

Role of Un-Loader Bracing in the Management of Medial Compartment Knee Osteoarthritis

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ABSTRACT

Objectives: To provide the documented efficacy of off-loader knee braces for improving symptomatology associated with painful disabling medial compartment knee OA.

Patients and methods: We prospectively enrolled 80 patients with symptomatic medial compartmental knee OA to treatment with valgus knee brace. All patients were assessed at 6 months. 4 patients lost follow up. The primary outcome measure was pain severity as measured on a visual analog scale. Secondary outcome measures were knee function score using WOMAC and correction of varus alignment on AP whole-leg radiographs taken with the patient in the standing position.

Results: There were total 80 patients of which 32(40%) were male while 48(60%) were female. The mean age of the patients was 48±8.93. We observed statistically significant differences in mean outcome assessments (pain severity, walking distance) by using un-loader bracing in the management of medial compartment knee osteoarthritis as (P-value<0.05).

Conclusion: Off-loader braces are effective in mediating pain relief in conjunction with knee OA

Keywords: Osteoarthritis, visual analog Scale, Western Ontario and McMaster Universities

INTRODUCTION

Knee OA is one of the most common joint disorders and causes considerable pain and immobility¹. It has prevalence between 6-12 % in general population based on the age and sex². OA is a progressive disease that, at present, has no cure; as such, by 2020, the incidence of OA in US is predicted to reach 40 million and become the fourth-leading cause of disability³. Many patients present with predominant medial compartmental knee OA⁴. It is frequently associated with conditions of previous injury to the joint, excessive wear or obesity; and the relationship of exercise and work is probable but not clear^{5,6}. The initial treatment is non-operative and consists of patient education, weight reduction, physical therapy, and, if needed, medication. The overall risk for developing knee OA in one's lifetime has been reported to be 46% in the normal population, 57% when there is a history of knee injury, and 66% among obese individuals⁷.

According to the Osteoarthritis Research Society International's new guidelines for managing hip and knee OA, the strength of recommendations scored 76% (95% confidence interval, 69%-83%) in the ability of off-loader knee braces to reduce pain and improve stability (the higher the percentage, the more evidence-based and expert consensus that the braces were effective)⁸.

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MATERIAL AND METHODS

This descriptive case series study was held in Orthotics Departments of Physical Rehabilitation Center in Lahore, Pakistan. During study period from July 2011 and February 2012, 80 patients were enrolled between the age of 35-65 years having history of knee pain and genu varum deformity based on radiographic evidences and moderate to severe medial compartment DJD (grades II, III and IV of Kellgren and Lawrence grading system) were included in the study⁹. The degree of malalignment was measured on a whole leg x-ray in standing position. The degree was measured according to one line from the center of the femur head to the middle of the distance between the tibial spines and a second line from the center of the ankle to the center of the tibial spines. The degrees more than 180 were considered as varus deformity. The exclusion criteria were history of any orthopedic lower limb surgery, whole knee DJD (based on radiologic findings), symptomatic patella femoral pain syndrome (radiographically confirmed), rheumatoid arthritis, any superimposed hip or ankle problems and body mass index greater than 30¹⁰. After examining the patient and relevant investigations, informed consent was given and baseline measurements were made. All patients received local (custom made) 3 point varus correction knee brace. All patients were examined by a doctor and that All patients were examined and fitted with brace individually by doctor (Figure 1). The brace was adjusted if necessary during follow up period and patient were instructed to do it on and off

every 3-4 hours for the first week and then put it on as long as possible during the day and take it off at nights. Patients were evaluated based on age, sex, severity of pain, severity of DJD and walking distance at base line and 9 months after interventions by a examiner. We used visual analog Scale to monitor the severity of pain and the second section of "Lequesne scale" to measure maximum walking distance. The second section of lequesne scale asked about the maximum walk distance in meters [graded from 0=unlimited to 6=less than 100 m]¹¹. Data will be analyzed using SPSS version 20.0. Outcome assessments (pain severity, walking distance) were analyzed using paired sample t test to observe the efficacy of the off-loader knee braces (treatment), 5% level of significance was used. All tests applied were two tailed.

RESULTS

There were total 80 patients of which 32(40%) were male while 48(60%) were female. The mean age of the patients was 48±8.93 as shown in table I. When patients were evaluated for pain scores the mean pain score was 6.25±1.49 before the treatment. Mean walking distance was 4.23±1.08 and mean number of pain killer used was 3.24±0.711.

Table 1: Demographical and clinical characteristics of the interventional group.

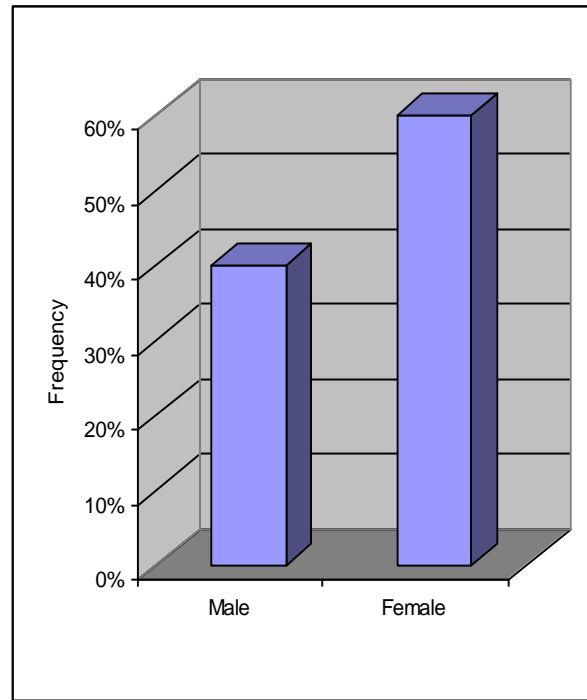
Gender	
Male	32(40%)
Female	48(60%)
Age	
35-40	4(5%)
41-46	5(6.2%)
47-52	18(22.5%)
53-58	32(40%)
59-64	14(17.5%)
65-70	7(8.8%)
Osteoarthritis medial grade	
2	25(31.2%)
3	47(58.8%)
4	8(10%)
Osteoarthritis lateral grade	
0	58(72.5%)
1	20(25%)
2	2(2.5%)

Table2: Before, after effect of these outcome assessments (pain severity, walking distance) response by using un-loader bracing:

Outcome	Pre	post	p-value
Pain	6.25±1.49	4.18±1.52	0.001
Walking distance	4.23±1.08	1.86±0.68	0.001
Pain killer	3.24±0.711	1.38±0.72	0.001

All the patients were subjected to the treatment and than their mean score of pain, walking distance and number of pain killer were assessed. The mean pain score after treatment was 4.18±1.52 and it was a statistically significant difference (p-value=0.000). Similarly mean walking distance after the treatment was also improved as 1.86±0.68 and this was a statistically significant difference in mean walking distance before and after treatment (p-value= 0.001). Brace has also reduced the number of pain killer used by the patients in time of pain as after treatment mean was 1.38±0.72. This prove that brace has resulted in reduction of pain killer almost half. 47(58%) of Kellgren-Lawrence system of Grade 3 were located over the medial compartment of the Knee osteoarthritis.

Fig. 1: Frequency distribution of the gender



DISCUSSION

The effect of unloading braces on self-reported knee pain and function have been evaluated by several researchers using different scores and surveys, such as WOMAC (Western Ontario & McMaster Universities), KOOS (Knee injury and Osteoarthritis Outcome Score), SF-36 (Short Form) survey, and Hospital for Special Surgery (HSS) knee scores, established that benefit from using an valgus knee brace as shown by significant improvement in WOMAC score for pain (p<0.001), stiffness (p<0.001) and function (p<0.001). A valgus brace is a treatment

alternative in moderate and severe unicompartmental knee OA¹².

It is evident that off-loader braces are effective in mediating pain relief in conjunction with knee OA, bracing should be fully used before joint realignment or replacement surgery is considered. Many patients who are unfit for surgery or who are reluctant to go for surgery, knee brace is a good option for such patients. Off-loader knee braces is useful to reduce pain, improve stability and diminish the risk of falling was 76% (95% confidence interval, 69%–83%). The more evidence the treatment is effective, the higher the percentage.¹³ Sattari (2011)¹⁴ compared the effect of lateral wedge insoles and 3 point knee supports in treatment of medial compartment knee OA, results found that 17(85%) patients in the brace group reported significant pain relief whereas 14(70%) patients in lateral wedge group experienced significant pain relief after 9 months treatment ($p=0.045$). The walking distance was significantly longer only in brace group ($p=0.034$), and there was no difference between control and wedge groups ($p=0.105$). Similarly in our study there was significant difference in pre and post treatment groups of patients in terms of pain (p -value=0.001) and walking distance (p -value=0.001).

Wilson (2011) demonstrated that a un-loader brace is effective in providing short-term pain relief and improved function; however, most patients subsequently opt for total knee replacement on the symptomatic knee. There was a statistically significant difference in osteoarthritis grades (3.47 vs. 2.0) for patients who had undergone arthroplasty versus patients who had not (unloader brace; $P\leq 0.05$). All patients who underwent arthroplasty reported that brace use had been effective in temporarily relieving pain. Another study by Tom et al (2010)⁵ examined no differences in pain scores between the wedged insoles or valgus braces as (13% versus 20%), while (mean, 0.06; 95% confidence interval [CI], $-1.05, 0.93$)¹⁵.

Feehan (2012)¹⁶ scrutinized effectiveness of un-loader knee orthoses in the treatment of pain in unilateral compartment osteoarthritis (OA), found forty-six initial articles. Of these, statistically significant pain reduction was noted by 73% of the studies reviewed and concluded that OA knee orthoses are a cost-effective way to reduce pain in patients with medial compartment OA.

Karen et al (2012) analyzed that braces specifically designed to unload the degenerative compartment of the knee can be an effective treatment. Results showed significant improvement in pain, stiffness, and function (WOMAC) ($p < 0.05$). 89% improving ability to walk, 57% patients reported all pain to be released and 39% reported most pain to

be released.93% improved ability to general health¹⁷, a further determined by Sean T. Hurley (2012) significant improvement in WOMAC pain ($P=.059$) and WOMAC function ($P=.089$) of the valgus unloaded brace. Hence there is a good importance of the technique¹⁸.

Moreover there was significant difference with respect to the intake of pain killer in patients after treatment. (P -value=0.001). This has additionally marked the knee brace is a good and less expensive treatment for as it not only lower the financial burden in terms of anti inflammatory medication but also significantly lower the pain and enhance walking distance.

CONCLUSIONS

Given the encouraging evidence that off-loader braces are effective in mediating pain relief in conjunction with knee OA and misalignment, bracing should be fully used before joint realignment or replacement surgery is considered. With the number of patients among varus deformities and knee pain predicted to increase as the population ages, a reduction of patient morbidity for this widespread chronic condition in combination with this treatment modality could have a positive impact on health care costs and the economic productivity and quality of life of the affected individuals.

The results indicate that patients who have varus gonarthrosis may benefit significantly from use of a knee brace in addition to standard medical treatment. We could not figure out whether the custom made off loading brace was more effective than the readymade Brace. Few patients were taking off and on analgesics for the pain and our study could not find if analgesics might have changed the results of pain relief.

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. Helmick CG, Felson DT, Lawrence RC, et al. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States, part I. *Arthritis Rheum.* 2008; 58(1):15-25.
3. Cooke TD, Harrison L, Khan B, Scudamore A, Chaudhary MA. Analysis of limb alignment in the pathogenesis of osteoarthritis: a comparison of Saudi Arabian and Canadian cases. *Rheumatol Int.* 2002;22(4):160–164.
4. Thomas KS, Muir KR, Doherty M, Jones AC, O'Reilly SC, Basse E. Home based exercise programme for knee pain and knee osteoarthritis. *BMJ* 2002; **325**:752.
5. Isdale A, Helliwell PS. Athletes and osteoarthritis- Is there any relationship? *Br J Rheumatol* 1991; **30**: 67-8.

6. Murphy L, Schwartz TA, Helmick CG, et al. Lifetime risk of symptomatic knee osteoarthritis. *Arthritis Rheum* 2008; 59(9):1207-1213.
7. Zhang W, Moskowitz RW, Nuki G, et al. OARSI recommendations for the management of hip and knee osteoarthritis, part II: OARSI evidence- based, expert consensus guidelines. *Osteoarthritis Cartilage*. 2008; 16(2):137-162.
8. Kelgren GH, Jeffrey M, Ball J. Atlas of standard radiographs, Vol 2. Oxford: Blackwell scientific, 1963.
9. Sharma L, Cahue S, Song J, Hayes K, Pai YC, Dunlop D. Physical functioning over three years in knee osteoarthritis: role of psychosocial, local, mechanical, and neuromuscular factors. *Arthritis Rheum*. 2003; 48(12):3359-70.
10. Lequesne MG. The algofunctional indices for hip and knee osteoarthritis. *The Journal of Rheumatology* 1997, 24(4):779-81.
11. T. Ingvarsson, Franklin J, Hardardottir E. Patients with moderate and severe knee OA do benefit from using a valgus knee brace. Presented at the 77th Annual Meeting of the American Academy of Orthopaedic Surgeons, New Orleans, LA, March 2010.
12. D.K. Ramsey and M.E. Russell. Unloader Braces for Medial Compartment Knee Osteoarthritis: Implications on Mediating Progression. *Sports Health: A Multidisciplinary Approach* 2009; 1(5): 416-426.
13. S Sattari and AR Ashraf. Comparison the Effect of 3 Point Valgus Stress Knee Support and Lateral Wedge Insoles in Medial Compartment Knee Osteoarthritis. *Iran Red Crescent Med J* 2011; 13(9):624-628.
14. Becky Wilson, Heather Rankin and C. Lowry Barnes. Long-term Results of an Unloader Brace in Patients with unicompartmental Knee Osteoarthritis. *Orthopedics* 2011; 34(8):334-7.
15. T.M. van Raaij, Max Reijman, R.W. Brouwer, S.M.A. Bierma-Zeinstra and J. A. N. Verhaar Medial Knee Osteoarthritis Treated by Insoles or Braces A Randomized Trial. *Clin Orthop Relat Res* (2010) 468:1926–1932.
16. Feehan, L.Nathanael, Trexler, Gary S. and Barringer, William J. The Effectiveness of Off-Loading Knee Orthoses in the Reduction of Pain in Medial Compartment Knee Osteoarthritis: A Systematic Review. *JPO* 2012; 24(1):39-49.
17. K. K. Briggs, L. M. Matheny, J. R. Steadman. Improvement in Quality of Life with Use of an Unloader Knee Brace in Active Patients with OA: A Prospective Cohort Study. *J Knee Surg* 2012;25(5):417-422.
18. T. H. Sean, L. Gillian L, M. Hatfield, D. William, Stanish, L. Cheryl, Hubley-Kozey. Is There a Dose Response for Valgus Unloader Brace Usage on Knee Pain, Function, and Muscle Strength? *Archives of Physical Medicine and Rehabilitation* 2012; 93(3):496-502.