MENTORS IN ORTHOPEDICS

REVISION ACL RECONSTRUCTION

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SUMMARY

Background: Anterior cruciate ligament reconstruction (ACLR) failure occurs in 7% to 25% of cases, necessitating revision surgery. Challenges in revision ACLR include identifying the etiology of failure—categorized as biological, traumatic, or technical—and managing bone loss, specifically tunnel expansion. Severe tibial tunnel widening often complicates graft placement and fixation, requiring staged procedures or alternative tunnel trajectories to ensure mechanical stability.

Objective: This case report describes a surgical strategy for a patient with multiple failed ACLRs and significant tibial tunnel expansion, utilizing a laterally-based tibial tunnel and lateral extra-articular tenodesis.

Key Points: A 28-year-old female with three prior ACLRs presented with recurrent instability and a 23-mm tibial tunnel. Following an initial stage of bone grafting and hardware removal, persistent tibial bone deficiency necessitated a modified second-stage approach. A contralateral patellar tendon autograft was utilized. To avoid the expanded defect, a laterally-based tibial tunnel was drilled through virgin bone adjacent to the tibial tubercle. On the femoral side, an anteromedial portal was used for hand-reaming to prevent posterior cortex blowout, followed by suspensory fixation. To address the high-risk nature of multiple failures, a lateral extra-articular iliotibial band tenodesis was performed, docking the graft into a femoral socket isometric from 0° to 30° of flexion.

Conclusion: In cases of severe, recurrent tibial tunnel expansion where traditional bone grafting is insufficient, a laterally-based tibial tunnel combined with lateral extra-articular tenodesis provides a viable salvage option. This approach facilitates stable graft fixation in virgin bone and enhances rotational stability, as evidenced by the elimination of instability at two-year follow-up.

KEYWORDS

Anterior Cruciate Ligament Reconstruction; Reoperation; Bone Transplantation; Tenodesis; Joint Instability

INTRODUCTION

Overview of ACL revision

Anterior cruciate ligament (ACL) injury is the most common sports-related knee injury. It is estimated that there are 250,000 ACL injuries per year in the United States alone1. In the early 2000's, it was estimated 100,000 to 175,000 reconstructions were performed in the United States each year[2],[3]. The success rate of primary ACL reconstruction (ACLR) has been reported to range from 75% to 93%[4],[5]. Given these variable success rates, many patients may have a less than satisfactory outcome, and as a result, undergo a revision ACLR. Though not all failed ACLRs need to be revised, indications for revision ACLR include recurrent instability or in the more acute situation, the age and activity of the patient[6].

If the decision to proceed with revision ACLR is made, pre-op planning and workup for revision ACLR requires evaluation of causes of failure, with particular attention to (1) possible biological failure, (2) trauma, and (3) technical considerations[7].

Biology :

- Generalized laxity.
- Knee hyper-extension.
- Inappropriate rehabilitation.
- Poor graft incorporation related to allograft use.

Trauma :

- Clear history of re-injury.

Technical :

- Tunnel malposition.
- Associated collateral and/or rotation instability.
- Inadequate fixation.

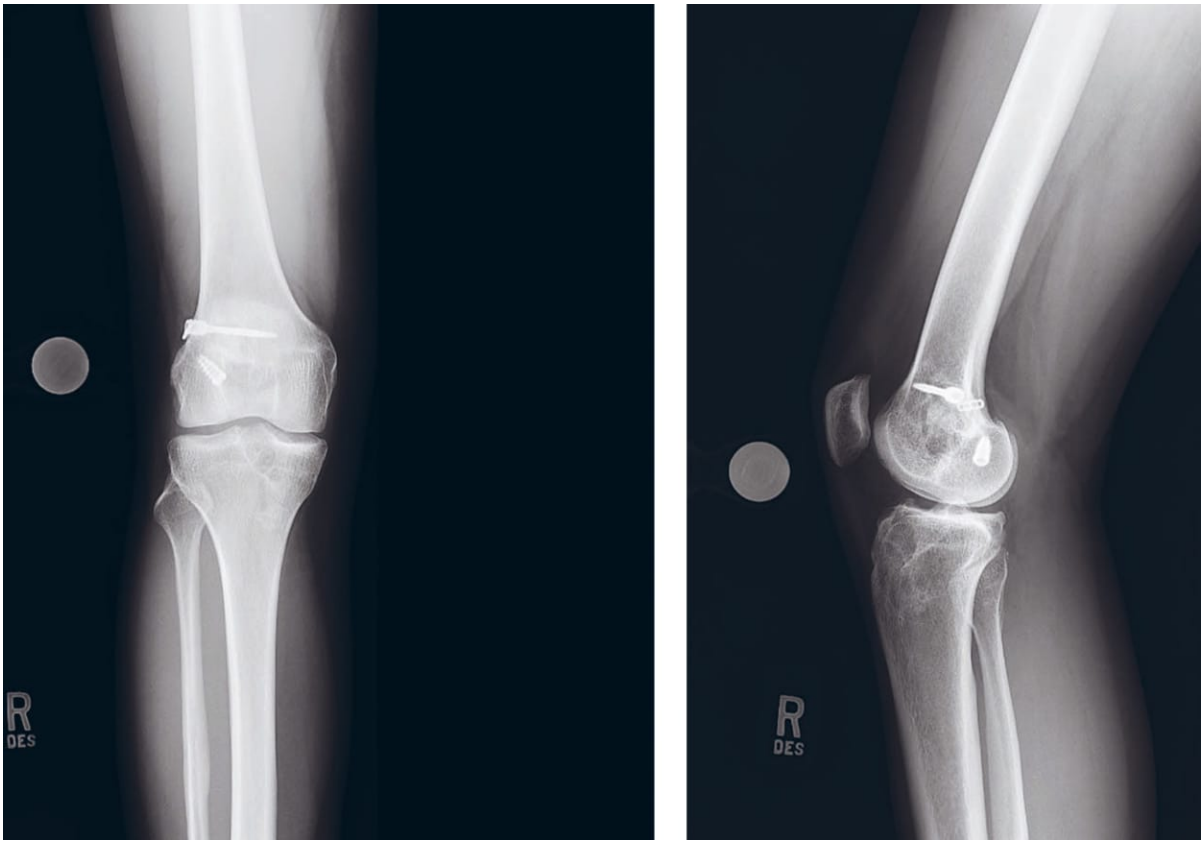

Figure 1a : Pre-op X-ray AP Right Kne. Figure 1b : Pre-op X-ray Lateral Right Knee.

Furthermore, additional surgery could also be required during the revision ACLR procedure, and must be planned for prior to surgery. If necessary, the surgeon should have a pre-operative plan for collateral reconstruction or for osteotomy in the case of a varus knee with posterolateral instability or medial OA[8],[9],[10]. In this case report, the patient had previously undergone three ACLRs (including one two-stage procedure). Due to the recurrent tibial tunnel expansion, we re-grafted the tibia. However, pre-operative CT scan showed a persistent, grossly enlarged tibial tunnel so we elected to use a laterally based tibial tunnel. In addition, we performed a lateral extra-articular ITB tenodesis due to the high-risk nature of the patient's multiple failed grafts without additional correctible factors such as malalignment, collateral laxity or increased posterior tibial slope[11].

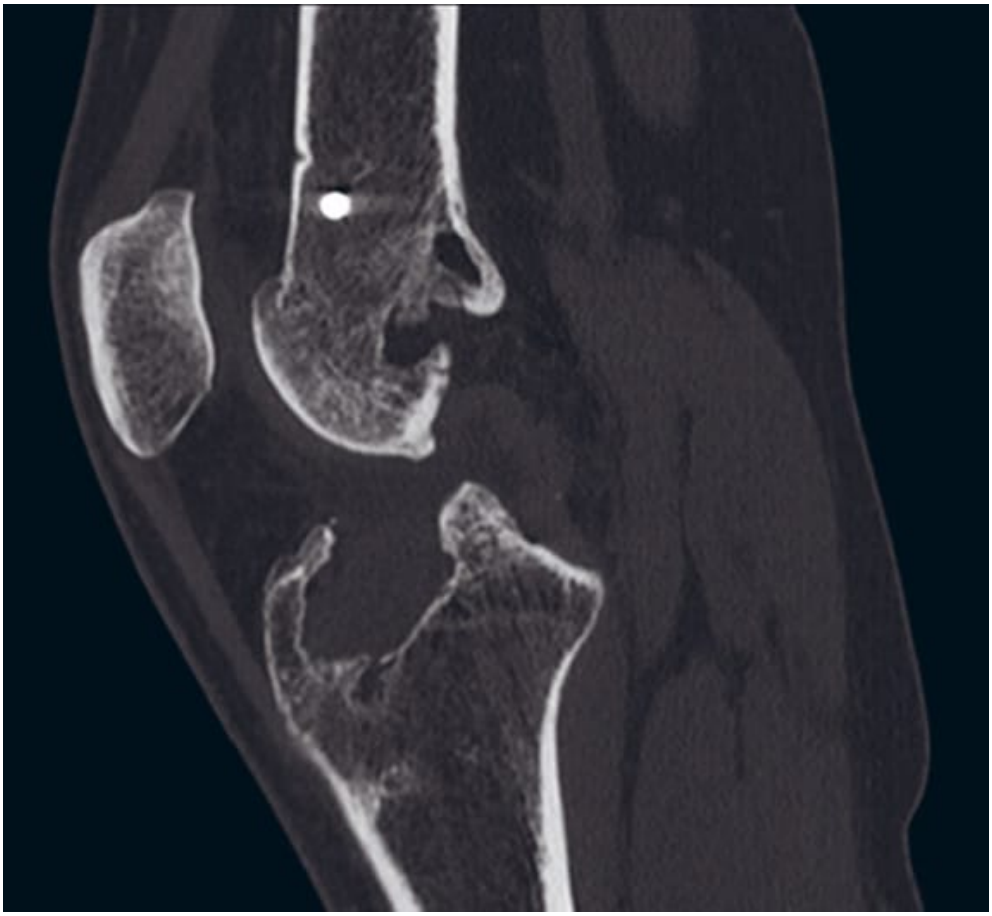

Figure 2 : Sagittal CT demonstrating a grossly expanded tibial tunnel.

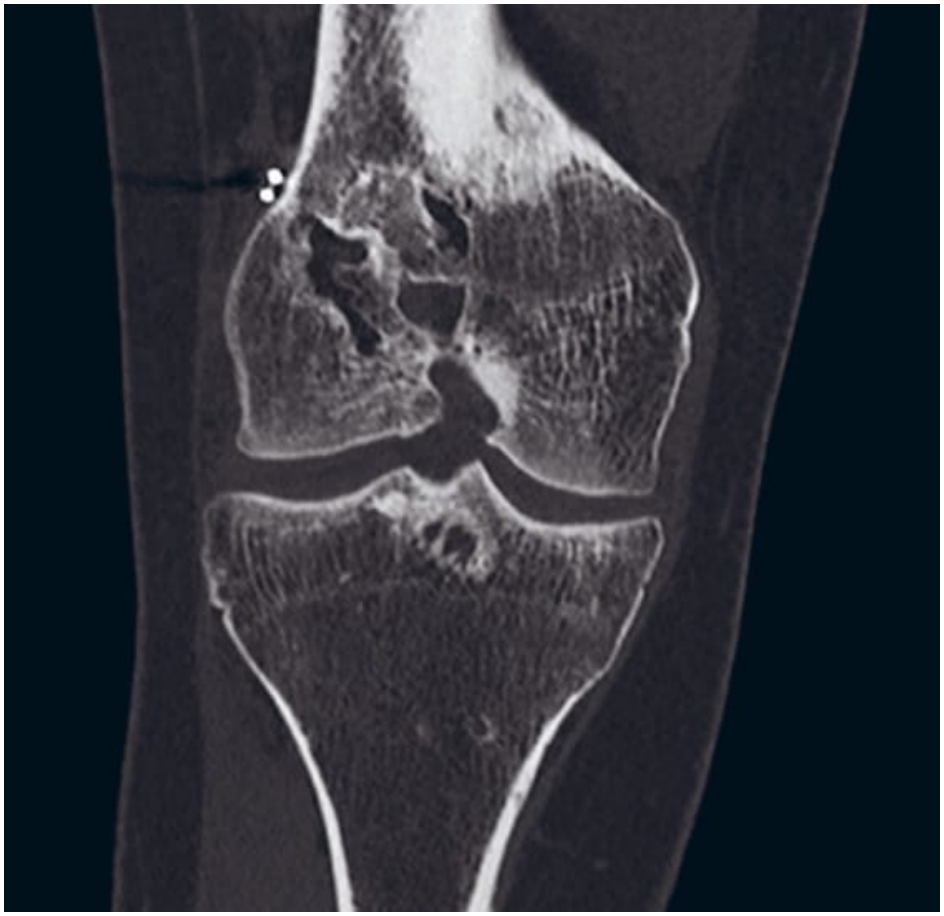

Figure 3 : Coronal CT demonstrating relatively intact femoral bone for tunnel creation.

Case Report

This case report details the procedure of a 28-year old female physician assistant in family medicine who presented to our clinic complaining of right knee instability after four prior operations (three ACL reconstructions and one bone grafting) by other surgeons. The patient first tore her ACL in high school, and had a subsequent hamstring autograft reconstruction. She then had two further re-injuries, for which she underwent revision on both occasions with allograft. The second revision was a two-stage procedure done with bone grafting. Her last ACLR was performed 6 years ago after her knee gave way on a trampoline.

The patient presented to our clinic after her knee gave way playing capture the flag two months prior to her visit. Her knee had felt very unstable since this incident. She had evidence of ACL graft laxity, without associated collateral ligament laxity.

In view of the number of operations that the patient had had, the senior author initially recommended physical therapy and activity modification. When the patient returned for follow-up she complained of instability with activities of daily living so she elected to undergo additional revision surgery.

A two-stage reconstruction was indicated, given the patient's severe tibial tunnel expansion to 23mm. For the ACL, a contralateral patellar tendon autograft was recommended. For the first stage of the two-stage reconstruction, bone grafting with allograft as well as hardware removal for the metal femoral screw was recommended. The second stage would be a contralateral patellar tendon autograft reconstruction with lateral extra-articular iliotibial (ITB) band tenodesis.

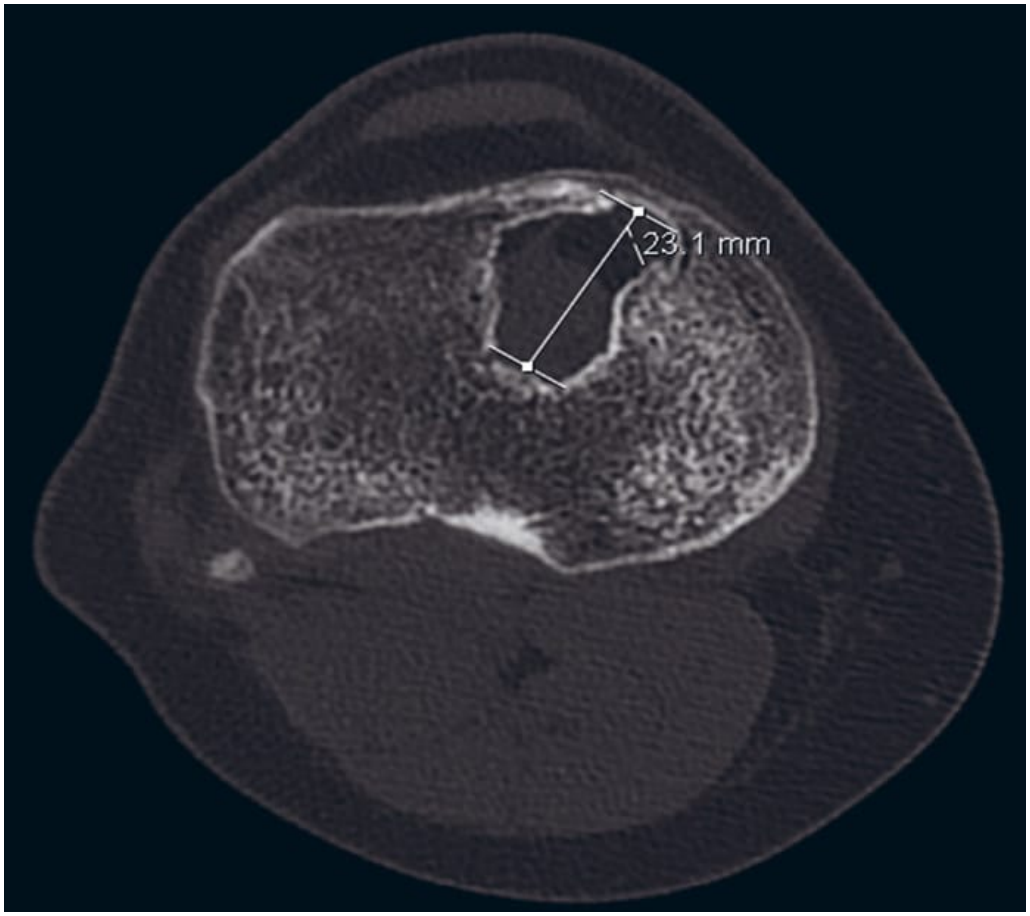

Figure 5 : Axial CT demonstrating the enlarged tibial tunnel

Surgical Technique

Six months after the tibial tunnel bone grafting, there was still a very large tibial defect. Rather than performing a repeat tibia bone graft, we elected to use a laterally-based tibial tunnel. The tunnel was created just adjacent to the tibial tubercle to go on the lateral side and was drilled through entirely virgin bone.

On the femoral side, there was no significant bone defect, however the bone was quite soft and we elected to use suspensory fixation, tying over a button. We used an anteromedial inferior portal to create our femoral socket. We reamed that by hand on the femoral side to avoid posterior cortex blowout.

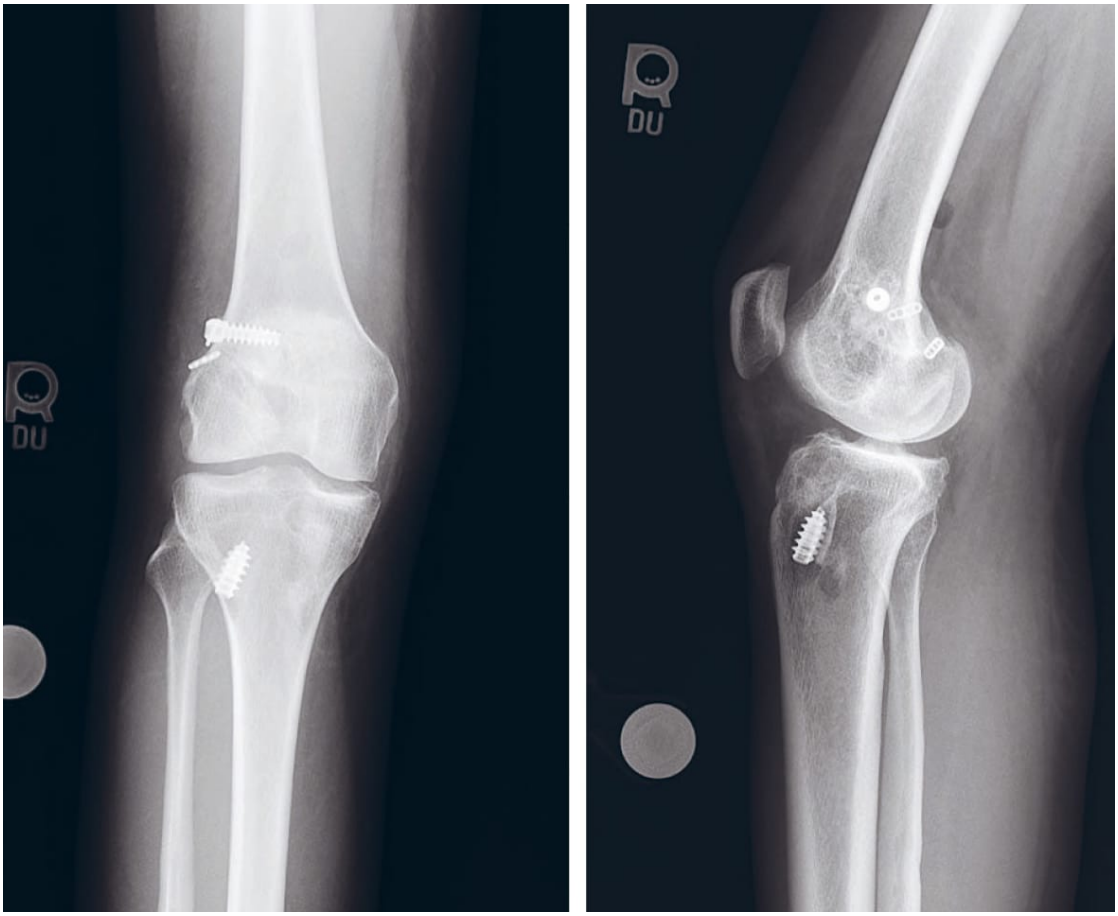

Figure 6 - a : Post-op AP X-ray / b : Post-op Lateral X-ray

The lateral femoral cortex was exposed for the ITB extra-articular tenodesis. We left harvested the central 1cm of the ITB and left it attached distally and tunneled it under the proximal FCL just distal to the lateral epicondyle of the femur. We then created a socket in the lateral femur in a position that was isometric from 0 to 30° of flexion. After docking the ITB in the socket, we pulled our sutures out medially and used an interference screw to fix the ITB on the lateral side.

CONCLUSION

The patient was treated with full motion and weight bearing as tolerated. She regained full motion in both knees by two months postoperatively and her instability was eliminated as recently as her two-year follow up.

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