INTRODUCTION:
Several imaging techniques, such as axial radiographs [1] [2], CT and MRI are used to evaluate the patellofemoral congruency and diagnose lateral patellar instability. They are quantitative, however, need imaging systems. The physical examinations such as J sign [3] and active patellar subluxation test [4] are simple technique used clinically, however, are unmeasurable and examiner-dependent. Lack of easily-applicable quantitative technique for screening lateral patellar instability makes difficult to diagnose asymptomatic patellar maltracking before onset of patellar dislocation or subluxation. In this study, the dynamic patellar tracking was quantitatively analyzed with a new measurement technique using a digital video system, and compared between the normal knees and the knee with patellar instability.

MATERIALS AND METHODS:
Ten knees of 10 volunteers with no past traumatic history or complaints of the knees (control group, mean age of 29.1±5.2 years-old) and 11 knees of 6 patients with prior dislocation and/or feeling of patellar apprehension (patient group, mean age of 27.5±11.0 years-old) participated in this study. Each subject was seated on a testing table with reflective markers placed on the medial, lateral femoral epicondyles (knee markers), greater trochanter, lateral femoral condyle and lateral malleolus. To identify the medial and lateral edge of the patella, the examiner pinched the patella with the thumb and index finger with reflective markers attached to the finger tips (patellar markers). The subject actively extended the knee from the seated position to full extension, and the examiner followed the patella (Active patellar subluxation test). Frontal and lateral views of the knee joint were recorded with digital video cameras. The patella position on the frontal plane was defined as the percent patellar position (%PP), which was a percentage of the distance from the medial knee marker to the midpoint of the medial and lateral patellar markers (MP in Figure 1) divided by the distance between the medial and lateral knee markers (ML in Figure 1). The knee flexion angle was measured using the markers on greater trochanter, lateral femoral condyle and lateral malleolus (Figure 2). In reference to the %PP at the seated position, the change in %PP at every 5° of knee flexion was determined until full extension.

RESULTS:
In the control group, the %PP was decreased with closing to knee extension and the change in %PP was less than 3% between 75° to 5° of knee flexion. In the patient group, the %PP was decreased from 75° to 35° and was increased from 35° to 5° of knee flexion (Figure 3).
At 25°, 20°, 15°, 10° and 5° of knee flexion, the change in %PP of the patient group was significantly larger than that of the control group (p<0.05 in Mann-Whitney U-test).

DISCUSSION:
In this study, the new measurement technique using the digital video system succeeded to noninvasively and quantitatively evaluate dynamic patellar tracking. A significant difference in patellar tracking was detected between the control and patient groups. The increased %PP in lower flexion angle was observed in the patient group, while not in the control group. The asymptomatic increase in %PP at the knee extension might be a risk factor for patellar dislocation. This technique will be useful for screening as well as cross-sectional and longitudinal study of patellar instability.

SIGNIFICANCE:
The measurement technique used in this study is a simple and noninvasive way to quantitatively evaluate the dynamic patellar tracking.

REFERENCES: