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## CLINICAL AND PEDOBAROGRAPHIC ANALYSIS OF PONSETI-TREATED CLUBFEET IN UGANDA

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### INTRODUCTION

After decades of surgical treatment as the predominant option for young children suffering from clubfoot deformity, non-surgical treatment with serial casting – as developed and proposed by Dr. Ignacio Ponseti in Iowa in the 1950's – is finally accepted as the treatment of choice.

This conservative approach usually achieves a high rate of satisfactory clinical and functional outcome when patients and parents show a sufficient compliance to adhere to the treatment strategy [1-5]. Though the treatment originated in the United States and has become more widely accepted in developed nations, it is a particularly attractive option in low- and middle-income countries where access to surgery and surgical correction is very constrained.

The Uganda Sustainable Clubfoot Care Project, a CIDA-funded partnership, has built capacity in Uganda for Ponseti clubfoot treatment delivery by orthopaedic paramedicals. Daily-life conditions for medical care are more difficult and less accessible in these environments where patients often have to travel long distances to the nearest healthcare provider. We were interested to evaluate the outcome of Ponseti clubfoot treatment in the Uganda setting which was shown to result in high parent satisfaction of around 90%.

The objective of the present study therefore, was to assess the clinical and functional outcomes after Ponseti treatment with pedobarographic measurements.

### METHODS

In January 2011, in total 101 children (mean age 43 months, range 32-60 months) were assessed in two Ugandan clinical centers, in Jinja and Kampala with 58 of them with unilateral or bilateral clubfeet after Ponseti treatment (average follow-up of 3 years). Clinical assessment was performed by experienced pediatric orthopedic surgeons. For pedobarography, children were asked to walk barefoot at self-selected speed over a pressure-sensitive platform (emed ST, Novel GmbH Munich) until 5 'good' trials of each foot (i.e. full contact, no targeting, fluent walking pattern) were stored for further analysis.

Standard parameters (peak pressure, maximum force, force-time integral, contact area, contact time) were determined for the whole foot as well as for 10 selected regions: 2 hindfoot, 2 midfoot, 3 forefoot, hallux & 2 toes.

Based on the clinical information on foot appearance and function, the treatment outcome was scaled for 77 feet into 4 levels: good (25 feet), fair+ (37 feet), fair- (6 feet), poor (9 feet). Statistical comparisons were performed with non-parametric tests.

### RESULTS AND DISCUSSION

Complete clinical and functional data sets were available for 77 feet. Foot pressure profiles indicated a significant shift of foot loading towards the lateral midfoot and lateral forefoot that was reflected in most of the parameters in a comparison with non-affected contralateral feet or to control subjects (Wilcoxon signed-rank test,  $p < 0.05$ ). This lateralization effect was even more pronounced with less satisfactory clinical outcome (Fig. 1) and revealed significant differences in regional loading with respect to peak pressures, maximum forces and force-time integrals in most regions (Kruskal-Wallis test;  $p < 0.05$ ).

In order to describe the overall effect of foot loading changes, we computed a lateral-medial loading ratio with summarizing force-time integrals in the lateral foot regions divided by the medial regions (with 1 indicating equal loading of lateral and medial foot structures). This value was 1.7 for the good group and gradually increased up to a value of 7.4 in the poor group indicating an increasingly lateral load transfer with a more pathological plantar pressure pattern (Tab. 1).

### CONCLUSIONS

After 3 years of Ponseti treatment, foot function as assessed with pedobarography revealed distinct differences to normal foot pressure profiles and these foot loading characteristics were more distinct with worse clinical outcome.

Nevertheless, even though clubfeet do not become normal after Ponseti treatment, parent satisfaction is generally high (close to 90%, as seen in a larger cohort) because the treatment can be considered as successful when compared to untreated feet in Uganda.

### ACKNOWLEDGEMENTS

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## REFERENCES

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**Table 1:** Lateral and medial force-time integrals (FTI) and the lateral-medial ratio for the 4 clinical groups (mean  $\pm$  standard deviation).

	Good	Fair+	Fair-	Poor
<b>FTI_lat [%]</b>	<b>61,0</b> $\pm$ 9,1	<b>73,0</b> $\pm$ 7,1	<b>80,8</b> $\pm$ 2,7	<b>83,7</b> $\pm$ 7,0
<b>FTI_med [%]</b>	<b>39,1</b> $\pm$ 9,2	<b>27,0</b> $\pm$ 7,1	<b>19,2</b> $\pm$ 2,8	<b>16,1</b> $\pm$ 7,1
<b>FTI lat/med</b>	<b>1,7</b> $\pm$ 0,7	<b>3,0</b> $\pm$ 1,1	<b>4,3</b> $\pm$ 0,8	<b>7,4</b> $\pm$ 5,4

**Figure 1:** Regional force-time integrals (FTI in % of total impulse) in the 10 foot regions for the 4 clinical groups (mean & standard deviation).

