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GAIT INITIATION IN PATTELAR CHONDROMALACIA SUBJECTS

Georgia Cristina Lehnen, Bioengineering and Biomechanics Laboratory/UFG/BR, georgialehnen@hotmail.com
Matias Noll, IF Goiano and Bioengineering and Biomechanics Laboratory/UFG/BR, matiasnoll@yahoo.com.br
Thales Baliero Takáo, Bioengineering and Biomechanics Laboratory/UFG/BR, engc.thales@gmail.com
Fernanda Nora, Bioengineering and Biomechanics Laboratory/UFG/BR, fgnora@gmail.com
Marcus Fraga Vieira, Bioengineering and Biomechanics Laboratory/UFG/BR, marcus.fraga.vieira@gmail.com

Resumo. *This study aimed to compare the gait initiation between healthy subjects and subjects with patellar chondromalacia, from kinetic and kinematic parameters, in order to analyze the adjustments due to this pathology to this task. Twenty one subjects of both sexes, aged 18-35 years, enrolled in this study. They were divided into healthy group (HG, n = 10) without patellar chondromalacia, and patellar chondromalacia group (CG; n = 11). Data were collected in a laboratory equipped with four AMTI force platforms and ten Bonita Vicon cameras, at a frequency of 100 Hz, using Vicon Nexus 2.0 software with Vicon Plug-in Gait with 35 reflective markers. Data acquisition started two seconds prior the sound command. Kinematic (knee maximum flexion angle) and kinetic parameters (center of pressure - COP) were evaluated. The results show that the CG executed the gait initiation faster than HC. Higher values of anterior-posterior COP displacement, especially in the anticipatory phase (phase 1), imply higher steady-state gait velocities [5]. Anticipatory adjustments create the propulsive forces necessary to reach steady-state gait [1]. Besides, higher velocities during gait, within certain limits, are associated with greater stability.*

Palavras chave*: gait initiation, pattelar chondromalacia, center of pressure.*

1. INTRODUCTION

Gait initiation is the transition from a standing position to the gait cyclic movement (Isais et al., 2014). The transition phase from a static to a dynamic condition involves contradictory postural stabilization functions: to prepare to an action and to recover from the perturbation (Bouisset e Do, 2008) Thus, the analysis of gait initiation by means of biomechanical parameters allows a better understanding of the central and peripheral control mechanisms involved in transient tasks (Xu et al., 2004). The comparison of these parameters between different groups provides clues as to how certain musculoskeletal restrictions interfere in these control mechanisms. Thus, this study aimed to compare the gait initiation between healthy subjects and subjects with patellar chondromalacia, from kinetic and kinematic parameters, in order to analyze the adjustments due to this pathology to this task.

2. METHODS

Twenty one subjects of both sexes, aged 18-35 years, enrolled in this study. They were divided into healthy group (HG, n = 10) without patellar chondromalacia, and patellar chondromalacia group (CG; n = 11), whose pathological condition was confirmed by magnetic resonance imaging. All volunteers were informed about the study purposes and signed a written consent. Data were collected in a laboratory equipped with four AMTI force platforms and ten Bonita Vicon cameras, at a frequency of 100 Hz, using Vicon Nexus 2.0 software with Vicon Plug-in Gait with 35 reflective markers. Kinematic data were processed using the Vicon Polygon software and kinetic data were processed using a custom Matlab code. Both groups performed five trials from a static standing position with one foot on each force platform. Two other force platforms recorded the first and second steps. The participants stood still until a sound command to start the gait with the right limb, walking six meters on a horizontal surface. Data acquisition started two seconds prior the sound command. Kinematic (knee maximum flexion angle) and kinetic parameters (center of pressure - COP) were evaluated. For evaluation of the COP, the gait initiation was divided into three phases (Hass et al., 2008): 1) Anticipatory adjustments phase; 2) Swing foot unloading phase and 3) Support foot unloading phase (Fig. 1). At each phase, the following COP descriptors were calculated: the anterior-posterior and medial-lateral displacement, calculated as the distance between the maximum and minimum position of the COP in the anterior-posterior and medial-lateral directions, and anterior-posterior and medial-lateral velocity, calculated dividing the COP displacements by the duration of each phase. For statistical analysis, we used the Shapiro-Wilk normality test and the paired T-test for intragroup comparisons and independent T-test for between group comparison, both with a significant level set at $\alpha = 0.05$.

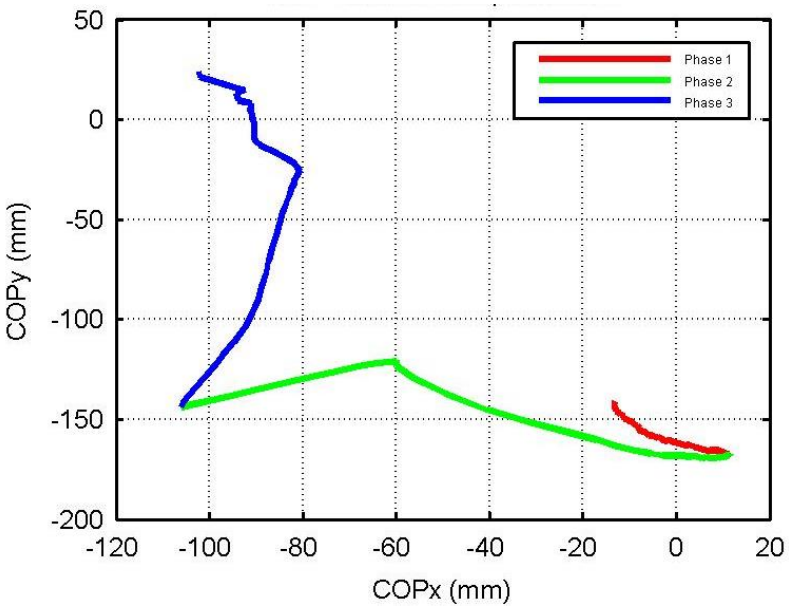

Figure 1. COP displacement during gait initiation showing the phases: in red, Phase 1, in green, Phase 2 and in blue, Phase 3.

3. RESULTS

Only the CG showed significant differences for the maximum knee flexion angle during swing phase of gait, being higher (p = 0.005) on the affected knee (51.08 ± 6.11°) compared to healthy knee (46.38 ± 3.14°). There was no significant difference for knee angle between the groups. The CG presented significant higher values than the HG for the COP descriptors, particularly in phases 1 and 3 (Table 1).

Table 1. Kinetic and kinematic results.

Kinetic parameters	**Phase**	**HG**	**CG**	**p**
Displacement (mm)	Anterior-posterior: 1	29,42±7,87	40,44±12,70	0,029 *
	Anterior-posterior: 2	55,91±25,18	51,89±21,84	0,700
	Anterior-posterior: 3	155,60±19,97	199,34±42,86	0,008 *
	Medial-lateral: 1	30,71±11,39	41,13±14,34	0,083
	Medial-lateral: 2	132,33±43,42	147,70±28,89	0,347
	Medial-lateral: 3	44,73±13,17	74,04±35,38	0,023 *
Velocity (mm/s)	Anterior-posterior: 1	84,13±21,40	118,39±34,44	0,014*
	Anterior-posterior: 2	154,19±70,61	180,98±65,72	0,379
	Anterior-posterior: 3	267,55±34,95	354,20±70,62	0,002*
	Medial-lateral: 1	91,14±37,32	123,54±52,47	0,123
	Medial-lateral: 2	366,70±110,49	551,53±157,91	0,006*
	Medial-lateral: 3	76,51±20,83	132,28±64,07	0,017*
Kinematic parameters				
Knee maximun flexion angle (º)		49,51 ± 9,19	48,73 ± 5,31	0,733

HG: healthy group (n=10), CG: patellar chondromalacia group (n=11). * p < 0,05.

4. CONCLUSION

In this study, the CG executed the gait initiation faster than HC. Higher values of anterior-posterior COP displacement, especially in the anticipatory phase (phase 1), imply higher steady-state gait velocities (Ledebt et al., 1998) Anticipatory adjustments create the propulsive forces necessary to reach steady-state gait (Isais et al., 2014). Besides, higher velocities during gait, within certain limits, are associated with greater stability (Kang e Dingwell, 2008). Thus, these results suggest that individuals with patellar chondromalacia execute the gait initiation faster in order to ensure greater stability, possibly an adaptation to the studied pathological condition.

5. REFERENCES

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7. CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.