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ORIGINAL ARTICLE

A COMPARATIVE STUDY BETWEEN RESISTED EXERCISE AND ECCENTRIC EXERCISE WITH SHORTWAVE DIATHERMY ON FUNCTION AMONG OA KNEE SUBJECTS

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ABSTRACT

Background of the study: Osteoarthritis of the knee is the degenerative disease of knee joint with exacerbations of acute inflammation. This study is aimed to determine the effects of resisted exercise and eccentric exercise on pain and functional status among patients with osteoarthritis of the knee. The aim of the study is to compare the effectiveness between resisted exercise versus eccentric exercise along with shortwave diathermy on pain and functional disability among the patients with osteoarthritis of the knee. **Methodology:** This experimental study of comparative type is conducted at ACS Medical College and Hospital- out Patient Department. This study duration was carried out for 6 weeks, among 30 patients, ageing 45 to 55 with osteoarthritis of the knee. The subjects were selected based on inclusion and exclusion criteria. Thirty subjects with osteoarthritis of the knee were assigned into two groups. The first group (A) was assigned with resisted exercise. The second group (B) was assigned with eccentric exercise. In both groups the treatment was combined with Shortwave diathermy with frequency of 27.12 MHz. Measuring tools used were Visual Analog Scale (VAS) and WOMAC Index. **Result:** On comparing the mean values of Group A & Group B on VAS and WOMAC score, it shows a significant decrease in the post test mean values in Group A - Resisted Exercises which is more effective than Group B -Eccentric Exercises at $P \leq 0.001$. **Conclusion:** Resisted exercise and shortwave therapy is more effective than Eccentric exercise and short wave therapy in decreasing pain and increasing functional ability in subjects with Osteoarthritis of the knee.

Keywords: Osteoarthritis of knee, Resisted exercise, Eccentric exercise, shortwave diathermy, pain, functional disability.

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INTRODUCTION

Osteoarthritis is a chronic joint disease, which commonly affects the knee. Osteoarthritis cause pain, stiffness, swelling, joint instabilityand muscle weakness, all of which can lead to impaired physical function and reduced quality of life[1] Knee osteoarthritis affects the 3 compartments of the knee joint (medial, lateral, and patellofemoral joint) and usually develops slowly over 10 to 15 years, interfering with daily life activities. It was interpreted as a "wear-and-tear" of the articular cartilage disease only because of aging and not related to inflammation[2].

Swelling, locking, and giving way of the knee are common problematic symptoms. These disabilities, mainly related to pain, are usually manifested by difficulty in walking, climbing stairs, performing household chores, and sitting upright and have a negative psychological impact, all of which can lead to a decreased quality of life[3]. Previously Osteoarthritis thought to be a normal consequence of aging and the mechanical consequence of "wear and tear," there by leading to the term degenerative joint disease[4]. However, it is now realized that osteoarthritis results from a multifactorial, complex interplay of constitutional and mechanical factors, including joint integrity, genetic predisposition, local inflammation, mechanical forces, and cellular and biochemical processes [5].

The classification and diagnosis of knee osteoarthritis should begin with a review of the different types of knee osteoarthritis. Osteoarthritis of the knee has traditionally been classified by etiology into either idiopathic (i.e., primary) or secondary forms [6]. Idiopathicosteoarthritisofthekneeisusuallylocalizedbutcanbegeneralizedifknee osteoarthritis involves three or more joint sites. Knee Osteoarthritis can also be classified by anatomic involvement by the chief joint involved [7].

Radiographs remain the usual means for assessment of osteoarthritic changes in the knee and their association with clinical features, such as knee pain. The association between findings of osteoarthritis on radiographs and clinical features, however, is poor. Magnetic resonance (MR) imaging allows another perspective of the structural abnormalities associated with osteoarthritis, and MR imaging findings have been with clinical features, which include knee pain. Reported findings include the association between knee pain and MR imaging findings, such as joint effusion and synovial thickening, bone marrow edema, osteophytes, minimal cartilaginous lesions, alterations in volume of patellar cartilage, and periarticular lesions, which include bursitis and iliotibial band syndrome[8]. Osteoarthritis treatment is often separated into non-pharmacological, pharma-cological and surgical interventions [9].

Exercise can reduce pain, improve function and enhance psychosocial status in patientswithkneeOsteoarthritis, butthemostclinicallyefficaciousintensityandmode of delivery remains unclear. National Institute of Health and Clinical Excellence guidelines strongly endorse the use of local strengthening and aerobic exercise, although do not explicitly state which healthcare professionals should provide these non-pharmacological interve-ntions[10]. Furthermore, other common physiotherapeutic modalities such as ultrasound and pulsed shortwave did not receive guideline recommendation, whilst

manual therapy, transcutaneous electrical stimulation(TENS) and acupuncture were suggested as possible adjuncts to exercise.

Exercise therapy is regarded as the cornerstone of conservative management and is recommended by clinical guidelines[11]. Importantly, exercise has similar effect sizes to simple analgesic and non-steroidal anti-inflammatory drugs, but is accompanied by few contraindications or adverse effects, unlike drugs and surgery. Resistance exercise is a vital component of the treatment for some of the underlying mechanisms of knee Osteoarthritis, including muscle strength insufficiency, muscle activation imbalance and aberrant biomechanics and cartilage loading. Resistance can be modified based on the patient symptoms and access to equipment [12].

Osteoarthritis, it is important to consider both the degree of Osteoarthritis severity as well as the level of pain[13]. Initiation of a resistance training program requires assessment of strength, total knee range of motion, knee pain throughout the range of motion, and the patient's access to exercise equipment. Resistance can be applied through various methods through body weight, bands, free weights, Machines[14].Eccentric exercise is used to improve muscle strength and power in healthy subjects andathletes.

Duetoitsspecificphysiologicalandmechanicalpr operties. The important feature of eccentric muscle actions is to combine high muscle force with a low energy cost (typically 4-to 5-times lower than concentric muscle work) when measured during leg cycle ergometry at a similar mechanical power output.Therefore, if cautionistakentominimize theoccurrenceofmuscledamage. Eccentric muscle exercise can be proposed not only to athletes and healthy subjects, but alsoto individuals with moderately to severely limited exercise capacity, with the ultimate goal being to improve their functional capacity and quality of life [15]. Eccentric exercise involves lengthening of muscle tendon unit as load is applied to it. Eccentric exercise promotes tendon healing and alters pain perception from tendon. Eccentric strength training results in increased collagen synthesis by activating mechanoreceptors. Eccentric exercise actions are characterized low energy cost, high force production, hypertrophic impact, and favorable effect on fall risk and physical function and mobility.

Eccentric resistance training may also increase volitional drive and reduce corticospinal inhibition to muscle in Osteoarthritis. Thus, improve functionality in activities, such as stair climb or ambulation [16]. Shortwave diathermy is the technique of choice when uniform marked elevation of temperature is required in the deep tissues. This heating can be targeted accurately by using an appropriate applicator positioned correctly[17,18]. SWD also allows superficial structures to be heated selectively, although for this the various methods of surface heating are usually preferable.Thus, theaimof thestudyistocomparetheeffectiveness of resisted exercise with shortwave diathermy and eccentric exercise with shortwave diathermy on pain and functional disability among OA knee subjects.

Aim of the study: The aim of the study is to compare the effectiveness of resisted exercise and shortwave diathermy and eccentric exercise with shortwave diathermyon pain and functional disability among OA knee subjects.

Need of the study: Osteoarthritis of knee is a chronic degenerative disease typically due to wear and tear of the cartilage. Osteoarthritis of knee is characterized by pain, functional discomfort and swelling. The main aim of the study is to compare the effectiveness of resisted exercise and eccentric exercise along with shortwave diathermy on pain and functional disability among OA knee subjects.

METHODOLOGY

It is experimental Comparative study. Conducted at ACS Medical College and hospital outpatient department. 30 subjects were selected for the study. Simple random sampling method used to allocate the samples in two groups. The study duration 6 weeks.

Inclusion criteria include subject within age range of 45to55years, both male and female patients with OA knee, Chronic knee pain, Unable to perform functional activities. Measuring tools used for the study were Visual Analogscale (VAS)and WOMAC.

Procedure: Thirty [30] Subjects participated in this study with mean value of age with maximum45 years and minimum 45 years. Concern form was signed before the procedure the complete process of treatment intervention and outcome measure procedure also the possible side effects has been explained completely. The subjects were randomly selected based on the inclusion and exclusion criteria. The study was conducted in physiotherapy OP department, faculty of physiotherapy, ACS medical college and Hospital under the supervision of my guide. Both the genders of above-mentioned age groups were included in the study, subjects with Chronic knee pain, Unable to perform functional activities were included and subjects with Systemic illness, Rheumatoid arthritis of knee, Recent surgery, Psychiatric illness were excluded. A detailed history and examination were carried out on each and every patient. Total, 30 patients who were randomly selected and divided into two groups. Group A includes 15 subjects who were diagnosed with osteoarthritis of the knee and Group B also included 15subjects with osteoarthritis of the knee.

Intervention will be done using resistance exercise and shortwave diathermy for Group A and eccentric exercise along with shortwave diathermy for Group B. At the beginning and at the end of treatment duration the subjects will be tested using VAS scale and WOMAC score. The duration of treatment was 6 weeks.

GroupA–Resistedexercise

1. Leg press in Lying: Hold the ends of the band in each hand and bend your knee to your chest to loop the band under your foot. Keeping your elbows at your side, push the leg straight out and down against the band. Slowly return to starting position. Repeat on other side. Repeat the exercise for 12 repetitions.

2. Knee extension: Attach elastic band to your ankle and to the opposite foot. Then draw your lower leg upwards to a straighten knee position while your other foot anchors the band. Repeat the exercise for 12 repetitions.

3. Squats: Place both feet on the middle of the resistance band and hold each end of it with your hands. Slowly bend your knees into a squatting position, then return to your starting position and repeat 13 times.

4. Seated leg Press: Sit on the chair with your back straight. Place one foot in the middle of

the resistance band and hold both ends of it with your hands. Bend your knee towards you, then straighten it back out in front of you before returning to your starting position and repeat 12 times.

5. Seated marching: Start by sitting in a chair with elastic band wrapped around your lower thighs. And then move a knee upward, set it back down and then alternate to other side. Repeat 12 times.

6. Short wave diathermy: The subjects were made to sit in a comfortable chair with a back and arm rest, the limb with OA was kept in 90-90 position with foot resting on a low stool. The subjects were instructed not to move and not to touch any cables. The electrodes were positioned over the medial and lateral aspect of the knee (contra planar method) and medium spacing was used with frequency of 27.12 MHz the subjects were asked to inform if they felt anything more than the warmth feel.

Fig: 1. Subject Receiving Short wave diathermy

Group B–Eccentric Exercise

1. Lunges: Askthepatienttostandandplaceonelegforwardandotherlegplacedbackward. Ask the patient to bend the knees. Repeat it for 12 times.

2. Squats: Ask the patient to stand and the patient can lean on the wall to get support. Ask the patient to bend knees, the knee should not cross the level of foot, repeat it for 12 times.

3. Toe touch: Askthepatientto standin stairs. Ask thepatienttomove one legforward tothelower stair and touch it with the toes repeat it on other side and repeat it for 12 times.

4. Toe touch (Sideways): Ask the patient to stand in stairs, and move one leg (as in side standing) to the lower stair and touch it with the toes. Repeat it on other side and repeat it for 12 times.

5. Leg raise: The patient isin sitting with knee bend on the edgeoff the plinth. Ask the patient, toraise the bent knee straight. Repeat the exercise for 12 times.

6. Shortwave diathermy: The subjects were made to sit in a comfortable chair with a back and arm rest, the limb with OA was kept in 90-90 position with foot resting on a low stool. The subjects were instructed not to move and not to touch any cables. The electrodes were positioned over the medial and lateral aspect of the knee (contra planar method) and medium spacing was used with frequency of 27.12 MHz the subjects were asked to inform if they felt anything more than the warmth feel.

Data analysis:

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using statistical package for social science (SPSS) version 24, with a significance level of p value less than 0.05 and a 95% confidence interval set for all analysis. The Shapiro Wilk test was used to determine the normality of

the data. In this study, Shapiro wilk test showed that the datawas normally distributed on the dependent values of VAS (significance 0.396) & WOMAC (significance 0.521) at P > 0.05. Henceparametric test was adopted. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find statistical difference between the groups.

TEST	GROUP–A		GROUP– B		t–TEST	df	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D			
PRE TEST	6.60	1.12	6.53	1.06	.167	28	.868*
POST TEST	2.80	.676	4.00	.925	-4.05	28	.000***

(*-P>0.05),(*-P ≤ 0.001)**

Table-1 Comparison of Visual Analogue Scale Score Between group–A and group–B in preand posttest

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom (df) and p-value between (Group A) & (Group B) in pre test and post testweeks.This table shows that there is no significant difference in pre test values between Group A & Group B (*P > 0.05).This table shows that statistically highly significant difference in posttestvalues between Group A & Group B (***- P ≤ 0.001).

Test	#GROUP–A		#GROUP –B		t–TEST	df	Significance
	MEAN	S.D	MEAN	S.D			
Pre test	46.53	6.43	45.80	4.87	.352	28	.728*
Post test	20.20	3.85	30.93	2.49	-9.05	28	.000***

(*-P>0.05),(*-P ≤ 0.001)**

Table – 2 Comparison of WOMACS core between group– A and group– B in pre and post Test

The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom (df) and p-value between (Group A) & (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values between Group A & Group B (*P > 0.05).This table shows that statistically highly

significant difference in posttest values between Group A & Group B (***- P ≤ 0.001).

ROUP	PRETEST		POSTTEST		t–TEST	SIGNIFICANCE
	MEAN	S.D	MEAN	S.D		
GROUP-A	6.60	1.12	2.80	.676	21.76	.000***
GROUP-B	6.53	1.06	4.00	.925	9.90	.000***

(*-P≤ 0.001)**

Table-3 Comparison of Visual Analogue Scale Score within Group–Aand Group–B between Pretest and Post Test

The above table reveals the Mean, Standard Deviation(S.D),t-value and p-value between pre-test and post-test within Group – A & Group – B . There is a statistically highly significant difference between the pretest and posttest values within Group A and Group B (***- P ≤ 0.001).

Group	PRETEST		OSTTEST		t–TEST	Significance
	MEAN	S. D	MEAN	S. D		
Group- A	46.53	6.43	20.20	3.85	28.18	.000***
GROUP- B	45.80	4.87	30.93	2.49	17.26	.000***

(*-P≤ 0.001)**

Table–4 ComparisonofWOMAC score within Group–A & group –B between pre-&post testvalues

TheabovetablerevealstheMean,StandardDeviation (S.D), t-valueandp-value between pre-test and post-test within Group – A & Group – B. There is a statistically highlysignificant difference between the pretest and posttest values within Group A and Group B (***- P ≤ 0.001).

RESULT

On comparing the mean values of Group A & Group B on Visual Analogue Scale Score, it shows a significant decrease in the post test mean values in both groups, but (Group A – Resisted Exercises) shows 2.80 which has the

lower mean value is more effective than(Group B–Eccentric Exercises) 4.00 at P≤ 0.001.

On comparing the mean values of Group, A & Group B on WOMAC score, it shows a significant decrease in the post test mean values in both groups, but (Group A – Resisted Exercises) shows 20.20 which has the lower mean value is more effective than(Group b– Eccentric Exercises) 30.93atP ≤0.001. On comparing Pretest and Posttest within Group A &Group B on VAS and WOMAC score shows highly significant difference in mean values at P ≤ 0.001

DISCUSSION

The study was conducted with the purpose to evaluate the effectiveness ofresisted exercise with shortwave diathermy and eccentric exercise with shortwave diathermy on pain and functional disability among OA knee subjects. And the study was done using 30 subjects for a period of 6 week.

Kevin R Vincent, Terrie et al 2019; Through their study concluded that eccentric and concentric resistance training effectively increased leg strength and modifies function and pain symptoms [19].

Eccentric training with high number of repetitions was effective to improve functional capacity and decrease pain in patients with OA of the knee [20].

Subjects treated with Shortwave diathermy had significantly greater ROM and function than ice group[21].

A study on resistance exercise is beneficial interms of reducing pain, alleviating stiffness, improving physical function in patients with knee osteoarthritis[22].

Resistance exercise decreases pain and increases functional ability of subjects with OA knee. After 6 weeks of treatment, the pre-test and post-test value using Visual Analog scale and WOMAC Index revealed significant difference in post-test values of both [23, 24]. It is highly suggestive to include Resisted exercise and shortwave diathermy for Osteoarthritis of knee

CONCLUSION

The study can be concluded that Resisted exercise and Shortwave therapy is more effective than Eccentric exercise and Shortwave therapy in decreasing pain and increasing functional ability in subjects with Osteoarthritis of the knee

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