ORIGINAL RESEARCH PAPER

Medical Science

KEY WORDS: Osteoarthritis, Diminished Joint Space, Quadriceps Strengthening, Cartilage Degeneration, Valgus Brace, Altered Weight Bearing, Orthotic Device.

# EFFICACY OF VALGUS BRACE IN MEDIAL COMPARTMENT KNEE OSTEOARTHRITIS- A COMPARATIVE STUDY

**Manish Bhawatkar*** MOT(Musculoskeletal Sciences) Occupational Therapy Department, Government Medical College, Nagpur 440003,India. *Corresponding Author

**Amitabh Dwivedi** PhD (OT) Professor & Dean, Jaipur Occupational Therapy College, Maharaj Vinayak Global University, Dhand, Amer, Jaipur, Rajasthan-302038, India

ABSTRACT

In this study to see the effectiveness of valgus brace in relieving the symptoms of pain & stability , A sample of 30 subjects were divided into two equal groups . The groups were divided into
A) Control Group which received Conventional Occupational Therapy program and,
B) Experimental group which received valgus brace with Conventional Occupational Therapy program.
The two groups were evaluated on the Lysholms Knee Scoring Scale, pain component, weight bearing on affected extremity and muscle strength. Readings of Lysholms scale, weight bearing on affected extremity and muscle strength were taken at the initial and final evaluation. Readings for pain component was taken at initial, mid and final follow-up and data were compared.
The study revealed that valgus brace with Conventional Occupational Therapy program both in combination brings better relief in pain and functional stability to the subjects of mild to moderate medial OA knee of the experimental groups. Valgus knee braces are used to decrease the load on the medial tibiofemoral joint by correcting the varus knee alignment in individuals with medial knee OA by applying three-point forces to the affected knee.

## INTRODUCTION

Knee OA is one of the most commonjoint disorders and causes considerable pain and immobility.

It has prevalence between 6-12 % in general population based on the age and sex[1].

Many patients present with predominant medial compartmental knee OA. A vicious cycle is set which encourages rapid progression of deformity, pain and instability. It is frequently associated with conditions of previous injury to the joint, excessive wear or obesity. The initial treatment is non-operative and consists of patient education, weight reduction, physical therapy, and, if needed, medication. According to the Osteoarthritis Research Society International's new guidelines for managing hip and knee OA, the strength of recommendations scored 76% in the ability of off-loader knee braces to reduce pain and improve stability[2].

The emphasis of treatment should be to reduce load on the knee joint, relieve knee pain to increase the overall activity. This can be achieved by using suitable approaches of treatment with appropriate physical activity.

The medial compartment is most often affected, especially in women of advanced age. As the varus deformity increases it aggravates the loading pressures acting on the medial articular surface. X-ray finding are useful to demonstrate degenerative changes of knee [3].

Quadriceps femoris is one such important structure in knee joint. Quadriceps femoris angle know as Q Angle which is decreased in genu varum, the normal Q- angle for male is 11-13 degree and in females is 18 degree. Pain is the presenting symptoms in osteoarthritis, is because of compressive stresses and is relaxed with rest.[4]

Research studies have introduced in valgus brace as conservative management for medial compartment of osteoarthritis. However there is not much literature available to say how or why valgus brace work wonders. So we have made an attempt to compare the effects of valgus brace in medial OA knee with varus deformity.

## AIM

The aim of the study is to compare the effectiveness of valgus brace in pain and stability in medial osteoarthritis knee

## BIOMECHANICS OF KNEE

The knee is comprised of tibiofemoral and patellofemeral joint and is a modified hinge joint. The tibia consists of two condyles. varus-valgus equilibrium can be obtained by shifting load from one condyle to another. It is recognized that within the joint severe loading occurs in medial condyle the fact that most patients present themselves with varus deformity. The external varus moment is responsible for shifting the load from the lateral to the medial compartment. The predominance of a varus moment and the concomitant increased medial compartment joint loads are thought to be responsible for the greater incidence of osteoarthritis in this knee joint compartment. The external varus moment about the knee depends on mechanical alignment of the knee as well as on the ground reaction force. In patients with medial compartment osteoarthritis, the medial joint space narrows as a result of articular cartilage degeneration and as the mechanical alignment shifts toward varus[5]. In Genu varum Quadriceps femoris angle i.e. Q-angle is decreased. Valgus knee braces are used to decrease the load on the medial tibiofemoral joint by correcting the varus knee alignment in individuals with medial knee OA by applying three-point forces to the affected knee.


**Figure no.1- Effect of Valgus brace**

## MATERIALS AND METHODOLOGY

A sample of thirty osteoarthritic knee subjects were taken for the purpose of this study. The selection of the subjects were according to the following criteria:-

## INCLUSION CRITERIA:

- Symptomatically and radiologically diagnosed cases of bilateral medial compartment knee osteoarthritis.
- Age group 50-70 years
- Mild and moderate osteoarthritis
- Patients were not put on any other kind of drug therapy pertaining to Osteoarthritis during the study.

## EXCLUSION CRITERIA:

- Any limb length discrepancies, congenital anomalies or neuromuscular disorders of lower extremity.

- Previous knee surgeries
- Hip and/or ankle pathologies, which may interfere
- with the usage of orthosis.
- Recent trauma to the knee.

Total subject population was divided into two groups each consisting of 15 subjects:-

A) Control Group : which received Conventional OT program.

B) Experimental Group : which received Conventional OT program and a Valgus brace. Valgus brace is given on more affected extremity.

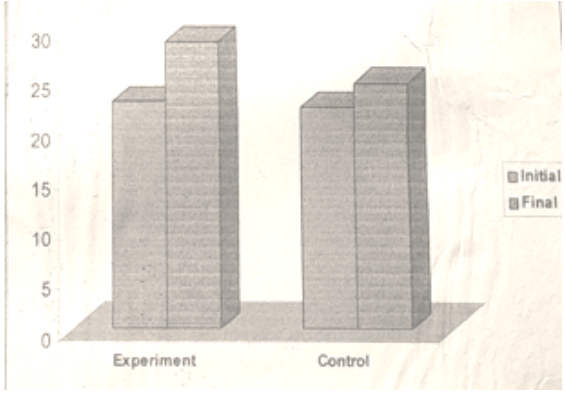
Two groups were evaluated at initial , first and second follow-ups, each after 15 days. Both experimental and control group were educated about energy conservation and work simplification techniques and were given Conventional Occupational Therapy program (Exercises) which included:

- Static quadriceps
- Straight leg raising
- Dynamic quadriceps exercise
- Hamstrings setting exercise
- Hamstrings strengthening in prone
- To facilitate co-contraction of quadriceps and hamstrings
- Cycling in supine position
- Bicycle fret saw

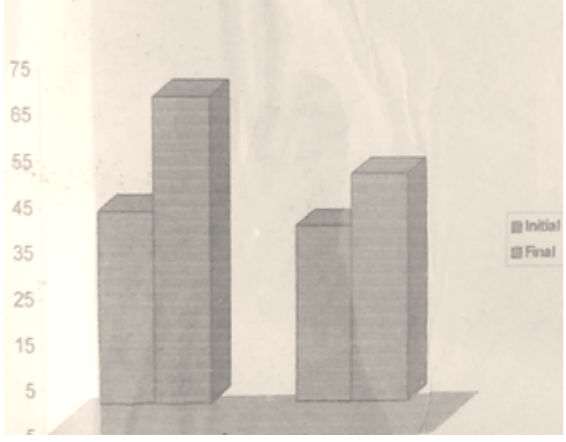
## RESULTS

The pre and post readings were evaluated on the Lysholms Knee Scoring Scale, weight bearing on affected extremity, muscle strength. Readings for pain component was taken at initial, mid and final follow-up and data were compared.

**Graph II -Mean weight bearing in experimental and Control group.**

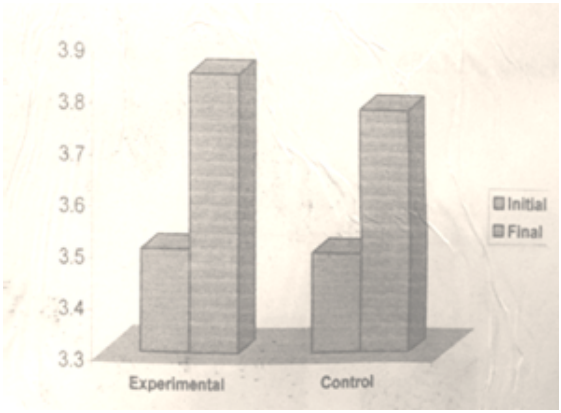



**Graph I -Mean score of Lysholm scale in experimental and control group**

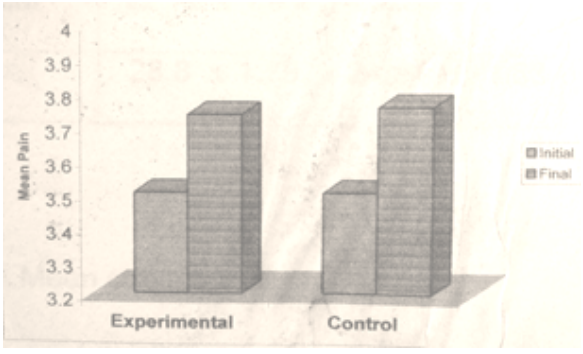



Experimental Group Control group

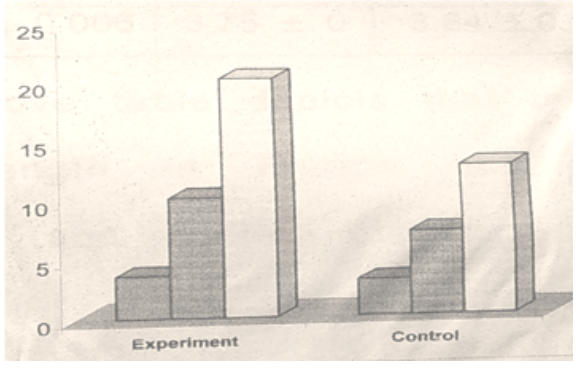
**Graph III- Muscle strength in experimental and control group for extension**




**Graph IV Muscle strength in experimental and control group for Flexion**




**Graph V- Pain assessment in experimental and control group**




Initial readings
Mid readings (15 days)
Final readings(30 days)

## DISCUSSION

In the management of OA knee according to Felson et.al. Total Knee Replacement unicompartmental Knee Replacement on high tibial osteotomy have been of great success to decrease load on the knee joint but before surgery a conservative treatment still continue to be important. In this conservative management pharmacology modalities such as anti-inflammatory drugs to relieve symptoms. However load on the knee joint is still there and tends to increase over the time. This concept was supported by Karapolat analysed the pain reliving pharmacology modalities results in loss of protective mechanism associated with pain & increased load on the knee joint over the disease progression. NSAIDS therefore may not be beneficial in long term.

White et.al recommended to conservative intervention effectiveness in pain relief & improve function. The conservative management includes exercises, education, weight loss if obese, hot & cold packs & orthotics. Surrounding musculature of the knee is strengthened &

valgus brace which can correct deformity and alter knee stresses of load bearing.

Kelgren suggested that during gait, valgus bracing reduced the net varus moment about the knee increasing valgus alignment with the adjustable brace had a greater effect on the medial compartment. On the basis of this study we have given single axis valgus knee brace with elastic strap tension. Brace is given to the more affected limb as described in the study of Global et.al. They studied the efficacy of unloader bracing in reducing symptoms of OA knee. Observation are reduction in pain, improve quality of life, ability to engage in sports and recreational activities. Knee brace are the cost effective treatment plan for unicompartmental OA knee. These findings strongly support the undertaking further research into longer impact. On the basis of this study brace is given mostly in unicompartmental OA knee. The important scores were discussed on Lysholms knee scoring scale, Pain, weight bearing on affected extremity, muscle strength. The scale comprise of 8 functional activities or specific response of the patient to attempted functional activities that help to determine the status of knee relative to the performance of normal activities of daily life. A score or 85/100 and higher indicates a level of functional normalcy of the knee joint.

## CONCLUSION

The strengthening of surrounding knee musculature helps the joint to tolerate the weight bearing forces better. This comparative study between the two groups, one with Conventional Occupational Therapy (Exercises) alone and other with a valgus brace along with Conventional Occupational Therapy (Exercises), suggests that it is the combination of the two that brings better relief to subjects of early medial osteoarthritis knee. Valgus knee braces are used to decrease the load on the medial tibiofemoral joint by correcting the varus knee alignment in individuals with medial knee OA by applying three-point forces to their affected knee. This result in a reduced load on the knee joint in individuals. However, since the effects of valgus brace become notable after the second week of usage, further studies to analyze its efficacies and limitations, if any, in long term usage in the Indian population would be very beneficial.

## ACKNOWLEDGEMENTS

We are thankful to Dr. Abhimanyu Niswade, Dean, GMC & H, Nagpur for allowing us to conduct this study. We express our sincere gratitude to Mr. Ritesh, Orthotist for fitting the brace, We are grateful to Dr. S. Morey for immense help with the statistical analysis and presentation. Above all we appreciate our patients for their invaluable cooperation.

## REFERENCES

1) Felson DT, Zhang Y. An update on the epidemiology of knee and hip osteoarthritis with a view to prevention. Arthritis Rheum.1998; 41(8):1343–1355.
2) Kelgren GH,Jeffrey M, Ball J. Atlas of standard radiographs,Vol 2. Oxford: Blackwell scientific, 1963.
3) White, D. K., Tudor-Locke, C., Zhang, Y., Fielding, R., LaValley, M., Felson, D. T.,& Neogi, T. (2014). Daily Walking and the Risk of Incident Functional Limitation in Knee Osteoarthritis: An Observational Study. Arthritis Care & Research, 66(9), 1328-1336.
4) Karapolat, H., Demir, E., Bozkaya, Y. T., Eyigor, S., Nalbantgil, S., Durmaz, B., & Zoghi, M. (2009). Comparison of hospital-based versus home-based exercise training in patients with heart failure: effects on functional capacity, quality of life, psychological symptoms, and hemodynamic parameters. Clinical Research in Cardiology, 98(10), 635-642.
5) Tegner Y. Lysholm. Rating system in the evaluation of knee ligament injuries. Clinical Orthopaedics Related Research. 1985: 43-49.
6) Pollo, F. E. Bracing and Heel Wedging for Unicompartmental Osteoarthritis of the Knee. American Journal of Knee Surgery, 11(1), 47-50.
7) Saunder's : Kelly's Textbook of Rheumatology, Vol.L 6th Edition,WB Saunder's Co, 2001.
8) Gaasbeek RD, Groen BE, Hampsink B, van Heerwaarden RJ, Duysens J. Valgus bracing in patients with medial compartment osteoarthritis of the knee. A gait analysis study of a new brace. Gait & posture. Jun 2007;26(1):3-10.