Original Article

Application of Lateral Wedge in Knee Osteoarthritis for Improving Pain and Quality of Life

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ABSTRACT

OBJECTIVE: To determine the effectiveness of lateral wedge with and without conventional physiotherapy in relieving knee pain and quality of life in patients of knee Osteoarthritis.

METHODOLOGY: This Randomized controlled study was conducted in Madina Clinics, Faisalabad. By using simple random technique 40 patients in range 40-60 years of age with clinically and radiologically diagnosed cases of grade II and III were studied, from February to August 2016. Subjects were divided in two groups with 20 subjects in each group. KOOS knee survey was used for the assessment of Quality of life.

RESULTS: Mean total pain score on baseline of experimental group was 79.95±2.5 while the score amongst the control group was 79.95±7.69, after application of lateral wedges along with other treatments, score after 2nd week was 84.65 ± 2.94 while in control group was 80.25±2.9.97. After 4th week the symptoms score in experimental group was 83.00 ± 0.00 while control group was 88.95 ± 2.96. After the 6th week score was 91.5±14.5 of experimental and 81.8±9.5 of control group.These results of insole Wedges is also correlated with a lateral shift in the location of the COP in stance phase. Increase in the knee joint varus moment with insole Wedges suggests that the indication and limitations of laterally wedged insoles in general should be analysed in detail.

CONCLUSION: This study concluded that the lateral wedges were significant in reduction of pain and symptoms as well as improve the quality of life

KEYWORDS: Knee Osteoarthritis, Quality of Life, Lateral Wedge

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INTRODUCTION

Osteoarthritis is also known as degenerative joint disease and progressive disorder of the joint that is due gradual loss of cartilage and resulting in development of bony spur and cysts in the margin of joints[1]. The non-surgical treatment that will reduce medial load on the knee joint is lateral wedge an inexpensive readily available treatment- that will show to reduce medial knee load. OA has prevalence that is age dependent, it's higher in age of 50 years male as compared to females. Women after 50 years are more affected[2]. There was more incidences seen in female (34%) and male (31%) and symptomatic proportion was found 11% in female and 7% in man[3].

Overall prevalence of self-reported OA in the total sample was 14.8 %, where 10.5 % of individuals reported having knee OA and 8.5 % reported having hip OA. Differences in prevalence were found for males and females across age categories for both knee and hip OA[4]. Lateral wedged insoles have been shown to help clinically alleviate pain associated with medial compartment osteoarthritis[5]. It is not known whether incorporating a lateral wedge into a custom-molded foot orthotics will achieve similar results[6]. Clinical management is hampered by lack of knowledge about their mechanism of effect[7]. Some people report increased pain associated with cold temperature, high humidity, and/or a drop in barometric pressure, but studies have had mixed results[8]. As OA progresses, the affected joints appear larger, are stiff and painful, and usually feel better with gentle use but worse with excessive or prolonged use, thus distinguishing it from rheumatoid arthritis. Bone spurs develop in osteoarthritis[9]. Prevalence was higher in older individuals and women. African Americans had higher prevalence of knee symptoms, radiographic knee OA, and symptomatic knee OA, but significantly higher prevalence of severe radiographic knee OA compared to Caucasians[10]. Radiographic changes of osteoarthritis of the knee (definite narrowing with or without arthritic features) were bilateral in 85% of patients[11,12]. Quality of life (QOL) is the basic well-being of individuals and societies, outlining negative and positive highlights of life. This observes life satisfaction, including everything from physical health, family, education, employment, riches, religious beliefs, finance and the environment[13]. There is evidence to indicate that physiotherapy interventions can reduce knee pain and

improve function in those with knee OA[14].

There is some confirmation that physiotherapy in blend with other administration systems, for example, weight reduction and regard for mental components may give more huge results than any of these in isolation[15].

However, limited research data is available in Pakistan to show any significant impact of lateral wedge on the symptoms and improving quality of life of patients of knee osteoarthritis. The study will be beneficial in improvement in quality of life and decrease symptoms of OA.

METHODOLOGY

This was a randomized controlled trail study. The duration of study was 6 months from February to August 2016. Data was collected from the patient coming in Madina clinic of physiotherapy, University of Faisalabad. The study included subjects with 40-60 years of age at Madina clinics were studied. Clinically and radio-logically diagnosed cases of medial compartment knee OA grade II and III were included. The sample was calculated on supposed population 1000 and Confidence interval 95% and response distribution was 90%. The sample size was 41 (www.raosoft.com/samplesize).We arranged two groups with the groups of 20 each by odd even numbers. Every first patient in criteria was in control and next was included in experimental group. This reduced chances of biased selection. Total 40 subjects with knee osteoarthritis fulfilling the inclusion criteria were studied. Subjects with Rheumatoid arthritis, fracture, tumor, or trauma or with any other systemic co-morbidity having age less than 40 and more than 60 were excluded.

In control group conventional physical therapy Ultrasound, SWD and Quadriceps isomeric exercises 5 times in a week up to 6 weeks. The aim was provision of lateral wedge along with conventional physical therapy to relieve pain and improve quality of life. Ultrasound, SWD and isometric exercises of quadriceps in both groups were applied 5 times in a week up to 6 weeks. Experimental group throughout week in day time Lateral wedge (thickness 7mm) was applied in them. Duration of each session was 35 minutes. Ultrasound therapy as per the patient's requirement with an intensity of 1.5 watts/cm2 for 5 minutes in continuous mode at the tender point around the knee joint. SWD was used for 15 minutes to help to relieve pain and swelling. Isometric exercise the most appropriate and easy to perform by the patients and can be easily and safely performed for a period of 15 minutes.

Outcome measurement tool used was KOOS knee survey. Data was taken at baseline and after every 2 weeks i.e at the end of 2nd, 4th and 6th week. The results of study were presented as frequency, percentages, mean±SD and p-value. For between groups, cross-sectional comparison, Independent sample t-test was used and for within the groups repeated measures ANOVA was used.

RESULTS

Study was conducted to find out that how much lateral wedges are effective in knee joint Osteoarthritis. According to the data analysis there were n=40 participants satisfying inclusion and exclusion criteria. There were 2 groups, n=20 subjects of knee osteoarthritis with medial joint space reduction in each group assigned randomly. Data analysis shows that the mean age of all the patients was 4.18±5.90. There was n=33 Male and n=7 females, amongst these patients n=5 were with normal BMI while n=35 were overweight. Mostly were in normal BMI Range (18.5-24.5), so their risk of obesity to effect the result was decreased. Statistical analysis shows that between the two group experimental group shows more improvement than the control one as the p value = <0.05, which was further justified by the mean score of the question being asked from all patients about their Symptoms. Bending knee Mean score of symptom bending zero week of experimental group was 3.65±.489 while the score amongst the control group was 4.00±0.00. (Table I) (Mean score of knee stiffness during zero week of experimental group was 3.50±.607 while the score amongst the control group was 4.00±0.00. Similarly Pain was assessed and found that according to KOOS scoring 100 points indicate perfect condition while worst condition indicated by 0 Which clearly elaborates that lateral wedges reduces the pain more significantly then the normal physical therapy intervention (Table II). Mean score of quality of life total score during zero week of experimental group was 10.95±12.5 while the score amongst the control group was 2.5±7.69. (Table III). After application of lateral wedges along with other rehabilitation protocols mean score after 2nd week was 36.0±11.92 while the mean score of control group was 10.65±10.97. After 4th week the symptom score was recorded in experimental group was 52.25±12.46 while control group score was 23.5±2.66. After the 6th week or last week the mean score was 70.70±14.5 of experimental and 28.8±9.5 of control group. According to KOOS scoring 100 points indicate perfect condition while worst condition indicated by 0 Which clearly elaborates that lateral wedges enhances the QOL more significantly then the normal physical therapy interventions (Table IV).

TABLE I: DESCRIPTIVE STATISTICS BETWEEN THE GROUP ABOUT MORNING STIFFNESS

	Groups	Mean	Std. Deviation	P-value
Stiffness morning (0 week)	Group A	3.50	.607	0.00
	Group B	4.00	.000	
Stiffness morning (After 2nd week)	Group A	2.75	.716	0.00
	Group B	3.75	.444	
Stiffness morning (After 4th week)	Group A	2.10	.641	0.00
	Group B	3.00	.000	
Stiffness morning (After 6th week)	Group A	1.60	.883	0.00
	Group B	3.00	.000	

TABLE II: DESCRIPTIVE STATISTICS BETWEEN THE GROUP MEAN PAIN ASSESSMENT

	Groups	Mean	Std. Deviation	P-value
Pain total zero week	Group A	79.9500	2.62528	0.00
	Group B	79.2500	2.22131	
Pain total 2nd week	Group A	84.6500	2.94288	0.00
	Group B	80.2500	2.22131	
Pain total 4th week	Group A	88.9500	2.98196	0.00
	Group B	83.0000	.00000	
Pain total score 6th week	Group A	91.4500	4.21120	0.00
	Group B	81.7500	2.22131	

TABLE III: DESCRIPTIVE STATISTICS REPEATED MEASURE ANOVA OF QUESTION PAIN TOTAL

Repeated Measure Anova		Experimental group (n=20)			Control group (n=20)		
		Mean	SD	p-value	Mean	SD	p-value
PAIN TOTAL	At zero week	79.9	2.62	0.00	79.2	2.22	0.00
	After 2 weeks	84.6	2.94		80.2	2.22	
	After 2 weeks	84.6	2.94	0.00	80.2	2.22	0.00
	After 4 weeks	88.9	2.98		83	.00	
	At zero week	79.9	2.62	0.00	79.2	2.22	0.00
	After 4TH weeks	88.9	2.98		83	.00	
	At zero week	79.9	2.62	0.00	79.2	2.22	0.00
	At 6TH week	91.4	4.21		81.7	2.22	

According to the table above experimental group shows significant improvement then control group suggested by mean score improvement and P value <0.05

TABLE IV: DESCRIPTIVE STATISTICS BETWEEN THE GROUP QOL ASSESSMENT

	Groups	Mean	Std. Deviation	P-value
QOL total zero week	Group A	10.950	12.56761	0.00
	Group B	2.5000	7.69484	
QOL total 2nd week	Group A	36.000	11.90312	0.00
	Group B	10.650	10.97497	
QOL total 4th week	Group A	52.250	12.46416	0.00
	Group B	23.500	2.66557	
QOL total 6th week	Group A	70.700	14.58225	0.00
	Group B	28.850	9.59317	

DISCUSSION

Statistical analysis shows that the lateral wedges are significant in reduction of pain and symptoms associated with osteoarthritis and improve the quality of life and enhances the sports and functional ability of the patient by reducing the biomechanical load on the knee joint.

The goal of the wedged orthotic is to indirectly realign the knee by altering foot alignment. Moment reductions have been reported in healthy subjects fitted with a 5 to 10 degree lateral wedge[10,16]. The lack of difference in peak knee adduction is similar to reports by previous authors who found no effect of the wedged orthosis on frontal plane knee motion of healthy individuals[17].

Another study reported that patients with knee osteoarthritis have greater knee laxity than healthy controls[18]. Therefore, they may be more amenable to realignment than a healthy population. Although no significant difference was observed between conditions for peak knee adduction, most subjects demonstrated a decrease for this variable in the wedged condition. A subgroup responded in the opposite direction, actually increasing peak knee adduction (1.4-2.8 degrees) in the wedged condition[19]. The laterally wedged orthotic device was expected to

increase rear foot eversion and therefore reduce knee adduction. On average, peak eversion increased by 1.7 degrees in the wedged condition. However, in the subgroup, peak eversion only increased 0.3 degrees. Our finding suggests that the subgroup may have compensated at the rear foot for the orthotic differently than the majority of the subjects. These subjects may have accounted for the lack of significance found in peak knee adduction.

Knee adduction excursion was significantly reduced even though the mean reduction was 0.7 degrees. However, 12 of 20 subjects exhibited at least a 10% reduction. However, if the reduction leads to a lateral shift in the contact forces in the knee, this may slow down the progression of the disease. As well, a reduction in adduction excursion could prevent the medial shift of the contact force and reduce the frontal plane moment at the knee. The laterally wedged device significantly reduced the first peak knee adduction moment. The amount of wedging needed for maximal pain relief increased as the subjects' K-L grade worsened, suggesting that greater wedging was needed for more advanced knee OA[20]. On average, each K-L group exhibited approximately a 10% reduction in the first peak knee adduction movement, which is similar to previous research. Previous research on unloading braces observed a similar 11% reduction in the frontal plane moment with the brace[21]. Although 10% may be considered small, it may be clinically significant when repeated over thousands of foot strikes per day. There have been few reports on the effects of wearing a laterally wedged insole on the angle and moment at the subtalar joint. In another r study found that, in a static standing position, the laterally wedged insole increased the valgus angle of the subtalar joint, and therefore reduced the load in the medial compartment of the knee joint[2]. Page CJ 2011[I5] suggested that during walking an increased valgus angle of the subtalar joint obtained by a laterally wedged insole might be effective for the reduction of knee pain in OA patients. In our study, the subtalar joint valgus angle did not increase significantly with the laterally wedged insole. It was assumed that the effect of wearing the laterally wedged insole on the subtalar joint angle during gait was not systematic among the subjects, in particular among OA patients[22]. In contrast, our previous study 11 and this one indicate that wearing a laterally wedged insole had the same effect on the increased subtalar joint valgus moment during gait in people with and without knee OA. We found that wearing a laterally wedged insole significantly increased the valgus moment arm of the subtalar joint, creating a lateral shift in COP location. Although the beneficial effect of reducing knee joint Varus moment with a laterally wedged insole were evident in both the healthy elders and the patients with OA, the patients with OA wearing such an insole had significantly greater knee joint Varus moments during gait compared with healthy elders[23], this finding could be interpreted as follows: the 6° lateral wedge seems to have a range of effectiveness where it successfully reduces the varus moments in OA patients. Although wearing A 6° lateral wedge reduced the varus moment significantly, it was unable to reduce it to normative levels. Kerrigan et al[9] showed that wearing a 10° lateral wedge further reduced the knee joint varus moment; however, it was associated with varying degrees of discomfort. Furthermore, it was assumed that the presence of knee OA was sufficient to generate differences in knee joint biomechanics during gait from age matched, healthy elders[24,25]. The dissimilarities in the tibio-femoral angle between the healthy elders and the OA patients were accompanied by differences in the knee varus angle and moment during stance phase. Non-surgical treatment was good but compared to TKR which is surgical procedure along with Insoles, exercise were more beneficial. Non-surgical alone was not as much effective as surgical[26].

CONCLUSION

The results of study were significant in reduction of pain and symptoms associated with osteoarthritis and improve the quality of life. There was also enhancement in the sports activities and functional ability of the patient as there was reduction in the biomechanical load on the knee joint. Wedges soles use suggests that these are indicated but there are also limitations of laterally wedged insoles.

LIMITATIONS

In general it should be analysed in more detail with possibly more sample size leading to new guidelines for the use of such wedged insoles.

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