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Modified Lemaire lateral tenodesis associated with revision anterior cruciate ligament reconstruction: a case series

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Abstract

To increase the success and reduce failures related to anterior cruciate ligament reconstruction (ACLR), many techniques of lateral extra-articular tenodesis (LEAT) have been developed, mainly in revision surgeries, where a previous failure has already occurred. This study aims to report a case series of patients with failed ACLR treated with revision techniques combined with LEAT. Seven patients were retrospectively evaluated. At the postoperative analysis, in all patients, after six months of follow-up, there was no range of motion loss, there was an improvement in the functional Lysholm score, a reduction in the instability degree according to the semiological maneuvers of the anterior drawer and in pivot shift tests, compared to preoperative evaluation. No complications were observed. In conclusion, revision ACLR combined with LEAT showed good clinical functional results, without any complications reported.

Keywords: Anterior Cruciate Ligament Reconstruction Revision; Modified Lemaire Lateral Tenodesis; Anterolateral Ligament.

Introduction

Approximately 90% of patients undergoing anterior cruciate ligament reconstruction (ACLR) have normal or almost normal knee function postoperatively, and 82% return to sports practice [1]. Despite this success, residual rotatory instability persists in 11% to 30% of them [2].

Knees with marked previous anterior tibial translation and, especially

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those associated with considerable rotatory instability, are at greater risk of failure after ACLR [3]. Therefore, it is essential to consider both the translational and rotational components of instability in the anterior cruciate ligament reconstruction strategy [3-5].

Understanding the role of the anterolateral structures in the pathophysiology of rotational knee instability has increased since the anterolateral ligament (ALL) was rediscovered in 2015 [6]. Since then, ALL anatomical reconstruction techniques and lateral extra-articular tenodesis (LEAT) are being increasingly studied and improved [7, 8].

In 2018, a biomechanical robotic study was developed to assess the role of ALL fibers and the Kaplan iliotibial band in extra-articular knee stabilization and evidenced that both structures contribute to the restriction of anterior tibial translation and pivot shift in knees with anterior cruciate ligament (ACL) injury [9].

Although the indications for ALL reconstructions remain controversial, most authors agree that it is biomechanically interesting to add techniques that improve the anterolateral rotational stability in cases in which there is an explosive pivot shift, anterior tibial translation exceeding 10mm, in athletes involved in sports with high rotational demand and in revision surgery [10, 11].

This study aims to report a case series of ACLR combined with LEAT in revision surgeries.

Methods

Patients that underwent ACLR revision associated with extra-articular tenodesis performed by a single surgeon, with more than ten years of experience, and a member of Brazilian Knee Surgery Society (DMP), between January 2017 and December 2018 were included. Patients presenting with other knee ligament lesions associated with ACL injury were excluded.

Data from physical examination and functional scores in medical records, performed preoperatively and close to the 6th postoperative month according to the Standard Evaluation Protocol, were recorded (Table 1):

- Range of motion (ROM), in degrees, measured with the help of a millimeter goniometer, from extension to maximum knee flexion.

- Anterior drawer tests (ADT), where 0 = without anteriorization; 1+ = anteriorization up to 0.5cm; 2+ = anteriorization up to 1cm; 3+ = anteriorization >1cm.

- Pivot Shift: where: 0= without any slip; 1+: mild slip; 2+: "*clunck*"; 3+: coarse slip.

- Lysholm functional score [12]. This functional score provides a score ranging from zero to one hundred, taking into account the presence of complaints such as pain, swelling, instability, claudication and locks in addition to the need or not of assistance for gait and the ability to squat and climb stairs.

- A sum fewer than 64 points is graded as a bad function; between 65 and 83 points as regular; between 84 and 94 points as good; and above 95 points as excellent [12].
- Delta Lysholm was calculated by the difference between post-and preoperative scores to evaluate variations in the score.

- Complications and failures that required further surgical intervention

ACLR revision was performed through the traditional transportal anatomic technique with a patellar tendon autograft [13], and LEAT was performed using the method described previously using the iliotibial band by Pavão et al. [13] (Figure 1).

Case report

Case 1 - A 33-year-old male adult patient

Previous RLCA 5 years ago. Reconstruction failure three years after primary surgery, in trauma playing football. They were presented with pain and instability at initial evaluation and a Lysholm score of 67 points. Arthroscopic joint inventory evidenced a ruptured ACL graft (Figure 2) and medial meniscal injury. Total meniscectomy was performed besides ACLR revision. The patient presented a remarkable functional clinical improvement in the postoperative follow-up indicated by a Lysholm score of 100 points.

Case 2 - A 36-year-old male adult patient

Previous RLCA 18 months before. Reconstruction failure after 17 months of primary surgery for trauma while playing football. Presented complaints of pain and limitations in daily living activities, without significant instability, and a Lysholm score of 51 points. Arthroscopic joint inventory showed a ruptured ACL graft and irreparable lateral meniscus injury (Figure 3). ACLR revision and total meniscectomy were performed.

The patient showed significant clinical functional improvement, postoperatively, with a Lysholm score of 90 points.

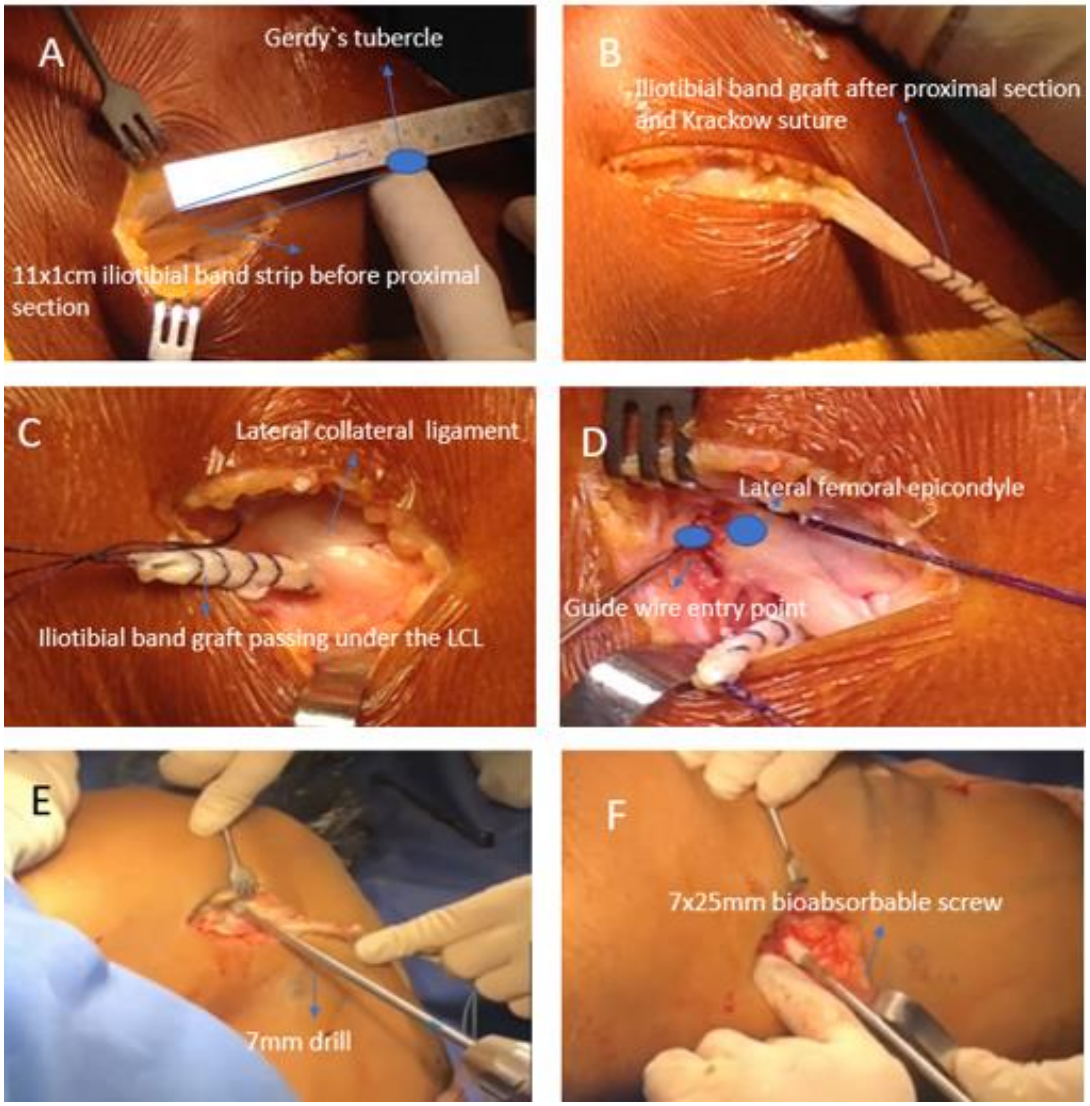

Figure 1: Lateral Extra-Articular Tenodesis. A. After accessing the skin and subcutaneous tissue, the iliotibial band (ITB) is identified and an 11x1cm graft is measured and dissected, keeping de Gerdy's tubercle insertion intact. After preparing the ITB graft with a Krackow type suture (B), the lateral collateral ligament (LCL) is dissected, and the ITB graft is passed under the LCL (C). D. A guidewire is inserted 3.0 mm posteriorly and proximally to the lateral femoral epicondyle, directed proximal and anterior. E. Finally, a tunnel of 7 mm in diameter and 3 cm in depth is drilled over the guidewire. F. The graft is then pulled into the tunnel and fixed with a 7x25mm bioabsorbable screw with the knee flexed at 30 degrees and neutral rotation.

Case 3 - A 36-year-old male adult patient

Previous RLCA 36 months before. Reconstruction failed after eight months of primary surgery due to a sprain during gait. He presented for evaluation with pain, instability, and limitation of the last degree of extension, with a

Lysholm score of 50 points. Arthroscopic joint inventory showed a ruptured ACL graft and absent medial meniscus, suggestive of previous meniscectomy and intercondylar roof osteophytosis, which required a roofplasty. He presented good functional clinical improvement in the postoperative follow-up, with a Lysholm score of 84 points.

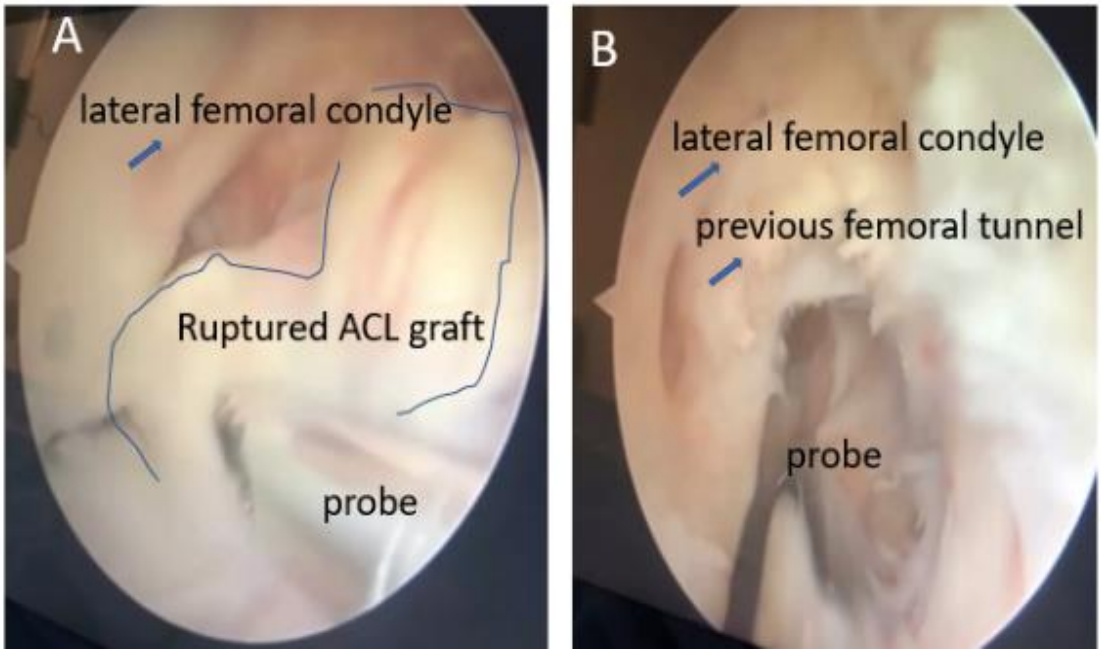

Figure 2. Arthroscopic view of an ACL graft rupture (2A) and a previous femoral tunnel (2B).

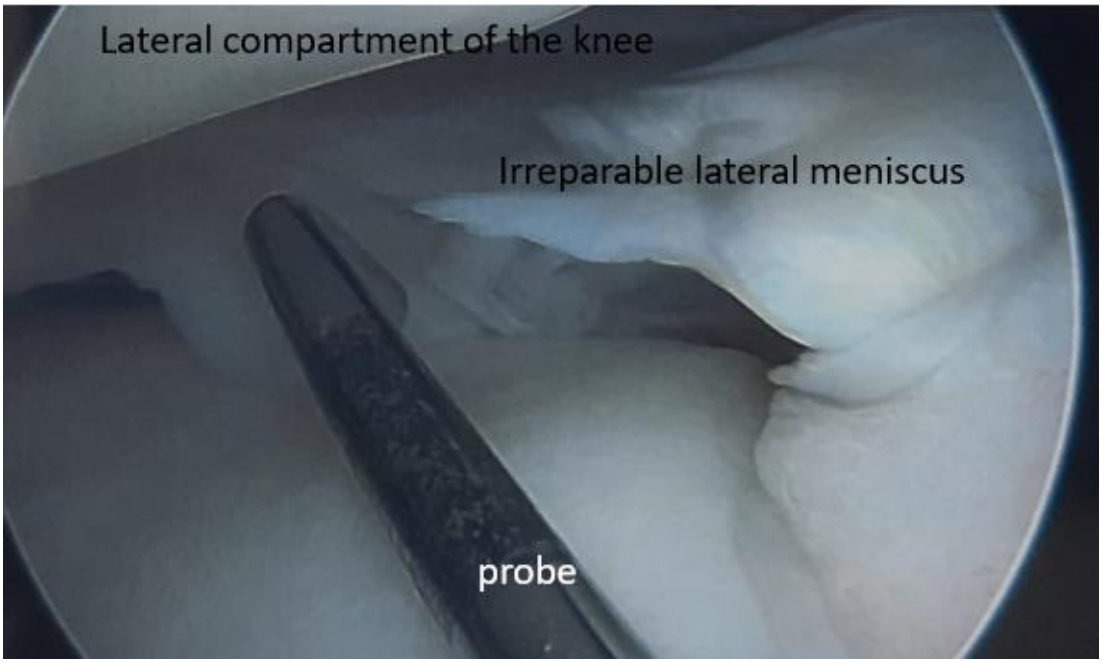

Figure 3. Arthroscopic view of an irreparable lateral meniscus injury.

Case 4 - A 36-year-old male adult patient

Previous RLCA 8 months before. Reconstruction failed seven months after primary surgery by trauma during a soccer match. He was presented for evaluation with pain and instability in daily living activities and a Lysholm score of 72 points. Arthroscopic joint inventory showed a ruptured ACL graft. Demonstrated an excellent functional clinical improvement in the postoperative follow-up, with a Lysholm score of 100 points.

Case 5 - A 32-year-old male adult patient

Previous RLCA 30 months before. Reconstruction failed after 29 months of primary surgery, with no history of trauma. Complained of pain and instability in daily living activities, with a Lysholm score of 69 points. Arthroscopic joint inventory demonstrated a ruptured ACL graft and an irreparable bucket-handle medial meniscus injury (Figure 4).

Total medial meniscectomy was performed besides ACLR revision. The patient presented good functional clinical improvement at the postoperative evaluation, with a Lyshom score of 84 points.

Case 6 - A 28-year-old male adult patient

Previous RLCA 11 months before. Reconstruction failed ten months after primary surgery due to torsional trauma while playing basketball. He presented mild pain and instability, with a Lysholm score of 71 points.

Arthroscopic joint inventory showed a ruptured ACL graft and medial meniscus injury, repaired by all-inside technique (Figure 5). Showed significant clinical functional improvement in the postoperative follow-up, with a Lysholm score of 90 points.

Case 7 - A 35-year-old male adult patient.

Previous RLCA 36 months before. Reconstruction failed 12 months after primary surgery by torsional trauma while playing football. The patient complained of pain and instability in daily living activities and presented a Lysholm score of 66 points.

Arthroscopic joint inventory showed a ruptured ACL graft and medial and lateral meniscus injuries; both were treated with meniscectomy. The patient presented a remarkable functional clinical improvement postoperatively, with a Lysholm of 95 points.

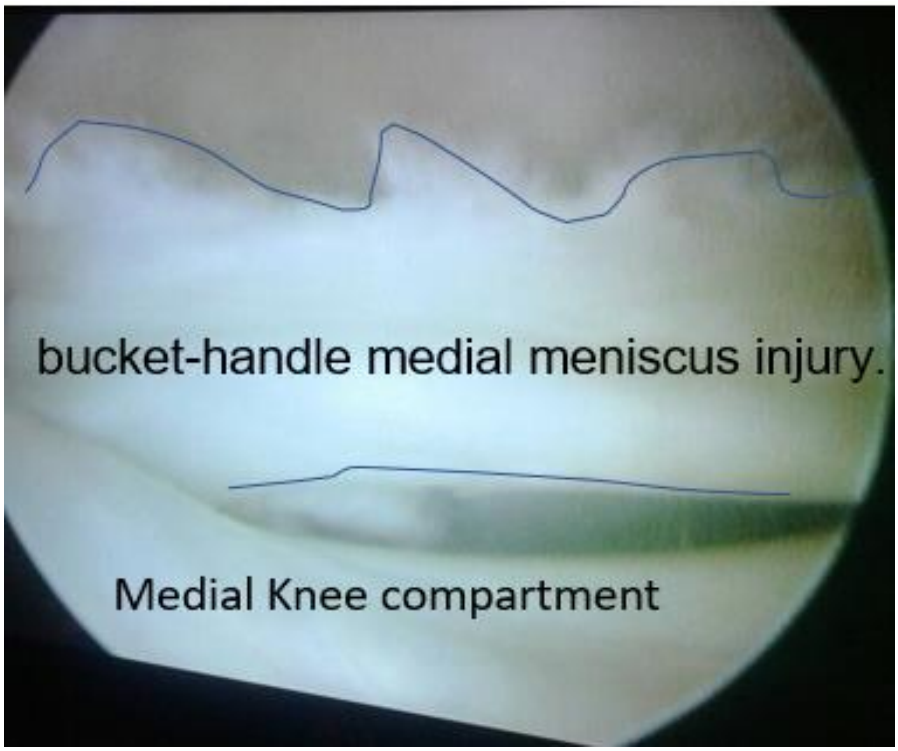

Figure 4. Arthroscopic view of an irreparable bucket-handle medial meniscus injury.

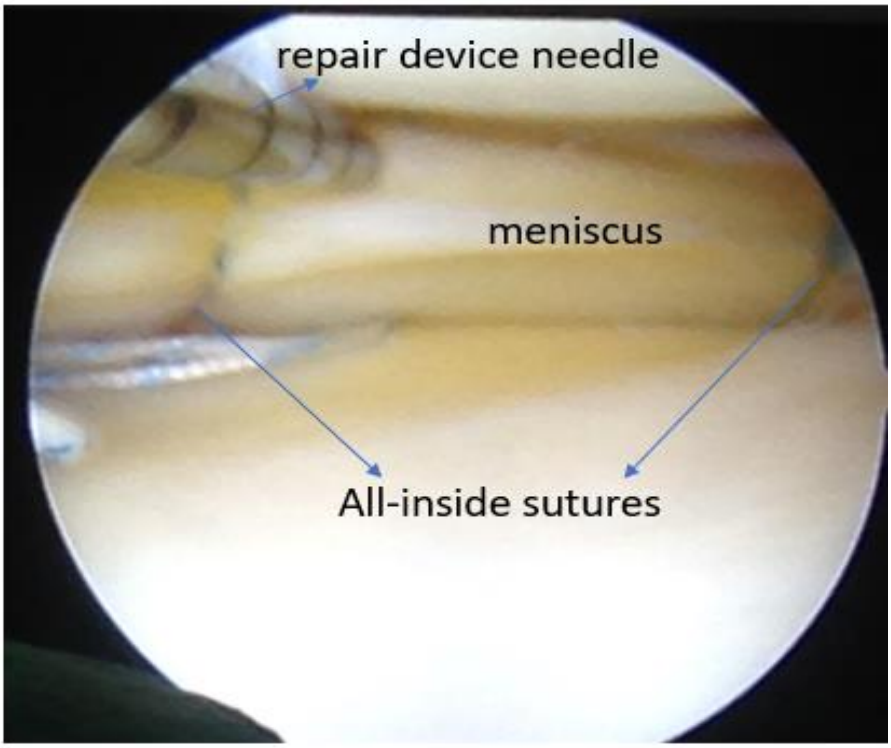

Figure 5. Arthroscopic view of an all-inside meniscal repair.

Table 1. Data from patients who underwent revision ACLR with LEAT.

Revision ACLR with LEAT											
	Sex	Age	PreOp ROM	PostOp ROM	PreOp ADT	Post Op ADT	PreOp Pivot	PostOp Pivot	PreOp Lysholm	Post Op Lysholm	Delta Lysholm
1	male	33	130	130	1	0	1	0	67	100	33
2	male	36	90	130	2	1	1	0	51	90	39
3	male	22	115	130	2	1	2	0	50	84	34
4	male	36	120	130	2	0	2	0	72	100	28
5	male	32	117	120	2	1	2	1	69	84	15
6	male	28	120	130	1	0	1	0	71	90	19
7	male	35	130	130	3	0	3	0	66	95	29

The table shows sex, age, pre and postoperative ROM, ADT, pivot, Lysholm and delta Lysholm data. PreOp: preoperative; PostOp: postoperative; ROM: range of motion; ADT: anterior drawer test.

Discussion and Conclusion

There was no ROM loss in any of the evaluated patients. Anderson et al. observed deficits in extension and flexion of approximately 20% in their ACLR plus LEAT group [14]. We believe that the accelerated rehabilitation protocols practiced today are responsible for the improvements in ROM viewed in the current publication [15].

All patients in this case series presented Lysholm improvement evaluated by the delta Lysholm. This shows that the combined LEAT in selected cases of ACL injury, especially in patients with lower functional scores typical for ACLR failure, can be beneficial, providing postoperative results as good as in patients with higher scores and lower functional impairment. Two recent systematic revisions showed that extra-articular procedures combined with ACLR are more effective than the isolated intra-articular ones in patients with a high-grade pivot, which usually have worse functional scores [16, 17].

In 2015, Dejour et al. used a similar extra-articular lateral tenodesis using the iliotibial band (ITB) graft with good results, presenting an average postoperative Lysholm score of 73.8 ± 5.8 [3]. Lee et al. compared the clinical effects of isolated ACL revisions (45 patients) and combined with ALL

anatomic reconstruction (42 patients) and observed a significantly reduced rotational laxity and a higher return to the same level of sports activity in the combined group [18].

Our evaluation did not observe short-term reconstruction failure in this group of patients. During the rehabilitation process, early failure usually occurs by positioning technical errors or when reconstruction does not address all instability components, overloading the graft and its fixation system during the ligamentization process [19].

In 2015, Rezende published a systematic review with a total of 682 patients and found no differences between groups regarding early failure [20]. Other authors have also evaluated both ACLR primary and revisions, with and without ALL anatomic reconstructions, indicating significant reductions in their failure rates in the combined groups [3, 21, 22].

Our attention was drawn to the high rate of meniscal injuries associated with RLCA failure. This is in line with the literature, which points out that ACL tears are frequently associated with meniscal injury [23]. Bearing in mind that this strong association and the well-known importance of menisci as secondary stabilizers of tibial anteriorization (medial meniscus) [24] and tibiofemoral rotation (lateral meniscus) [25] and that medial meniscectomy increases RLCA stress by 30-50% [24], we see in these cases a double indication for the combined reconstruction of ACL and LEAT, which would be revision surgery and meniscectomy.

Reports of complications involving patients who underwent ACLR combined with LEAT techniques are unusual. Side edema is mentioned by rubbing the ITB in the fibular ligament, hypoesthesia, infection, and stiffness [15]. All patients included in our series did not present any complications.

As a limitation of our study, we highlight the small sample due to the fact that ACLR failures are less common with current reconstruction techniques and the absence of a control group. Prospective and randomized studies are still needed to determine all the advantages and disadvantages of the ACLR revision technique combined with LEAT in relation to the ACLR revision technique alone.

ACLR combined with LEAT showed good clinical functional results in ACLR revision surgery, without any complications reported.

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