

Effectiveness of Semirigid Shoe Wedge in Workers with Patellofemoral Pain Syndrome- A Pilot Study

Kasturi Pawade,* Keerthi Rao**, Deepali Hande,** Khatri SM**

Department of Community Physiotherapy,
College of Physiotherapy (COPT),
Pravara Institute of Medical Sciences (PIMS), Loni (Shirdi), Maharashtra 413 736

ABSTRACT

Background: Retro patellar pain resulting from physical & biomechanical changes in patellofemoral joint is described as Patellofemoral Pain Syndrome (PFPS). Incidence for PFPS in India was 22/1000 person in 2010. Females were 2.23 times more likely to develop PFPS compared with males. There have been many studies done using foot orthosis in PFPS for various time intervals in the runners. However there is hardly any study using foot orthosis in PFPS that has shown the effectiveness over a period of 6 weeks in the class 4 workers whose maximum work is in prolong sitting, standing, ascending & descending stairs, bending, walking on a flat surface. Hence, there is a need to study the effectiveness of semi rigid shoe wedge in PFPS in the class 4 workers at Pravara Medical College. Further semirigid shoe wedge can be means of ergonomic aid for treatment of PFPS

Objectives: Primary objective of this study is to find out the effectiveness of Semirigid Shoe Wedge in Class IV Workers with Patellofemoral Pain Syndrome. Secondary objective of the study is to compare shoe wedge and Conventional Physiotherapy with Conventional Physiotherapy in reducing pain, Q Angle & improving physical function.

Methods: A randomized controlled study was conducted between 2012 and 2013. Ten Class IV Workers with clinical diagnosis of patellofemoral pain syndrome were assigned to two groups where Conventional Physiotherapy was common treatment for each group, while medial full length semirigid shoe wedge was given to experimental group except control one, for the duration of six weeks. Outcome measures used were visual analogue scale (VAS), Q Angle (Q Angle), Western Ontario Mac Master Questionnaire (WOMAC) (Physical Function subscale).

Results: The findings of this study showed that all interventions in the form of Semirigid shoe wedge and Conventional Physiotherapy Group (Group A), Conventional Physiotherapy Group (Group B) were effective in reducing pain, Q Angle and improving physical performance in class IV workers (Security Guards) over a period of six weeks according to the score on VAS, Q Angle, WOMAC. But overall improvement was greater in combination group i.e. Semirigid shoe wedge and Conventional Physiotherapy Group (Group A) as compared to Conventional Physiotherapy group (Group B).

Conclusion: The results of this study concluded that combined Medial full length Semirigid Shoe Wedge and Conventional Physiotherapy over a period of six weeks reduce pain intensity, Q Angle, improves Physical Performance of Class IV Workers diagnosed with PFPS.

Index Terms: Class IV Workers, Patellofemoral Pain Syndrome (PFPS), VAS, Q Angle, WOMAC (Physical Function), Semirigid Shoe Wedges, Conventional Physiotherapy.

I. INTRODUCTION

Knee pain accounts for approximately one third of musculoskeletal problems seen in India. This complaint is most prevalent in physically active persons, with as many as 54% of athletes and non-athletes having some degree of knee pain each year. Knee pain can be a source of significant disability, restricting the ability to work or perform activities of daily living¹. Patellofemoral pain syndrome can be a debilitating problem that is associated with complex etiology and intervention strategies. Foot orthoses (shoe wedge) are commonly used in treating patients with patellofemoral pain syndrome. However, available literature providing direct evidence of the effectiveness of semirigid shoe wedge for Class IV workers on patellofemoral joint position for pain, Q Angle, physical function is scarce. A few authors have studied the effects of foot orthoses on clinical outcomes of pain and function for

patients with patellofemoral pain in runners. Because foot orthoses entail a mechanical intervention at the foot, the theoretical support for their use involves establishing a model between abnormal foot mechanics and abnormal patellofemoral mechanics that may explain the clinical entity of patellofemoral pain syndrome. Semirigid shoe wedge i.e. foot orthosis is a piece of material thick at one edge and tapered to a thin edge at the other end. Semi rigid shoe wedge is high density ethylene vinyl acetate foam which will affect a change in lower extremity mechanical function and specific patellofemoral joint mechanics.^{2,3} It is an inexpensive way to determine if changing foot function will have positive effects on PFPS. The effect of orthotics is that it reduces vertical loading rate and ankle inversion moment and increased maximum foot inversion and maximum knee external rotation movement.⁴ A combined effect of shoe wedge & Conventional Physiotherapy program will contribute greatly to reduce patellofemoral pain syndrome in workers. The purpose of this study is to find out the effectiveness of semirigid shoe wedge in class IV workers with PFPS and to find out effectiveness of semi rigid shoe wedge compared with Conventional Physiotherapy programme on Visual Analogue Scale (VAS), Quadriceps Angle (Q Angle), and physical function in workers with PFPS at PIMS, Loni in 6weeks.

II. METHODS

Ten male security guards i.e. Class IV Workers, 20-35 years of age, diagnosed with unilateral PFPS were chosen to serve as subjects in this study.

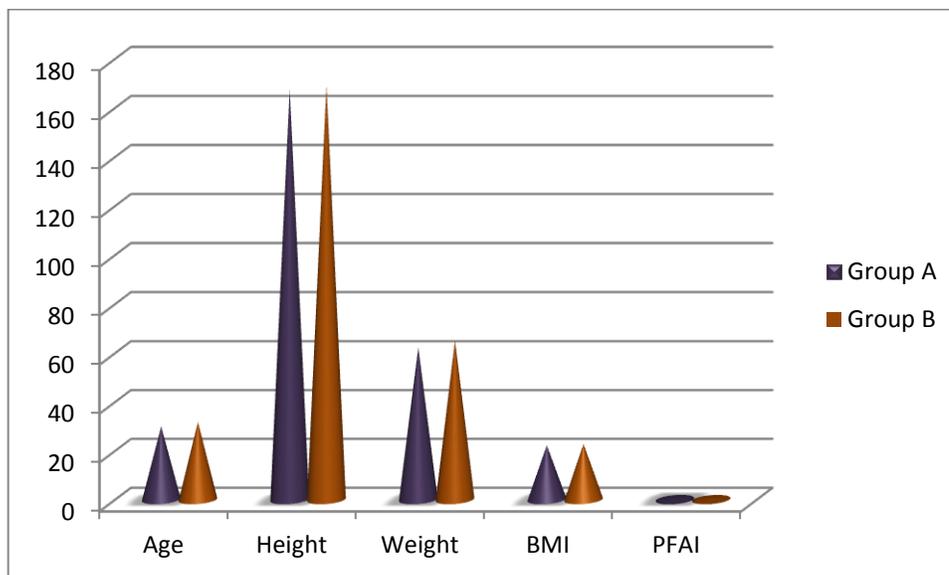


Figure1: Provides demographic characteristics of the workers

All the workers were referred to community Physiotherapy Department. Reassessment for diagnosis of PFPS was done by investigator. The following criteria were used for inclusion in this study: workers with age 20 to 35years.^{5,6,7,8} Anterior knee pain of non-traumatic origin since 4 weeks⁹: 2 of the following activities aggravating the symptom, prolonged sitting or kneeling, squatting, or pain on descending stairs;^{4,10} and 3 of clinical diagnostic test for PFPS positive;¹⁰ pronated feet as per plantar foot arch index(PFAI)(unilateral);¹¹ workers who were able to attend pre and post interventional assessment sessions; Q angle >10⁰.¹² Excluded from this study were workers with associated past history of trauma, fracture or surgery at or around knee;¹⁰ prior treatments with foot orthosis was also precluded;¹⁰ PFJES score normal, participants with PFAI score <6mm.¹¹ Subjects were randomly assigned to either an experimental group (n=5) or a control group (n=5).

III. PROCEDURE

The study received approval from the Institutional Ethical Committee of Pravara Institute of Medical Sciences (Deemed University), Loni. Participants were screened as per Screening Form. Following the session, eligible participants were told about the study

intervention and duration in the language best understood by them and written informed consent was taken from those who were willing to participate in the study. Measurements such as VAS, Q Angle, WOMAC (physical function) was taken. Then they were randomized into two groups i.e. group A (Interventional group) and group B (Control group). For group A intervention such as medial full length Semirigid shoe wedge (made by Prosthetic and Orthotic Department) was added in their shoe which they had to wear during their working hours and home exercises in the form of static quadriceps, straight leg raises, double leg squat, unilateral step down, hamstring stretch, calf stretch were given for 2 sessions /day for four days/week as home exercise program and 2 sessions/day for two day/week at community physiotherapy department. Session lasted for lasting for 20-60 minutes.^{10,13} Total interventional period was of six weeks. For group B home exercises were given for six weeks same as given for group A. After 3 weeks follow up was done and reassessment was taken after 6 weeks of intervention and baseline data was compared of both groups.

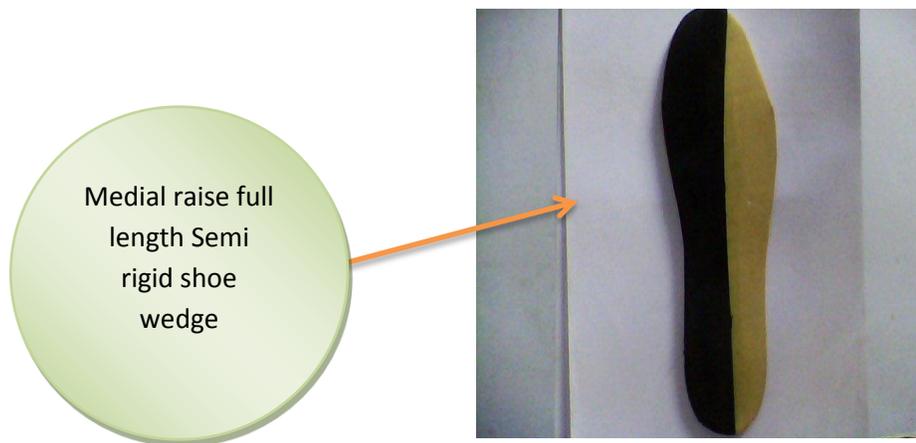


Figure 2: Semirigid shoe wedge

In this study, semirigid shoe wedge was chosen because they are inexpensive and easily adjustable, which is important for workers especially security guards who spend their time duty by standing for prolong period of time and walking. They can't take physiotherapy regularly due to time constrain and duty commitments and Semi rigid shoe wedge can be used as a ergonomic aid. Semi rigid shoe wedge is high density ethylene vinyl acetate foam which will affect a change in lower extremity mechanical function and specific patellofemoral joint mechanics.^{2,3} It is an cost effective way to determine if changing foot function will have positive effects on PFPS. The effect of orthotics is that it reduces vertical loading rate and ankle inversion moment and increased maximum foot inversion and maximum knee external rotation movement.

IV. DATA ANALYSIS

Means and standard deviations were calculated for the descriptive characteristics. Independent t tests were used to compare these variables between the two groups. Significance was accepted at the .05 level. As all subjects experienced unilateral knee pain, reduced physical function as per WOMAC and increase Q Angle. Paired t test was used to compare pre and post interventional score of outcome measures of both groups whereas unpaired t test was use to compare post interventional scores of outcome measures of both groups. It was found that there is significant change in both groups but change was more in experimental group as compared to control group. The level of significance was accepted at .05. (Table 2)

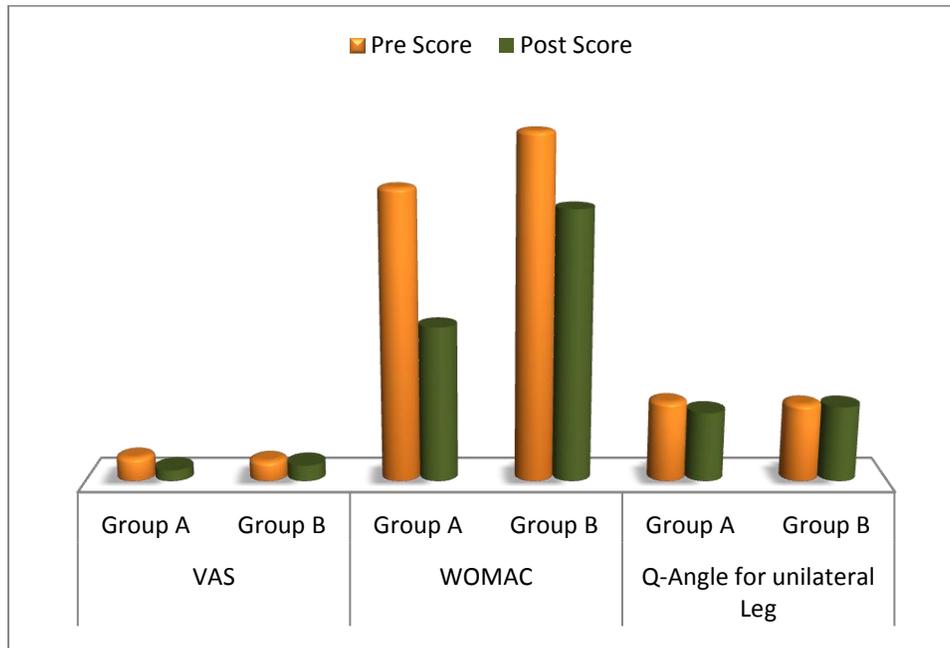


Figure 3: Pre and post score for outcome measure

V. RESULTS

For 1st outcome measure, VAS score for experimental group reduced almost 50% and for control group less than 35%. 2nd outcome measure, WOMAC score for experimental group reduced approximately 50% and for control group less than 35% and the 3rd outcome measure, Q Angle score showed 1⁰-2⁰ of difference in experimental group whereas few workers showed only 1⁰ of reduction which was not a significant change.

VI. DISCUSSION

The finding of the study showed that intervention in both the groups were effective in reducing pain intensity, Q Angle and improving physical functions in Class IV Workers over a period of six weeks according to the score on VAS, Q Angle, WOMAC. But overall improvement was greater in experimental group i.e. workers provided with semirigid shoe wedge and conventional physiotherapy as compared to conventional physiotherapy alone. Worker with patellofemoral pain for whom medial full length semirigid shoe wedge most commonly demonstrate the lower-extremity alignment profile. The workers typically reveals internal rotation of the entire lower extremity, increased knee valgus, and increased Q angle compared with the unloaded lower-extremity alignment. The workers usually is able to use hip external rotators and foot supinator muscles to move lower extremity alignment out of the weight-bearing alignment. In doing so, they move toward an alignment exhibiting reduced foot pronation, less-excessive internal rotation of the lower extremity, and less pronounced knee valgus and Q angle. The intent of foot orthosis intervention is to enable the patient to maintain this latter structural alignment profile during functional weight bearing activities, without over taxing muscles that ordinarily might not be capable of meeting this demand. This may be due to semirigid medial full length shoe wedge which produces compensatory changes in the Patellofemoral Joint mechanics by altering the weight bearing force line.¹²

VII. CLINICAL IMPLICATION FOR PRACTICE

Six weeks of Semirigid Shoe Wedge and Conventional Physiotherapy in combination provides reduction of pain and Q Angle and improvement in Physical Performance of Class IV Workers diagnosed with PFPS. It is likely that Class IV workers works in prolong standing, ascending & descending stairs, bending, walking will benefit from combination of Semirigid Shoe Wedge along with

Conventional Physiotherapy. Medial full length Semirigid Shoe Wedge of 4-5mm which was placed in worker's shoe and by wearing during their working hours along with 20-60 min of Conventional Physiotherapy twice per day which was used in this study were easy to perform and the monetary and temporal cost of performing these exercises into a home exercise program is cost-effective. This type of treatment protocol in Class IV Workers with diagnosed PFPS i.e. Semirigid shoe Wedge with Conventional Physiotherapy helps in reducing pain intensity, Q Angle and improve Physical Performance.

VIII. LIMITATIONS OF STUDY

Limitations of present study includes small sample size, long duration intervention and present study has focused only on Class IV Workers Security Guards, there was no female security guards workers, other Class IV workers were also not included, so the findings are applicable to male Class IV Workers diagnosed with PFPS.

IX. SUGGESTIONS FOR FUTURE RESEARCH

Further study with shorter duration i.e. 3 weeks, regular follow up is suggested. As this study was focusing on Class IV workers (Security Guard) with Patellofemoral Pain Syndrome, effectiveness of Semirigid Shoe Wedge in other Class IV workers is still unclear. Also in this study there was no female security guards, a future research can be done on female security guard workers with Patellofemoral Pain Syndrome.

X. CONCLUSION

On the basis of this study it can be concluded that combined Medial full length Semirigid Shoe Wedge and Conventional Physiotherapy over a period of six weeks reduce pain intensity, Q Angle, improves Physical Performance of Class IV Workers diagnosed with PFPS.

ACKNOWLEDGMENT

We would like to thank all the participants who participated in this study for their participation and kind cooperation during the study.

REFERENCES

1. Walter L. Calmbach. Evaluation of patients presenting with knee pain: part1 .history , physical examination, radiographs, & laboratory test. Am Fam Physician. 2003 sep1,68(5):907-912.
2. Bill Vicenzino. Foot Orthosis& Physiotherapy in treatment of PFPS: A Randomised clinical trial: BMC Musculoskeletal Disorder 27th February 2008.
3. J.W.Philips. The Functional Foot Orthosis.2nd edition, 1995, 18th page.
4. Stuart Currie DC. Knee Pain and Foot Orthotics: Sunday, April 1, 2012.
5. I. Hetsroni. A prospective biomechanical study of the association between foot pronation and the incidence of anterior knee pain among military recruits. Scand J Med SciSports.July, 2012 94.
6. S.BrentBrotzman. Kevin E.Wilk:2nd adition:323-324,1991.
7. Boden BP, Pearsall AW, Garrett WE, Feagin JA: Patellofemoral instability: evaluation and management. J Am AcadOrthop Surg. 1997;5:47-57.
8. FeazadehAvraham. The Efficacy of Treatment of Different Intervention Programs for Patellofemoral Pain Syndrome– A Single Blinded Randomized Clinical Trial. Pilot Study. The Scientific World Journal (2007) 7, 1256-1262.
9. Lori A. Bolgla. An update for the conservative management of patellofemoral pain syndrome: a systematic review of the literature from 2000 TO 2010, Int J Sports PhysTher. 2011 June; 6(2): 112–125.
10. Sara R. Piva. Predictors of pain and function outcome after rehabilitation in patients with patellofemoral pain syndrome. J Rehabil Med, 2009; 41: 604–612
11. Staheli, L. T. The longitudinal arch. A survey of eight hundred and eighty-two feet in normal children and adults. The Journal of Bone and Joint Surgery, 69, 426-428.
12. Mark S. Juhn. Patellofemoral Pain Syndrome: A Review & Guidelines for treatment. American Family physician 1999;60:2012-22.
13. Cowan, S. Physical therapy alters recruitment of the vasti in patellofemoral pain syndrome. Medicine and Science in Sports and Exercise. 2002, 34(12), 1879-1885.

AUTHORS

First Author – Dr. Kasturi N. Pawade, Final Year M.P.Th in Community Physiotherapy, COPT, PIMS, Loni (Bk)
Email: k_pawade@rediffmail.com

Second Author – Dr. Keerthi Rao, M.P.Th , Associate Professor (Musculoskeletal Sciences), COPT, PIMS, Loni (Bk).
Email: keerthimpt@gmail.com

Third Author – Dr. Deepali Hande, M.P.Th, Associate Professor (Community Health and Rehabilitation), COPT, PIMS, Loni (Bk)
Email: sanjaykote1@gmail.com

Fourth Author – Dr. Subhash Khatri, PhD. Principal, COPT, PIMS, Loni (Bk).
Email: physiokhatri@yahoo.com

Correspondence Author – Dr. Kasturi N. Pawade, Final Year M.P.Th in Community Physiotherapy, COPT, PIMS, Loni (Bk)
Email: rannu16@yahoo.com