

ORIF of a Large Segond Fracture and Lateral Extra-Articular Tenodesis in a 29-Year-Old Male: A Case Report

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Background

- **Segond fracture:** an avulsion fracture of the lateral proximal tibia, considered pathognomonic for injury to the anterior cruciate ligament and anterolateral structures of the knee¹
- **Pivot Shift:** a measure of rotational instability graded on a scale from I-III based on clinical presentation²
 - Low grade pivot shift (grade I or II) → treated indirectly via reconstruction of the ACL
 - Grade III pivot shift is indicative of concomitant injury to secondary stabilizers, most commonly the anterolateral ligament (ALL) → primarily treated via ACL reconstruction and reinforced via a lateral sided procedure³

Lateral-sided procedures:

- Anterolateral ligament (ALL) reconstruction
 - restores the ligament at its native insertion site, functioning across original plane¹
- Lateral extra-articular tenodesis (LET).
 - alters anatomic biomechanics, providing restraint by rerouting autograft under the lateral collateral ligament and anchoring at Gerdy's tubercle⁴

Significance: Unique operative approach to address grade 3 pivot shift following ACL injury AND a profoundly large segond fracture

Case Presentation

29-year-old active male sustained a right knee injury while skiing → twisting mechanism, immediate pain, swelling, inability to bear weight

MRI findings:

- full-thickness tear of the anterior cruciate ligament (ACL)
- large avulsion fracture of the lateral tibial condyle consistent with Segond fracture
- sprain of medial collateral ligament (MCL) and other meniscocapsular ligaments

Exam: Grade III pivot shift indicative of severe rotational instability

Outcome

- Progressive rehabilitation → full recovery of function by 5 months
- No complications or residual instability

Intervention

Multi-Tiered Stabilization

- To optimize outcomes and reduce the risk of graft failure, a multifaceted approach was taken to reinforce resistance to internal tibial rotation and stabilize the joint:
 - ACL reconstruction → universally indicated in ACL injuries as it provides primary restraint and stabilization of the joint⁵
 - Lateral-Sided Procedure → secondary restraint to provide extra-articular reinforcement and protect the graft⁴
 - **Second fixation with ALL augmentation** → **anatomic restoration of natural backup**⁶

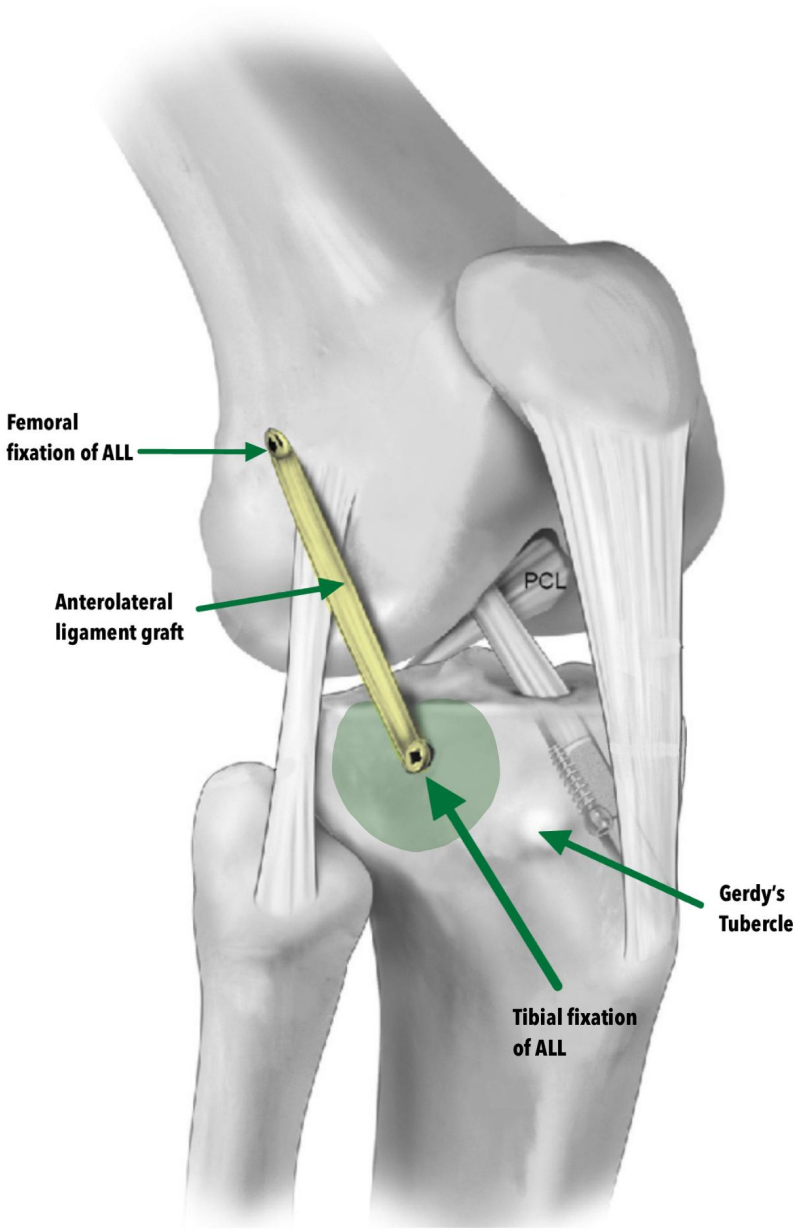


Figure 1. Anterolateral ligament reconstruction. Adapted from Kraeutler MJ, Welton KL, Chahla J, LaPrade RF, McCarty EC. Am J Sports Med. 2017;46(5):1235–1242.

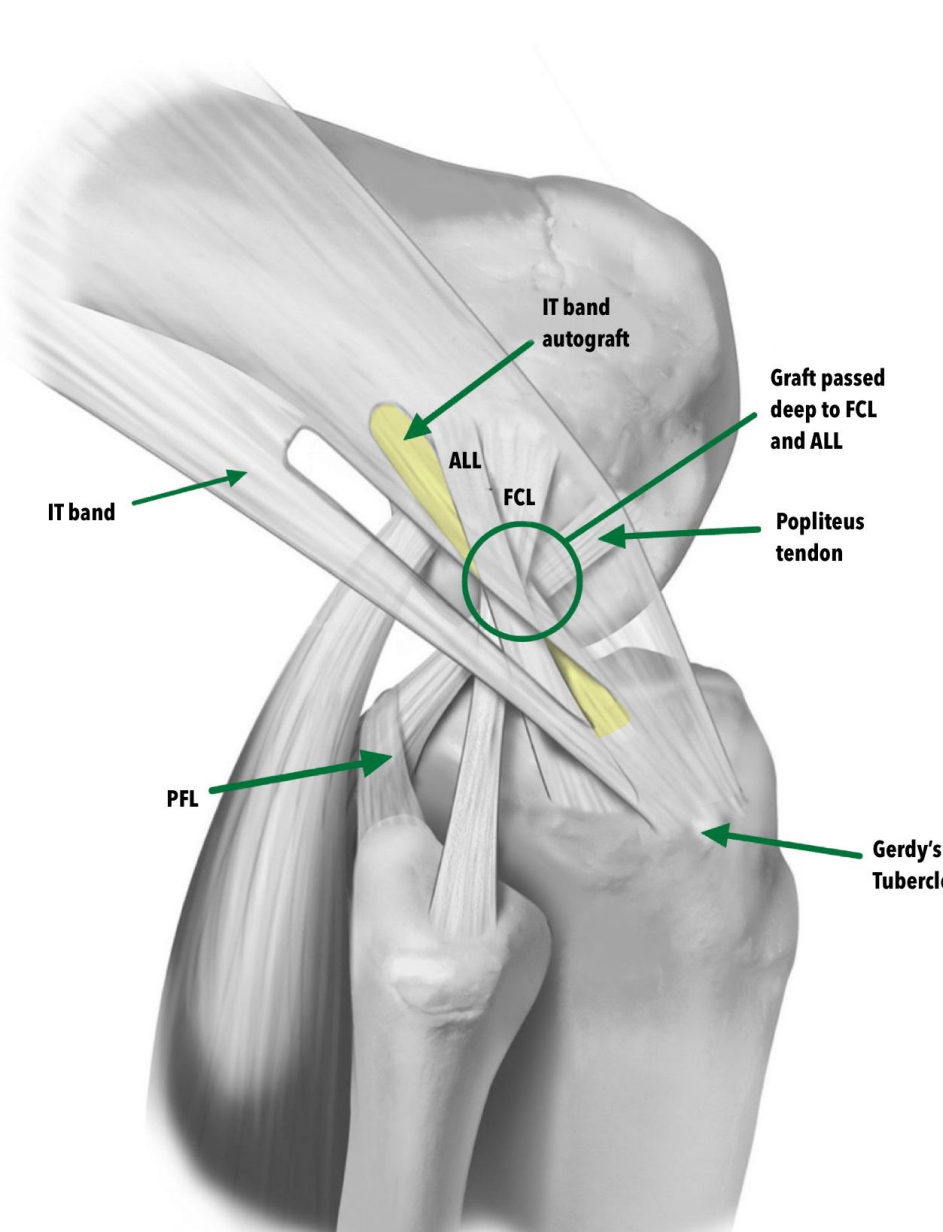


Figure 2. modified Lemaire lateral extra-articular tenodesis (LET). Adapted from Geeslin AG et al., Am J Sports Med. 2017;46(3):607–616

Lateral Extra-Articular Tenodesis (LET)

- The abnormally large size of the Segond fracture compromised the anatomic insertion site of the anterolateral ligament (ALL), precluding an ALL reconstruction
- In place of the traditional lateral sided procedure, a lateral extra-articular tenodesis (LET) was performed in order to establish a new biomechanical plane and address the grade III pivot shift

Fixation of the Segond Fracture

- Given the significant size of the Segond fracture, fixation of the fragment was necessary to restore local integrity of the lateral tibial cortex¹
- By using anchors to stabilize the fragment, the native insertion site of the ALL was re-established while minimizing the risk of intra-articular complications¹
- Fixation then provided a platform for subsequent ligament augmentation, further reinforcing rotational stability along the anatomic plane of the ligament

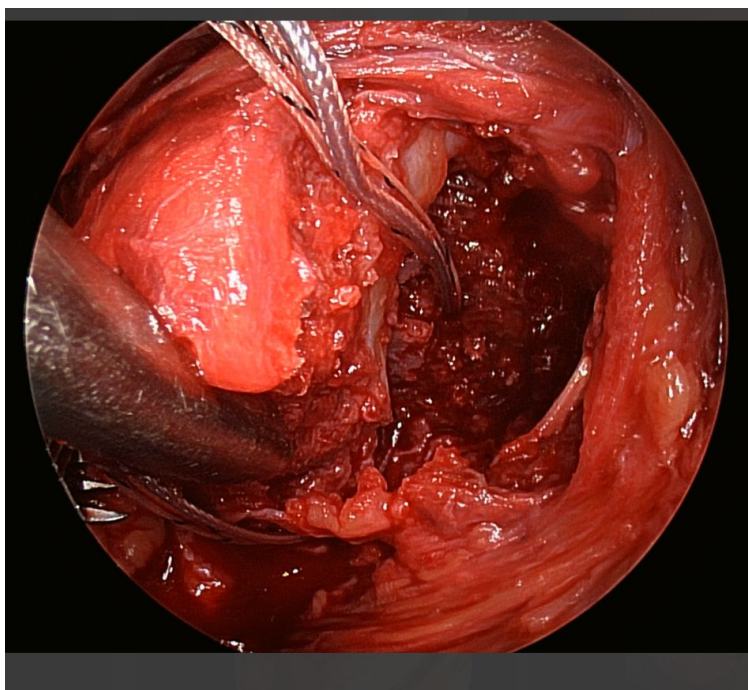


Figure 3. Arthroscopic view showing bony fragments prior to fixation. Image courtesy of the operating surgeon (M. Lissy, MD)

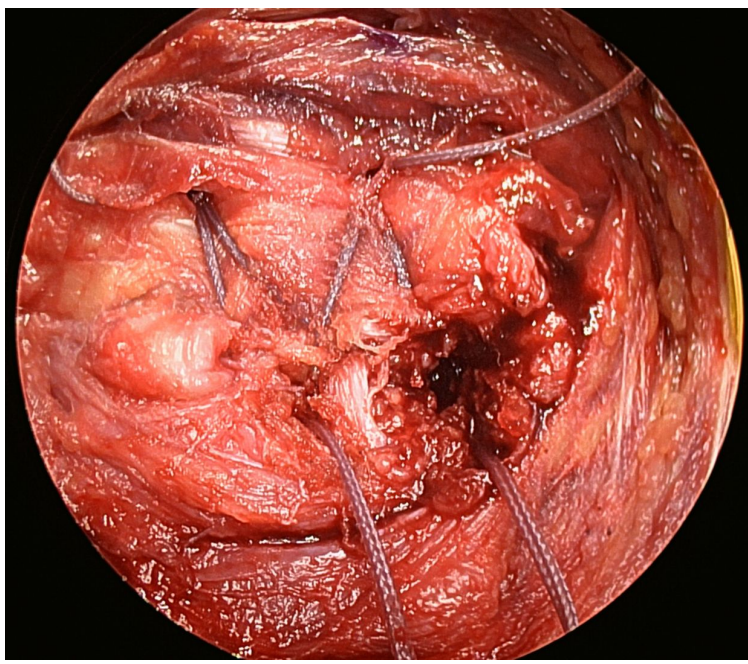


Figure 4. Intraoperative image showing fixation of the large Segond fragment. Image courtesy of the operating surgeon (M. Lissy, MD)

Discussion

LET was performed as the clinical presentation of a high grade pivot shift necessitated a lateral sided procedure to backup the rotational stabilization provided by the ACL reconstruction⁷

The significance of this specific case comes into play as the ACL reconstruction and LET were then further backed up by fixation of the segond fx and reinforcement of the anterolateral ligament

Was ORIF and ALL Repair Necessary?

- Originally, this patient's rotational stability had been maintained by both the ACL and its anatomical backup, the ALL, made evident by the compromise of both structures during injury.
- The avulsion injury of the ALL clearly indicates the significance of this ligament's structural and functional engagement in stabilization
- Fixation restored not only the bony integrity, but also the native footprint of the ALL → Subsequent reinforcement of the ALL addressed any potential compromise to the integrity of the ligament itself
- Collectively, fixation and repair restored the the ligament's ability to provide effective restraint and make a meaningful contribution to rotational stability along its original, anatomic plane

The Alternative?

- Excision or nonoperative management could have compromised the local integrity of the lateral tibial cortex, increasing stress on the ACL graft and impairing postoperative functional outcomes⁷

Conclusion

- The comprehensive strategy allowed for maximization of structural and functional support, enabling safe return to high-intensity pivoting sport while mitigating the risk of reinjury for our patient.
- Current evidence measures graft survival, not true functional rotational stability.
- Few studies stratify ACL outcomes by pivot-shift grade or presence of Segond fracture.
- Further investigation is warranted to determine if this multi-layered construct provides superior long term outcomes in cases of complex segond fractures

References

Lit Sources

1. Claes S et al. *J Anat.* 2013.
2. Ferretti A et al. *Orthop J Sports Med.* 2017.
3. Jesani S, Getgood A. *JBJS Essent Surg Tech.* 2019.
4. Mazza D et al. *Arthroscopy Tech.* 2021.

Figure Sources

- A. Kraeutler MJ, et al. *Am J Sports Med.* 2017;46(5):1235–1242.
B. Geeslin AG, et al. *Am J Sports Med.* 2017;46(3):607–616.