

RELATIONSHIP BETWEEN REDUCED OF MEDIAL LONGITUDINAL ARCH HEIGHT AND KNEE VALGUS

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INTRODUCTION: Knee valgus during jump landing is considered to be one of the situations that may cause injury to the anterior cruciate ligament (ACL). Decreased muscle torque during hip abduction is also reported to be a causative factor for knee valgus, as is pronation of the ankle joint (Joseph M et al. 2008). Further, knee valgus may occur when a reduction in the height of the medial longitudinal arch causes ankle pronation, leading to tibial inclination angle to the inside. In this study, motion analysis was performed to investigate the relationship between a reduction in the height of the medial longitudinal arch and knee valgus.

METHODS: This study involved 15 healthy subjects who were not experiencing any pain in the lower limbs at the time of measurement. Prior to the experiment, the distance from the navicular tuberosity to the floor was measured in seated position and in weightbearing position to determine reduction of the medial longitudinal arch height. The leg-heel angle was also measured. The subjects were asked to perform single leg jump landing as a trial task. Twelve markers were attached to each subject. Four high speed video cameras (FKN-HC200C, 4Assist, Inc., Japan, 200 Hz) were used for recording the trial task. The video sequences were digitized. A direct linear transformation method was performed to establish the three-dimensional coordinates of the femur and tibia during landing by a 3D motion analyzer (Frame-DIAS II, DKH Co., Japan). The angles of flexion, knee valgus, and tibial inclination angle to the inside were calculated using the joint coordinate system proposed (Grood ES et al. 1983). When knee flexion angle was 45° during the single-leg jump-landing task, the correlation between the reduction in the medial longitudinal arch height and (1) the knee valgus angle, (2) the tibial inclination angle to the inside, and (3) the leg-heel angle was examined using Pearson's correlation analysis. The statistical significance level was set at less than 5%.

RESULTS: A significant relationship was identified between a reduction in the medial longitudinal arch height and the knee valgus angle ($r=0.54$, $p<0.05$). A significant relationship was also recognized between the tibial inclination angle to the inside and the knee valgus angle ($r=0.59$, $p<0.05$). No significant correlation was observed between the leg-heel angle and the knee valgus angle.

DISCUSSION & CONCLUSION: Knee valgus angle is considered to be influenced not only the knee joints but also hip and ankle joints. The results of this study revealed that a reduction in the height of the medial longitudinal arch might trigger tibial inclination to the inside and increased the knee valgus angle. Thus we consider it necessary to assess foot function in order to prevent ACL injury. Interestingly, no relationship was identified between the leg-heel angle (the pronation angle of the calcaneus) and the knee valgus angle; the importance of this finding is made clear in our future studies. Our results indicated that a reduction in the height of the medial longitudinal arch increases the knee valgus angle consequently increasing the risk of ACL injury.

REFERENCES:

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