

Measurement of 3D Knee Kinematics Using Skin Marker System: Internal tibiarotation during side-step cutting

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Introduction

Knee joint has complicated 3D movement. This complexity should be a reason to cause knee ligament injuries. It is clinically important to analyze tibial rotation during sports movement. However, there are few studies showing accurate kinematics of internal tibial rotation. In this study, we used skin markers to measure detailed 3D knee joint kinematics during walking and side-step cutting.

Material and Methods

Seven male athletes who play sports at least 4days in a week (average age: 21.6yrs) performed level walking and side-step cutting following one or two steps. A five camera motion analysis system and a force plate were used at 120Hz. A point cluster method was used to calculate knee kinematics, in which 21 reflective markers were instrumented on subject's limb. The relative positions of the femur and tibia were calculated.

Result

A point cluster method showed similar results in knee flexion angles when compared to regular skin marker system. The tibia rotated internally as the knee bent during level walking. There was average 17.0internal tibial rotation during walking. We also confirmed the screw-home movement. The tibia also internally rotated as the result of knee flexion during the side-cut. Average knee flexion angle and internal tibia rotation angle were 75.8 and 19.8 during one step approach running, and 75.3 and 16.0 during two step approach running, respectively.

Conclusion

Internal tibia rotation could be measured in details using a point cluster method. Motion analysis using skin markers is less invasive than X-ray analysis." In addition, the motion was not restricted in the analysis. Measuring internal tibia rotation during the motion like side-step cutting seemed effective to understand mechanism of the knee ligament injury.