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Quality Improvement Case Series

Isolated Lateral Extra-articular Tenodesis After Prior Anterior Cruciate Ligament Reconstruction

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ABSTRACT

Lateral extra-articular tenodesis (LET), as an adjunct to anterior cruciate ligament (ACL) reconstruction, is gaining popularity among pediatric and sports medicine orthopaedic surgeons for the treatment of ACL injury, especially in the female, hyperflexible, and high-risk athlete population. The addition of LET or anterolateral ligament (ALL) reconstruction is typically recommended at the time of index ACL reconstruction surgery and is performed after the ACL graft is tensioned. Rotational instability has been described in cases where the ACL graft was malpositioned too vertically, and in those cases, ACL revision is indicated. In our case, ACL reconstruction was performed in isolation in a hyperflexible, high-risk (volleyball) female athlete, and she had persistent complaints of rotational instability despite an intact and well-positioned ACL graft on magnetic resonance imaging (MRI) scan. She demonstrated excessive internal rotation of the tibia in relation to the femur and exhibited symptomatic anterolateral instability on clinical examination, with a negative pivot shift but pain on internal rotation stress. She underwent a second surgery consisting of isolated modified Lemaire LET after examination under anesthesia (EUA) demonstrated negative Lachman and pivot shift. Second-look arthroscopy demonstrated an intact quadriceps autograft ACL graft. She recovered uneventfully, and her rotational instability problem was resolved. She returned to sports 12 months after the surgery and has been pleased with her result.

Key Concepts:

(1) Lateral extra-articular tenodesis (LET) can be added to increased rotational stability in the setting of anterior cruciate ligament (ACL) reconstruction.
(2) Although typically added during the index procedure, it can be successfully completed later if needed.
(3) The ACL confers both anteroposterior and rotational stability to prevent excessive anterior translation and excessive internal rotation of the tibia with respect to the femur.
(4) LET can augment the ACL graft in preventing rotational instability in the setting of an ACL-deficient knee.

Introduction

The anterior cruciate ligament (ACL) functions to stabilize the knee against excessive anterior translation and internal rotation of the tibia. ACL injuries can lead to unstable knee mechanics and other intra-articular knee injuries, and ACL reconstruction is recommended for young patients for this reason. Reconstruction of the anterolateral ligament (ALL) or lateral extra-articular tenodesis (LET) can be performed concomitantly with ACL reconstruction to further stabilize the knee against rotational stresses. Residual rotational instability can be problematic after ACL reconstruction if the femoral tunnel is malpositioned too vertically, but in our case, the tunnel positions were correct, and yet rotational instability persisted. This is the first report of an isolated LET performed after ACL reconstruction for persistent rotational instability with a well-positioned ACL graft.

Case report

An otherwise healthy 12-year-old postmenarchal female presented with a left knee full-thickness ACL midsubstance tear and medial collateral ligament (MCL) sprain from a skiing accident in which her ski twisted but did not come out of the binding (Fig. 1). She did have several signs indicating ligamentous laxity on examination, including hyperextension of the elbows, knee hyperextension, and the ability to touch the ipsilateral thumbs to the forearms, but no family history of connective tissue disorder. She underwent quadriceps autograft all-inside ACL reconstruction after demonstrating excellent preoperative range of

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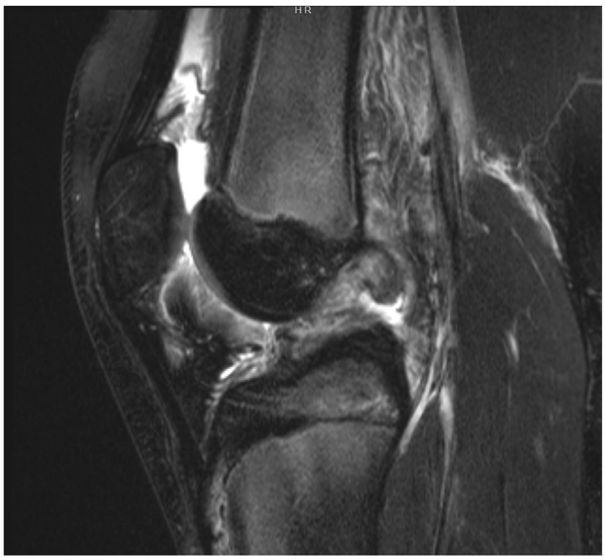

Figure 1. Index ACL injury. *ACL, anterior cruciate ligament*.

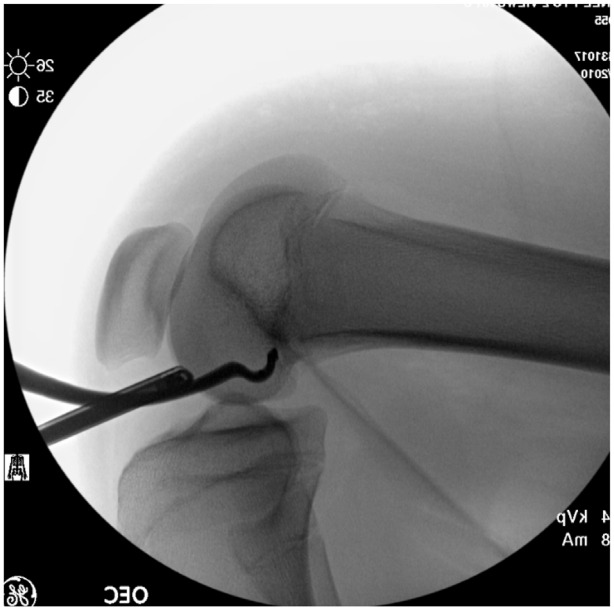

Figure 2. Intraoperative fluoroscopy views confirming anatomic tunnel position in femur.

motion (Fig. 2). She completed her physical therapy including 4 months of ACL rehab protocol, and chose to use an ACL custom brace for return to volleyball at 12 months post-op (Fig. 3). At 14 months post-op, she returned to the clinic with pain, swelling, and feeling of instability of the left knee after a fall during volleyball practice. Magnetic resonance imaging (MRI) demonstrated significant internal rotation of the tibia with respect to the femur, when comparing the posterior aspect of each, and intact ACL graft that was well-positioned (Fig. 4A–C). She underwent LET procedure using the modified Lemaire technique [1] and recovered uneventfully and completed physical therapy to ensure her plyometrics and landing mechanics were safe prior to resuming sports (Fig. 5). She is now 16 months post-op from her LET and is doing excellent clinically with no further complaints of instability (Fig. 6A–B)).

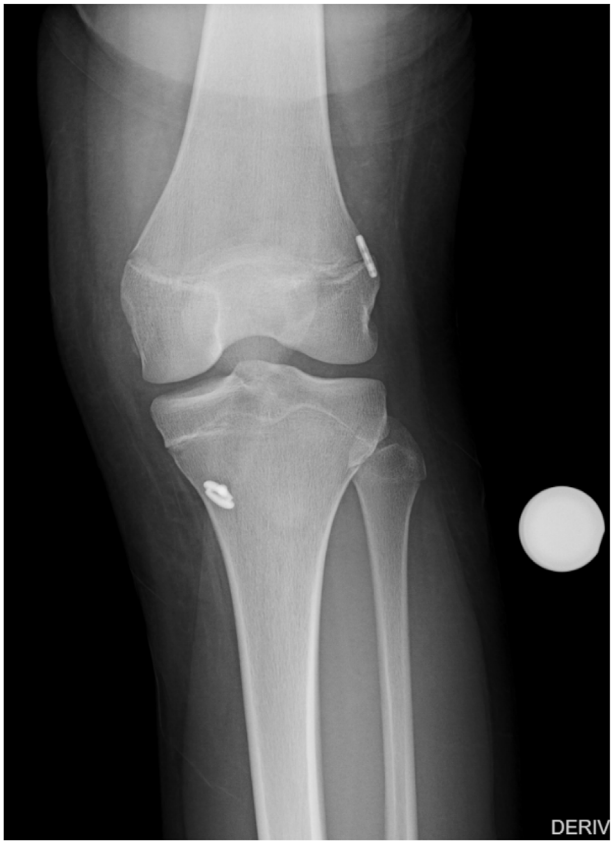

Figure 3. Postoperative x-ray in follow-up.

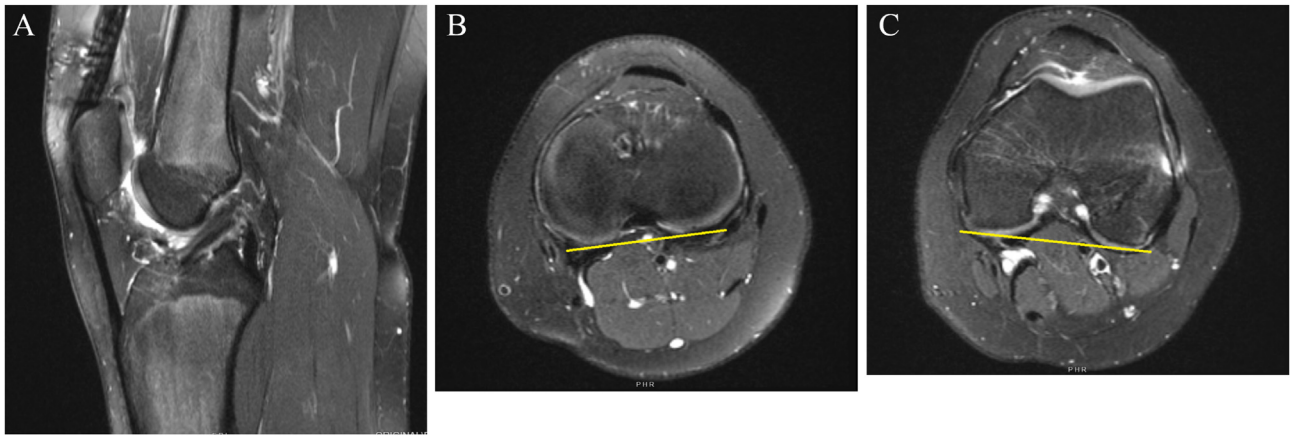

Figure 4. MRI demonstrating intact ACL graft, good tunnel positions in femur and tibia (A), and excessive internal rotation of the tibia (B) with respect to the femur (C), with posterior axes highlighted. *ACL, anterior cruciate ligament; MRI, magnetic resonance imaging.*

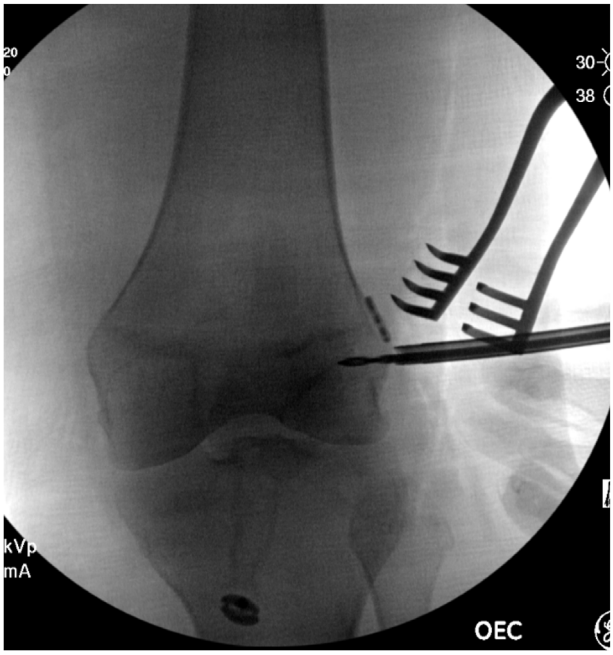

Figure 5. Intraoperative fluoroscopy views during *LET procedure. LET, lateral extra-articular tenodesis.*

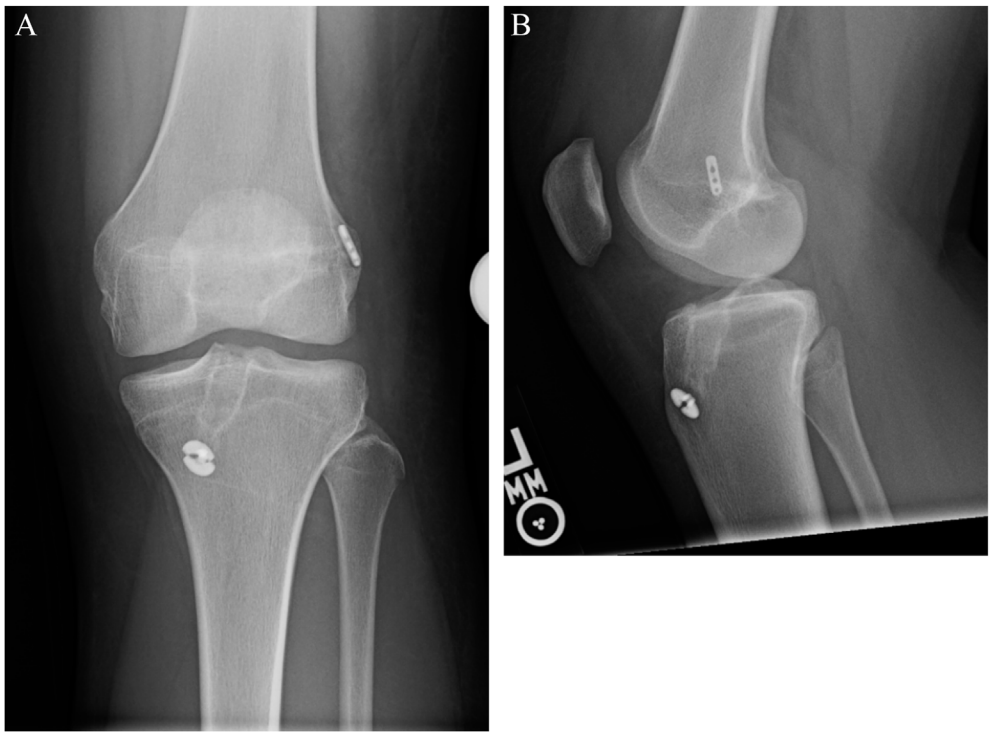

Figure 6. Postoperative x-rays in follow-up after LET in anterior-posterior (AP) (A) and lateral (B) views. *LET, lateral extra-articular tenodesis*.

Discussion

Persistent rotational stability after ACL reconstruction is typically associated with a femoral tunnel position that is too vertical in the lateral intercondylar notch. However, in our case, our patient had persistent rotational instability after a well-positioned ACL reconstruction using anatomic footprints for tibial and femoral tunnels. Perhaps this was due to inadvertent tensioning the ACL graft in a position of internal rotation of the tibia, or perhaps the patient's connective tissue laxity resulted in excessive rotational motion after her ACL reconstruction. She did benefit from isolated LET procedure over one year post-op from her index ACL reconstruction surgery and has not had any additional instability events since that time.

Additional links

- **JBJS Essential Surgical Techniques**: Modified Lemaire Lateral Extra-Articular Tenodesis Augmentation of Anterior Cruciate Ligament Reconstruction

Author Contributions

Rachel M. Randall: Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

Disclosures

None.

Consent for publication

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Declaration of competing of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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[1] Jesani S, Getgood A. Modified Lemaire lateral extraarticular tenodesis augmentation of anterior cruciate ligament reconstruction. JBJS essential surgical techniques 2019; 9(4):e41. 1-7.