ADOLESCENT IDIOPATHIC SCOLIOSYS PATIENTS SHOW SIGNIFICANTLY LARGER HIP ADDUCTION MOMENT ON CONCAVE SIDE THAN CONVEX SIDE

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Introduction

Adolescent idiopathic scoliosis (AIS) patients show lateral spinal deformity, thus many researchers have reported the relationship among scoliotic severity and kinematics of a level gait [Mahaudens, 2009, Syczewska, 2012]. On the other hand, there are less reports on the kinetics of AIS. To elucidate the kinetics of AIS is one of the most important factors to understand the pathology. The purpose of the study is to analyse the characteristics of the kinetics of AIS patients during a gait.

Methods

Ten female patients with AIS participated in this study. The mean age of the patients was 17.3 years old, and they had been not yet treated clinically. Their spinal curve pattern according to Lenke's classification and curve severity by Cobb's angle were recorded. The objective gait analysis was performed using an opt-electronic camera system and two force platforms. Three-dimensional joint moments and ground reaction forces were obtained, and the peak values during a stance phase in a gait were analysed. To compare between the concave and convex sides of AIS statistically, the distribution of the quantitative variables was established using paired–T test. The significance level was at 0.05.

Results

Table 1 shows representative mechanical parameters of the gait. No significant effect
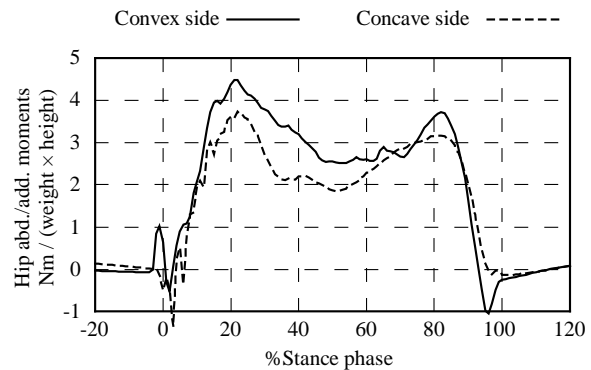

Figure 1: Typical hip adduction moments

was observed for the ground reaction forces between the both sides. The hip adduction moment on the concave side only was significantly larger than the convex side. As shown in Figure 1, through the stance phase, the typical hip adduction moments of the concave side showed larger than the one of convex sides.

Discussion

Because the center of gravity is shifted to the convex side due to the scoliotic deformity in the patients with AIS, a ground reaction force vectors on the concave side is inclined toward the convex side. Indeed, the lateral components of a ground reaction force (Fy) on the concave side tended to increase. Therefore, the moment arm between the force vector and the hip joint center should increase, which resulted in an increase of the hip adduction moment on the concave side. That difference of the hip adduction moment might affect the scoliotic deformity harmfully, and should cause the difference of the muscle activation or the bone mineral density at least. Thus, because a joint moment reflects a little geometrical deformity, kinetic analysis of the lower extremities of AIS patients could be useful to understand the pathology of AIS.

Table 1: Representative gait parameters

	Convex	Concave	*p val.*
GRF(Fy)	18.88 ± 3.40	19.71 ± 4.68	N.S.
GRF(Fz)	109.76 ± 7.92	110.35 ± 6.72	N.S.
Ankle Add.	1.46 ± 0.48	1.49 ± 0.62	N.S.
Knee Add.	2.31 ± 0.66	2.71 ± 0.79	N.S.
Hip Add.	4.25 ± 0.56	5.28 ± 0.86	0.02

Note: GRF: Ground Reaction Force, Fy: lateral direction, Fz: vertical direction, Add.: adduction moment

References

Mahaudens et al., Eur Spine J, 18:512-521, 2009.
Syczewska *et al*, Gait & Post, 35:209-213, 2012.