Gait & Posture 65 (2018) 329–330

Contents lists available at ScienceDirect

Gait & Posture

journal homepage: www.elsevier.com/locate/gaitpost

Short communication

P 059 – The influence of hypermobility on children with increased femoral anteversion: Static and dynamic foot pressure behavior

N.E. Akalan[a,*], A. Apti[a], A. Kurt[b,c], R. Sert[d], K. Onerge[e], G. Leblebici[e,f], S. Kuchimov[g], F. Bilgili[h], Y. Temelli[i], F. Miller[j]

[a] Istanbul Kultur University – Faculy of Health Science, Physiotherapy and Rehabilitation Department, Istanbul, Turkey
[b] Biruni University – Faculty of Health Sciences, Physiotherapy and Rehabilitation Department, Istanbul, Turkey
[c] Bezmialem University, Institute of Health Science, Istanbul, Turkey
[d] Istanbul University, Faculty of Health Science Physiotherapy and Rehabilitation Division, Istanbul, Turkey
[e] Istanbul University, Institute of Health Science, Istanbul, Turkey
[f] Istanbul Medeniyet University – Faculy of Health Science, Physiotherapy and Rehabilitation Division, Istanbul, Turkey
[g] Bogazici University, Institute of Biomedical Engineering, Istanbul, Turkey
[h] Istanbul University – Istanbul Faculty of Medicine, Orthopedics and Traumatology, Istanbul, Turkey
[i] MEDAmerikan Medical Center, Orthopedics, Istanbul, Turkey
[j] Nemours/Alfred I. duPont Hospital for Children, Ortopedics, DE, USA

1. Introduction

Increased femoral anteversion (IFA) is the forwardly rotated femoral head relative to transcondilar axis of the knee [1]. IFA and hypermobility syndrome are seen together in pediatric clinic [2]. For IFA children, effects of hypermobility on plantar pressure behavior during walking are absent in the literature.

2. Research question

How does hypermobility affect plantar pressure behavior for children with IFA during walking?

3. Methods

Eighteen non-hypermobiles with IFA (6men; Av.Age:9.13 ± 2.6; Weight:40.11 ± 16.8 kg; Height:139.44 ± 14.4 cm) who have ≥25° Trochanteric Prominence Angle Test (TPAT) (mean:45.55 ± 8.6°) [3], ultrasound measurement: 18.92 ± 4.1° [4] and < 5 Beighton Test score (mean:2.33 ± 1.2) [5], Thight-Foot Angle:5.44 ± 10.4°, ultrasound measurement: 13.57 ± 3.7° [4] and nineteen hypermobiles with IFA(5 men; Av.Age:7.42 ± 2.4; Weight:28.36 ± 11.1 kg; Height:128.63 ± 12.8 cm) who have ≥25° TPAT (mean:47.20 ± 7.1°), ultrasound measurement: 20.62 ± 6.8°, ≥5 Beighton Test (mean:7.36 ± 1.5), Thigh-Foot Angle:4.85 ± 7.8° ultrasound measurement:12.25 ± 2.6° participants were included in the study. The static foot posture was assessed by the Foot Posture Index (FPI-6) [6]. The plantar pressure behavior during static standing (heels were apart in pelvis wide with comfortable foot rotation) and during walking were analyzed by foot pressure analysis system (Tekscan Inc. Mass. USA). The foot progression angles, static and dynamic foot coronal index (FCI) [7], peak-medial-midfoot/total-plantar-foot (MMF/PF) pressures, the magnitude of the first and the second peak forces (F1, F2) (kgs), the difference between T1 (the time of 1 st force peak) and T2(the time of 2nd force peak) (T2-T1) (sec) and total stance duration (Ts) (sec) were compared between both groups by student t-test. Mann-Whitney U test estimated for comparison of FPI-6($p < 0.05$).

4. Results

The dynamic MMF/PF was lower in non-hypermobiles than in hypermobiles. T1 was earlier in hypermobiles than in non-hypermobiles. No significant difference was found in foot progression angle, static FCI, static MMF/PF, dynamic FCI, F1/Weight, F2/Weight, T1, T2 and Ts between both groups (Table 1).

5. Discussion

Our previous work demonstrated that MMF/PF is already higher in IFAs than their healthy pairs. The hypermobility seemed to increase the peak pressure on medial-mid-foot during walking in our longitudinal work. For hypermobile IFAs, the prematurely developed peak force (T1), with similar stance duration, should be also investigated combining with kinematic alterations of loading response and mid-stance sub-phases of gait. Although, IFA effects the static foot and dynamic foot pressures differently in the previous work [2], interestingly hypermobility influences only the dynamic foot pressure. Therefore, hypermobile IFAs have a tendency to develop valgus foot more than their

* Corresponding author.
E-mail address: ekin.akalan@gmail.com (N.E. Akalan).

https://doi.org/10.1016/j.gaitpost.2018.06.211

Table 1
Interested gait parameters and groups.

	IFA ≤ 4	IFA ≤6	N ≤ 4	N≥6
Peak DF in swing (°)	9.7 ± 5.4	9.6 ± 3.9*	−2.1 ± 3.2	−5.2 ± 4.6**
Knee flex at Ic (°)	4.7 ± 7.2	9.8 ± 5.4*	2.5 ± 3.8	3.5 ± 5.1
Peak knee flx (°)	54.3 ± 5.0	59.0 ± 4.7*	55.45.9	54.8 ± 3.6
Peak knee extension (°)	1.2 ± 5.9	5.6 ± 4.8*	−2.2 ± 3.5	−0.0 ± 3.9
Toe off time (Frame)	42.1 ± 5.5	42.6 ± 6.1*	58.8 ± 2.4	57.2 ± 1.9**
Max Int Rot @ST (°)	15.7 ± 6.3	10.3 ± 4.4*	2.1 ± 4.8	4.3 ± 2.4**
Mean Hip rot @ST (°)	11.6 ± 5.7	5.7 ± 3.9*	−1.8 ± 4.8	1.2 ± 2.7**
Min pelvic Rot (°)	−8.4 ± 3.1	−7.8 ± 2.4*	−5.4 ± 2.8	−3.4 ± 1.6**
ROM pelvic Rot (°)	17.4 ± 6.7	17.5 ± 5.4*	10.9 ± 5.2	10.3 ± 3.9**
Stance time (msec)	588.2 ± 106	569.0 ± 87.6	632.1 ± 39.4	544.0 ± 68.5**

DF: Dorsiflexion, Ic: Initial Contact, flx: Flexion, Max: Maximum Int: Internal, Rot: Rotation. ST: Stance, Min: Minimum. Significantly different parameters; **FA ≤ 4/ IFA ≤ 4:** *.
N ≤ 4/ N≥6: ** ($p < 0.05$).

non-hypermobile pairs. During prescribing in-lay insoles, besides the static evaluation, the dynamic foot evaluation should be performed.

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