

# The effectiveness of lateral extra-articular tenodesis in static anterior tibial subluxation on MRI in primary anterior cruciate ligament reconstruction

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## INTRODUCTION:

Static anterior tibial subluxation (ATS) after an anterior cruciate ligament (ACL) injury highlights the abnormal relationship between the tibia and femur in patients with ACL insufficiency. Several studies indicated that an abnormal tibiofemoral relationship remained after ACL reconstruction (ACLR). Chronicity of ACL deficiency had an effect on the preoperative tibiofemoral relationship in the sagittal plane. Early graft failure at 6 months increased in patients with ACL deficiency longer than 2 years. The preoperative ATS might be one of the risk factor for early graft failure on MRI. Lateral extra-articular tenodesis (LET) has been shown to be effective in decreasing ACL rupture rates in high-risk young patients as well as the revision setting. The purpose of this study was to evaluate the effectiveness of LET in static anterior tibial subluxation on MR in primary double-bundle ACLR.

## METHODS:

Sixty-nine patients who underwent primary double-bundle ACLR without (n=59) or with LET (n=10) procedure between January 1 and December 31, 2022 were included in this retrospective study. All participants underwent magnetic resonance imaging (MRI) preoperative and postoperative at 3 weeks, 3 months and 6 months. All patients provided their informed consent to participate in this study, which was approved by our institutional review board.

Examinations were performed in the supine position with a pillow under the knee, supporting it in neutral rotation. Anterior tibial subluxation of the lateral and medial compartments relative to the femoral condyles were measured on MRI. On sagittal proton density images, we drew a best fit-circle over the posterior femoral condyle at the subchondral bone. Along the posterior margin of the circle, a line perpendicular to the tibial plateau was drawn at the posterior aspect of the tibia. The distance between these lines determined the amount of anterior tibial subluxation (Figure 1).

The changes of the ATS data in each group were analyzed for using paired *t* test. The Mann-Whitney *U* test was used to determine the difference in the ATS data of the ACLR without and with LET group.

## RESULTS:

Patient demographic data and meniscus status are summarized in Table 1.

In lateral compartment, the mean ATS in the ACLR without LET group was 5.5 mm before surgery, while it was -0.4 mm, 3.1 mm and 3.7 mm at 3 weeks, 3 months, 6 months after surgery, respectively. The mean lateral ATS in the ACLR with LET group was 6.8 mm before surgery, while it was 1.1 mm, 5.3 mm and 4.9 mm at 3 weeks, 3 months, 6 months after surgery, respectively. In lateral compartment, at 3 weeks, 3 months and 6 months after surgery, the ATS were significantly less than before surgery in both group (Figure 2,3). No significant difference was found between 2 groups (Table 2).

In medial compartment, the mean ATS in the ACLR without LET group was 1.4 mm before surgery, while it was -2.3 mm, 0.2 mm and 0.7 mm at 3 weeks, 3 months, 6 months after surgery, respectively. The mean ATS in the ACLR with LET group was 1.8 mm before surgery, while it was -2.8 mm, -0.6 mm and 0.6 mm at 3 weeks, 3 months, 6 months after surgery, respectively. In medial compartment, at 3 weeks, 3 months and 6 months after surgery, the ATS were significantly less than before surgery in both group. No significant difference was found between 2 groups.

Table 1

	ACLR without LET	ACLR with LET	P value
Number	59	10	
Sex	Male 24 : Female 35	Male 4 : Female 6	P=0.97
Age(years old)	31.0 ± 13.5	26.3 ± 14.9	P=0.32
BMI(kg/m <sup>2</sup> )	23.2 ± 3.7	23.7 ± 3.1	P=0.71
Injury-Surgery Interval (months)	26.1 ± 76.1	104.6 ± 142.3	P=0.11
Associated injury	Medial meniscus tear: 9 Lateral meniscus tear: 16 Bilateral meniscus tear: 14 Intact: 20	Medial meniscus tear: 3 Lateral meniscus tear: 1 Bilateral meniscus tear: 3 Intact: 3	P=0.52



Figure 1

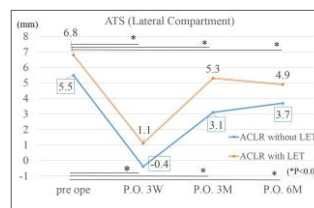


Figure 2

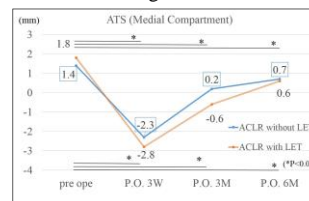


Figure 3

Table 2

		ACLR without LET	ACLR with LET	P value
Preoperative	Lateral ATS (mm)	5.5 ± 3.9	6.8 ± 4.0	P=0.85
	Medial ATS (mm)	1.4 ± 2.8	1.8 ± 3.0	P=0.68
P.O. 3 weeks	Lateral ATS (mm)	-0.4 ± 3.0	1.1 ± 1.7	P=0.93
	Medial ATS (mm)	-2.3 ± 2.3	-2.8 ± 1.3	P=0.22
P.O. 3 months	Lateral ATS (mm)	3.1 ± 2.7	5.3 ± 2.5	P=0.98
	Medial ATS (mm)	0.2 ± 2.4	-0.6 ± 2.6	P=0.17
P.O. 6 months	Lateral ATS (mm)	3.7 ± 2.8	4.9 ± 3.0	P=0.89
	Medial ATS (mm)	0.7 ± 2.4	0.6 ± 2.2	P=0.44

## DISCUSSION:

The finding of this study was that the ATS in both of lateral and medial compartment was significant different between before and after surgery in primary ACLR without and with LET. In the same period, the ATS in both of lateral and medial compartment were not significant different between ACLR without and with LET. Almekinders et al. found that irreducible ATS remains after conventional reconstruction of the ACL. Preoperative ATS might be one of the risk factor for early graft failure. The addition of LET to an intra-articular ACLR helped control rotatory laxity as measured by the pivot shift. In this study, the addition of LET to ACLR didn't reduce the ATS in both of lateral and medial compartment compared with ACLR alone.

## SIGNIFICANCE/CLINICAL RELEVANCE:

The preoperative large ATS might affect graft maturation, in that case, the additional procedure should be performed with ACL reconstruction. However, the LET procedure might not reduce the ATS compared with ACLR alone.

## REFERENCES:

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