

Comparing Symptomatic and Asymptomatic Flatfeet Using Known Markers of Progressive Collapsing Foot Deformity: A Prospective Case Control Study

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INTRODUCTION: Flattening of the longitudinal arch of the foot (flatfoot) can represent a normal spectrum of foot morphology. The issue comes when the foot is collapsing progressively, what is now termed Progressive Collapsing Foot Deformity (PCFD). Interestingly, while patients may appear subjectively or radiographically similar, the clinical presentation of the deformity ranges from severe pain requiring treatment to entirely asymptomatic. Literature on this asymptomatic cohort, thought to represent a key step in the development of this progressive disease, has been scarce since asymptomatic patients do not seek medical attention. Alignment differences between asymptomatic flatfoot and PCFD have not been established and may represent a key step in understanding predictors of PCFD. The objective of this prospective study was to compare established PCFD measures in a cohort of asymptomatic flatfoot, PCFD patients, and healthy controls. We hypothesized that asymptomatic flatfoot alignment would differ from both symptomatic PCFD patients and healthy controls.

METHODS: In this prospective comparative study, patients with asymptomatic flatfeet were recruited to undergo a weight-bearing CT (WBCT) scan. This cohort (22 feet, 10 males and 12 females) was compared to two other prospective cohorts (22 symptomatic PCFD patients and 22 healthy controls). Along with demographic data, PCFD measurements performed include Foot and Ankle Offset (FAO), Forefoot Arch Angle (FAA), Middle Facet Uncoverage, and the Transverse Arch Plantar (TAP) angle. Normality of variables was assessed using the Shapiro-Wilk test. Chi-squared or analysis of variance (ANOVA) test was performed to compare each parameter between the three groups. A post-hoc Bonferroni test was then performed to assess significance between each group pairing. P-values >0.05 were considered significant.

RESULTS: All three groups were comparable on BMI (p=0.10), Age (p=0.75), and Gender (p=0.78). All measurements taken differed significantly between the symptomatic PCFD and healthy controls (Table 1). FAO was significantly different between controls vs. asymptomatic (p<0.001) and asymptomatic vs. symptomatic (p<0.001). FAA was also significantly different between asymptomatic and both symptomatic (p=0.001) and control groups (p=.001). Middle facet uncoverage differed between the asymptomatic and control group (p=0.001) but the asymptomatic and symptomatic group were similar (p=0.106). While the TAP angle was significantly different between asymptomatic and symptomatic groups (p=0.013), the asymptomatic and control groups failed to reach significance (p=0.061) (Table 1). Lastly, deformity measurements for asymptomatic flatfeet were in between the values for healthy controls and symptomatic PCFD for all measures (Figures 1-3).

DISCUSSION AND CONCLUSION: To our knowledge this is the first prospective study to compare healthy controls, asymptomatic flatfoot, and symptomatic PCFD patients. We observed that asymptomatic flatfoot patients had measurements of PCFD that would fall in between normal alignment and symptomatic PCFD patients. Further, the asymptomatic group differed significantly from both other groups on every measure but two. Our data supports the idea that asymptomatic flatfoot should be considered a risk factor for Progressive Collapsing Foot Deformity and may represent a step in the progression from a healthy foot to a painful foot in the overall clinical understanding of this deformity.

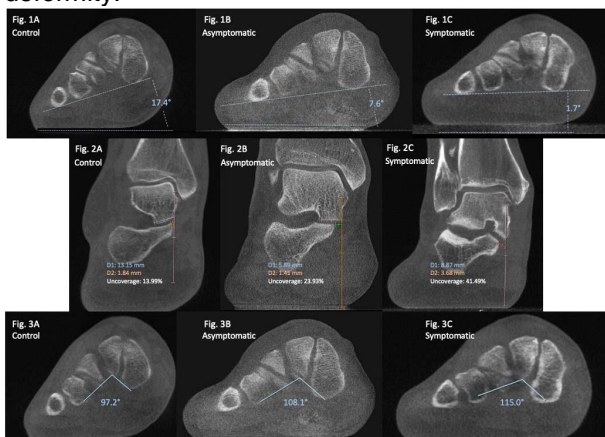


Table 1. Measurement ANOVA, means and 95% confidence Intervals

Measurement	ANOVA P	Means	95% Confidence Interval		p
			Lower	Upper	
Foot and Ankle Offset (FAO) (%)	Control vs Asymp	1.75 vs 6.19	-6.62	2.26	<0.001
	Control vs Symp	1.75 vs 10.30	-10.73	-6.37	<0.001
	Asymp vs Symp	6.19 vs 10.30	-6.29	-1.93	<0.001
Forefoot Arch Angle (°)	Control vs Asymp	12.98 vs 7.47	1.97	9.04	0.001
	Control vs Symp	12.98 vs 1.98	7.46	14.53	<0.001
	Asymp vs Symp	7.47 vs 1.98	1.96	9.03	0.001
Middle Facet Uncoverage (%)	Control vs Asymp	15.68 vs 32.17	-26.84	-6.15	0.001
	Control vs Symp	15.68 vs 41.15	-35.82	-15.13	<0.001
	Asymp vs Symp	32.17 vs 41.15	-19.33	1.36	0.106
Transverse Arch Plantar (TAP) Angle (°)	Control vs Asymp	98.86 vs 105.45	-13.46	0.27	0.061
	Control vs Symp	98.86 vs 113.69	-21.69	-7.97	<0.001
	Asymp vs Symp	105.45 vs 113.69	-15.10	-1.37	0.013