**Introduction:** Rupture of anterior cruciate ligament (ACL) causes anterolateral rotatory instability (ALRI), which often results in an unstable knee with a symptom of “giving-way”. The clinical success of the surgical treatment for ACL-deficient knee depends on the improvement of ALRI. However, in the clinical evaluation of the ACL-deficient knee, ALRI is assessed by manual tests such as the pivot shift test, which is subjective and not quantitative. Therefore, we developed a new method to quantify the ALRI in ACL-deficient knee by using an open MRI and evaluated the feasibility and reliability of this method.

**Materials and Methods:** Eighteen subjects with ACL-deficient knees and 18 with normal knees were recruited. We administered the Slocum’s ALRI test in the open MRI scanner. Briefly, the subject lied on the unaffected side and was rotated posteriorly to be at a 30 degrees angle from the surface of the table. The weight of the affected extremity was borne on the medial side of the heel and the knee was placed in 10 degrees of flexion. In this position, the tibia rotates internally and the knee sags into valgus. The examiner stood at the posterior side and pushed the fibular head anteriorly to increase the stress that makes the tibia rotate anteriorly and internally. The sagittal view of the knee was scanned and the anterior displacements of the tibia at the medial and lateral compartments were measured. Furthermore, we examined twice for 14 ACL-deficient knees to assess intra- and inter-observer reproducibility and evaluated the difference and interclass correlation coefficient of two measures.

**Results:** In the ACL-deficient knee, displacement was $14.4 \pm 5.5$ mm at the lateral compartment and $1.6 \pm 2.3$ mm at the medial compartment; and in the normal knee, displacement was $0.7 \pm 1.9$ mm and $-1.1 \pm 1.2$ mm, respectively. Therefore, the anterior displacement of tibia of ACL-deficient knee is significant in the lateral compartment, but not in the medial compartment, indicating the ALRI. The difference and interclass correlation coefficient between two repeated measures at the lateral compartment were $1.0 \pm 0.7$ mm and 0.98 for the intra-observer reproducibility, and were $1.1 \pm 0.7$ mm and 0.91 for the inter-observer reproducibility, respectively. (Figure 2)

**Discussion:** The surgical procedure for the reconstruction of ACL has been under continuing development to improve stability under rotatory stresses; ie: more oblique positioning of the graft or anatomical two-bundle reconstruction. However, the clinical advantage of these most current techniques compared with the conventional method is undecided probably because of the difficulty of assessing the rotatory instability. This method is useful to assess the ALRI of the ACL-deficient knee in the comparing study of the surgical techniques.