



A Comparative Study of Kinematic Chain Exercise with Theraband Exercises in Osteoarthritis of Knee

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ABSTRACT

Arthritis is one of the common crippling diseases of the past which causes long-term disability. The concept of wear and tear is generally attributed of **osteoarthritis**. This condition is strongly age related heterogeneous group of disorders in synovial joint being less common before 40 years , but rising in frequency with age. Osteoarthritis (OA) has a very high prevalence among middle aged and elderly people and the diseases is responsible for substantial direct and Indirect socioeconomic costs and the treatment options are few and unsatisfactory. Osteoarthritis mainly affects the weight bearing joints. It varies from person to person. In India osteoarthritis of knee is common more than any other joint due to their cultural practices of crossed leg sitting and squatting it is marked by pain, stiffness and muscle atrophy, deformity and progressive loss of independence. In OA, the role of physiotherapy is vast, besides these kinematic chain exercises plays a vital role now a days. Kinematic chains are usually of open and closed, [1] which is mainly based on the contacts of the distal end either in stationary (or) to space. The use of elastic resistance [2] products in therapeutic exercise programs has become widespread in rehabilitation and has been shown to be an effective method of providing sufficient resistance [5] to improve muscle strength. Kinematic chain exercises along with theraband [1] exercise play a great role in strengthening the knee joint. In this project we are dealing with this kinematic chain exercises along with theraband exercise for osteoarthritis knee to make themselves independent [11] in their activities of daily living.

Keywords: Osteoarthritis, Kinematic exercise, Thera – Band, Range of motion, Visual Analogue Scale, WOMAC Questionnaire

1. INTRODUCTION

Osteoarthritis is strongly age related heterogeneous group of disorders in synovial joint being less common before 40 years , but rising in frequency with age. Osteoarthritis (OA) has a very high prevalence among middle aged and elderly people and the diseases is responsible for substantial direct and Indirect socioeconomic costs and the treatment options are few and unsatisfactory. **Osteoarthritis** of the knee is the most common joint disorder, accounting for a large proportion of disability in adults. It is a Morphologic, biochemical, molecular changes of both cells and matrix which leads to softening, fibrillation ulceration, loss of articular cartilage, sclerosis and eburnation of the subchondral bone. Aging and sedentary lifestyles are the hall marks of these changes associated with deconditioning and degeneration. There are mainly two types of OA **Primary OA** and **secondary OA**.

Primary OA is due to the Intrinsic alteration of articular tissue themselves. Secondary OA arises as a consequent of another condition.(such as trauma or dysplasia). It is divided into one of the following four categories. Metabolic, anatomic, traumatic and inflammation. The clinical problems associated with these is pain, swelling, Resisted movements and inability to squat in the Indian toilet insidious onset of mild aching pain and relieved by rest. Other symptom is stiffness which is maximum at the end of a long rest period and loosens on activity for a few minutes

Osteoarthritis mainly affects the weight bearing joints. It varies from person to person. In India osteoarthritis of knee is common more than any other joint due to their cultural practices of crossed leg sitting and squatting it is marked by pain, stiffness and muscle atrophy, deformity and progressive loss of independence. In OA, the role of physiotherapy is vast, besides these kinematic chain exercises plays a vital role now a days. Physiotherapy management will centre on regarding function and mobility through exercise, pain relieving measures and advice. The physiotherapist will attempt to minimize future disability while maximizing function. Kinematic chains are usually of open and closed, [1] which is mainly based on the contacts of the distal end either in stationary (or) to space. The use of elastic resistance [2] products in therapeutic exercise programs has become widespread in rehabilitation and has been shown to be an effective method of providing sufficient resistance [5] to improve muscle strength. Kinematic chain exercises along with theraband [1] exercise play a great role in strengthening the knee joint. In this project we are dealing with this kinematic chain exercises along with theraband exercise for osteoarthritis knee to make themselves independent [11] in their activities of daily living.

1.1 AIM OF THE STUDY

To study the efficacy of kinematic chain exercise with theraband exercise in subjects with osteoarthritis of knee

1.2 OBJECTIVE OF THE STUDY

To find the efficacy of kinematic chain exercise in relieving the pain and improving the range of motion among the subjects with osteoarthritis of knee, to find the efficacy of combination of kinematic chain exercise and Theraband exercise in relieving the pain and improving the range of motion among the subjects with osteoarthritis of knee and to compare the efficacy of kinematic chain exercise and Theraband exercises in subjects with osteoarthritis of knee.

1.3 MATERIALS AND METHODOLOGY

MATERIALS USED: Theraband , WOMAC Questionnaire (Western Ontario and McMaster Osteoarthritis Index) , Towels and Pillows, Treatment table, Universal Goniometer

METHODOLOGY

Study design

This study is an comparative study with pre and post test evaluation.

Sample collection

To perform the study the patients were divided into 2 groups (group A & B) of 3 each using purposive sampling technique and informed consent of each was taken.

- **Group A received Kinematic chain exercise**
- **Group B received kinematic chain exercises with Theraband Exercises**

1.4 Inclusion Criteria

- Patient in the age group of 40-50 years of both sexes
- Unilateral knee involvement with tibiofemoral arthritis
- Duration more than 3 months
- Those fall over Grade 1 on the kellegren and Lawrence scale
- Visual Analog Scale Score between 5-8

1.5 Exclusion Criteria

- Prior knee surgery
- Patellofemoral arthritis
- Any acute inflammatory condition
- Having any systemic diseases
- Having taken any physical therapy in past one month
- Having received steroid injection
- Rheumatoid arthritis

1.6 Study period

- Six subjects fulfilling the inclusive criteria are included in the study for three months.

Study setting

- The study was conducted in Shri Indra Ganesan Institute Of Medical Science, College Of Physiotherapy Outpatient Department, Trichy.

Study method

- comparative study

1.7 OUTCOME MEASURES

With the help of the measurement tools like assessment, Visual analogue scale, WOMAC questionnaire and Range of motion

1.8 STATISTICAL ANALYSIS

The collected data will be tabulated and analyzed using descriptive & inferential statistics. To all the parameters mean and standard deviation (SD) will be used. Paired t-test will be used to analyze significant changes between pre-test & post-test measurements.

1.9 HYPOTHESIS OF THE STUDY

NULL HYPOTHESIS: There will be no significant difference in the effect of combination of kinematic chain exercise and Theraband exercises than kinematic chain exercise alone in subjects with osteoarthritis of knee.

ALTERNATE HYPOTHESIS: There will be a significant difference in the effect of combination of kinematic chain exercise and Theraband exercises than kinematic chain exercise alone in subjects with osteoarthritis of knee.

2. PROCEDURE

The subject referred to Shri Indra Ganesan Institute Of Medical Science College Of Physiotherapy, outpatient department were considered for study informed consent was taken from the participants and they were arranged subjected to treatment subjects were assessed for baseline data's of numerical pain rating scale and goniometry. A two group of three members were identified with the help of provisional diagnosis. Their pain was assessed with the help of visual analogue scale , WOMAC questionnaire. Their range of motion was with the help of goniometry. The patients who has osteoarthritis was treated with kinematic chain exercises and theraband exercises program. The Pre test data and post test data was collected The results were recorded. The results of post test of the same parameter was recorded and compared.

2.1 PARAMETERS:

Visual analogue scale, WOMAC questionnaire and Range of motion using Universal Goniometer

Visual Analogue scale

Pain intensity: Measured by means of Visual Analogue Scale (VAS). For recording the subjects were asked to mark their intensity of pain on a 10 centimetre long line. Marked with numbers 0-10 where 0 indicated no pain and 10 was for maximum pain.

WOMAC Questionnaire

WOMAC (Western Ontario and McMaster Osteoarthritis Index): WOMAC scale has 17 items divided into 3 sections (A, B, C), i.e. section A for pain and section B .Stiffness and section C for functional difficulty. Subjects were asked to rate their score out of 5 .Grades of severity, i.e. no pain, mild pain, moderate pain, severe pain and extreme pain by marking .The grade on a line representing for the 5 grades.

RANGE OF MOTION (ROM)

Knee Range of Movement: Knee range of motion for both flexion and extension was measured with the Goniometer for both active and passive range of motions using the standard technique of measuring range of motion of knee joint.

2.2 TECHNIQUES USED

1. KINEMATIC CHAIN EXERCISE:

The following exercises are coming under the Kinematic Chain Exercises.

- **QUADRICEPS EXERCISE:** Instruct the patient to sit on the bed with a small pillow beneath the affected knee and press it down with the knee several times. This helps strengthen the all important quadriceps muscles.
- **STRAIGHT LEG RAISES:** With the patient supine, instruct them to lift the leg straight without being at the knee and hold it straight for some time men repeat it with the other leg A therapist is required to teach the patients these simple exercises.
- **STRENGTHENING EXERCISES:** While doing the above active knee exercises, instruct the patient to for resistance exercises and is aimed at strengthening the Quadriceps Active knee flexion and Active knee extension.

2. THERABAND EXERCISE

- **SEATED KNEE EXTENSION WITH RESISTANCE:** Sit in a chair with a resistance band around one of the chair's legs and an ankle on

the same side as the chair. Slowly straighten your leg until it's about 2/3 straight, hold for five seconds, and slowly return to start.

- **SEATED KNEE FLEXION WITH RESISTANCE:** Sit in a chair with the resistance and tied to a table ,tie the other end of the band to your leg , slowly slide your heel back bending the knee and pull against resistance wait for 3-5 seconds and return to starting position.
- **SEATED LEGPRESS WITH RESISTANCE BAND :** Sit with theraband looped around the ball of your foot and held tightly in your hands, knee and hips are bent. Push your foot away, straightening your knee and hip pushing against the resistance band. Hold or do small pulses bending the knee slightly for 3-5 seconds. Slowly return to starting position



Figure :1 Seated legpress with resistance



Figure :2 lying knee extension with resistance

- **LYING KNEE EXTENSION WITH RESISTANCE:** Lie down on your back. Bring your right knee to your chest then wrap the power band under your heel. Grab the firmly with both hands with the back of your upper arm in contact with the floor. Slowly extend your knee and lift your leg up so your toes. Return to the starting position in a slow,controlled motion.

TABLE 1

Table 1 represent the mean values, mean difference, standard deviation, t value between the pre test and post test of VAS scale of group A.

S. No	VAS Group A	Mean	Mean Difference	Standard Deviation	T value
1	Pretest	7.6	4	5.65	1.224
2	Post test	3.6			

TABLE 2

Table 2 represent the mean value, mean difference, standard deviation, t value between pre test and post test of VAS scale of group B.

S. No	(VAS Group B)	Mean	Mean difference	Standard Deviation	T value
1	Pre test	8.3	5	6.57	1.231
2	Post test	3.3			

On comparing the table 1 and table 2, the mean difference and standard deviation of group B is greater than the mean difference and standard deviation of group A , which shows there is significant difference in group B when compared to group A. Therefore the study is rejecting the null hypothesis and accepting the alternative hypothesis.

TABLE 3

Table 3 represent the mean value, mean difference, standard deviation, t value between pre test and post test of WOMAC scale of group A.

S. No	WOMAC Group A	Mean	Mean Difference	Standard Deviation	T value
1	Pre test	63	31.34	44.31	1.224
2	Post test	31.66			

TABLE 4

Table 4 represent the mean value, mean difference, standard deviation, t value between pre test and post test of WOMAC scale of group B

S. No	WOMAC Group B	Mean	Mean Difference	Standard Deviation	T value
1	Pre test	67.66	36.33	51.41	1.223
2	Post test	31.33			

On comparing the table 1 and table 2 , the mean difference and standard deviation of group B is greater than the mean difference and standard deviation of group A, which shows there is significant difference in group B when compared to group A. Therefore the study is rejecting the null hypothesis and accepting the alternative hypothesis.

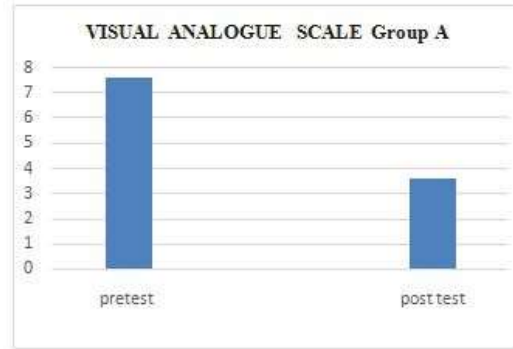


Figure: 3 Graphical representation of VAS (Group A)

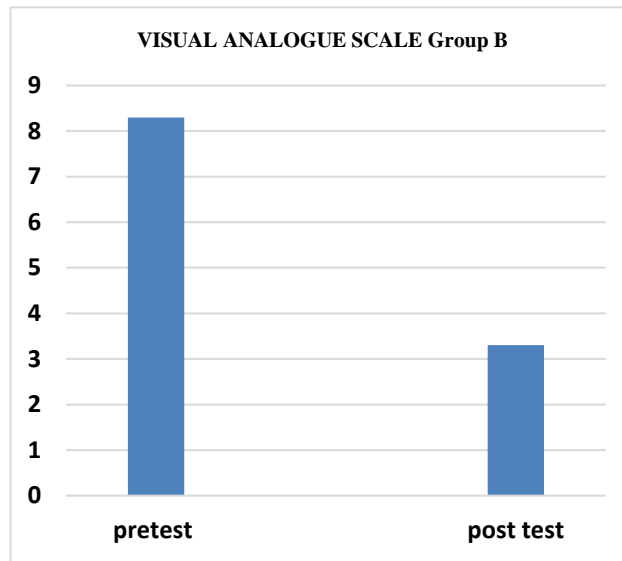


Figure: 4 Graphical representation of VAS (Group B)

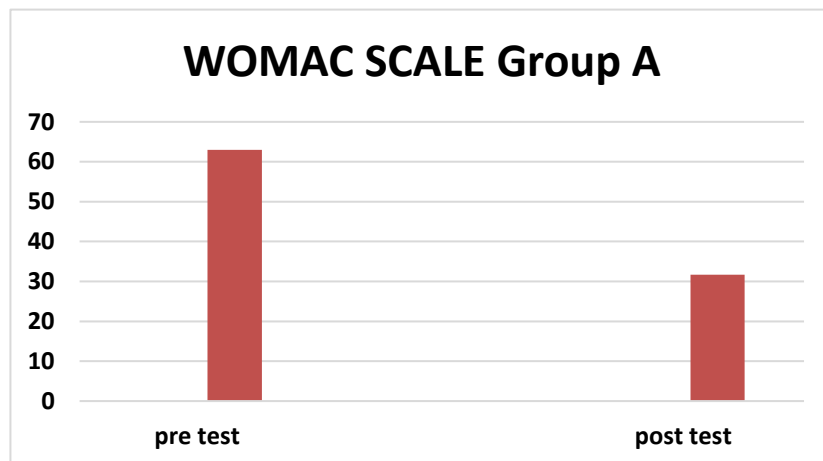


Figure: 5 Graphical representation of WOMAC scale group A

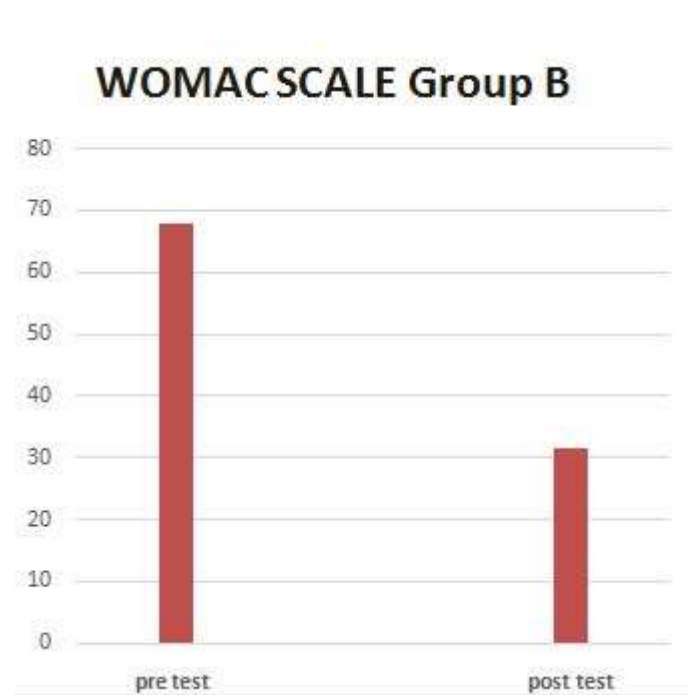


Figure: 6 Graphical representation of WOMAC scale Group B

2.3 DISCUSSION

The aim of study was to find out the effectiveness of kinematic chain exercise and theraband exercise in patients with osteoarthritis of knee. A total no of 6 patients with knee osteoarthritis were considered, they were split into two group with three members each. One group was treated with kinematic chain exercise only and other was treated with kinematic chain exercise along with theraband exercise. After 12 weeks a post test was conducted by VAS score, womac questionnaire and result was recorded and further statistical analysis. The analysis of result showed that there is a significant improvement for pain relief and increase the range of motion.

2.4 LIMITATIONS

This study duration was short only 8 weeks and the result apply to commonly and short term only, which might differ in longer run. Sample size take for the study is small and bigger example might have lead to some difference in the results. Limited parameter of outcome measures was used which might bias the result. There are some limitations with respect to data source and availability, which should be taken into consideration when interpreting the results.

2.5 RECOMMENDATIONS:

Follow up can be extended to study the long term benefits of kinematic chain exercise along with Theraband exercises. Long term study with more subjects might give more lucid conclusion. Further studies can be made in varied subject groups like difference in Age groups, sex, Level of activity and BMI score >30. Study can be extended by comparing with other treatment modalities using a control Group.

2.6 CONCLUSION

In present study, it can be concluded, that kinematic chain exercise along with Theraband exercise for duration not less than 12 weeks is an effective practice for osteoarthritis of knee. As the exercises has a great advantage of being easy and can be done at any time without being noticed by others. It also has significant positive effect on strengthen knee joint muscles and these exercises significantly improve the quality of life. In due course it has been concluded that the kinematic chain exercise along with Theraband exercise is helpful in subjects with osteoarthritis of knee.

2.7 References

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