

The Anterolateral Ligament (ALL): A Comprehensive Anatomic, Radiographic, and Native Biomechanical Analysis

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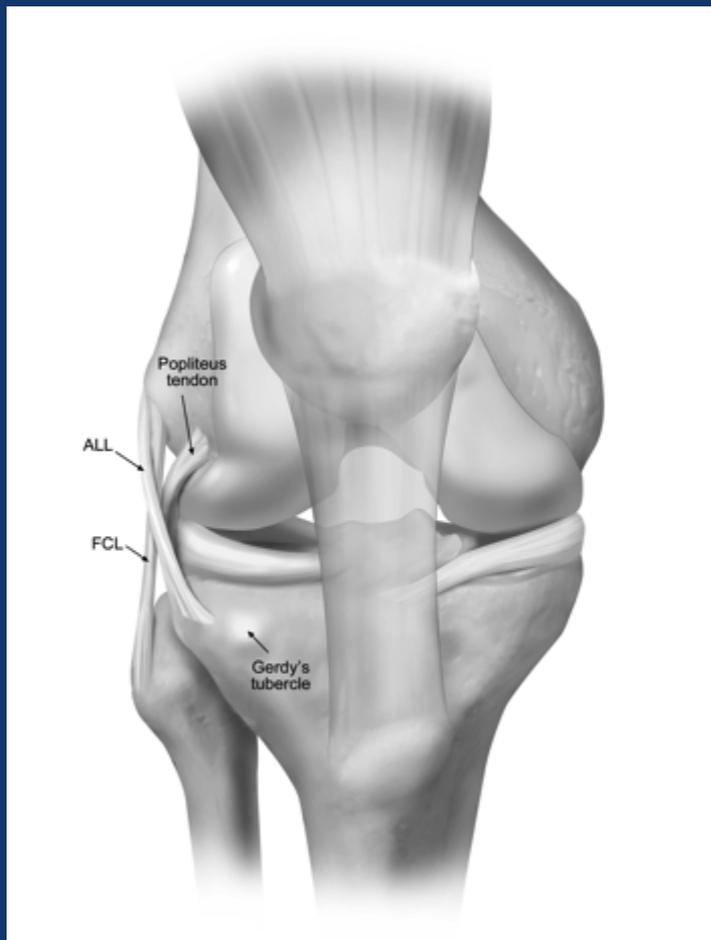
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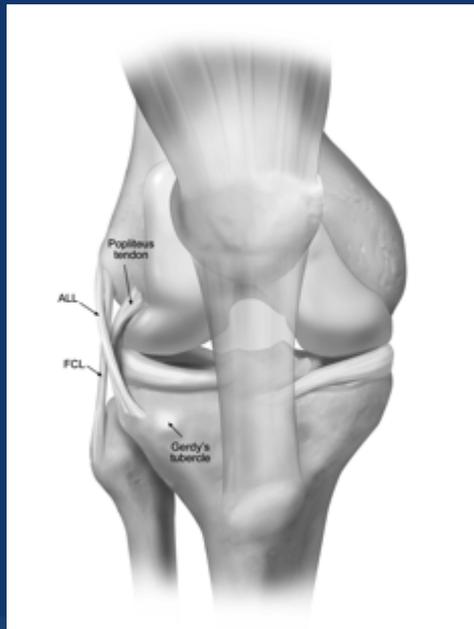
Anterolateral Ligament History



- Increased interest due to failure to restore ACL-injured knees to full rotational stability
- Varying nomenclature
 - Segond (1879): Fibers of the iliotibial band that were tensioned during internal rotation
 - Lobenhoffer (1987): retrograde tract fibers
 - Terry (1993): capsuloosseous layer of the iliotibial band
 - LaPrade (1997): mid-third lateral capsular ligament
 - Vieira (2007): anterolateral ligament

Scientific Purpose

- Provide quantitative data to characterize and confirm the anatomic and radiographic locations of the ALL
- Identify structural properties of the ALL to assist in the development of an evidence-based approach to anterolateral ligament reconstructions
- We hypothesized that the ALL attachment sites could be **reproducibly defined** both by anatomic dissection and radiographic views, and that the ALL will have biomechanical properties comparable to other similar ligamentous stabilizers in the knee



KNEE

A cadaveric study of the anterolateral ligament: re-introducing the lateral capsular ligament

Scott Caterine · Robert Litchfield · Marjorie Johnson ·
Blaine Chronik · Alan Getgood

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Anatomy of the anterolateral ligament of the knee

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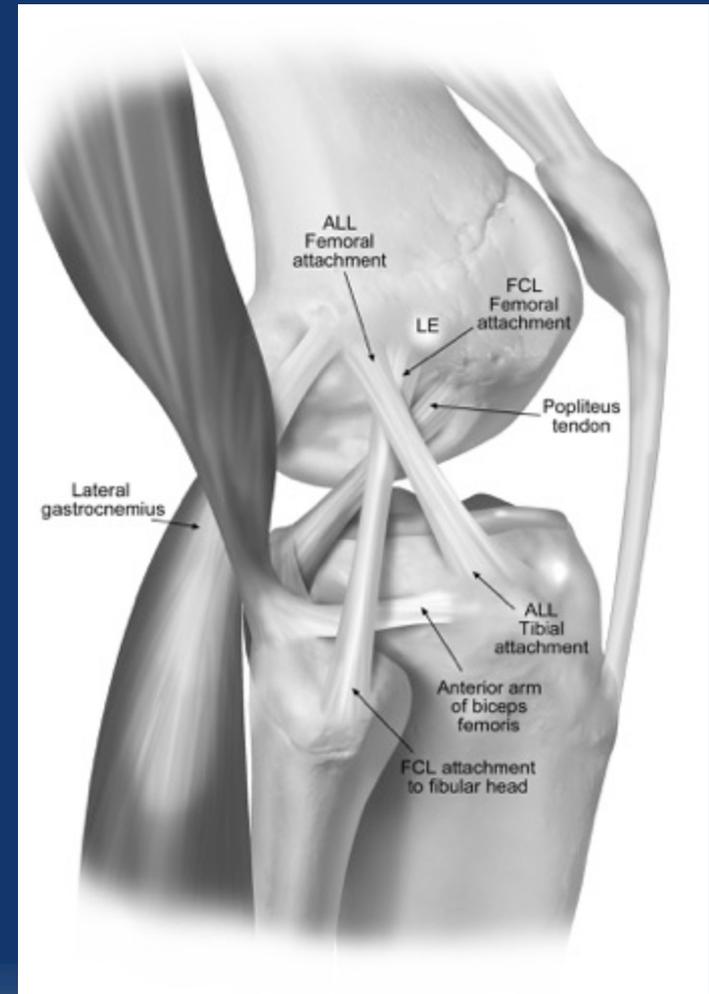
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Methods

- 15 fresh-frozen human cadaveric knees with no prior history of surgery, ligamentous injury, and/or indication of osteoarthritis
 - Male, mean: 58.2 years, range: 39-69
- **Outside-in** and **inside-out** anatomic dissection in combination with an applied **internal rotation**



Dissections - Anatomy



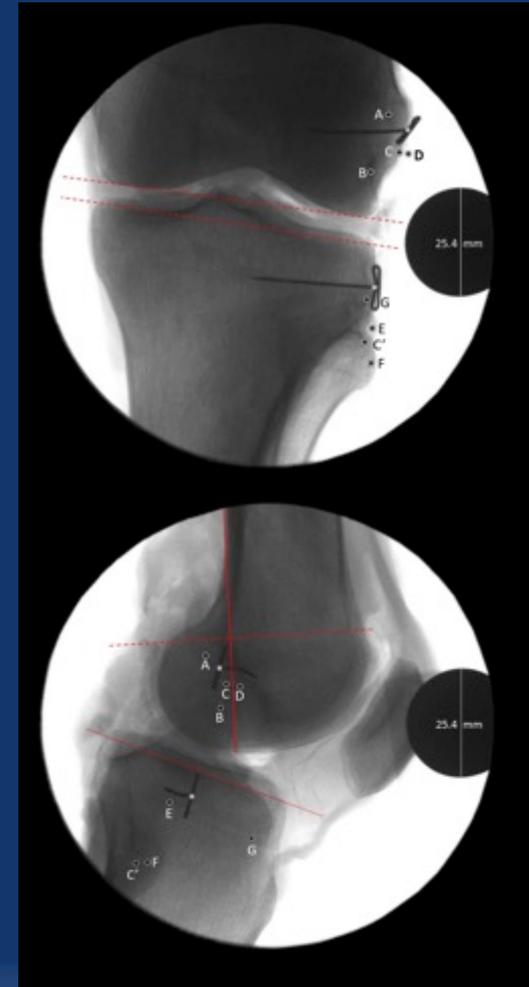
- ITB was inferiorly reflected to its distal aspect following a **midsubstance incision 6 cm proximal to the lateral epicondyle**
- An applied **internal rotation torque** revealed tensioned fibers
- Fibers spanned from the **lateral capsule** primarily posterior to the **lateral femoral epicondyle** to the area between **Gerdy's tubercle** and the anterior margin of the **fibular head**

Anatomy

- Anatomical landmarks were visually identified and measured circumferentially with a coordinate measuring machine

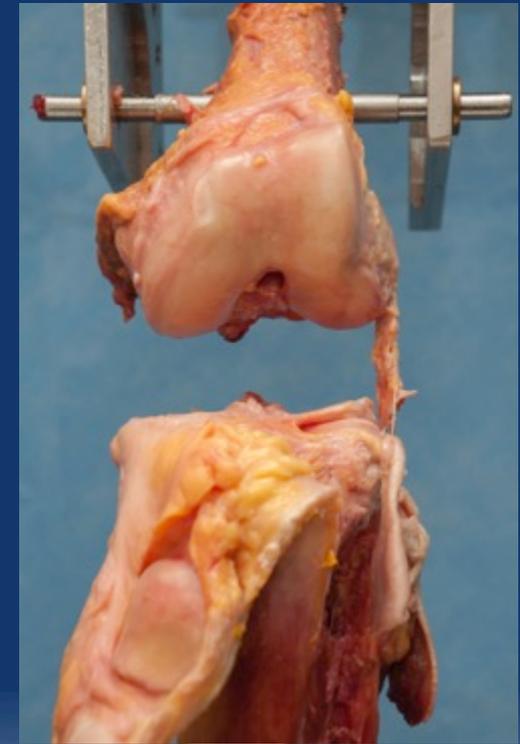
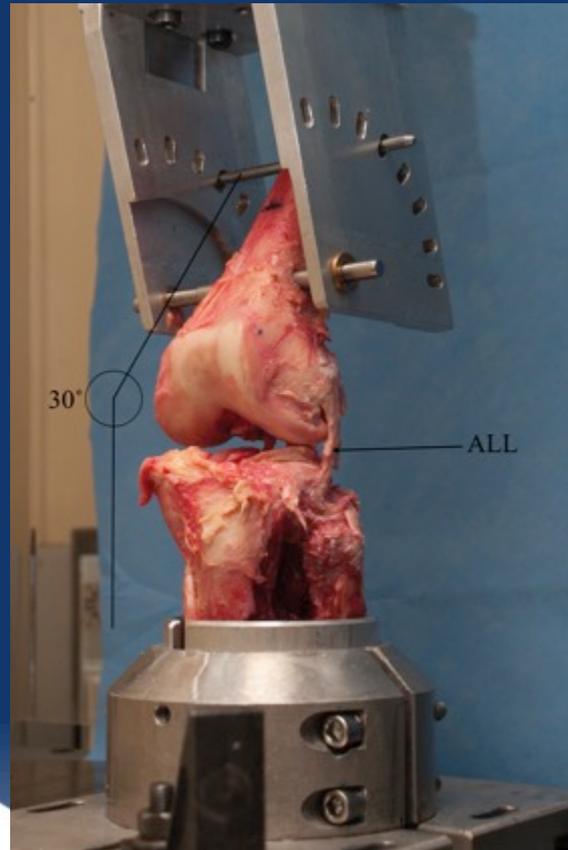
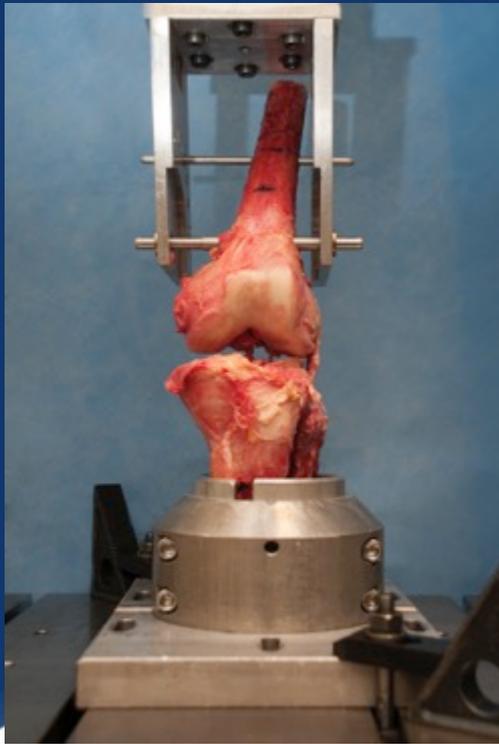
Radiography

- 1.03 mm diameter **T-pins** inserted into the centers of the ALL attachment
- Ligaments marked with 2 mm **metallic spheres**
 - Lateral gastrocnemius tendon femoral attachment (A)
 - Lateral femoral epicondyle (D)
 - Center of Gerdy's tubercle (G)
 - Anterior margin of the fibular head (F)
 - Popliteus femoral attachment (B)
 - Biceps femoris tibial attachment (E)
 - Femoral & fibular attachments of the FCL (C & C')



Biomechanical Testing

- Distal end of the tibia was potted in poly (methyl methacrylate) and rigidly secured to the base of a tensile testing machine
- Pulled to failure after cyclic preconditioning
- Orientation of fibers set to mimic natural positioning of the ALL at times of injury



Results

- Anatomy

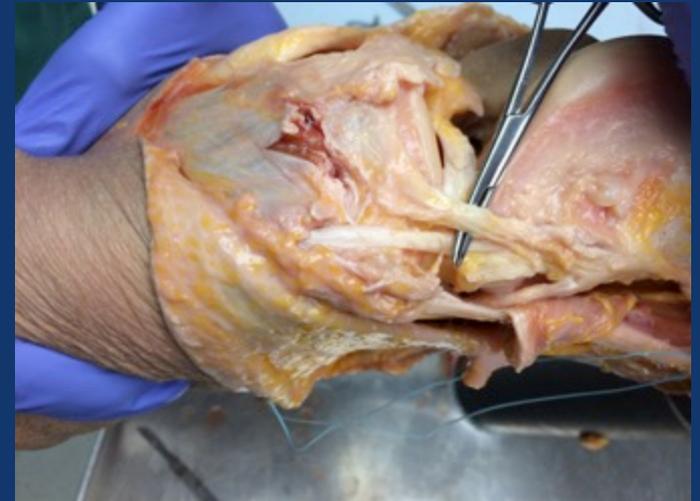
- Femoral attachment was consistently located 7.0 mm posterior and proximal to the lateral epicondyle (LE)
 - 4.7 mm posterior and proximal to the fibular collateral ligament (FCL) attachment

- Radiography

- ALL coursed anterodistally to its anterolateral tibial attachment approximately midway between Gerdy's tubercle (24.7 mm) and the anterior margin of the fibular head (26.1 mm)

- Biomechanical

- Average maximum load during pull-to-failure was 175 N
 - 6 Second fractures (n=15)



Conclusions and Surgical Implications

- Radiographically, ALL attaches 22.3 mm proximal to joint line on femur and 13.1 mm distal to joint line on tibia
- ALL courses from proximal posterior to the lateral epicondyle approximately midway between fibular head and Gerdy's Tubercle
- Load of **175 N** should be matched or exceeded by the chosen graft and procedure for ALL reconstruction
 - Single-looped semitendinosus tendon (1216 N)
 - Gracilis tendon graft (838 N)



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