A COMPARATIVE STUDY ON EFFECTIVENESS OF LATERAL WEDGE HEEL AND CLOSED KINEMATIC CHAIN EXERCISE IN PATIENTS WITH ACUTE OSTEOARTHRITIS

A dissertation submitted in partial fulfillment of the requirement for the degree of

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TAMIL NADU

INDIA

A COMPARATIVE STUDY ON EFFECTIVENESS OF LATERAL WEDGE HEEL AND CLOSED KINEMATIC CHAIN EXERCISE IN PATIENTS WITH ACUTE OSTEOARTHRITIS

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SUBMITTED IN THE PARTIAL FULFILLMENT OF THE REQUIREMENT FOR DEGREE OF "MASTER OF PHYSIOTHERAPY" AT THE TAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY,

CHENNAI

APRIL 2011

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INTERNAL EXAMINER:

EXTERNAL EXAMINER:

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DECLARATION

I hereby declare and present my project work entitled "**A COMPARATIVE STUDY ON EFFECTIVENESS OF LATERAL WEDGE HEEL AND CLOSED KINEMATIC CHAIN EXERCISE IN PATIENTS WITH ACUTE OSTEOARTHRITIS"** The outcome of the original research work undertaken and carried out by me, under the guidance of Associate Professor **Mr. M. K. FRANKLIN SHAJU, MPT, MSPT., (Ph.D)., RVS COLLEGE OF PHYSIOTHERAPY,** Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University.

SIGNATURE

ACKNOWLEDGEMENT

I give my thanks to God almighty for providing me the wisdom and knowledge to complete my study successfully.

I acknowledge my sincere thanks to **CHAIRMAN and SECRETARY OF R.V.S EDUCATIONAL TRUST,** Sulur, Coimbatore for providing me an opportunity to do this project.

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I. INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or describes In terms of from potentially damaging situations, protect a damaged body part white it heels and avoid those situations in the future.

Knee joint is one among the major joints of the body which is prone to several painful conditions. Pain can occur in the knee, from diseases or conditions that involve the soft tissues, bones surrounding the joint or the nerve that supply sensation to the joint.

Knee pain is an extremely common complaint and there are many causes. It includes arthritis, meniscal pathology, ligament injury, infections and rarely tumors of bone etc., The most common cause to provoke pain in knee is osteoarthritis.

Osteoarthritis also known as degenerative arthritis or degenerative joint disease is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone. Symptoms of knee osteoarthritis include joint pain, tenderness, stiffness, locking and sometimes an effusion.

Knee joint is divided into 3 compartments. Medial compartment, lateral compartment and patellofemoral compartment. All three compartments are prone to get affected by osteoarthritis. Among the three compartments, medial compartment is more frequently affected than the other two compartments.

In walking, the normal forces acting on the leg produce a varus torque (a torque tending to adduct the knee into varus).This varus torque is directly associated with the compressive forces across the medial aspect of the knee, which is nearly 2 ½ times the forces through the lateral aspect of knee.

Medial osteoarthritis also known as varum gonarthrosis is a common problem that produces considerable functional limitation for affected patients. although the etiology is not well defined, many investigators suggest that factors such as obesity, heavy physical labour,prior knee trauma as well as structural deformity of the lower limb plays a significant role in the pathophysiology of osteoarthritis of knee.

Knee osteoarthritis occurs symptomatically in approximately 8% of adults in the age group of 65 yrs and older. the predominance of medial compartment osteoarthritis likely results from the high medial compartment forces from the high medial compartment forces during weight bearing activities such as walking,whichis by far the most common daily activity exerting the greatest repetitive forces through the knees.

Exercises in closed kinetic chain promotes more balanced initial quadriceps activation than does exercise in open kinetic chain exercise. Thus the purpose of the study is to decrease the load on the medial compartment of the knee with lateral wedge insole and to know the effect of closed kinematic chain exercises.

EPIDEMIOLOGY:

Radiographic and autopsy studies show that osteoarthritis preferentially targets only certain small and large joints. The overall prevalence starts from age group of 30 years and by 60 years, 80% of people have some radiographic evidence of osteoarthritis, though only 25-30%

have associated symptoms. The knee and hip are the principle sites of significant disability. Knee osteoarthritis is more prevalent than hip osteoarthritis but taken together they affect 10-25% of those aged over 65 years.

Tibiofemoral joint forces

When standing on both feet; the body weight vector passes between the knees, and each tibial plateau has a compressive force of 45% of body weight. In person unilateral stance, however, the compressive force increases to about twice the body weight. The force is equally distributed over the weight bearing surfaces of the tibia. The knee supports the weight of the tight and the opposite lower extremity. This weight acts through a center of gravity that is slightly higher than s2 and projects to the base of support, thus passing on the medial side of the knee causing a varus thrust.

Tibiofemoral joint forces during walking have been calculated to be up to six times body weight at the beginning of the single leg stance phase.During the stance phase, the compression forces fall to equal body weight and then rise to four times body weight at the end of single leg stance. In the swing phase, the compression on the joint surfaces is less than body weight.

Abnormalities that alter the torque of the weight cause movement of the central joint force medially or laterally with unequal distribution of compression forces.Areas receiving excessive physiologic pressure over many years may develop pain, destruction of cartilage, and osteoarthritis. An example of biomechanical causes in the development of knee joint pathology can be seen in obesity. As the weight gain increases, the individual can be seen to shift the trunk more and more laterally with each step in walking.

The management for osteoarthritis includes conservative and surgical techniques. Analgesics and non steroidal anti inflammatory drugs (NSAID's) play a major role in controlling pain.

In most chronic cases and in patients whose symptoms are not adequately controlled with medial therapy and who have moderate to severe pain and functional impairment are candidates for orthopedic surgery.

Osteotomy may be performed if significant misalignment of the knee or hip joint is present. Also total joint arthroplasty has an excellent outcome and markedly improves quality of life.

In recent days, wearing appropriate footwear is a management strategy recommended in recent knee osteoarthritis guidelines.

Statement of the problem:

A study to compare the effectiveness of lateral wedge heel and closed kinematic chain exercise in reducing pain and improving function among acute osteoarthritis of knee.

Aim and need for the study:

- The study helps in promoting awareness among the therapist regarding the foot wear modification for osteoarthritis patients .
- The study helps the patient population regarding the importance of the foot wear.

Hyopthesis:

Null hypothesis:

There is no significant difference in pain and functional activities following heel wedge correction along with conservative management and closed kinematic chain exercise along with conservative management among osteoarthritis patients.

Alternate hypothesis:

There is significant difference in pain and functional activities following heel wedge correction along with conservative management and closed kinematic chain exercise along with conservative management among osteoarthritis patients.

OPERATIONAL DEFINITIONS

Pain:

It is an unpleasant sensory or emotional experience which is usually associated with or described in terms of tissue damage or both. Pain acts as a warning signal that an injury is immediately impending such as touching a hot object or has occurred.

Osteoarthritis:

Osteoarthritis(OA) also known as degenerative arthritis or degenerative joint diseases which includes a group of mechanical abnormalities involving degradation of joints, articular structures and subchondral bone. Symptoms may include pain, tenderness, stiffness, locking and sometimes an effusion.

Closed Kinetic Chain Exercises:

These are Physical exercises performed where the foot is fixed and cannot move. The foot remains in constant contact with the surface, usually the ground or the base of a machine. These exercises are typically weight bearing exercises, where an exerciser uses their own body weight and/or external weight.

Lateral Heel Wedge (LHW):

Lateral heel wedge is a modified foot wear in which the lateral arch of the sole is elevated. This wedge helps in shifting the weight from the medial compartment to lateral compartment of knee and there by reduces the load on medial compartment.

II. REVIEW OF LITERATURE

Tuzun EH, Eker L, (2008) did a study on reliability, validity and acceptability of WOMAC Index. He concluded that the functional ability of the subjects are improved with therapeutic procedures after a period of 8 weeks.

Roddy E, Zhang W, Doherly (2007) did a study on strengthening exercise for osteoarthritis of knee. They concluded that static quadriceps exercise improve strength and reduce pain in patients with osteoarthritis.

Brovwer RW, Jakma TS (2005) did a study on effectiveness of braces and orthoses in osteoarthritis. Their study concluded that the lateral wedge insole produced significant results than the neutral insole foot wear

Boonsta, Anne M, Schiphorst Preuper (2004) Conducted a study to determine the reliability and validity of visual analogue scale in chronic musculoskeletal pain aged over 18 years. The study population consists of 52 patients in the reliability study and 344 patients in the validity study The conclusion of the study was that the validity of VAS was moderate to good and its reliability was questionable.

Olaegun , Mathew , Adedoyin , Rufus , (2004) Conducted a study to determine the intra-class and inter-class correlation of VAS and a scmatic differential sibe in patients with low back pain. 25 patients with chronic low back pain were selected for the study. Two testers independently rated the pain experienced by the patient. The results suggested that visual analogue scale is reliable and valid for clinical rating of low back pain.

Pham T, Maillefort JF, Hordy c (2004) did a two year study on laterally elevated wedged insoles in the treatment of medial knee osteoarthritis. They concluded that the study produced beneficial effects in medial tibiofemoral osteoarthritis.

Stendsdotter, A.K, P.W. Hodges, R. Mellor (2003) did a study on quadriceps activation and concluded that closed kinematic chain exercise promotes more balanced initial quadriceps activation than in open kinematic chain exercise.

D. Casey Kerrigan (2002) did a study on effectiveness of lateral wedge heel on knee varus torque in patients with knee osteoarthritis. They concluded that the wedged insoles are Bio-mechanically effective and reduce loading of the medial compartment in persons with medial knee osteoarthritis.

Segal N and Toda Y (2001) did a study on effectiveness of insole with subtalar strapping for patients with medial osteoarthritis. The results of their study showed that lateral wedge insole induces symptomatic relief in patients with varus deformity of osteoarthritis .

Crenshaw SI, Pollo FE, Calton (2000) analyzed the effects of lateral wedge insole on osteoarthritis. They concluded that reduction in pain and improvement in function is reported by the patient with the usage of lateral wedge heel.

Bennell K, Bowles KA, Hinman R (1999) did a study on two hundred participants with painful medial knee osteoarthritis. Their study concluded that laterally wedged insoles are effective in shifting the compressive forces from medial compartment to lateral compartment.

Kawamura Kenji (1999) did a study on closed kinematic chain exercise for osteoarthritis patient. He concluded that leg press is safe and effective for the patients with acute osteoarthritis.

Stucki G Sangha O et al. (1998) Comparison of WOMAC (Western Ontario and McMaster Universities) osteoarthritis index and a self-report format of the self-administered Lequesne-Algofunctional index in patients with knee and hip osteoarthritis. Osteoarthritis and Cartilage.

Stuart MJ, Meglan DA (1996) did a comparative study on intersegmental tibiofemoral joint forces and muscle activity during closed kinematic chain exercise and concluded that the anteroposterior shear forces correspond to anterior and posterior cruciate ligament forces in osteoarthritis of knee.

Hawker G Melfi C et al.(1995) Comparison of a generic (SF-36) and a disease specific (WOMAC) instrument in the measurement of outcomes after knee replacement surgery. J Rheumatol.

J.Robert giffin(1994) did a study on the application of lateral heel wedge as a non-operative treatment for varum gonarthrosis. He concluded that the lateral wedge provide functional effects of the lower leg during static standing and free-speed gait.

Lutz GE Palmitier (1993)did a study on tibiofemoral forces during closed kinematic chain exercise. He concluded that closed kinematic chain exercises produced greater compression forces and increased muscular co-contraction in patient with osteoarthritis.

Bellamy N Buchanan WW et al. (1988) Validation study of WOMAC: A health status instrument for measuring clinically important patient relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee.

III. RESEARCH DESIGN AND METHODOLOGY

Research Design:

Experimental study, comparative in nature.

Sample size:

30 subjects were selected and divided into two groups A and B

- Group A consists of 15 subjects who receives lateral wedge heel with wax therapy and Isometric Quadriceps exercise.
- Group B consists of 15 subjects who receive closed kinematic chain exercise along with wax therapy and Isometric Quadriceps exercise.

Study Duration:

6 weeks.

Study setting:

Department of physiotherapy, Gayathri hospital, Madurai.

Inclusion criteria:

- With radiographs, clinically diagnosed acute osteoarthritis with most involvement of medial compartment of knee
- Age group of 40-45
- Males alone are included

Exclusion criteria:

- Soft tissue injuries
- Diabets mellitus
- Fractures around hip and knee
- Joint infections
- Meniscal injuries
- Ligament injuries.

Variables:

1. **Independent variables**

- Lateral wedge heel
- Closed kinematic chain exercise

2. **Dependent variables**

- Pain
- Knee function

Measurement tools:

- VAS (Visual analogue scale)
- WOMAC (Western Ontario and McMaster universities) Index of osteoarthritis.

Procedure:

The study is carried out in 4 steps.

STEP 1 : Pre-test all the participants regarding the dependent variables.

STEP 2 : Divide the subjects randomly into 2 groups

STEP 3 : Treatment interventions.

STEP 4 : Post-test all the participants regarding the dependent variable.

Measurment Procedure:

- Visual Analog Scale (VAS)
- Western Ontario MacMaster Universities Index of osteoarthritis (WOMAC)

Visual Analog Scale :

The VAS is the most commonly known and used for measurement of pain. The scale consists of a straight line of a specified length (100mm) with verbal descriptors at each end. The line may be horizontal or vertical. NO PAIN is on one end of the line and WORST PAIN is on the other end of the line. The subjects are instructed to place a mark on the line to report, the intensity of pain experienced at that moment. Scoring is done by measuring the millimeters from the low end of the scale to the subjects mark.

WOMAC Index:

The WOMAC index is one of the principle condition specified outcome measure used in the management of osteoarthritis. It provides a good function scale because it deals with the activities of daily living.

The index is based on patient's response and concerns affection daily life. The index is out of a total of 96 possible points, with 0 being the best and 96 being the worst.

Individual question responses are assigned a score of between 0(None) and 4(extreme). The scores are than summed to form a raw score ranging from 0(best) to 96(worst). Finally multiplying each score by 100/96 normalizes raw scores.

Treatment Procedure :

Group A :

Lateral Wedge Heel with conventional physiotherapy.

Lateral Wedge Heel :

The subjects were given an alteration in the foot wear. They were provided with a lateral wedge heel insole. 5 degree wedged insole was given to the patients. Pain was assessed by VAS and the functional index was measured by WOMAC index on the first day and at the end of the sixth week.

Isometric Quadriceps exercise:

Position :

Sitting on a couch with the legs parallel to the ground with a towel placed under the knee.

Technique :

The patients were asked to contract the quadriceps and lock the knee by pressing the towel placed under the knee. They were asked to maintain the position for 10 seconds and then release.

Parameters :

2 sets of 10 repititions each for two times a day.

Wax Therapy :

Position :

The subjects were asked to sit on the chair with the thighs parallel to the floor and the foot placed on the ground.

Technique :

Method :

Skin sensation of the patient was checked. Dip and wrap method was then used. 5 to 6 padding was given upto the heat tolerable level of the patient. The treatment was given for a period of six weeks.

Group B :

Closed kinematic chain exercise with conventional physiotherapy

Closed kinematic chain exercise :

Position :

Standing with feet shoulder width apart and the feet facing forwards. Place the ball behind the wall and the lower back.

Technique :

The patient is asked to perform a half squat, keeping the back straight. The knees are seen to be in line with the middle toe.

Paremeters :

2 sets of 10 repetitions each for two times a day.

Isometric Quadriceps exercise:

Position :

Sitting on a couch with the legs parallel to the ground with a towel placed under the knee.

Technique :

The patient is asked to contract the quadriceps and lock the knee by pressing the towel placed under the knee. They were asked to maintain the position for 10 seconds and then release.

Parameters :

2 sets of 10 repititions each for two times a day.

Wax Therapy :

Position :

The subjects were asked to sit on the chair with the thighs parallel to the floor and the foot placed on the ground.

Technique :

Method :

Skin sensation of the patient was checked. Dip and wrap method was then used. 5 to 6 padding was given upto the heat tolerable level of the patient. The treatment was given for a period of six weeks.

IV. DATA ANALYSIS AND INTERPRETATION

Paired ‘t’ test:

The paired ‘t’ test is used to compare the pre and post test values of pain and functional ability of Group A and B

$$t = \frac{\overline{d}\sqrt{n}}{s}$$

$$s = \sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n-1}}$$

d = difference between the pre-test VS post test

d = mean difference

n = number of observations

s = standard deviation

UNPAIRED ‘T’ TEST

The unpaired ‘t’ test was used to compare the statistically significant difference pain and functional ability between Group A and Group B.

$$T = \frac{\overline{x}_1 - \overline{x}_2}{s} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

$$S = \sqrt{\frac{\sum(\overline{X}_1 - X_1)^2 + \sum(\overline{X}_2 - X_2)^2}{n_1 + n_2 - 2}}$$

n_1 = Total number of subjects in group A.

n_2 = Total number of subjects in group B.

X_1 = Difference between pre test Vs post test value of group A.

$\overline{X}_1$ = mean value of difference between pre test Vs post test value of group A.

X_2= Difference between pre post test value of group B.

$\overline{X}_2$= Mean value of difference between pre test Vs post test value of group B.

Table - 1

Table 1 shows the mean value, mean difference, standard deviation & 't' value between pre and post test of pain in group A.

S. No	Variable Pain	Improvement		Standard deviation	Paired 't' value
		Mean	Mean difference		
1.	Pre test	7.2	4	0.70	21.56
2.	Post test	3.2			

In paired 't' test the calculated 't' value is 21.56, 't' table value is 2.145 at 0.05 level. Above values shows that there is significant difference among pre & post test values i.e. there is significant decrease in pain following Lateral wedge heel along with conventional physiotherapy treatment.

GRAPH – 1

Pain difference between Pre and Post test values of Group A

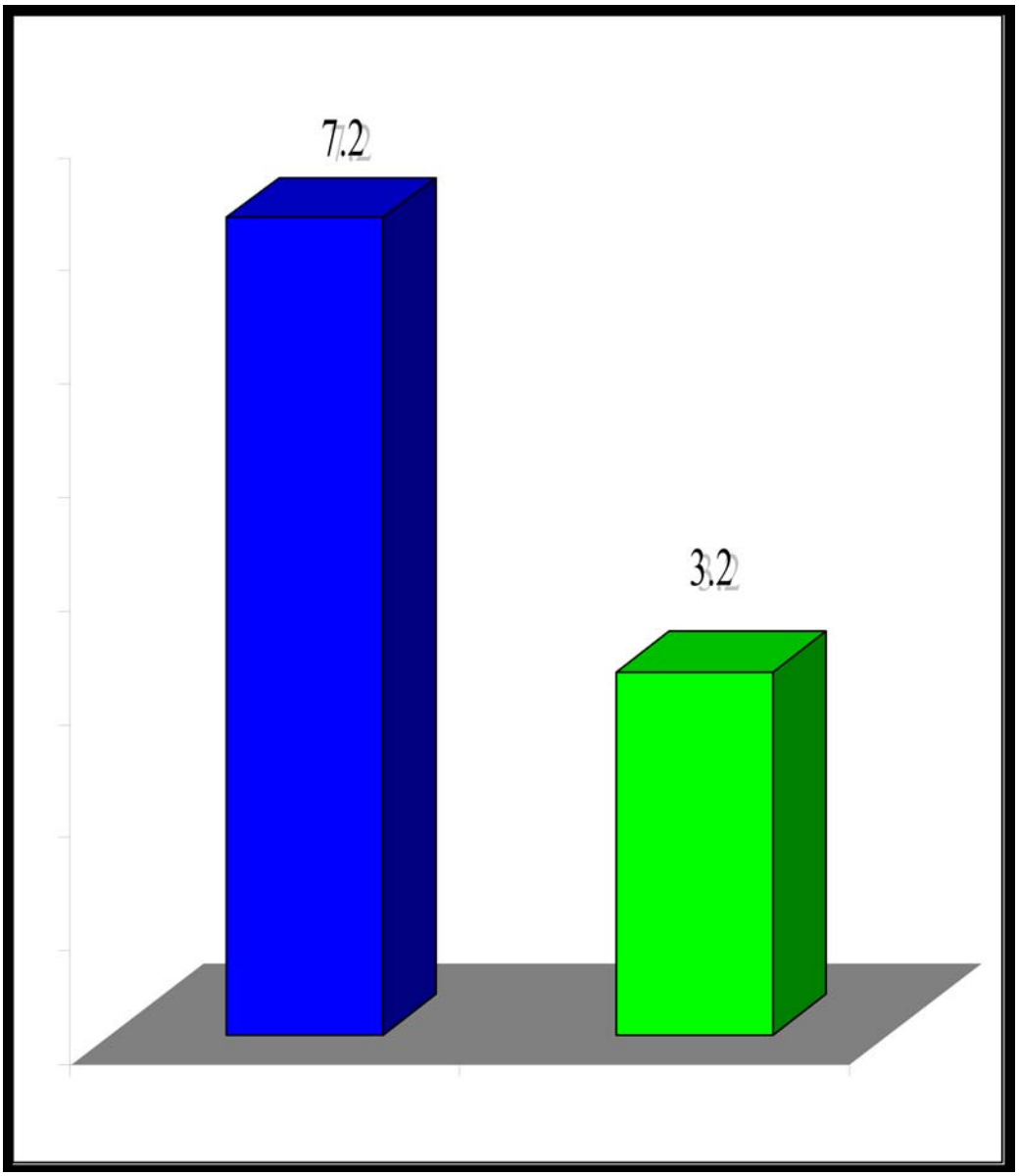


Table - 2

Table 2 shows the mean value, mean difference, standard deviation & 't' value between pre and post test of pain in group B.

S. No	Variable Pain	Improvement		Standard deviation	Paired 't' value
		Mean	Mean difference		
1.	Pre test	7.3	1.6	0.73	8.3
2.	Post test	5.7			

In paired 't' test the calculated 't' value is 8.3, 't' table value is 2.145 at 0.05 level. Above values shows that there is significant difference among pre & post test values i.e. there is significant decrease in pain following Closed kinamatic chain exercise along with conventional physiotherapy treatment.

GRAPH –2

Pain difference between Pre and Post test values of Group B

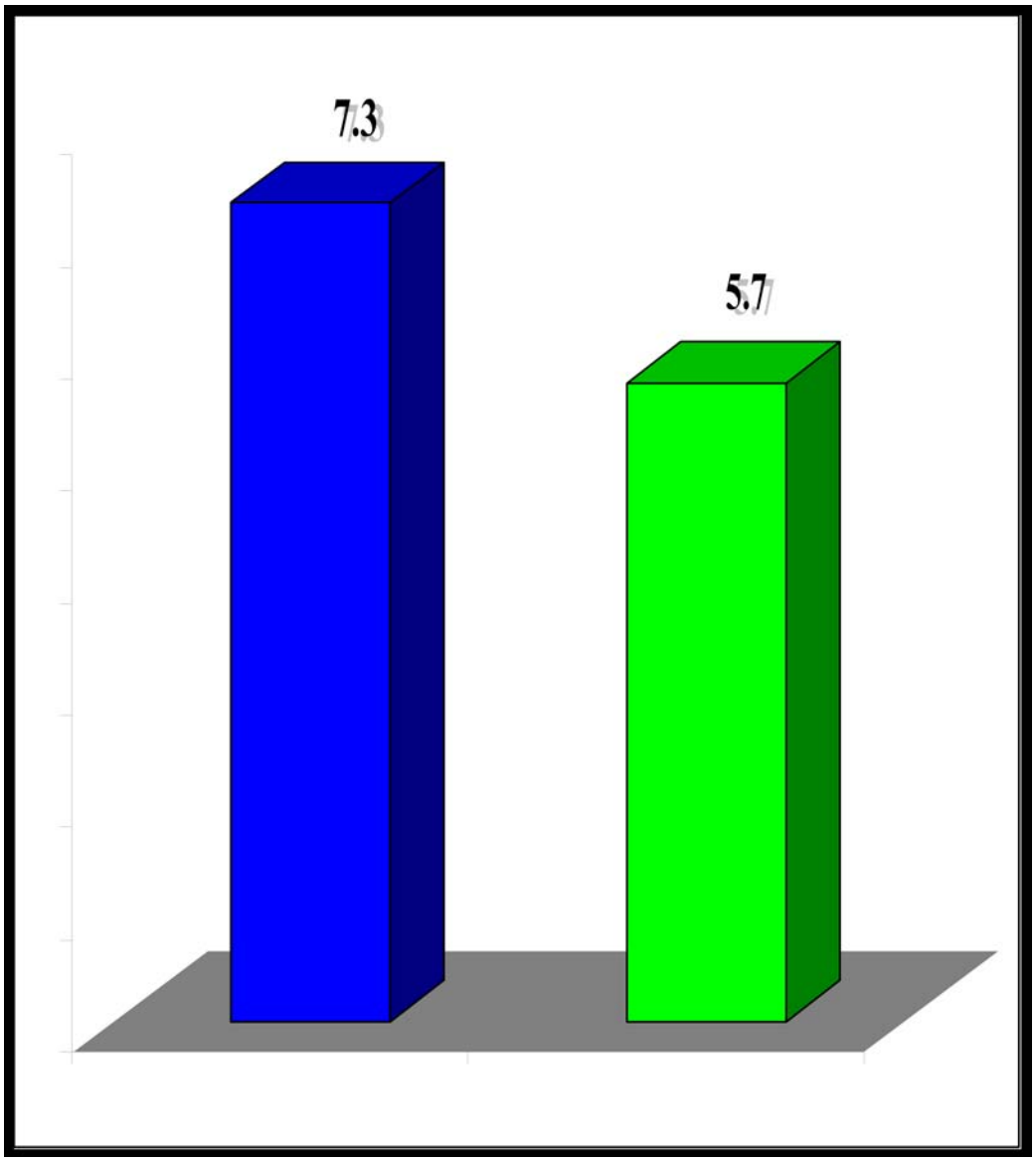


Table - 3

Table 3 shows the mean difference, standard deviation & 't' value between pre and post test of pain in group A & group B.

S. No	Variable Pain	Improvement		Unpaired 't' value
		Mean Difference	Standard deviation	
1.	Group A	4.0	0.72	8.72
2.	Group B	1.6		

In unpaired 't' test the calculated 't' value is 8.72, 't' table value is 2.048 at 0.05 level. Above values shows that there is significant difference between Group A & Group B. i.e., there is significant difference in pain reduction following Lateral wedge heel along with conventional physiotherapy treatment and Closed kinematic chain exercise along with conventional physiotherapy treatment.

GRAPH – 3

Mean difference between Group A and Group B for Pain

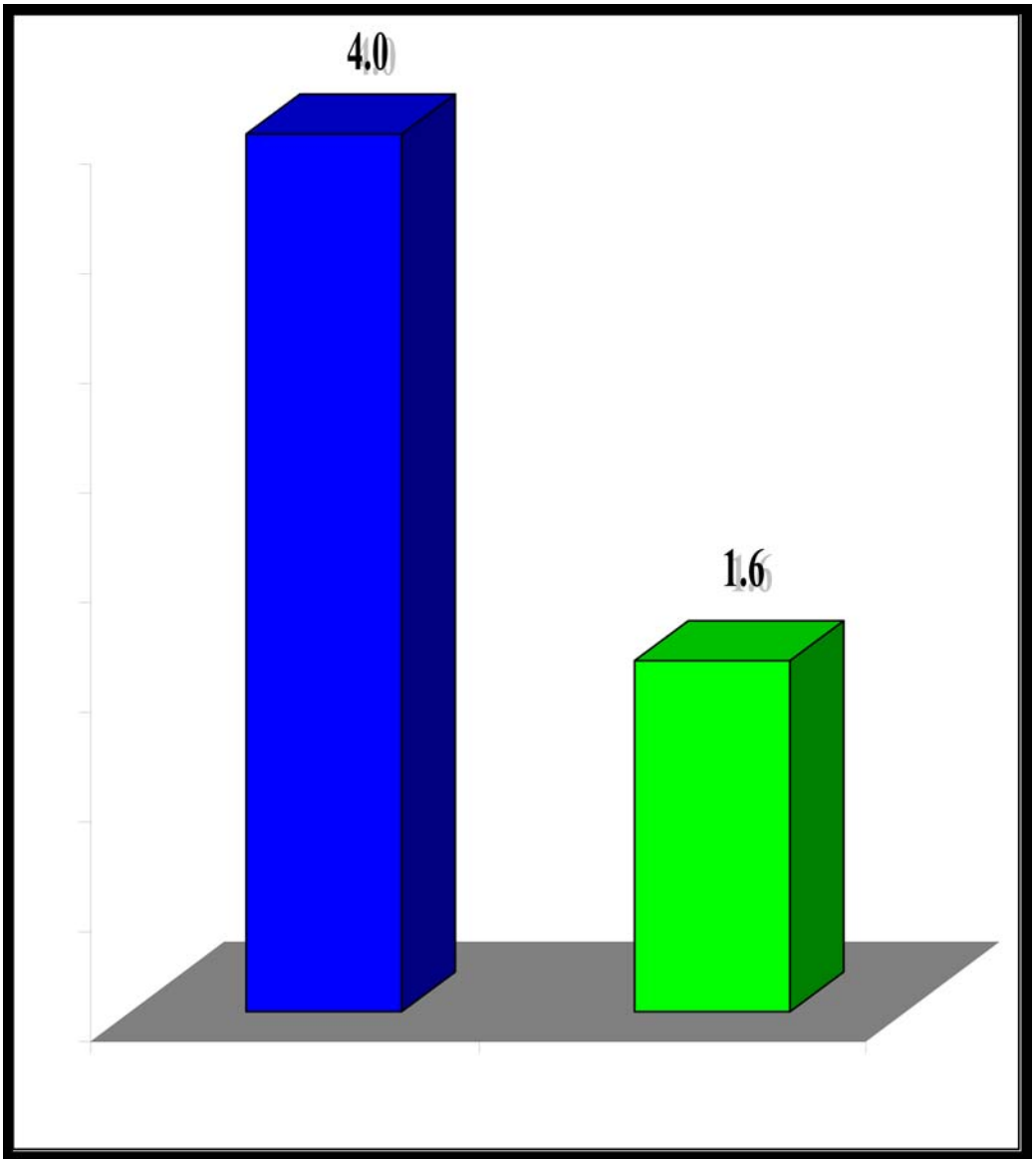


Table - 4

Table 4 shows the mean value, mean difference, standard deviation & 't' value between pre and post test of functional ability in group A.

S. No	Variable Pain	Improvement		Standard deviation	Paired 't' value
		Mean	Mean difference		
1.	Pre test	67.67	10.98	3.25	13.07
2.	Post test	56.68			

In paired 't' test the calculated 't' value is 13.07, 't' table value is 2.145 at 0.05 level. Above values shows that there is significant difference among pre & post test values i.e. there is significant improvement in functional ability following Lateral wedge heel along with conventional physiotherapy treatment. .

GRAPH – 4

Difference in functional ability for Pre and Post test values of Group A

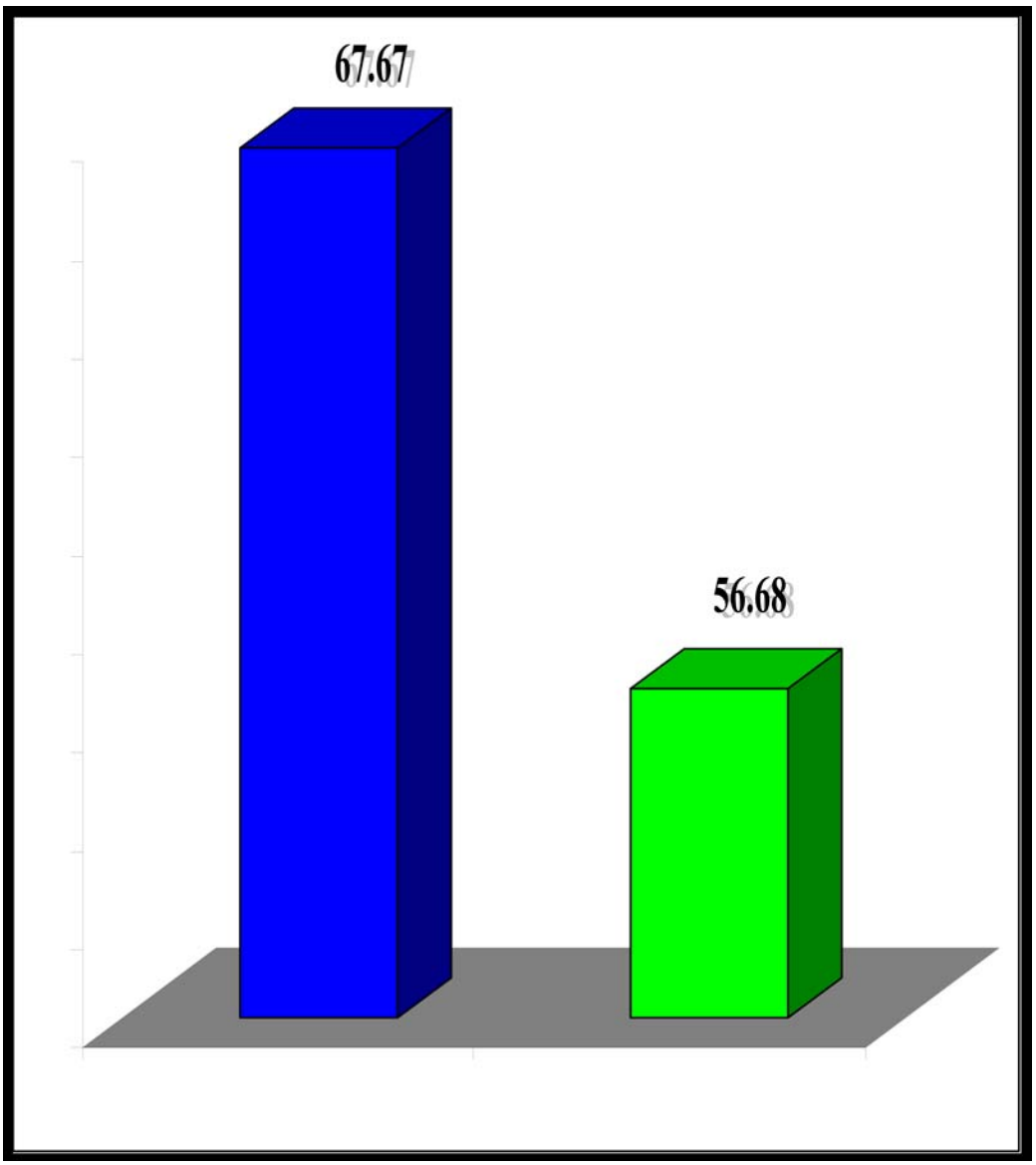


Table - 5

Table 5 shows the comparative value, mean difference, standard deviation & 't' value between pre and post test of functional ability in group B.

S. No	Variable Pain	Improvement		Standard deviation	Paired 't' value
		Mean	Mean difference		
1.	Pre test	70.9	5.61	1.67	12.97
2.	Post test	65.29			

In paired 't' test the calculated 't' value is 12.97, 't' table value is 2.145 at 0.05 level. Above values shows that there is significant difference among pre & post test values i.e. there is significant improvement in functional ability following Closed kinamatic chain exercise along with conventional physiotherapy treatment.

GRAPH – 5

Difference in functional ability for Pre and Post test values of Group B

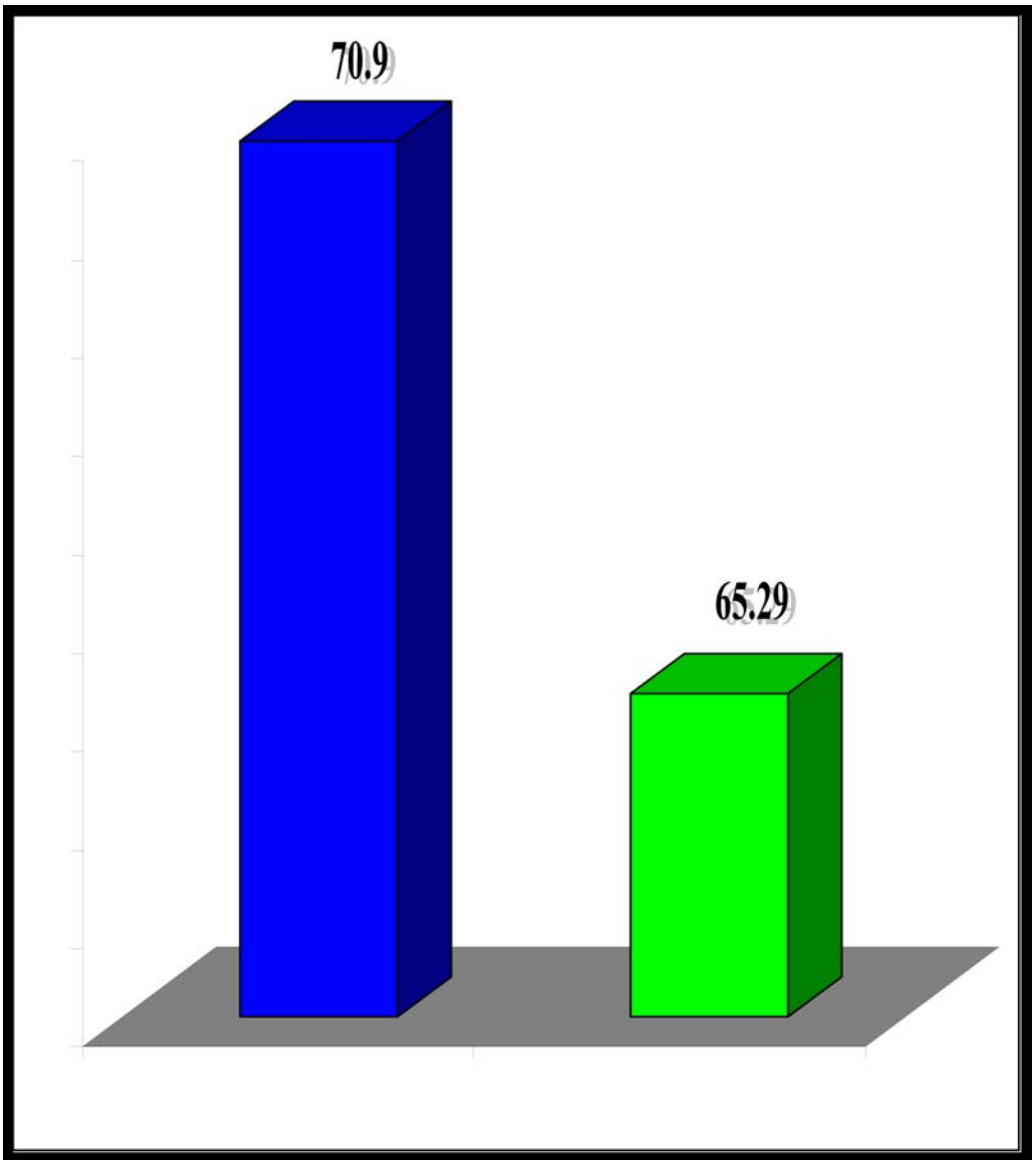


Table - 6

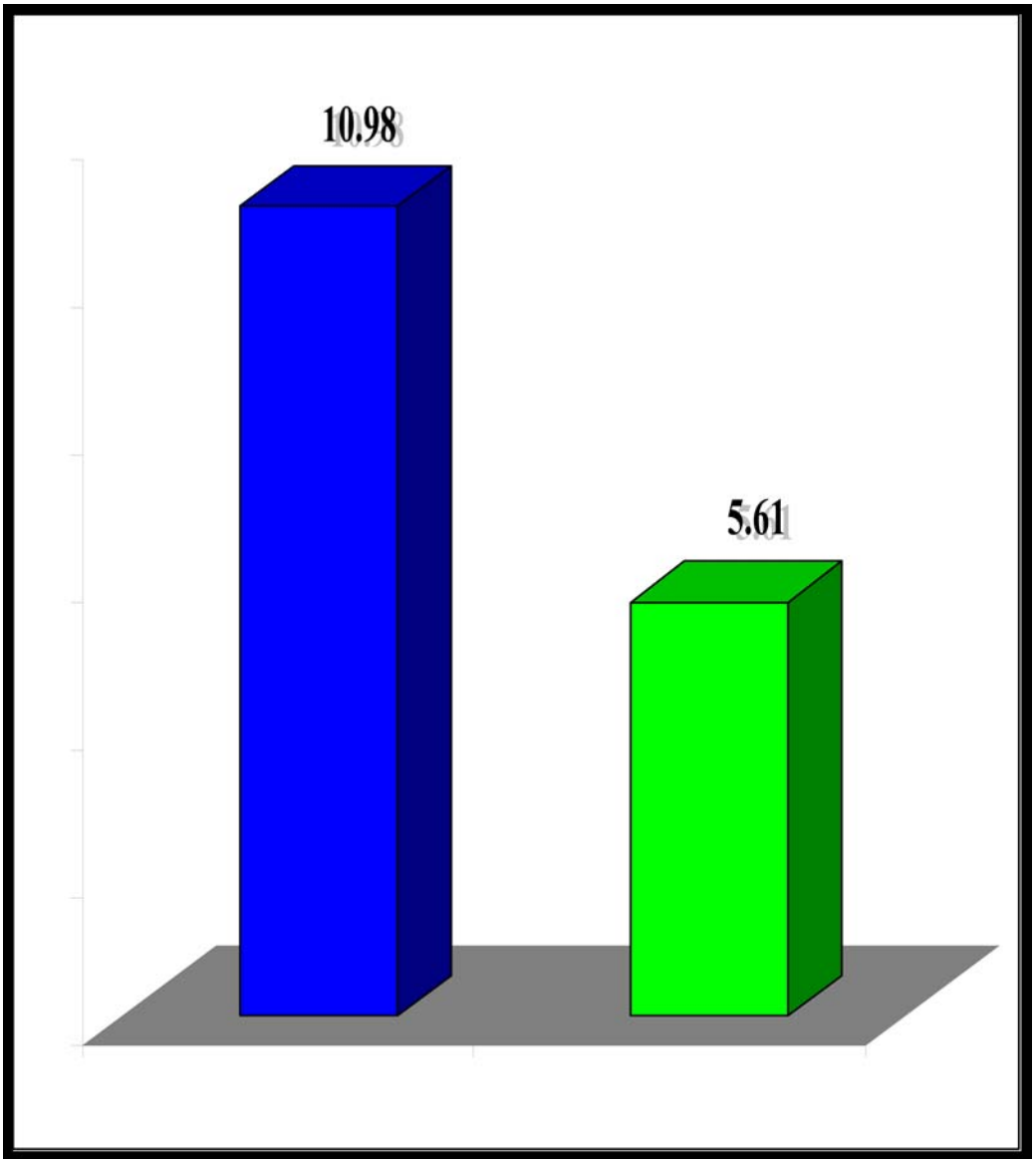
Table 6 shows the mean difference, standard deviation & 't' value between pre and post test of functional ability in group A & group B.

S. No	Variable Pain	Improvement		Unpaired 't' value
		Mean Difference	Standard deviation	
1.	Group A	10.98	2.59	5.67
2.	Group B	5.61		

In unpaired 't' test the calculated 't' value is 5.67, 't' table value is 2.048 at 0.05 level. Above values shows that there is significant difference between Group A & Group B. i.e., there is significant improvement in functional ability following Lateral wedge heel along with conventional physiotherapy treatment and Closed kinematic chain exercise along with conventional physiotherapy treatment.

GRAPH – 6

Mean difference between Group A and B for Functional ability



V. RESULTS

The number of subjects for the study was 30. The subjects were divided into two groups. Group A and Group B. For Group A, Lateral wedge heel along with wax therapy and Isometric Quadriceps exercise was given. For group B, Closed kinematic chain exercise along with wax therapy and Isometric Quadriceps exercise was given.

The patient was treated per session a day like that for 6 weeks. Before starting the treatment, pain was graded by VAS and functional ability was graded by WOMAC Index. The measurement was repeated after the treatment.

Readings of pre and post test values of pain for Group A and Group B is given in table 1 and 2 respectively. For group A, the calculated 't' value is 21.56. The 't' table value is 2.145 at 0.05 level. For group B, the calculated 't' value is 8.3 and the 't' table value is 2.145 at 0.05 level.

In both the groups the 't' table value is less than the calculated 't' value. This shows that there is significant reduction in pain in both the groups.

The unpaired 't' test is used to compare the effects between both the groups. In unpaired 't' test, the calculated 't' value is 8.72 and the 't' table value is 2.048 at 0.05 level.

The above values show that there is significant difference in pain reduction between two groups. When comparing the mean difference, Group A subjects who received lateral wedge heel and conventional physiotherapy treatment showed more difference. Hence we can conclude that pain reduction is more in Group A.

Readings of pre and post test values of functional ability for Group A and B is given in table 3 and 4 respectively. For group A, the calculated 't' value is 13.07. The 't' table value is

2.145 at 0.05 level. For group B, the calculated ‘t’ value is 12.97 and ‘t’ table value is 2.145 at 0.05 level.

In both the groups the ‘t’ table value is less than the calculated ‘t’ value. This shows that there is significant improvement in functional ability in both the groups.

In unpaired ‘t’ test, the calculated ‘t’ value is 5.67 and the ‘t’ table value is 2.048 at 0.05 level.

The above values show that there is significant improvement in functional ability between two groups. When comparing the mean difference, Group A subjects who received Lateral wadge heel and conventional physiotherapy treatment showed more difference. Hence we can conclude that the improvement of functional ability is more in GroupA. There by we are going to accept the alternative hypothesis and reject null hypothesis.

VI. DISCUSSION

The number of subjects for the study was 30. The subjects were divided into two groups. Group A and Group B. For Group A, Lateral wedge heel along with wax therapy and Isometric Quadriceps exercise was given. For group B, Closed kinematic chain exercise along with wax therapy and Isometric Quadriceps exercise.

In a study D.casey Kerrigan etc., al in 2002 concluded that a 5 degree insole used as a lateral wedge causes a shifting in the weight bearing from medical compartment to lateral compartment and thus reduces pain.

Evick D, Sonel B, in their study has utilized WOMAC index and concluded that closed kinematic chain exercise with lateral heel wedge is effective in treating osteoarthritis.

Stensdotter AK and Hodges PH, 2003 on a study concluded that exercise in closed kinematic chain promote more balanced initial quadriceps activation than does exercises in open kinematic chain.

Hence all the above studies showed that there is significant reduction in pain and improvement in function with lateral heel wedge and closed kinematic chain exercise which is relevant to our study.

VII. LIMITATIONS AND SUGGESTIONS

LIMITATIONS:

- Occupational factors.
- Obesity
- Social factors.

SUGGESTIONS:

- Lateral wedge insole influence kinetic profiles rather than muscular function at the knee joint during dynamic activities. Further studies should be performed to statistically to analyze the effect of lateral wedge heel for a large number of patient group.
- Lateral wedge heel influence knee alignment but further study is required to assess the same on mechanics of ankle joint.
- Only patients with acute Osteoarthritis were taken. Hence the effects of chronic osteoarthritis are not possible to interpret. Hence chronic osteoarthritis can be included.

VIII. CONCLUSION

In this study which was performed on 30 participants consisting of males with the diagnosis of acute osteoarthritis with interventions in the form of lateral wedge heel, Wax therapy and Isometric Quadriceps exercise (Group A) and closed kinematic chain exercise with wax therapy and Isometric Quadriceps exercise (Group B)showed that both the interventions are

useful in reducing pain and improving functional ability in terms of VAS and WOMAC index. But the subjects in Group A showed significant improvement than the subjects in Group B.

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ANNEXURE – I

ASSESSMENT PEFORMA

Name:

Age:

Sex:

Address:

Occupation:

Chief Complaints:

PATIENT HISTORY

Presenting Illness:

Past History:

Personal History:

PAIN ASSESSMENT

Duration of pain:

Site of pain:

Type of pain:

Intensity of pain:

Pattern of pain:

Aggravating factors:

Relieving factors:

On observation:

1. Deformity

2. Bony and soft tissue contours

3. Swelling

4. Skin changes

5. Gait

On palpation:

1. Tenderness

2. Warmth

3. Swelling

On examination:

Range of motion for Knee:

MOVEMENT	AROM	PROM
Flexion		
Extension:		

ANNEXURE – II

CONSENT FORM

I have been informed about the procedure and the purpose of the study. I have understood that I have the right to refuse my consent or withdraw it any time during the study without adversely

affecting the study. I am aware that being subjected to this study, I will have to give sometime to this study and this assessment do not interfere with the benefits.

I _____ , the undersigned give my consent to be a participant of the study program.

Signature of the consent

(Name and Address)

ANNEXURE – III

Closed kinematic chain exercise :

Position :

Standing with feet shoulder width apart and the feet facing forwards. Ball is placed behind the wall and the lower back.

Technique :

The patient is asked to perform a half squat, keeping the back straight. The knees are seen to be in line with the middle toe.

Paremeters :

2 sets of 10 repetitions

Duration :

The subjects were asked to continue the exercise for a period of six weeks.

Isometric Quadriceps exercise:

Position :

Sitting on a couch with the legs parallel to the ground with a towel placed under the knee

Technique :

The patients were asked to contract the quadriceps and lock the knee by pressing the towel placed under the knee. They were asked to maintain the position for 10 seconds and then release.

Parameters :

2 sets of 10 repititions each for two times a day.

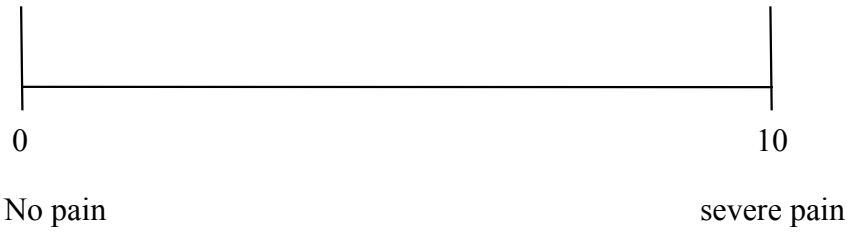
Duration :

The subjects were asked to continue the exercise for a period of six weeks.

ANNEXURE - IV

VISUAL ANALOGUE SCALE

The participants were asked to mark their intensity of pain on a 10cm long line with numbers 0 to 10 where 0 symbolizes no pain and 10 symbolizes severe pain.



ANNEXURE - V

The WOMAC (Western Ontario and McMastsr Universities) Index of Osteoarthritis

WOMAC Index:

The WOMAC index is one of the principle condition specified outcome measure used in the management of osteoarthritis. It provides a good function scale because it deals with the activities of daily living.

The index is based on patient's response and concerns affection daily life. The index is out of a total of 96 possible points, with 0 being the best and 96 being the worst.

Individual question responses are assigned a score of between 0(None) and 4(extreme). The scores are than summed to form a raw score ranging from 0(best) to 96(worst). Finally multiplying each score by 100/96 normalizes raw scores.

Overview:

The WOMAC (Westren Ontario and McMaster Universities) index is used to assess patients with osteoarthritis of the hip or knee using 24 parameters. It can be used to monitor the course of the disease or to determine the effectiveness of anti-rheumatic medications.

Pain:

(1) walking

(2) stair climbing

(3) nocturnal

(4) rest

(5) weight bearing

Stiffness:

(1) morning stiffness

(2) stiffness occurring later in the day

Physical function:

(1) descending stairs

(2) ascending stairs

(3) rising from sitting

(4) standing

(5) bending to floor

(6) walking on flat

(7) getting in or out of car

(8) going shopping

(9) putting on socks

(10) rising from bed

(11) taking off socks

(12) lying in bed

(13) sitting

(14) sitting

(15) getting on or off toilet

(16) heavy domestic duties

(17) light domestic duties

While the index was being developed performance of social functions and the status of emotional function were also included. These were not included in the final instrument.

Interpretation:

- minimum total score: 0
- maximum total score: 96

Parameters :

Scoring and Interpretation Response	Points

NONE	0
SLIGHT	1
MODERATE	2
SEVERE	3
EXTREME	4

ANNEXURE – VI

Table: 7

Pre & Post test values of Group A for pain

S.NO	Pre-test	Post- test	D	D^2
1	7	3	4	16
2	6	3	3	9
3	8	4	4	16
4	5	2	3	9
5	6	2	4	16
6	8	4	4	16
7	7	2	5	25
8	9	5	4	16
9	8	4	4	16
10	8	3	5	25
11	6`	3	3	9
12	8	4	4	16
13	9	5	4	16
14	8	3	5	25
15	5	2	3	9

Table: 8

Pre & Post test values of Group B for pain

S.NO	Pre-test	Post- test	D	D^2
1	8	5	3	9
2	7	6	1	1
3	5	3	2	4
4	6	4	2	4
5	8	6	2	4
6	9	8	1	1
7	9	8	1	1
8	8	5	3	9
9	5	4	1	1
10	6	5	1	1
11	7	6	1	1
12	6	4	2	4
13	8	6	2	4
14	9	8	1	1
15	9	8	1	1

Table: 9

Pre & Post test values of Group A for Functional Activity

S.NO	Pre-test	Post- test	D	D^2
1	55.2	43.0	12.2	148.84
2	67.2	55.1	12.1	146.41
3	71.4	66.8	4.6	21.16
4	73.4	65.1	8.3	68.89
5	80.2	69.1	11.1	123.21
6	66.4	51.7	14.7	216.09
7	55.7	45.6	10.1	102.01
8	62.4	46.4	16.0	256.00
9	66.4	54.3	12.1	146.41
10	71.8	61.3	10.5	110.25
11	71.4	66.8	4.6	21.16
12	55.2	43.0	12.2	148.84
13	80.2	69.1	11.1	123.21
14	66.4	51.7	14.7	216.09
15	71.8	61.3	10.5	110.25

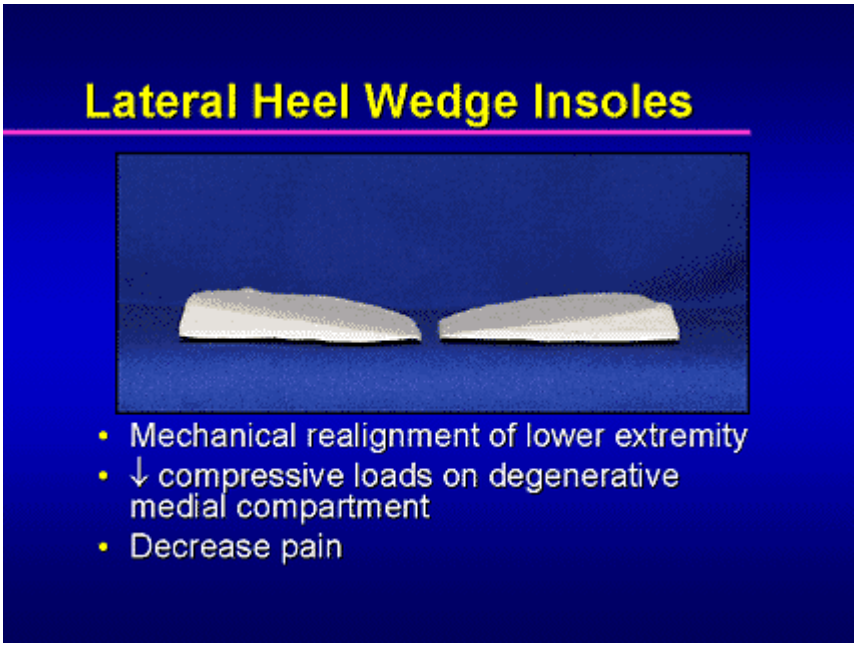
Table: 10

Pre & Post test values of Group B for Functional Activity

S.NO	Pre-test	Post- test	D	D^2
1	71.6	65.7	5.9	34.81
2	65.4	59.7	5.7	32.49
3	69.7	65.3	4.4	19.36
4	54.8	52.6	2.2	4.84
5	71.2	67.4	3.8	14.46
6	80.6	71.9	8.7	75.69
7	54.8	49.7	5.1	26.01
8	85.2	79.6	5.6	31.36
9	76.9	70.6	6.3	39.69
10	71.4	64.7	6.7	44.89
11	69.7	65.3	4.4	19.36
12	54.8	49.7	5.1	26.01
13	80.6	71.9	8.7	75.69
14	71.6	65.7	5.9	34.81
15	85.2	79.6	5.6	31.36

ANNEXURE – VII

LATERAL HEEL WEDGE



ISOMETRIC QUADRICEPS EXERCISE: