

# Comparative Study of in vivo stability using using Navigation System between Normal knee and ACL injured knee

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## Purpose

We compared anteroposterior translation and internal-external rotation of the tibia of normal knee to it of ACL injured knee by navigation system, and suggested objective index to diagnose instability resulted from ACL injury.

## Materials and Methods

We evaluated normal group who were treated with arthroscopy from March 2007 to February 2008, were composed of 44 patients (31 males and 13 females), and their mean age was 36.8 years old (16~57). The group of ACL injury included 41 patients(31 males, 10 females) who were performed ACL reconstruction with navigation during the same period of time and their mean age was 34.5 years old (17~64). We measured amount of anteroposterior displacement and rotation of the knee in 0, 30, 60 and 90 degrees of flexion position using Orthopilot navigation system. All tests were simulated by same single surgeon under manual maximal force.

## Results

The mean anterior displacement was  $3.6 \pm 2.0$ ,  $6.7 \pm 2.7$ ,  $6.0 \pm 2.4$  and  $4.7 \pm 1.8$  mm in 0, 30, 60 and 90 degrees of flexion respectively in normal group, the mean anterior displacement was  $6.8 \pm 3.6$ ,  $14.7 \pm 6.7$ ,  $11.9 \pm 4.6$  and  $8.5 \pm 4.8$  mm in 0, 30, 60 and 90 degrees of flexion in the group of ACL injury. The mean posterior displacement was  $2.1 \pm 0.8$ ,  $2.4 \pm 0.8$ ,  $2.1 \pm 0.6$  and  $2.2 \pm 0.9$  at each degree in normal group, the mean posterior displacement was  $3.2 \pm 0.8$ ,  $2.4 \pm 0.8$ ,  $2.1 \pm 0.6$  and  $2.2 \pm 0.9$  mm at each degree in the group of ACL injury. The difference of anterior displacement at each degree showed statistically significance, however the difference of posterior displacement was significantly different only at 0 and 30 degrees. The difference of anterior displacement at 30 degrees of flexion between two groups was  $8.0 \pm 0.6$ , and was recored significantly larger than other degrees. The mean internal rotation was  $10.7 \pm 3.0$ ,  $15.4 \pm 3.7$ ,  $16.5 \pm 3.2$  and  $15.2 \pm 4.0$  degree at each degree in normal

group, The mean internal rotation was  $14.4 \pm 3.6$ ,  $18.4 \pm 4.5$ ,  $18.3 \pm 4.7$  and  $16.6 \pm 3.9$  degree at each degree in the group of ACL injury, significant difference was presented at 0, 30, 60 degrees. The mean external rotation was  $8.1 \pm 3.2$ ,  $16.0 \pm 3.4$ ,  $13.7 \pm 3.9$  and  $13.2 \pm 3.4$  degree at each degree in normal group, the mean external rotation was  $9.5 \pm 3.5$ ,  $18.6 \pm 4.1$ ,  $16.6 \pm 3.7$  and  $16.2 \pm 4.2$  degree at each degree in ACL injured group, significant difference was found only at 60 and 90 degrees.

## Conclusions

In the measurement of laxity using navigation, we could acquire previously mentioned results. The difference of anterior displacement at 30 degrees of flexion between two groups was  $8.0 \pm 0.6$ . In case of more than 10 mm of displacement at 30 degrees of flexion, ACL injury can be diagnose, sensitivity 92.7% and specificity 90.9%. The measurement of stability of knee will be useful in diagnosing ACL injury and evaluating degree of postoperative symptomatic improvement.