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Effect of faradic stimulation vs. intrinsic muscle strengthening of foot in young individuals with flat feet

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Abstract

Background: The aim of the study was to find the effect of faradic stimulation vs. Intrinsic muscles strengthening of foot in young individuals with flat feet using foot posture index (FPI) and foot function index (FFI)

Methodology: 30 participants with flat feet of age between 18-30 years were divided into two groups i.e. Group A and Group B. The participants were examined with their prior permission after explaining the need of study. subjects in the group A were treated by faradic stimulation to the intrinsic muscles of the foot. Those in group B they were treated by strengthening exercises. Each patient was assessed on day 1st day i.e. pre intervention and on 14th day i.e. post intervention and subject were intervened for 14 days.

Result: Mean value of Pre FPI score of foot intrinsic muscle exercises was 8.8 and mean value Post FPI score of foot intrinsic muscle strengthening exercises was 1.266. p value was 0.0017. Which is extremely significant.

Conclusion: From the present study we concluded that strengthening of intrinsic muscles is more beneficial in improving foot posture index (FPI) and foot function index (FFI) in individuals with flat feet.

Keywords: Flat feet, foot posture index, foot function index

1. Introduction

Flat feet also called pes planus or fallen arches is a postural deformity in which the arches of the foot collapse, with the entire sole of the foot coming into complete or near complete contact with ground. The study which was done on Prevalence of flat foot among 18 -25 years old physiotherapy students in an Indian population was 11.25% for all participants affected with bilateral flat feet [1]. Flat feet have excessive subtalar joint pronation; in the case of flat feet, instability and damage to the lower extremity cause hypermobility and passive instability [2]. A flexible pes planus is caused by tibialis posterior dysfunction, foot bone malformation, ligament loosening, Achilles tendon shortening, and foot muscle weakness. These deformations lead to excessive pronation of the foot during weight bearing [3]. Intrinsic foot muscles are important for foot arch postures while gait loads are applied, and other studies have reported that strengthening exercises targeting these muscles are necessary to maintain and enhance foot function [4]. Balance is a process through which the center of gravity is maintained by the body's support base. Postural control is an automatic response of the visual, vestibular, and proprioception systems. These peripheral elements supply diverse information to the central nervous system, which receive the information, causes the appropriate muscle responses to maintain posture [2]. People with flat feet or fallen arches either have no arch or it is very low. Pes planus treatments are divided into surgical and conservative treatments. Conservative treatments include taping, orthosis, special shoes, and foot muscle exercises [3]. In a hyperpronation population, electrical stimulation to the medial aspect of plantar sole may reduce plantar pressure at the midfoot, and a contact area would represent an increase in the medial longitudinal arch height [5]. Foot muscle exercise interventions for the height of the MLA have been limited to intrinsic foot muscle strengthening exercises without considering extrinsic foot muscle strengthening [4]. Assessment of Hyperpronation - The six-item version of the foot posture index is a clinical tool developed by Redmond *et al.* 2005 [6]. Used to classify foot type as either supinated neutral or pronated foot type.

2. Material and Methodology

2.1 Study design: Experimental study.

2.2 Study Setting: General population.

2.3 Sample Size: Convenient.

2.4 Sampling Method: Random.

2.5 Target Population: Individuals with flat feet.

2.6 Material Required: Electrical stimulator, goniometry, measuring tape, pen, pencil, data collection sheet

2.7 Outcome Measures: Foot posture index, Foot function index

Procedure

- It was an experimental study in which 30 sample size between 18-30 were divided into two group i.e. Group A and Group B.
- Participants in the group A were treated once a day for 14 days by faradic stimulation to the intrinsic muscles of the feet to correct the foot posture index and to improve foot function index. The proximal electrode was positioned so its center bisected the navicular tuberosity in the sagittal

plane, and was at the medial most aspect of the plantar sole. The distal electrode was positioned so its center was also at the medial most aspect of the plantar sole, with a gap of 1 cm between the two pads. The intensity of electrical stimulation was set by increasing the stimulation unit intensity until a visible local muscle response was produced, then reducing it until that response was eliminated and the stimulation was not painful.

- Those in group B they were treated thrice a day for 14 days by strengthening exercises Toe clawing- The toes of the feet are flexed fully, Toe spreading, Foot closing, Active foot rolling, Picking up small logs Standing on the outer borders of the feet, hold it for 10 seconds, relax and then repeat it again., Toe flexion and extension while standing on the edge of the stairs with toes off the stairs., Walk on a straight line., Walking on the lateral border of the feet.
- Each patient was assessed on day 1st day i.e. pre intervention and on 14th day i.e. post intervention and participants were intervened for 14 days. Assess with foot posture index, Foot function index.

3. Results and Discussion

3.1 Results

Table 1

Groups		Group A (Faradic stimulation) n-15	Group B (Strengthening Exercises) n-15
Age in years		18-30 year	18-30
Gender		4 males, 11 females	4 male, 11 female
BMI	Normal	1	0
	Overweight	10	11
	Obese	4	4
FFI (mean± SD)	Pre	69.73±5.625	76.6 ±5.527
	Post	67.86±5.768	66.06 ±5.257
	P value	0.0001	
FPI (mean± SD)	Pre	8± 1.363	8.8 ±1.014
	Post	8± 1.363	7.53±0.9904
	P value	0.9999	0.0017

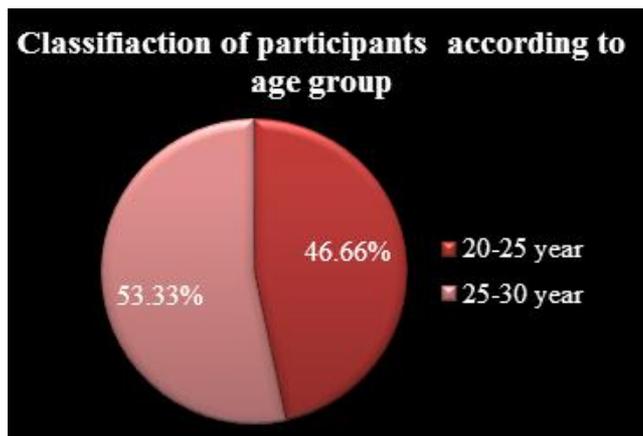


Fig 1: Classification of participants according to age group.

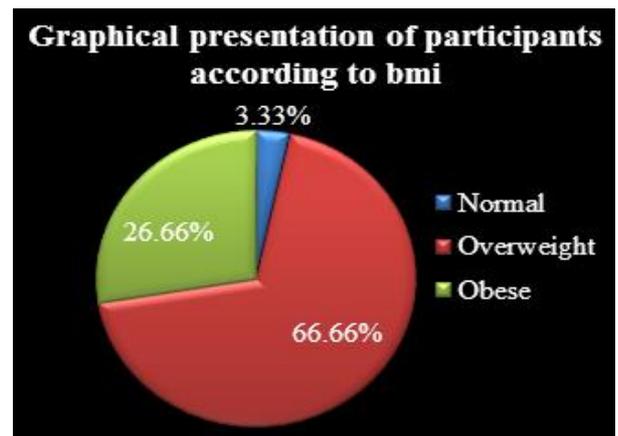


Fig 2: Graphical presentation of participants according to BMI

Interpretation – In age group (20-25) 14 samples were included and in age group (25-30) 16 samples were included.

Interpretation- Out of 30 sample size 1(3.33%) were normal, 20 (66.66%) were overweight, 8(26.66%) were obese.

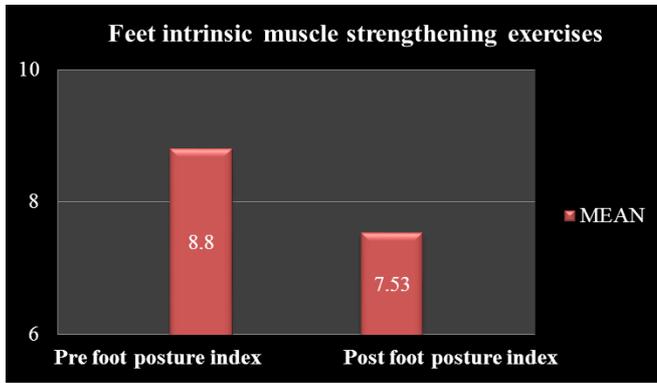


Fig 3: Effect of strengthening exercise on FPI

Interpretation- This graph showed that there is significant difference in foot posture index after feet intrinsic muscle strengthening exercises

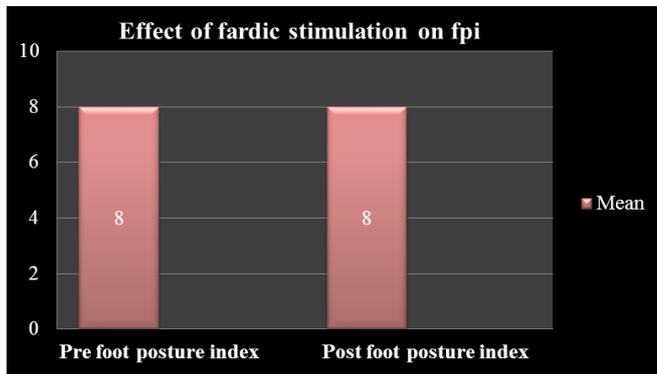


Fig 2: Comparison of FPI and FFI

Interpretation- This graph showed that there is no significant difference in foot posture index after use of faradic stimulation.

Interpretation- This graph showed that there is improvement in foot function index after the treatment of faradic stimulation. But there is no significant effect in foot posture index.

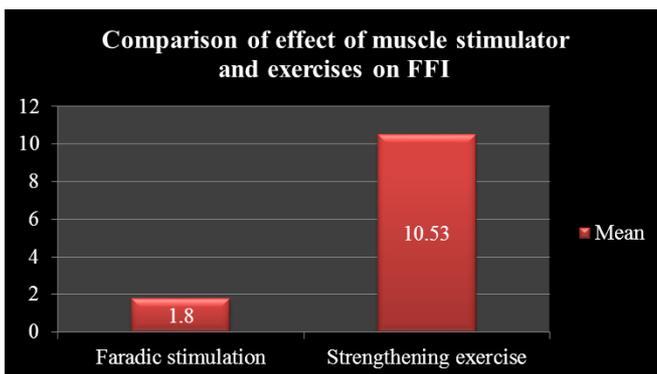


Fig 6: Comparison of effect of faradic stimulation and exercises on FFI

Interpretation- This graph showed that strengthening exercise is more effective than faradic stimulation on foot function index.

3.2 Discussion

The study was aimed to compare the effect of faradic stimulation and strengthening exercises in flat feet individuals. An experimental study was carried out in 30 samples. In which there were 8 males and 22 females between

age group of 18-30 years. The samples in the present study were divided into two groups i.e. group A (for faradic stimulation) and Group B (intrinsic feet muscle strengthening). Participants were selected according to the inclusion criteria. The participants were examined with their prior permission after explaining the need of study. Participants in the group A were treated by faradic stimulation to the intrinsic muscles of the feet. Those in group B they were treated by strengthening exercises to correct foot posture index and to improve foot function index. Each patient was assessed on day 1st day i.e. pre intervention and on 14th day i.e. post intervention and participants were intervened for 14 days. The age of participants in the study was 18-30 years. Tejashree bhoir, Deepak anap *et al.* (2014)^[1] conducted study on Prevalence of flat foot among 18 -25 years old physiotherapy students in an Indian population. They concluded that prevalence of flat foot in a population of 18 to 25 years old physiotherapy students was 11.25% for all participants affected with bilateral flat.

As shown in Graph 2, When BMI was calculated for all 30 samples in which 3.33% were normal, 66.66% were overweight, 26.66% were obese it shows that the overweight and obese peoples more prone to the foot complication. Karen J. Mickle, Julie R. Steele *et al.* (2015) Obese older adults suffer foot pain and foot-related functional limitation. They concluded that overweight or obese places adults are at greater risk of developing foot complications such as osteoarthritis, tendonitis and plantar fasciitis etc. In the present study graph 2 shows that overweight and obese people more prone to flat feet.

In the present study as proved in Graph 3 when pre and post intervention FPI score was calculated the mean value of Pre FPI score of foot intrinsic muscle exercises was 8.8 and mean value Post FPI score of foot intrinsic muscle strengthening exercises was 1.266. p value was 0.0017. which is extremely significant. Takayuki Hashimoto *et al.* (2014)^[8] conducted study on Strength Training for the Intrinsic Flexor Muscles of the Foot: Effects on Muscle Strength, the Foot Arch, and Dynamic Parameters Before and After the Training they concluded that this muscle strength training method significantly improved muscle strength scores, foot arch shape, and movement performance. in present study we used foot posture index to assess the flat feet and results shows that feet intrinsic muscle strengthening exercises is effective on foot posture index (FPI). In the present study when pre and post intervention FPI score was calculated that mean value is Pre FPI score of faradic stimulation was 8 and mean value Post FPI score of faradic stimulation was 8 which is not significant. As proved in the present study (graph 4) it shows that there is a no difference in post foot posture index after the faradic stimulation which proves that electrical stimulation is not effective to improve foot posture index.

In the present study comparison of post foot posture index and post foot function index for the faradic stimulation was calculated that mean value of post foot posture index was 8 and mean value of post foot function index was 67.866. p value of 0.0001. Which is significant. graph 5 shows that that there is improvement in foot function index than the foot posture index after the treatment of faradic stimulation.

when pre and post intervention FFI score was calculated that mean value of electrical stimulator was 1.8 and mean value of intrinsic muscle strengthening exercises was 10.53 p value was 0.0001 which is very significant. graph 6 shows that effect of muscle strengthening exercise is more effective than faradic stimulation on foot Function index.

The overall result showed that the participants were benefited from the strengthening exercise and found to be effective in improvement of foot posture index and foot function index in individuals with flat feet. Intrinsic muscle strengthening exercises stimulates the proprioceptors in the feet thereby improving the stability and voluntary muscle activities.

4. Conclusion

From the above study we can conclude that strengthening of intrinsic muscles is more beneficial in improving foot posture index (FPI) and foot function index (FFI) in individuals with flat feet.

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