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INTRODUCTION

JIA may affect various joints and may lead to specific malpositions with compensatory movements. Arthritis releases a pronounced pain stimulus, which causes the children to respond with a pain relieving position thus causing muscular dysbalance. In children with JIA-oligo the joint problem can partially be compensated by neighbouring joints, maintaining an asymmetric but usually rather smooth gait pattern. In children with JIA-poly the neighbouring joints are also affected and compensation is hardly possible. Therefore, these patients may develop a slow robot-like gait pattern [1]. The aim of this pilot study was to evaluate characteristic gait patterns in these diseases to show the necessity of specific treatment for the affected patients.

AIMS

- differences between JIA oligo and poly
- evaluate characteristic gait patterns of JIA oligo/poly patterns
- necessity of specific treatment for effected patients

PATIENTS, MATERIALS AND METHODS

20 patients with JIA-oligo (15 female; 5 male; age: 11.0 ±3.5 years) and 22 patients with JIA-poly (15 female; 7 male; age: 14.2 ±3.6 years) were examined.

Clinical data and pedobarographic measurements (emed ST 4, Novel; 50Hz) were collected from inpatients. Every participant passed a clinical examination and the visual analogue scale was used to assess the current pain intensity.

Plantar pressure measurements were carried out with the instruction to walk normal at self-selected velocity and recording a step in full gait. Ten valid trials (5 steps left /5 steps right) were stored for subsequent analyses. The foot was divided in 10 regions of interest and dynamic parameters (peak pressure PP, maximum force MF, force time integral FTI) were evaluated for all regions. All MF data were normalized to body mass.

The averaged data of right and left foot were used for statistical comparisons. Mann-Whitney U Tests were used for statistical analysis.

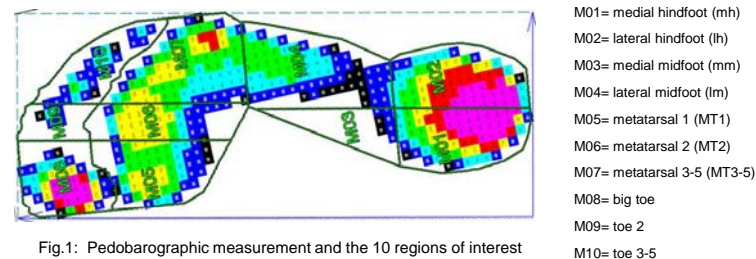


Fig.1: Pedobarographic measurement and the 10 regions of interest

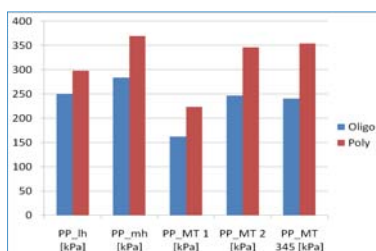


Fig.2: peak pressure values of selected regions under the foot of both groups

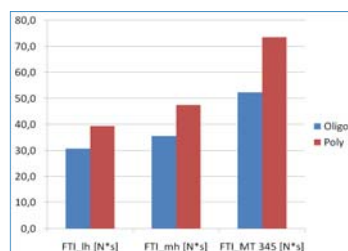


Fig.3: Force time integral in different regions

RESULTS

We found higher PP under the hindfoot in children with JIA-poly (medial (mh); lateral (lh)). Furthermore, significantly higher PP were seen in children with JIA-poly in the first metatarsal (MT1), second (MT2) and third to fifth metatarsal (MT3-5). The results of MF revealed higher force peaks in the lateral midfoot (lm) in patients with JIA-oligo. The analyses of the FTI showed higher values in the lateral and medial hindfoot and also in the third to fifth metatarsal (MT3-5) in patients with JIA-poly. The clinical findings indicated movement restrictions in dorsal and plantar flexion in patients with JIA-poly more frequently than in patients with JIA-oligo.

Tab.1: median, quartile distance (Q₇₅-Q₂₅) and results of Mann Whitney-U Test

	Oligoarthritis		Polyarticular arthritis		Mann-Whitney U Tests	
	median	n=20	Q ₇₅ -Q ₂₅	median (n=22)	Q ₇₅ -Q ₂₅	significance
PP_lh [kPa]	250		57	298	94	p=0,016
PP_mh [kPa]	284		117	370	123	p=0,037
PP_MT 1 [kPa]	162		117	224	98	p=0,049
PP_MT 2 [kPa]	247		124	346	174	p=0,022
PP_MT 345 [kPa]	241		129	354	189	p=0,008
MF_lm [N]	0,17		0,11	0,11	0,13	p=0,035
FTI_lh [N*s]	30,8		19,7	39,4	24,4	p=0,030
FTI_mh [N*s]	35,7		21,4	47,6	40,8	p=0,044
FTI_MT 345 [N*s]	52,4		28,3	73,5	37,2	p=0,034



Fig.4: Patient while stepping off the measure platform

Significant higher values:

- PP hindfoot (mh+lh) Poly-Patients
- PP metatarsal (1-5) Poly-Patients
- FTI hindfoot (mh+lh) Poly-Patients
- FTI metatarsal (1-3) Poly-Patients
- MF lateral midfoot Oligo-Patients

DISCUSSION

The higher values in the PP (heel), PP (metatarsal 1-5) as well as FTI (heel) of JIA-poly show that the pressure loads under the sole differ substantially between the compared diseases. Particularly the pressure values in these specific regions illustrate changes in the loading response (hindfoot) and the terminal stance phase (metatarsal). The differences in MF (lm) were significant, but the values were very small and so not essential.

The findings of this study demonstrate that the number of concerned joints influence the load structure. More involved joints can mean higher values in plantar pressure. (But both kinds of JIA differ a lot in number and combination of inflamed joints.) This shows that the necessity is given of preventive measures in these patients as well as different treatments in rehabilitation programs.

- number of concerned joints influence load structure
- preventive measures are necessary
- different treatment in rehabilitation is necessary

SUMMARY

The present study compared plantar pressure patterns of 22 patients with JIA polyarticular arthritis versus 20 Patients with JIA oligoarthritis in order to evaluate the necessity of specific treatment for affected patients. Ten trials (5 steps left/5steps right) were measured with self selected velocity. The measurements revealed higher peak pressure (PP) and force time integral in the hindfoot and higher PP in the first to fifth metatarsal in patients with polyarticular arthritis.

REFERENCES

- [1] Häfner, R., Spamer, M.: Rehabilitation of children. In: Isenberg DA., Maddison PJ., Woo P., Glass, D., Breedveld FC.: Oxford Textbook of Rheumatology, 3rd Edition. Oxford University Press 2004, 269-279.