Gait Deviations of Subjects with Flexible Flatfeet

G. Yavuzer, S. Sarmer, S. Ergin
Ankara University Medical School, Department of Physical Medicine and Rehabilitation, Turkey

Introduction

Flatfeet is one the most common lower limb conditions in both children and adults in which one or both feet fail to form a normal arch. Two types of flat feet have been defined: flexible (when weight bearing ceases, the arch remodels to a slightly more archiform shape compared to the loaded situation) or rigid. Some authors believed that flexible flatfoot (FF) is self-coorecting in early childhood and that the condition resolves spontaneously without treatment (1). However, some others suggest that subjects who fall outside the normal range of biomechanics require some form of treatment (2). There is a great deal of controversy regarding the management of FF. Many authors doubt the effectiveness of the orthopedic treatment of FF. Garcia-Rodriguez et al. showed that an excessive number of orthopedic treatments have been prescribed unnecessarily for the children with FF (3). In a recent study, Lin et al suggested that FF should not simply be regarded as a problem of static alignment of the ankle and foot complex, but may be the consequence of a dynamic functional change of the lower extremity (4). They stressed the need of appropriate treatment for the children with FF. On the other hand, Song claimed that there was really no proof to show that having a flexible flatfoot is something that leads to long-term disability (5).

Statement of Clinical Significance

This prospective, controlled study was designed to assess the long term impairment in gait biomechanics of adults who had FF since their childhood but never treated.

Methodology

Subjects were 34 patients (25 female, 9 male) with bilateral FF. Mean ± age was 43.7 ± 9.7 years. None of them were overweight. They had no history of foot and ankle surgery or use of foot orthotics, or trauma or inflammatory joint disease. Examination and X-rays of the feet were performed. Lateral talometatarsal and talocalcaneal angles were evaluated. Flat feet was diagnosed if lateral talometatarsal angle was > 4°, and talocalcaneal angle was > 30°. Spatio-temporal, kinematic and kinetic characteristics of gait using a three-dimensional computerized gait analysis system (Vicon 370 with five cameras, and two Bertec forceplates) were measured. Data analysis was performed using SPSS for Windows version 9.0. Time-distance parameters (walking velocity, stride length, stride time), kinematic (joint rotation angles of pelvis, hip, knee and ankle in sagittal plane) and kinetic variables (moments of knee and ankle in sagittal plane, power generated by ankle flexors, peak scaled ground reaction forces) of the patients with FF and age-sex matched normal controls were compared with “paired *t* test”, setting the significance level at less than 5%.

Results

Mean age of the 34 patients (25 female) with bilateral FF was 43.7 ± 9.7 years. None of them were overweight, they had no history of foot and ankle surgery or use of foot orthotics, or history of trauma or inflammatory joint disease. The mean ± SD lateral talometatarsal and

talocalcaneal angles were 6.3 ± 2.5 and 56.1 ± 8.6 degrees, respectively. All of the patients reported pain at their lower extremity (50% feet, 34% calf, 25% thigh and 15% low back and buttocks). There was not a statistically significant difference between subjects with FF and normal controls in terms of time-distance, kinematic and kinetic parameters of gait (Table 1).

Discussion

In patients with flexible flat feet, the medial longitudinal arch of the foot is depressed, the subtalar joint is pronated and calcaneus goes to a valgus position. Flexible flat foot may be asymptomatic, or may present pain in the foot, calf, even at legs, and formation bunion, hammertoes and calluses at the feet. This study showed that the biomechanics of gait of adults who had FF since their childhood but never treated was not different than normal population. Agressive treatment may not be necessary during childhood for flexible flat feet.

Table 1: Time-distance, kinematic and kinetic parameters of patients with FF and normal controls (mean±SD)

	Patients with FF	Normal subjects
Walking velocity	0.97 ± 0.16	0.99 ± 0.11*
Stride time	1.18 ± 0.12	1.2 ± 0.2*
Stride length	1.13 ± 0.13	1.11 ± 0.13*
Pelvic tilt	2.25 ± 0.9	2.01 ± 0.8*
Hip excursion (sagittal)	38.4 ± 4.7	40.1 ± 5.0*
Knee excursion (sagittal)	51.2 ± 7.0	52.1 ± 8.0*
Ankle excursion (sagittal)	22.0 ± 6.0	23.1 ± 4.0*
Hip flexor moment	1.22 ± 0.09	1.2 ± 0.2*
Knee extensor moment	0.32 ± 0.10	0.36 ± 0.2*
Ankle PF moment	1.8 ± 0.21	1.9 ± 0.3*
Ankle power	1.9 ± 0.4	2.0 ± 0.6*
Vertical GRF (first peak) %bodyweight	96.24 ± 4.9	96.54 ± 5.2*
Vertical GRF (second peak) %bodyweight	99.5 ± 4.1	100.2 ± 3.5*

* p>0,05

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