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P 114 - Gait kinematics in children with Ponseti treated clubfeet, relapse clubfeet and healthy controls using the Oxford Foot Model

L. Grin[a], L. van Oorschot[a], M. van der Steen[b,c], A. Besselaar[c], B. Vanwanseele[a,d]

[a] Fontys University of Applied Sciences, Department of Health Innovation and Technology, Eindhoven, Netherlands
[b] Catharina Hospital Eindhoven, Department of Orthopaedic Surgery, Eindhoven, Netherlands
[c] Máxima Medical Center, Orthopeadic Center Máxima, Eindhoven, Netherlands
[d] KU Leuven, Department of Movement Sciences, Heverlee, Belgium

1. Introduction

A clubfoot is characterized by a three-dimensional deformity with an equinus, varus, cavus and adduction component [1]. Nowadays the Ponseti method is the preferred treatment for clubfeet, aiming to achieve a normal appearing, functional and painless foot [2]. The re-occurrence of clubfoot components in treated clubfeet, a relapse, is a known problem in clubfoot patients. 3Dgait analysis can be used in assessment of foot function and residual deviations in gait or possible relapses [3–6].

Gait analysis is frequently used to analyse differences in gait between clubfoot and healthy controls. However, the usage of multi-segment foot models is, although of importance considering the characteristics of the clubfoot, rare. In order to capture the full multi-planar and multi-joint nature of a clubfoot, it is highly important to implement multi-segment foot models in gait analysis. In order to improve treatment of individual relapse clubfoot kinematics differences in clinical relevant functional outcomes should be known.

2. Research Question

This study aims to identify kinematic differences between children with Ponseti treated clubfeet, relapse clubfeet and age-matched healthy controls during gait, using the Oxford Foot Model(OFM).

3. Methods

Currently, eight Ponseti treated clubfoot patients, age 4-8 years old, five relapse patients and twelve healthy age- and gender-matched controls participated. Unilateral or bilateral Ponseti treated clubfeet and relapse clubfeet were recruited by an orthopaedic surgeon at Máxima Medical Centre (Eindhoven, the Netherlands) between September 2017 and April 2019.

Gait analysis, to determine kinematics of the foot, lower and upper leg and the pelvis, was performed using a wireless active 3D-system (Charnwood Dynamics Ltd., Codamotion CX 1, sampling rate: 100Hz), in which the OFM was used to identify different foot segments [7]. Participants were instructed to walk in a straight line (8m) at comfortable speed. Sagittal and transversal plane kinematics were analysed using SPM two sample t-test. A p-value ≤ 0.10 was considered significant.

4. Results

Preliminary results of eight clubfeet patients, five relapse patients and twelve controls (age: 5.3 ± 1.3y, 6.0 ± 1.3y, 5.3 ± 1.6y, height: 1.14 ± 0.10m, 1.16 ± 0.12m, 1.17 ± 0.13m, walking speed: 0.94 ± 0.10 m/s, 0.88 ± 0.20 m/s, 1.01 ± 0.15m/s) show significant decreased dorsiflexion (tibia/hindfoot) and increased adduction (hindfoot/forefoot) in relapse patients (grey bars, Fig. 1).

5. Discussion

Preliminary results show impaired foot kinematics in relapse patients compared to healthy controls. Compensation would be expected in knee or hip kinematics. Due to limited sample size and large variations between subjects, more participants are necessary. The final goal of this project is to identify relevant gait parameters which will allow for early detection of a relapse clubfoot. Subsequently, the relation with clinical relevant functional outcomes, focused on treatment of individual relapse clubfoot, will be investigated.

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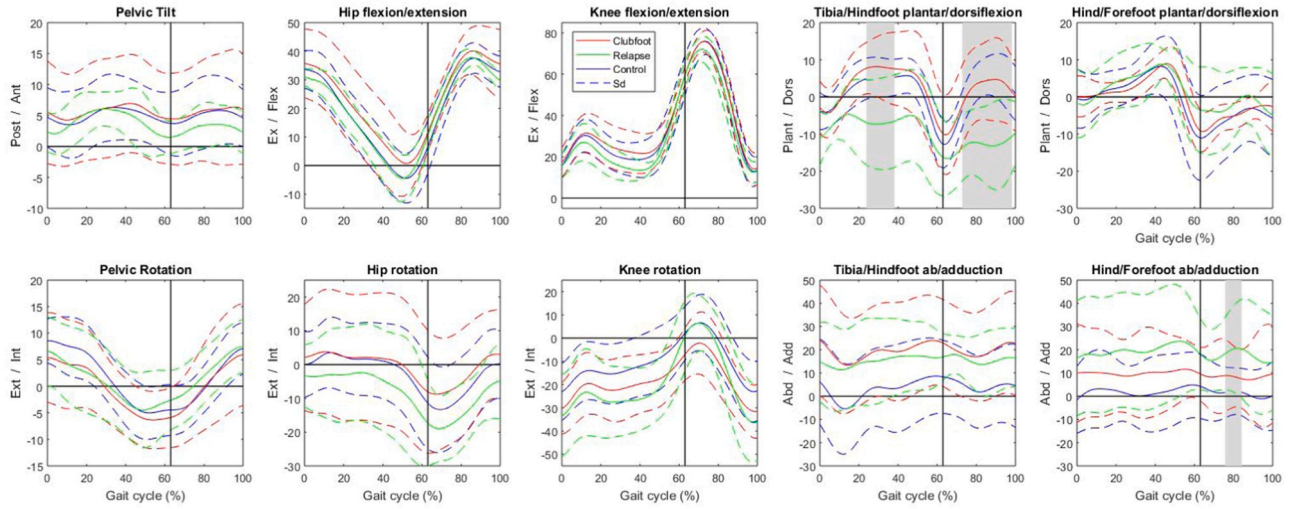

Fig. 1. Gait kinematics in children with clubfeet(red), relapse clubfeet(green) versus control(blue). Dotted lines (- -) show the standard deviation and the vertical line indicates stance versus swing. Grey bars indicate significant difference($p < 0.10$) relapse versus control.

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