INTRODUCTION.

Patients with posterior cruciate ligament (PCL) deficient sometimes experience giving way during stair descending, although they do not usually have disability in performing most of activities of daily living (ADL). This fact suggests that the patients should have adaptation mechanism to lack of posterior stability during the activity. However the mechanics of PCL deficient knee during ADL is not well understood. The purpose of this study was to analyze knee mechanics of PCL deficient knees during stair descending. Knee kinematics and kinetics of the patients with the symptom were compared to those of the patients without the symptom and healthy knees.

METHODS.

Mechanics of the knee were obtained from 22 patients (14 males and 8 females) with isolated PCL injury and 20 healthy volunteers (10 males and 10 females). All patients and subjects read and sign a consent form. Ten of twenty-two patients had giving way during stair descending though twelve had no complaint during the activity. All patients were tested at more than 6 months after injury, and had a questionnaire before the test. A three camera and a force plate system were used to obtain knee kinematics and kinetics. Each subject performed stair descending with two single platforms, having a height of 21 cm \[1\]. The first step onto the platform was recorded. As a statistical test, an analysis of variance (ANOVA) with a single factor was used.

RESULTS.

There were remarkable differences in the knee mechanics during stair descending between PCL deficient knees with and without giving way, while there was no difference between PCL deficient knees without the symptom and normal volunteers. Average knee flexion angle during the early stance phase (between 10 and 40% stance phase) was smaller in PCL deficient knees with the symptom than without the symptom (p<0.05). There was no difference in the angles during late stance phase between two groups of the patients (Figure 1).

During early stance phase, lack of the first peak in knee flexion moment was seen with 60% of PCL deficient patients with the symptom. Maximum values of the first peaks were significantly smaller in PCL deficient knees with the symptom \((1.16 \pm 1.7 \, \%BW*Ht)\) than without the symptom \((4.02 \pm 1.57\%BW*Ht, \ p<0.05)\).

In addition, there were smaller or no first peaks in knee posterior force in 60% of PCL deficient knees with the symptom. (Figure 2) Maximum values of the first peaks were significantly smaller in PCL deficient knees with the symptom than without the symptom \((p<0.05)\).

DISCUSSION.

Stair descending is a common activity of ADL. Knee is more flexed during stair descending (about 90 degrees) than during level walking (about 65 degrees). In early stance phase during stair descending, PCL deficient knees with the symptom had smaller knee flexion angle, net flexion moment and net posterior force than without symptom. Keeping knee in less flexion with PCL deficient knees should be adaptive motion during stair descending, since the large posterior force sustained at the knee will result in larger stress at high angle of flexion \[2\]. This typical motion should be followed by posterior translation of the tibia in PCL deficient knees. In future studies, kinematics of PCL deficient knees in swing phase will be evaluated by fluoroscopy. In addition activity of muscles around the knee will be also discussed.

REFERENCES.
