffected leg was upward with flexion of hip and knee and put foot on bed where the affected leg was against bed. The affected leg was lifted into adduction and held for 10 seconds and gently lowered back to starting position. This exercise was performed 3 sets of 10 repetitions with few seconds of rest in between. After 4 sessions the exercise sets was increased to 5 with 20 repetitions and held for 10 seconds.

Manual therapy technique was consisted of: active physiologic and accessory joint movements (long-axis traction technique and gliding movement). From supine position, the patient was performed active physiological movements in directions of knee and extension for 10 times.

- The long-axis traction. The patient was sat at edge of bed with knee was flexed approximately 25° . The therapist in front of the ventral surfaces of patient's leg at comfortable position. The hands grasp was around the distal leg, proximal to the malleoli with both hands. Long-axis traction grades 2 and 3 were used. For grade 2, the therapist pulled slowly on the long-axis of the tibia to separate the joint surfaces (the slack is taken up and the tissues surrounding the knee joint are tightened) for 10 seconds intervals and then slowly released to starting position with rest for a few seconds, repeated for 10 repetitions with 2 sets. For grade 3, the therapist pulled slowly on long-axis of the tibia to separate the joint surfaces (after slack has been taken up, more traction was

applied and the tissues crossing the joint are stretched) and held for 7 seconds and slowly released to rest position with rest for a few seconds, repeated for 10 repetitions with 2 sets.

- The gliding movements, figure (6): the patient was in supine position with knee flexed to 25° (small cushion placed beneath the affected knee). The therapist grasp the proximal aspect of the tibia, thumbs anterior and glided the tibia anteriorly and posteriorly. Gliding grades 2 and 3 were used. For gliding grade 2, the therapist was glided the tibia anteriorly and posteriorly until the slack was taken up and the tissues surrounding the knee joint were tightened and held the tibia for 7 seconds and released to rest position. The repetitions were 10 with 2 sets. For gliding grade 3, after slack has been taken up, more force was applied and the tissues crossing the knee joint were stretched and held the tibia for 7 seconds, then released to rest position. The repetitions were 10 with 2 sets.

The final assessment was performed at end of the program. The overall program has been done within 4 weeks; 2 sessions per week and each session took 35 - 45 minutes for each individual.

DATA ANALYSIS

All data analysis has been done by using SPSS (version 17) for windows. The initial measures of each groups were compared with the final measures of the study period and compared between the groups by using paired *t* test.

RESULT

This study included 40 patients with mean age (60 years) and SD of (3.1). There were 20 patients in the exercises only group vs. 20 patients in the manual therapy and exercises group. All patients completed treatments and testing at baseline and at the end of the program.

Age variables of the groups:

1. Exercise group

The distribution of the study exercise group according to age variable, as it is indicated that there were (4 patients) with percentage of (20.0%) aged (59 years old), also there were (3 patients) with percentage of (15.0%) aged (55 and 64 years old), there were (two patients) with percentage of (10.0%) aged (60 and 65 years old). Finally, there was one patient with percentage of (5.0%) in the category of other ages and this can be identified in the table (1). The mean age of this group is (60 years old) with SD of (3.4).

Age	Frequency	Percent	Mean	SD
55	3	15.0	60.0	3.4
56	1	5.0		
57	1	5.0		
58	1	5.0		
59	4	20.0		
60	2	10.0		
61	1	5.0		
62	1	5.0		
63	1	5.0		
64	3	15.0		
65	2	10.0		
Total	20	100.0		

Table 1: Distributing study of exercises group according to age variable

2. Manual therapy and exercises group

The distribution of the study manual therapy and exercises group according to age variable as it is indicated that there were (5 patients) with percentage of (25.0%) aged (62 years), also there were (4 patients) with percentage of (20.0%) aged (63 years), there were (two patients) with percentage of (10.0%) aged (61 and 64 years). Finally, there was one patient with percentage of (5.0 %) in the category of other ages and this can be identified in the table (2). The mean age of this group is (61 years old) with SD of (2.8).

Age	Frequency	Percent	Mean	SD
55	1	5.0	61	2.8
56	1	5.0		
57	1	5.0		
58	1	5.0		
59	1	5.0		
60	1	5.0		
61	2	10.0		
62	5	25.0		
63	4	20.0		
64	2	10.0		
65	1	5.0		
Total	20	100.0		

Table 2: Distributing study of manual therapy and exercises group according to age variable

Distribution of patients according to severity of knee OA:

According to Kellgren – Lawrence radiographic grading scale that measures severity of knee OA; there was 17 patients with grade 2 and 2 3 patients with grade 3 as shown in table (3).

Grade	No
2	17
3	23

Table 3: Distribution of patients according to severity of KOA Kellgren-Lawrence radiographic grading scale

Exercises Group:

A. The differences between means of the WOMAC post test score and pre-test scores for the exercises group.

The t-test for paired samples was used between pre and posttest of the WOMAC for the exercises group. It was seen from the table (4), the mean before exercises was (21.55) and it was decrease to (9.60) which is significant differences between the two means at level of significant $\alpha \leq 0.05$, (with p- value = 0.0001 which is less than 0.05) of the two tests, pre and posttest of the exercises group of WOMAC test towards the pretest.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	21.55	10.26	9.047	.0001
Post-test	20	9.60	5.75		

Table 4: The mean and standard deviation values for WOMAC pre and post-test in exercises group

B. The differences between means of the VAS post test score and pre-test scores for the exercises group.

The t-test for paired samples was used between pre and posttest of the VAS for the exercises group. It was seen from the table (5), the mean before exercises was (6.25) and decreased to (3.40); which was significant differences between the two means at level of significant $\alpha \leq 0.05$, (with p-value = 0.0001 which was less than 0.05) of the two tests, pre and posttest of the exercises group of VAS test towards the pretest.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	6.25	1.51	15.68	.0001
Post-test	20	3.40	1.53		

Table 5: The mean and standard deviations value for VAS pre and post-test in exercises group

C. The differences between means of the ROM of knee posttest score and pretest scores for the exercise group.

The t-test for paired samples was used between pre and posttest ROM of the knee for the exercise group. As seen from the table (6), the mean before exercises was (111.05) and it increased to (119.10); which was a significant difference between the two means at level of significant $\alpha \leq 0.05$, (with p- value = 0.0001 which was less than 0.05) of the two tests, pre and posttest of the exercises group of ROM test towards the post test.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	111.05	5.69	21.169	.0001
Post-test	20	119.10	4.64		

Table 6: The mean and standard deviation values for ROM pre and post-test in exercises group

Manual therapy and exercises group

A. The differences between means of the WOMA C post test score and pre test scores for the manual therapy and exercises group.

The t-test for paired samples was used between pre and posttest of the WO MAC for the manual therapy and exercises group. As seen from the table (7), the mean for manual therapy and exercises was (26.13) and it decreased to (13.50) which was significant differences between the two means at level of significant $\alpha \leq 0.05$, (with p-value = 0.0001 which was less than 0.05) of the two tests, pre and posttest of the manual therapy and exercise s group of WOMAC test towards the pretest.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	26.13	20.78	7.472	.0001
Post-test	20	13.50	9.32		

Table 7: The mean and standard deviation values for WOMAC pre and post-test in manual therapy and exercises group

B. The differences between means of the VAS post test score and pre test scores for the manual therapy and exercises group.

The t-test for paired samples was used between pre and posttest of the VAS for the manual therapy and exercises group. As seen from the table (8), the mean before manual therapy and exercises was (6.95) and it decreased to (2.75); which was significant differences between the two means at level of significant $\alpha \leq 0.05$, (with p- value = 0.0001

which was less than 0.05) of the two tests, pre and posttest of the manual therapy and exercises group of VAS test towards the pretest.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	6.95	2.03	14.209	.0001
Post-test	20	2.75	1.20		

Table 8: The mean and standard deviation values for VAS pre and post-test in manual therapy and exercises group

C. The differences between means of the ROM of knee post test score and pretest scores for the manual therapy and exercises group.

The t-test for paired samples was used between pre and posttest ROM of the knee for the manual therapy and exercises group. As seen from the table (9), the mean before exercises and manual therapy was (109.20) and it increased to (128 .10); which was significant differences between the two means at level of significant $\alpha \leq 0.05$, (with p-value = 0.0001 which was less than 0.05) of the two tests, pre and posttest of the manual therapy and exercises group of ROM test towards the posttest.

Test	N	Mean	SD	t-value	p-value
Pre-test	20	109.20	3.86	20.226	.0001
Post-test	20	128.10	2.84		

Table 9: The mean and standard deviation values for ROM pre and post-test in manual therapy and exercises group

Comparison between the two groups of (WOMAC)

As seen from table (10), there was no significant differences between the two means of exercises group vs. manual therapy and exercises group (p-value = 0.12 more than 0.005), manual therapy and exercises group (26.13 vs. 13.50) while, the exercises group (21.55 vs. 9.60).

WOMAC	Exercises group		Manual therapy & exercises group		P-value
	Pre-test	Post-test	Pre-test	Post-test	
	21.55	9.60	26.13	13.50	

Table 10: The mean values for WOMAC pre and post-test in both groups

Comparison between the two groups of (VAS)

It was seen from the table (11), there was no significant differences between the two means of

exercises group vs. manual therapy and exercises group (p-value = 0.14 more than 0.005), the manual therapy and exercises group (6.95 vs. 2.75) while, the exercises group (6.25 vs. 3.40).

VAS	Exercise group		Manual therapy & exercises group		p-value
	Pre-test	Post-test	Pre-test	Post-test	
	6.25	3.40	6.95	2.75	

Table 11: The mean values for VAS pre and post-test in both groups

Comparison between the two groups of ROM for the knee

It was seen from the table (12), there was significant differences between the two means of exercises group vs. manual therapy and exercises group (p-value = 0.0001 less than 0.05), the manual therapy and exercises group (109.20 vs. 128.10) while, the exercises group (111.05 vs. 119.10).

ROM	Exercises group		Manual therapy & exercises group		p-value
	Pre	Post	Pre	Post	
	111.05	119.10	109.20	128.10	

Table 12: The mean values for ROM pre and post-test in both groups

DISCUSSION

The purpose of the study was to evaluate the effectiveness of exercises alone versus manual therapy plus exercises in knee osteoarthritis elderly patients. In this study, both treatment groups obtained successful outcomes, as measured by significant reductions in WOMAC scores, VAS, and improvement in ROM of the knee. There were no statistically significant difference found between the two groups at WOMAC score and VAS, only the different was found in ROM of the knee.

Results of this study showed the following:

1. Manual therapy and exercises had a significant effect in reduction of WOMAC score in elderly people with knee OA.
2. Manual therapy and exercises had a significant effect in pain reduction in elderly people with knee OA.

The post-treatment ROM of the knee measurement in manual therapy and exercises group were better than the ROM of the knee measurement in exercises group and its significant. The result of this study was supported by Falconer et al (1992), found

improvements in motion (11%), pain (33%), and gait speed (11%) after 12 treatments of stretching, strengthening, and mobility exercises combined with manual therapy procedures performed in a physical therapy clinic over 4 to 6 weeks⁽²¹⁾.

In a controlled, randomized, single-blinded study, Deyle et al (2000), demonstrated that manual therapy techniques and exercises applied by physical therapists for 8 clinical visits produced averaged 56% improvement in self-reports of functional ability 54%, stiffness 54%, and pain 60% as measured by the WOMAC scale and a 12% improvement in 6-minute walk test scores. A placebo control group that received equal clinical attention showed no improvement in WOMAC scores or 6-minute walk test scores. They concluded that a combination of manual physical therapy and supervised exercise is more effective than no treatment in improving walking distance and decreasing pain, dysfunction, and stiffness in patients with osteoarthritis of the knee⁽¹⁹⁾. However, Sterling et al (2001), have demonstrated that joint mobilization produces rapid hypoalgesia⁽²²⁾.

The result of present study was also supported by Deyle et al (2005), who compared a home based physical therapy program and a clinically based physical therapy program in 134 subjects with knee OA. Subjects in the clinic treatment group received supervised exercise, individualized manual therapy, and a home exercise program for a 4 weeks period. Subjects in the home exercise group received the same exercise program initially, reinforced at a clinic visit 2 weeks later. Both groups showed significant improvements in 6-min walk distances (approximately 10%) and Western Ontario McMasters University Arthritis Index scores at 4 weeks (particularly in the pain, stiffness, and function subscales) and at 8 weeks. The subjects in the clinic treatment group improved 52%, and the home exercise group improved only 26% in Western Ontario McMasters University Arthritis Index scores at 4 weeks. By one year, there was no difference between the groups, presumably because they were both completing the same home exercise program⁽²³⁾.

This study showed that there was reduction in WOMAC score, VAS and ROM of the knee that lead to improvement in physical performance with exercise alone. The improvement with exercises in this study were supported by Fransen et al (2002), conducted a systematic review to determine whether land-based exercise is beneficial for people with hip or knee osteoarthritis. Fourteen studies provided data on 1633 participants with knee osteoarthritis but only 9 of these studies were considered to be of high methodological quality. For pain, results revealed a mean moderate beneficial effect while for self-reported physical function there was a mean small beneficial effect⁽²⁴⁾. In

an update to this review, Fransen et al (2005), found a total of 17 studies with data on 2562 participants. Results for pain and physical function were similar to the previous review. Supervised group programs appeared to be as effective as treatments provided on a one-to-one basis⁽²⁵⁾.

The result of this study was also supported by results of Jan et al (2009), showed the simple knee flexion and extension exercises weight bearing (WB) and non-weight-bearing (NWB) performed over 8 weeks resulted in significant improvement in the WOMAC function scale and knee strength compared with the control group. NWB exercise alone may be sufficient enough to improve function and muscle strength. The additional benefit of WB exercise was improved position sense, which may enhance complex walking tasks (walking on figure of 8 route and spongy surface)⁽²⁶⁾.

Fisher et al (1991), used isometric plus isotonic training programs lasting 16 weeks in a similar group of patients with knee OA. They found that improvements in walk time and functional capacity were approximately 9% after 8 weeks and approximately 14% and 18%, respectively, after 16 weeks. They observed the most important improvements in pain during walking, standing, rising from a chair, and climbing stairs, with a value of 30% for 16 weeks of training and 10% for 8 weeks of training⁽²⁷⁾. Fransen et al (2001), in randomized controlled trials in patients with knee OA showed that strengthening of the quadriceps musculature with either isometric or isotonic resistive exercise was associated with significant improvement in quadriceps strength, reduction of knee pain, and improved function⁽²⁸⁾. Hurley et al (2007), concluded at 6 weeks, participants in the study (12 supervised quadriceps strengthening sessions) showed improvements in function and this effect was less evident at 6 months⁽²⁹⁾. In other study, Barr et al (1994), reported that changes of 20% to 25% at WOMAC scores are generally considered to be clinically important⁽³⁰⁾.

Most of the studies that have dealt with exercise interventions for OA disease introduced exercise programs that ranged in duration from 30 to 45 minutes per session, 2 to 3 times per week⁽³¹⁾. The American College of Sports Medicine (ACSM) guidelines suggest that exercise intensity for elderly subjects with orthopedic conditions should start at a low level and progress according to the tolerance and preferences of the subject, with training sessions not longer than 60 minutes, to maintain the appropriate adherence to exercises⁽³¹⁾.

The improvements in this study showed after 4 weeks of program. The most important point is that

adding manual therapy to strengthening exercises will be more effective than exercises alone.

CONCLUSION:

The aim of this study was to evaluate the effectiveness of exercises alone versus manual therapy plus exercises in knee osteoarthritis elderly patients. The participants were 40 male subjects, divided into two groups randomly (20 exercises alone group, 20 manual therapy and exercises group). WOMAC score, VAS and ROM were evaluated at baseline and at the end of 4 weeks.

The result of this study showed significant improvement in WOMAC score, VAS and ROM of the knee in both groups. There were no statistically significant differences could be demonstrated at WOMAC score and VAS between the manual therapy and exercises vs. exercises alone. The only statistically significant difference was found in ROM of the knee. It was concluded that a manual therapy improves the effectiveness of the treatment program of exercises in treating symptoms of knee OA and improves function in elderly people with knee OA.

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