

# Effect of LM suture repair and centralization on rotational laxity in ACLR knees.

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**INTRODUCTION:** Rotational laxity after anterior cruciate ligament reconstruction (ACLR) decreases the postoperative patient satisfaction, causes knee joint dysfunction, and may lead to knee osteoarthritis. Since the lateral meniscus (LM) is a secondary stabilizer of the ACL, its dysfunction is one of the causes of residual rotational laxity of the knee joint. In this study, LM suture and centralization was performed during ACLR in the patients of ACL injury accompanied with LM injury, and investigated the changes of the tibial acceleration during pivot-shift test.

**MATERIALS and METHODS:** Nineteen primary ACL injury patients who required LM repair were included in this study. The pivot-shift test was performed under preoperative anesthesia (PreOP state), after double-bundle ACLR (LM injured state), after LM suture (LM suture state), and after LM suture and centralization (centralization state), and the acceleration of the tibia were measured using a tri-axial accelerometer (KiRA). The tension of each graft was set to 5N for the antero-medial (AM) bundle, 5N for the posterolateral (PL) bundle (A5P5), and A10P10, utilizing graft tensioning system (Zimmer-Biomet). Multiple comparisons were performed between the tibial acceleration of the healthy and the injured knee at each intraoperative time point. A one-way ANOVA test was conducted for evaluating tibial acceleration at each state, followed by Bonferroni correction, with  $P < 0.05$  considered a significant difference. Data are shown as mean  $\pm$  standard deviation.

**RESULTS:** In A5P5, tibial acceleration was significantly lower in the LM injured state ( $5.0 \pm 1.6 \text{ m/s}^2$ ), the LM suture state ( $4.0 \pm 0.9 \text{ m/s}^2$ ), and the LM suture and centralization state ( $2.9 \pm 1.0 \text{ m/s}^2$ ) compared to PreOP state ( $8.2 \pm 2.2 \text{ m/s}^2$ ). Furthermore, it was also significantly lower with LM suture and centralization than with ACLR without LM repair. The same results were also observed in A10P10 (LM injured:  $4.5 \pm 1.5 \text{ m/s}^2$ , LM suture:  $3.5 \pm 1.0 \text{ m/s}^2$ , LM suture and centralization:  $2.8 \pm 0.8 \text{ m/s}^2$ ).

**DISCUSSION:** In recent years, lateral extra-articular tenodesis (LET) and anterolateral structure reconstruction (ALSR) have been performed in patients with ACL injuries who have risk factors for residual rotational laxity of the knee joint after ACLR, but they are relatively invasive. On the other hand, the centralization technique is less invasive and relatively simple compared to these techniques. This study showed that the centralization technique would be a useful alternative to LET and ALSR.

**SIGNIFICANCE/CLINICAL RELEVANCE:** LM centralization would be a relatively simple and minimally invasive technique for stabilizing rotational laxity of the knee joint.

Fig. 1

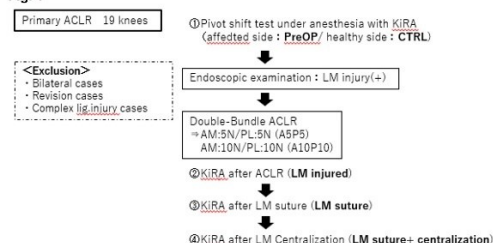


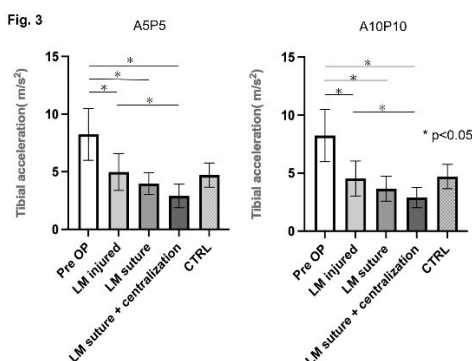
Fig. 1 Study design

Fig. 2



**Fig. 2**  
Evaluation of tibial acceleration by pivot shift test using a tri-axial accelerometer (KiRA). (A) The device is attached to the lateral aspect between tibial tuberosity and Gerdy's tubercle. (B) An example of waves obtained by KiRA. The difference between maximum value ( $a_{max}$ ) and minimum values ( $a_{min}$ ) of the acceleration ( $a_{range}$ :  $a_{max} - a_{min}$ ) was used to evaluate the magnitude of subluxation during the pivot shift phenomenon.

Fig. 3



**Fig. 3**  
Tibial acceleration ( $\text{m/s}^2$ ) at each phase (Pre OP, LM injured, LM suture, LM suture + centralization). ACL graft (AM/PL) tension is set to 5N and 10N. \* Significant difference at  $p < 0.05$ .

Table 1 Patient' background

Age, years (range <sup>a</sup> )	28.6 (17-54)
Gender, male/female	9/10
Period <sup>b</sup> , months (range <sup>a</sup> )	3 (1-420)
MM injury	12

MM; medial meniscus

<sup>a</sup> Data are shown with median (range)

<sup>b</sup> Period from injury to surgery