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Arch Height in Individuals with Multiple Sclerosis: A Pilot Study

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Introduction

Multiple Sclerosis (MS) is the most common neurological disorder affecting younger adults. MS causes demyelination of nerves in the central nervous system, which impairs the ability of the nerve to conduct its impulse to other nerves and muscles. Over time, weaknesses and sensory deficits in the limbs may lead to structural changes in the musculoskeletal system, such as tightness in certain muscles and joints (calf and ankle) and excessive motion in others (foot and knee). Structural changes in the foot, including arch height and mid-foot flexibility, have yet to be measured or studied in persons with MS.

Purpose

The primary purpose of this pilot study was to measure the arch height index in individuals with MS and compare values between the more involved and less involved lower extremity.

Hypothesis

MS subjects have decreased arch height on the more involved lower extremity when compared to the less involved lower extremity in both sitting and standing.

Subjects

Eighteen individuals with relapsing-remitting or secondary progressive MS who were ambulatory, defined by Expanded Disability Status Scale of ≤ 6.5.

Methods and Materials

Arch height index was determined for each subject using the Arch Height Index Measurement System (JAK Tool and Model LLC, Matawan, New Jersey) in sitting and standing positions. (Figure 1) Foot posture index was performed in standing.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Standing (Involved)	18	0.09	0.26	0.35	0.31	0.026
Standing (Uninvolved)	18	0.09	0.25	0.34	0.31	0.028
Sitting (Involved)	18	0.10	0.28	0.38	0.34	0.032
Sitting (Uninvolved)	18	0.11	0.29	0.40	0.35	0.030

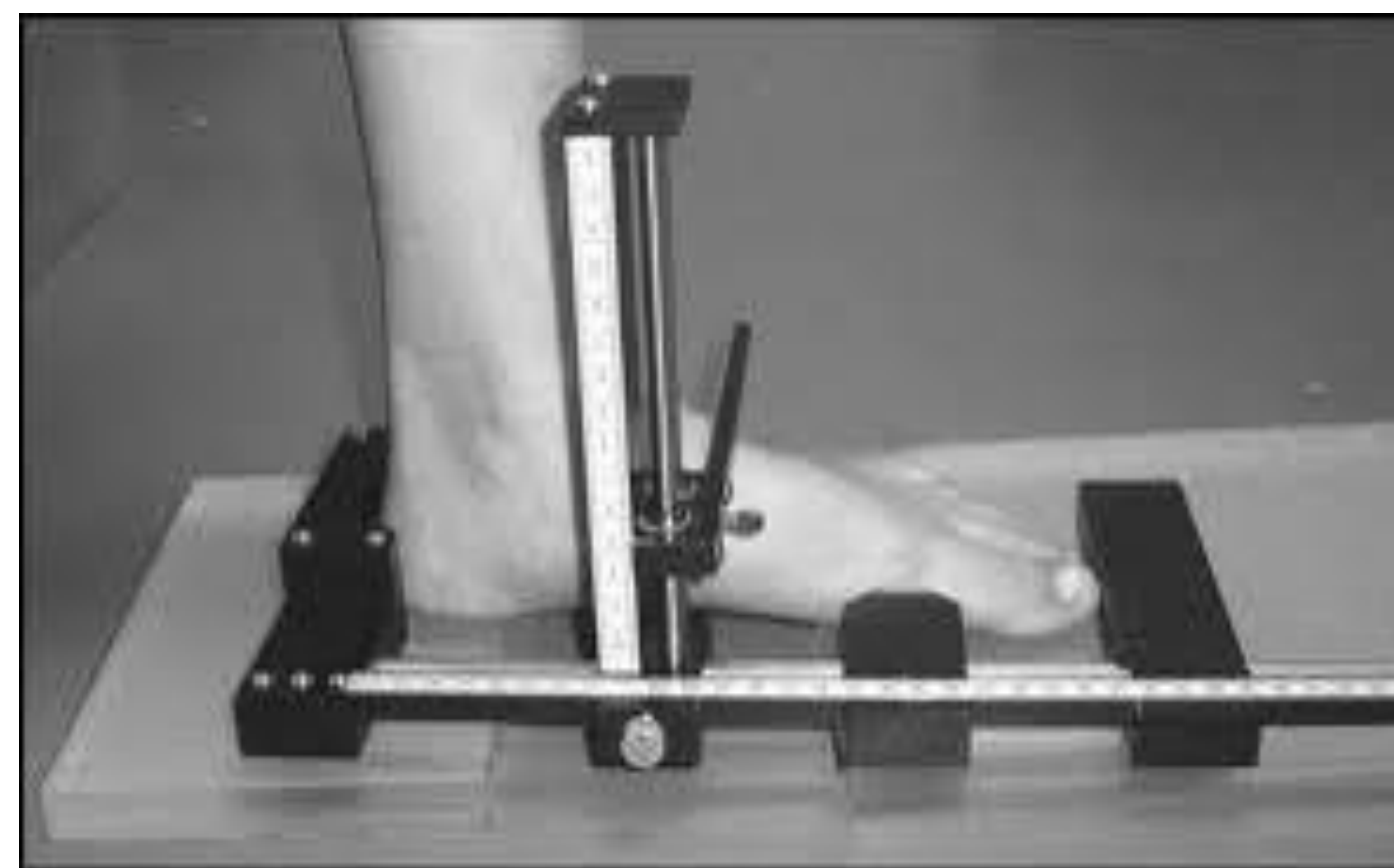Table 1: Arch height data summary

Figure 1: Arch height measuring device

Data Analysis and Results

Data from Wilcoxon Signed Rank tests demonstrated no significant differences between the standing arch height index and foot posture index of the more involved and less involved lower extremities. However, there was a significant difference between the sitting arch height index, with the more involved side being shorter than the less involved side ($p = 0.02$).

Conclusion and Clinical Relevance

In this exploratory observational study, no differences in standing arch height index were observed between the more and less involved lower extremity in individuals with MS. A larger study that allows for analysis of factors such as time since diagnosis, sensation and strength as well as comparisons with age matched normative values may provide more useful information. Due to the foot structure in the MS population, therapists should consider recommending orthotic intervention to prophylactically protect the arch. Furthermore, therapeutic exercise prescription should incorporate intrinsic foot strengthening as well as strengthening of the core, hip abductors and external rotators.

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