Static and dynamic indexes of the medial longitudinal arch of the foot

Koji Kawamichi, P.T. [#1], Orie Iwata, P.T. [#1], Naoto Suzue, M.D.[#2], Takenobu Iwase, M.D.[#3] Takao Mitsui, M.D. [#4]

#1. Department of Rehabilitation, Tokushima National Hospital, National Hospital Organization, 1354 Shikiji, Kamojima, Yoshinogawa, Tokushima 776-8585 Japan

#2. Department of Orthopedics, University of Tokushima

#3. Department of Orthopedics, Tokushima National Hospital, National Hospital Organization, 1354 Shikiji, Kamojima, Yoshinogawa, Tokushima 776-8585 Japan

#4. Department of neurology, Tokushima National Hospital, National Hospital Organization, 1354 Shikiji, Kamojima, Yoshinogawa, Tokushima 776-8585 Japan

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Abstract

We examined the static index (Arch Ratio) and the dynamic index (Arch Drop Ratio) of the medial longitudinal arch of the foot of primary school-aged footballers.
The subjects exhibited symptoms related to both the Normal Group and Ankle/Foot Pain Group.
In a non-weight bearing position, the arch ratio and arch drop ratio showed equilateral correlation. In the weight bearing position, the arch ratio and arch drop ratio showed a negative correlation. The arch drop ratio of the Ankle/Foot Pain Group was significantly larger than that of the Normal Group. The arch drop ratio of the patients whose arches remained in a non-weight bearing position but became flat in a weight bearing position was high. The patients whose arch drop ratio was large complained of foot pain frequently.

Key Words: static index, arch ratio, dynamic index, arch drop ratio, primary schoolchild footballer, Ankle/foot pain,

Introduction

Medial checks in the school / sports classroom are useful for early detection of sports-related injuries [1]. Medical checks for primary school aged footballers have been conducted in Tokushima for 20 years. In disorders affecting primary school aged footballers, disorders of the knee and the foot account for 75% of all disorders. Investigation into the development of lower limb disorders is necessary. We have studied the relationship between the medial longitudinal arch of the foot (MLA) and foot disorders. We conducted static and dynamic evaluation of MLA in a non-pain group and a pain group.

Subjects and Methods

The subjects were primary school boys (5th or 6th graders) who received a primary schoolchild soccer Medical Check at Tokushima hospital in 2010. The subjects were classified into two groups; a normal group (n=138) and an ankle/foot pain group (n=50). The arch ratio was measured for a static evaluation index in a bearing position

Correspondence to: Koji Kawamichi, P.T., Tokushima National Hospital, National Hospital Organization, 1354 Shikiji, Kamojima, Yoshinogawa, Tokushima 776-8585 Japan. Phone: +81-883-24-2161 Fax : +81-883-24-8661

and a weight bearing position. The arch drop ratio was measured for a dynamic evaluation index. The measurement of the non-load position was carried out in a sitting position. The measurement of the load position was carried out in a single leg standing position. The height from the sole side to foot part tubercle of the scaphoid bone was defined as the "navicular height". The arch ratio was defined as the "navicular height" / "foot length". The arch drop ratio was defined as the difference between the arch ratio in non weight bearing and weight bearing conditions. The statistical analysis used a Student T test and a Pearson's product moment analysis.

Results

The relationship between arch ratio and arch drop ratio is shown in Figure 1. The arch ratio in the non-weight bearing condition and the arch drop ratio showed an equilateral correlation ($r=0.217, P<0.01$). The arch ratio in the weight bearing condition and the arch drop ratio showed a negative correlation ($r=-0.329, P<0.05$). The arch ratio and arch drop ratio of the normal/pain groups is shown in Figure 2. The arch ratio in the non-weight bearing condition was 17.5+-2.4% (mean+-SD) in the normal group, and 17.4+-2.5% in the ankle/foot pain group. The arch ratio in the weight bearing condition was 15.4+-2.4% in the normal group, and 14.8+-2.6% in the ankle/foot pain group. The arch drop ratio for the normal group was 2.1+-1.3%, and for the ankle/foot pain group it was 2.6+-1.5%. There was no significant difference in arch ratio and static perimetry index. The arch drop ratio and kinetic perimetry index were significantly higher in the Ankle/Foot Pain Group($P <0.05$).

Discussion

The arch ratio, which is a static evaluation index, is often used for evaluation of MLA. Because most sports activities are dependent on movement while under load, a dynamic index considering load is important. We measured the arch drop ratio for a dynamic index. In the results of this study, a correlation was shown between the arch ratio and arch drop ratio. The arch ratio in a non-weight bearing condition and the arch drop ratio showed an equilateral correlation. The arch ratio in a weight bearing condition and the arch drop ratio showed a negative correlation. The results indicate that arch ratio is high in a non-weight bearing condition and the arch drop ratio increases in a weight bearing condition. In other words, it is thought that the arch of a boy's foot becomes flat during sports activity. From the comparison between the normal group and the ankle/foot pain group, the arch ratio of the static evaluation index did not show any difference. However, the arch drop ratio, which was the kinetic perimetry index, significantly increased in the Ankle/Foot Pain Group. When a disorder is detected for an evaluation index of MLA, the arch drop ratio seems more sensitive than the arch ratio.

References

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