

Effectiveness of Lateral Heel Wedge in Patient Suffering from Knee Osteoarthritis

Zarmina Faim CPO^{1*}, Muhammad Kamran Khan CPO, MPH², Wisal Shah CPO², Bibi Uzma CPO²

¹Pakistan Institute of Prosthetic and Orthotic Sciences Peshawar, Pakistan

²Prosthetics and Orthotics Department, CHAL Foundation Islamabad, Pakistan

Correspondence*:

Address: Pakistan Institute of Prosthetic and Orthotic Sciences Peshawar, Pakistan |

e-mail: zwazir42@gmail.com

Abstract

Background: Knee osteoarthritis, which most commonly affects the medial compartment of the knee, is a chronic joint disorder that imposes a major healthcare burden. As no cure exists, traditional management aims to reduce pain, improve function, and enhance the quality of life while minimizing the adverse effects of therapy. Non-drug conservative interventions are considered the first-line approach to osteoarthritis management. Patients with medial compartment osteoarthritis of the knee typically exhibit genu varum on weight-bearing. This misalignment shifts the mechanical axis medially at the level of the knee joint, increasing the stresses on the medial compartment of the knee and potentially exacerbating knee osteoarthritis.

Methods: The study design was a cross-sectional survey to determine the effectiveness of the lateral heel wedge in patients suffering from knee osteoarthritis. This study was conducted at the Pakistan Institute of Prosthetic and Orthotic Sciences in Peshawar.

Results: This study concluded that there is a considerable effectiveness of the lateral heel wedge in patients with OA knee. There is some evidence to suggest that they do have some symptomatic effect, and it also shows that the ratio of females to males is high. Additionally, the rate of Knee OA is greater in older age.

Keywords: Lateral Heel Wedge, Knee Osteoarthritis, Genu Varum

Article History

Received date: 04-07-2023

Revised date: 29-07-2023

Accepted date: 04-10-2023



Journal Prosthetics Orthotics and Science Technology (JPOST)

e-ISSN [2962-8016](https://doi.org/10.36082/jpost.v2i2.1194)

Organized by [Department of Prosthetics and Orthotics](#)

Published by [Poltekkes Kemenkes Jakarta I](#)

email: jpost@poltekkesjakarta1.ac.id

Introduction

Knee osteoarthritis, which most commonly affects the medial compartment, is a chronic joint disorder that imposes a major healthcare burden. As no cure exists, traditional management aims to reduce pain, improve function, and enhance quality of life while minimizing the adverse effects of therapy. Non-drug conservative interventions are considered the first line approach to osteoarthritis management.

Patients with medial compartment osteoarthritis of the knee typically feature genu varum on weight-bearing. This misalignment shifts the mechanical axis medially at the level of the knee joint, increasing the stresses on the medial compartment of the knee and potentially exacerbating knee osteoarthritis.

Obesity is the primary, modifiable risk factor for both the development and the progression of bilateral knee osteoarthritis (KOA). Obese individuals have a four-fold greater incidence of KOA than their healthy-weight counterparts because of increased loading on the joint resulting from greater body weights. KOA typically develops in the medial compartment because the internal knee joint contact loads are greater there than on the lateral side during the stance portion of gait.

A number of interventions are aimed at laterally redistributing tibiofemoral loads for those with medial knee OA. The most invasive of these interventions are osteotomies. However, conservative management strategies are more appropriate for most individuals with medial knee OA. For example, use of knee braces has been recommended for individuals with varus gonarthrosis. Unfortunately, long-term compliance with bracing has been problematic. Another approach is the use of laterally wedged foot orthoses. These devices indirectly alter frontal plane knee mechanics by directly influencing foot, ankle, and tibial mechanics.

The integral role of biomechanical factors in the development and progression of OA, especially of the lower limb, is becoming widely acknowledged. Throughout the entire stance

phase of walking, an external adduction moment acts around the knee joint, which tends to rotate the tibia medially with respect to the femur in the frontal plane. This external knee adduction moment is primarily caused by a medially acting ground reaction force, which is present during level walking and other locomotor paradigms, such as stair negotiation.

One type of treatment for medial knee osteoarthritis involves reducing medial loading to ease the physical stress applied to that compartment of the joint. The wedge is placed under the sole of the foot and angulated so that it is thicker over the lateral than the medial edge, transferring loading during weight bearing from the medial to the lateral knee compartment. Studies have documented a modest 5% to 6% reduction in the external knee adduction moment, a measure of medial (vs lateral) loading.

Methods

It was a cross-sectional study to determine the effectiveness of lateral heel wedges in knee Osteoarthritis. A total of 52 patients participated in study and was conducted at Pakistan institute of Prosthetic and Orthotic Sciences Peshawar Pakistan and duration of this study was 6 months.

Results and Analysis

SPSS version 22 and R studio were used for data analysis. Descriptive analysis was applied to find the frequencies and percentages of age, marital status, education, and WOMAC pain Index. The descriptive analysis of gender of the participants was carried out to find the frequency and Percentage of male and female participants. From a total of 52 participants, there were 24 males and 28 females (n=52). In percentage their score was 46.2 and 53.8 respectively. The frequencies and percentages of the gender are shown in Table 1.

	Frequency	Percent	Valid Percent
Valid male	24	46.2	46.2
female	28	53.8	53.8
Total	52	100.0	100.0

The descriptive analysis of the age of the participants was carried out to find the frequency and percentage of age groups. The total number of participants is 52 (n=52). There were 6 patients in group one (11.5%), 3 patients in group 2 (5.8%), 5 patients in group 3 (9.6%), 6 patients in groups 4 and 5 (11.5% each), 9 patients in group 6 (17.3%), and 17 patients in an unspecified group.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
After use of orthosis	52	42.08	18.467	2.561
Before use of orthosis	52	74.90	15.116	2.096

The descriptive analysis of marital status of the participants was carried out to find the frequency and percentage of married and unmarried participants. Out of 52 participants 43 were married and 9 were unmarried (n=50). In percentage their score was 82.69 and 17.30 respectively. The frequencies and percentages of the gender of both groups are shown in **Table 3**.

	Frequency	Percent	Valid Percent
Married	43	82.69	82.69
Unmarried	9	17.30	17.30
Total	52	100.0	100.0

One sample t test is carried to find the mean value of WOMAC pain index score the results shows that mean of the pain is decreased in patient using orthosis and the mean difference is highly significant $P=0.000$ mean after use of an orthosis is 42.08 and before used of orthosis is 74.90 respectively.

Discussion

The management in osteoarthritis, but if a patient does not need any other treatment after the disappearance or decrease of symptoms with the use of a heel wedge and analgesics, then this treatment will be valuable. According to the current study from a total of 52 participants, there were 24 males and 28

females (n=52) and 43 married and 9 were unmarried (n=52). The Participant is divided into ages group following There was 6 patient in group one (11.5%), 3 patient in group 2 (5.8%), 5 patients in group 3 (9.6%), 6 patients in group 4 and 5 (11.5 and 11.5%) , 9 patients in group 6(17.3%) and 17 patients in group 7(32.7).

The mean values are compared before and after the use of an orthosis, showing a significant difference. The mean before the use of an orthosis is 70.90, and after the use of an orthosis is 42.08, respectively. This indicates a decrease in the WOMAC pain index score when an orthosis is used for two weeks. The means of both patients are highly significant ($P=0.000$).

Years	Freq	%	Valid %	Cumulative Percent
Valid 25-30	6	11.5	11.5	11.5
30-35	3	5.8	5.8	17.3
35-40	5	9.6	9.6	26.9
40-45	6	11.5	11.5	38.5
45-50	6	11.5	11.5	50.0
50-55	9	17.3	17.3	67.3
55-60	17	32.7	32.7	100.0
Total	52	100.0	100.0	

Matthew J. Parkes et.al (2013) said it is possible that lateral wedges are no more efficacious than neutral inserts for pain reduction because their effect on medial loading of the knee does not affect pain. First, lateral wedges cause only 5% to 6% reductions in the external adduction moment across the knee, and this may be insufficient to reduce pain. Second, other factors such as the sagittal moment and muscle co-contraction may contribute importantly to medial knee loading so that reducing the adduction moment alone may be insufficient to reduce knee pain ^[6]. In my study patients reported decreased pain with use of an orthosis the WOMAC pain Index mean is less than before use of an orthosis.

Toda *et al.*, (2005) conducted a study where participants had to wear insoles with subtalar strappings for varying durations over two weeks, and found that the greatest improvement was seen in patients who wore the

insoles for eight hours a day. The study shows the effectiveness of lateral wedges and also supports our study. Further investigation is needed with different degrees and biomechanical gait analysis of patients using heel wedges.

Conclusion and Recommendation

This study concluded that there is considerable effectiveness of the lateral heel wedge in patients with OA knee. There is some evidence to suggest that it does have a symptomatic effect and also shows a higher ratio of females to males. Additionally, the rate of Knee OA is greater in older age.

Recommendations include selecting large sample sizes for a generalized study, extending the time period for the study, conducting specific future studies, promoting the use of newer synthetic and lightweight materials that are more acceptable to patients both functionally and cosmetically, and giving more attention to poor and illiterate patients during treatment.

References

1. Bennell KL, Bowles KA, Payne C, Cicuttini F, Williamson E, Forbes A, Hanna F, Davies-Tuck M, Harris A, Hinman RS. Lateral wedge insoles for medial knee osteoarthritis: 12 month randomised controlled trial. *Bmj*. 2011 May 18;342.
2. Malvankar S, Khan WS, Mahapatra A, Dowd GS. Suppl 3: How effective are lateral wedge orthotics in treating medial compartment osteoarthritis of the knee? A systematic review of the recent literature. *The open orthopaedics journal*. 2012;6:544.
3. Russell EM, Hamill J. Lateral wedges decrease biomechanical risk factors for knee osteoarthritis in obese women. *Journal of biomechanics*. 2011 Aug 11;44(12):2286-91.
4. Barrios JA, Butler RJ, Crenshaw JR, Royer TD, Davis IS. Mechanical effectiveness of lateral foot wedging in medial knee osteoarthritis after 1 year of wear. *Journal of Orthopaedic Research*. 2013 May;31(5):659bB-64.
5. Reeves ND, Bowling FL. Conservative biomechanical strategies for knee osteoarthritis. *Nature Reviews Rheumatology*. 2011 Feb;7(2):113.
6. Parkes MJ, Maricar N, Lunt M, LaValley MP, Jones RK, Segal NA, Takahashi-Narita K, Felson DT. Lateral wedge insoles as a conservative treatment for pain in patients with medial knee osteoarthritis: a meta-analysis. *Jama*. 2013 Aug 21;310(7):722-30.
7. Hinman RS, Payne C, Metcalf BR, Wrigley TV, Bennell KL. Lateral wedges in knee osteoarthritis: What are their immediate clinical and biomechanical effects and can these predict a three-month clinical outcome?. *Arthritis Care & Research*. 2008 Mar 15;59(3):408-15.
8. Kakahana W, Akai M, Nakazawa K, Naito K, Torii S. Inconsistent knee varus moment reduction caused by a lateral wedge in knee osteoarthritis. *American journal of physical medicine & rehabilitation*. 2007 Jun 1;86(6):446-54.
9. Tohyama H, Yasuda K, Kaneda K. Treatment of osteoarthritis of the knee with heel wedges. *International orthopaedics*. 1991 Apr 1;15(1):31-3.
10. Kerrigan DC, Lelas JL, Goggins J, Merriman GJ, Kaplan RJ, Felson DT. Effectiveness of a lateral-wedge insole on knee varus torque in patients with knee osteoarthritis. *Archives of physical medicine and rehabilitation*. 2002 Jul 1;83(7):889-93.
11. Arden N, Nevitt MC. Osteoarthritis: epidemiology. *Best practice & research Clinical rheumatology*. 2006 Feb 1;20(1):3-25.
12. Toda Y, Tsukimura N, Segal N. An optimal duration of daily wear for an insole with subtalar strapping in patients with varus deformity osteoarthritis of the knee. *Osteoarthritis Cartilage*. 2005;13(4):353-60.

13. Rajeev Kumar¹, Anjani K. Sinha², Ranjeet Kumar³, Akshay Kumar⁴, Ranjay Kumar Choudhary⁵, Rashmi A Saibannavar⁶ Effect of Lateral Wedge in Reduction of Knee Pain and Improvement of Gait Parameter in Subject with Knee Osteoarthritis: in Context with Indian Population 4; April 2022
14. Kuroyanagi Y, Nagura T, Matsumoto H, Otani T, Suda Y, Nakamura T, Toyama Y. The lateral wedged insole with subtalar strapping significantly reduces dynamic knee load in the medial compartment: Gait analysis on patients with medial knee osteoarthritis. *Osteoarthritis and cartilage*. 2007 Aug 1;15(8):932-6.
15. Altman R, Asch E, Bloch D, Bole G, Borenstein D, Brandt K, Christy W, Cooke TD, Greenwald R, Hochberg M, Howell D. Development of criteria for the classification and reporting of osteoarthritis: classification of osteoarthritis of the knee. *Arthritis & Rheumatism: Official Journal of the American College of Rheumatology*. 1986 Aug;29(8):1039-49.
16. Wolfe SA, Brueckmann FR. Conservative treatment of genu valgus and varum with medial/lateral heel wedges. *Indiana medicine: the journal of the Indiana State Medical Association*. 1991 Sep 1;84(9):614
17. Isabel A. C. Baert & Jo Nijs & Mira Meeus, The effect of lateral edge insoles in patient with medial compartment knee osteoarthritis: balancing biomechanics with pain neuroscience 21, May 2014
18. Amal M.S. Eldin Abbas Hamed , Mona L. Zamzamb , Mona A. El-Sebaieb , Sahar F. Ahmedb The effects of lateral wedge insoles on primary knee osteoarthritis patients 2019, 46:189-194
19. Astephen J, Deluzio K, Caldwell G, Dunbar M, Hubley-Kozey C. Gait and neuromuscular pattern changes are associated with differences in knee osteoarthritis severity levels. *J Biomech* 2008; 41:868-876.
20. Wei-Ching Hsu 1,2ORCID,Li-Wei Chou 2,3,4ORCID,Hsiao-Yen Chiu 1,Chang-Wei Hsieh 5,*ORCID andWen-Pin Hu 1,*ORCID A Study on the Effects of Lateral-Wedge Insoles on Plantar-Pressure Pattern for Medial Knee Osteoarthritis Using the Wearable Sensing Insole 22, December 2022.
21. Michael A. Hunt, Judit Takacs, Natasha M. Krowchuk, Gillian L. Hatfield, Rana S. Hinman & Ryan Chang Lateral wedges with and without custom arch support for people with medial knee osteoarthritis and pronated feet: an exploratory randomized crossover study 02, May 2017