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RESEARCH ARTICLE

A COMPARATIVE STUDY OF FOOTWEAR ALTERATION AND EXERCISE TO IMPROVE FUNCTIONAL ACTIVITY IN FLAT FOOT

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ABSTRACT

Aim: The aim of the study is to compare the effectiveness of footwear alteration and footwear alteration with exercise in improving the functional activities in subjects with flatfoot.

Background of the study: Flatfoot is one of the most common postural deformities, in which the arches of the foot become collapsed. This results in increased load in the first metatarsal and increased stress in the ligaments which supports the joints of the medial arch, these changes leads to a disturbance in the functional activities. Hence the study aimed to compare the effectiveness of footwear alteration and footwear alteration combined with exercise in improving the functional activities in subjects with flatfoot.

Methodology: Once the study is approved by the institutional review broad, 30 out of 40 volunteers were selected based on the inclusion criteria. It is an experimental study carried out for the duration of 6week, in out-patient department of physiotherapy in ACS Medical college and Hospital, in which the individuals were randomly selected and divided into two groups (each of 15 individuals). Group-A treated with footwear alteration and group-B treated with footwear alteration along with exercises (heel raising, toe curling, short foot, toe raising, calf stretching). Navicular drop test and VAS were used pre and post to the test to evaluate the effectiveness of the treatment given to the individuals.

Result: On comparing the mean values of navicular drop test and VAS, pre and post to the treatment, the group-B has shown highly significant improvement in the functional activities(***- $P \leq 0.001$) than the group-A(*- $P > 0.05$), and highly significant reduction in pain in both the group (***- $P \leq 0.001$).

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INTRODUCTION

Flatfoot is one of the most common deformities, in which the arches of the foot become collapsed, leads to a complete or near complete contact of the foot with the ground. The arches of the foot consist of medial column and lateral column. The medial column consists of talus, navicular, cuneiforms and 1st three rays. The lateral column consists of calcaneus, cuboid and lateral two rays. Normally, the medial longitudinal arch of the foot develops in the age of 5 to 6 in which the fat pad in babies is gradually absorbed and balance improves when skilled movements are acquired. In some children however, the arch fails to develop which may be due to tightness of the calf muscles, laxity in the Achilles tendon or poor core stability in other areas such as around the hips (Oeffinger, 2009 and Pediatrics-Angela, 2010). There is a functional relationship between the arch of the foot and the biomechanics of the lower leg. The arch provides an elastic, springy connection between the forefoot and hind foot (Franco, 1987). The injury or illness, unusual or prolonged stress to the arches leads to the faulty biomechanics. Known risk factors include obesity, hypertension, diabetes (Science daily, 2012). Flatfoot is also due to progressive loss of dynamic and static structures which are responsible for the deformity (Blanke, 1987). In the flatfoot, there will be a reduced function of Tibialis posterior muscle, increased stress is placed on the other supporting structures of the medial longitudinal arch. This results in progressive flattening of the foot leads to reduced medial arch height, plantar flexion and medial rotation of the talus, hind

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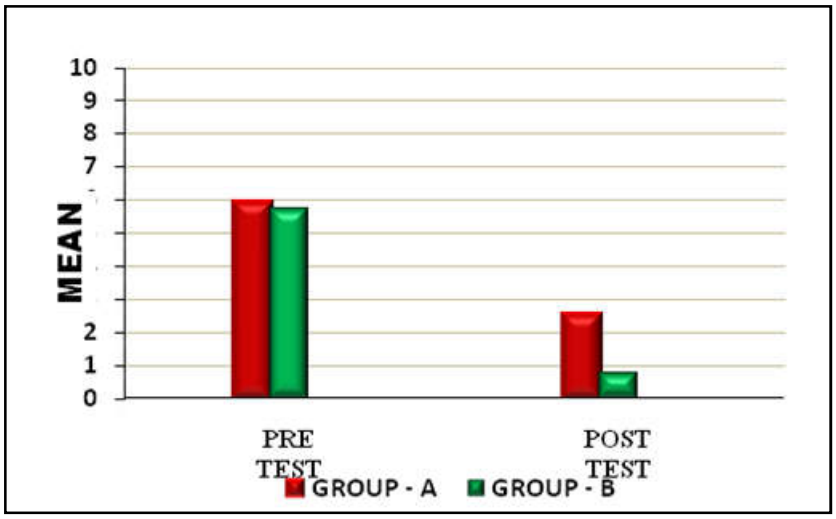
foot valgus and forefoot abduction. There is also an increase loading on the 1st metatarsal and increased stress on the ligaments supporting the joints of the medial arch (Rothstein, 1998; Prudham, 1981; Overstall, 1977). It can also due to the attenuation and ligament dysfunction and reduced stabilization by the tendons in the medial column. If the medial longitudinal arch is absent or non-functional in both the seated and standing position, the individual has "Rigid flatfoot". If the medial longitudinal arch is present and functional while the individual is sitting or standing up on their toes, but the arch disappears when assuming a weight-bearing stance, this is called "Supple flatfoot". This condition can be correctable with well fitting arch support (Franco, 1987). Footwear plays an important role in the correction of the flatfoot by supporting the arch. Correction in the footwear can be done by supporting the structures which are attenuated or become weak and overstretched. Exercises are given to increase the strength, to relieve the tension in the structures of the arch due to overload, and to maintain the arch support. During heel raising the lower leg muscles which support the arch are strengthened, while toe curling exercise, the muscles that control the toes get control and strength.

MATERIALS AND METHODS

Once the study is approved by the institutional review broad, 30 out of 40 volunteers were selected based on the inclusion criteria. Subjects with decreased medial longitudinal arch, both male and female with age 15-25 yrs were included in the study. Subjects with recent fracture in and around the ankle and foot complex, diabetes foot with spasticity were excluded from the study. It is an experimental study, carried out for the duration of 6week, in out-patient department of physiotherapy in ACS MEDICAL COLLEGE AND HOSPITAL, in which the individuals were randomly selected and divided into two groups (each of 15 individuals). Group-A treated with footwear alteration and group-B treated with footwear alteration along with exercises (toe raising, toe curling, short foot, heel raising, calf stretching). Navicular drop test and VAS were used pre and post to the test to evaluate the effectiveness of the treatment given to the individuals. Before the treatment, the procedure and benefits of the treatment was clearly explained to the patient. After obtaining informed consent from the patient, demographic information of the standardized history include age, gender, occupation are

Comparison of vas between group – A and group - b in pre and post test

#Vas	Pre -Test		Post -test		t - Test		
	Mean	S.D	Mean	S.D		df	Significance
Group-A	5.93	.703	2.53	.516	.728	28	.473*
Group-B	5.73	.798	.773	.798	7.32	28	.000***



Comparison of vas between group – A and group – B in pre &post test

During calf stretch, there will be an improvement in the ankle flexibility that controls the excess pronation of the foot (Oeffinger, 2009). Short foot exercise targets the small muscles that support the arch on the underside of the foot. Navicular drop test was described by Brody in 1982, to quantify the amount of foot pronation in runners (Brody, 1982). It's intended to represent the sagittal plane displacement of the navicular tuberosity from a neutral position to a relaxed position in standing (Vinicombe, 2001). The position of the patient is standing, so there is full weight-bearing through the lower extremity and ensures that the foot is in the subtalar joint neutral position. Mark the location of the navicular tuberosity and measure its distance from the supporting surface. Ask the patient to relax and then measure the amount of sagittal plane excursion of the navicular with a ruler (Vinicombe, 1998).

collected. The subjects in group-A were treated with footwear alteration for the duration of 6 weeks, navicular drop test and VAS are measured pre and post to the test to find the effectiveness of the treatment.

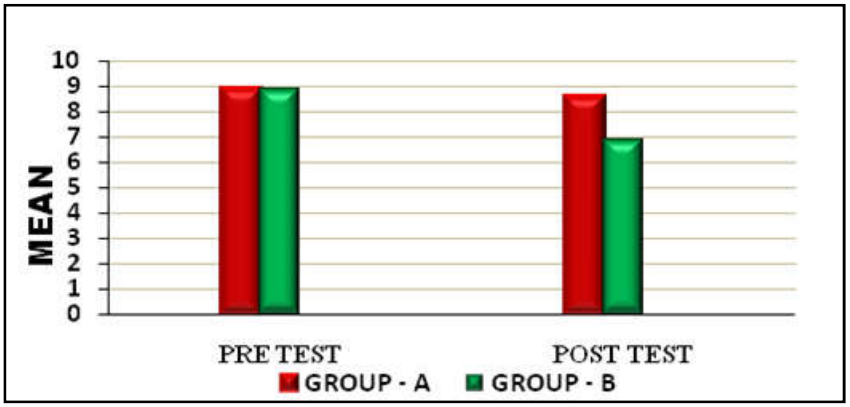
The subjects in group-B were treated with footwear alteration along with exercises [heel raises, toe curling, short foot, toe raises, and calf stretching] for 6 weeks; navicular drop test and VAS were used pre and post to the test. Materials used are white index card, paper, pen, inch tape, foot stool, and chair.

RESULTS

On comparing the mean values of navicular drop test and VAS, pre and post to the treatment, the group-B has shown

Comparison of NDT between group – A and group - B in pre and post test

#NDT	#Group - A		#Group – B		t - TEST		
	Mean	S.D	Mean	S.D		Df	Significance
Group-A	8.90	1.22	8.58	1.20	.074	28	.942*
Group-B	8.86	1.24	6.87	1.35	3.66	28	.000***



Comparison of NDT between group – A and group – B in pre & post test

highly significant improvement in the functional activities (***- P ≤ 0.001) than the group-A (*- P > 0.05), and highly significant reduction in pain in both the group (***- P ≤ 0.001).

Data Analysis

The collected data were tabulated and analyzed using both descriptive and inferential statistics all the parameters were assessed using statistical package for social science (SPSS) version 24. Paired t-test was adopted to find statistical difference within the groups and independent t-test (student t-test) was adopted to find statistical difference between the groups.

DISCUSSION

The result of the present study shows that footwear alteration and foot wear alteration with exercise improves the functional activity and reduces the pain in subjects with flatfoot. The VAS means values of pre-test of group-A is 5.93 and pre-test values of group-B is 5.73 and the mean values of post-test, group-A is 2.53 and group-B is 0.773. The t-test of group-A is .728, and Group-B-7.32. The significance obtained in group-A is .473 and the significance obtained in group-B is .000. The NDT pre-test mean values of Group-A are 8.90 and group-B are 8.86, the post test values of group-A are 8.58 and group-B 6.87. The t-test value of the group-A is .074 and the group-B is 3.66. The Signifance of the group-A are .942 and the Group-B are .000. The study shows that there is a highly significant difference in the post-test values of group-B than group-A. But there is a significant reduction in the pain in both the Groups. There is also increase in the functional activity in group-B than group-A.

Conclusion

The present study concluded that there is highly significant difference in the post test values of group-B, the subjects undergone footwear alteration with exercise than group-B, who undergone footwear alteration alone. Hence the study concludes that the exercise plays an important role in improving the functional activities in patients with flatfoot.

Conflict of Interest: none.

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