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The Impact of the Anterolateral Capsule Injury on the Rotational Laxity in the Anterior Cruciate Ligament Injured-Knees. A Result of Clinical Quantitative Evaluation of the Pivot-Shift Test

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Summary:
The impact of the anterolateral capsule (ALC) injury on the rotational laxity in the ACL-injured knees was tested using a quantitative evaluation of the pivot-shift test in 82 clinical cases, and the measurements were compared between the ACL-injured knees with and without the ALC injury determined by MRI. As a result, the ALC injury did not worsen the rotational laxity in the ACL-injured knees.

Abstract:
Purpose
The potential impact of the anterolateral capsule (ALC) injury on the rotational laxity in the anterior cruciate ligament (ACL) injured-knees has been suggested by some basic in-vitro studies, however most of such studies utilized their original rotational stress test rather than the clinically-used pivot-shift test. The pivot-shift test might be difficult to be simulated by applying a complex rotational stress but is exclusively specific to evaluate the rotational laxity. There are some quantitative measurement devices for the pivot-shift test which can be used in our clinical practice. The purpose of this study was to quantitatively evaluate the pivot-shift test in clinical cases and compared them between ACL injured-knees with and without the ALC injury determined by MRI.

Methods
There were 82 patients (38 males and 44 females, age 25.1 ± 11.7 y.o.) who underwent primary unilateral ACL reconstruction in this study. The pivot-shift test was performed under anesthesia before ACL reconstruction, and the quantitative evaluation using electromagnetic measurement system (EMS) was conducted to provide the rotational laxity measurements as the tibial acceleration (m/sec2) in addition to the four levels of clinical grading according to the IKDC (none, glide, clunk, and gross). The presence of the concomitant ALC injury in the ACL injured knees were assessed on the MRI based on the report of Helito et al, forming two groups ALC-injured group (ALC+) and ALC intact-group (ALC-). Chi-square test and independent t-test were used to assess the difference between ALC+ and ALC- groups for clinical grading and quantitative measurements respectively. Statistical significance was defined as a p value of <0.05.

Results
There were 42 knees in the ALC+ group and 40 knees in the ALC- group. In clinical grading, there were 21 knees were graded as glide, 18 knees as clunk, and 3 knees as gross in ALC+ group, whereas 21 knees of ACL- group were judged

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as glide, 16 knees as clunk, and 3 knees as gross respectively. There was no difference in clinical grading between ALC+ and ALC- groups ($p = 0.97$).
The tibial acceleration during the pivot-shift test was also similar in ALC+ group (1.41 ± 1.16 m/sec2) and ALC- group (1.65 ± 1.29 m/sec2) ($p = 0.19$).

Discussion
The effect of the ALC injury accompanied with the ACL injury on the rotational laxity was not observed in our clinical cases by either clinical grading or quantitative evaluation. Although the ALC injury cannot be accurately identified especially in clinical cases due to its anatomic variation and immature definition, it has recently been suspected as a major factor to aggravate the knee rotational laxity leading to high-grade pivot-shift. In this study, however, the impact of the ALC injury on the rotational laxity was not confirmed. Therefore, we should pay more attention to the other common and identifiable injures such as meniscus and cartilage tear.

Conclusion
The concomitant ALC injury determined by MRI did not affect to the rotational laxity in the ACL-injured knees.