A Randomized Trial Comparing Drop Vertical Jump Landing Mechanics in Patients Undergoing Anterior Cruciate Ligament Reconstruction With and Without Lateral Extra-Articular Tenodesis

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Background and Rationale

- Lateral extra-articular tenodesis (LET) with anterior cruciate ligament (ACL) reconstruction is proposed to augment knee anterolateral stability
- By harvesting a strip of the iliotibial tract, the LET is intended to improve control of tibial rotation, yet compromised lateral knee musculature and/or overtightening rotation may have unintended paradoxical effects on functional stability

Objective

- To compare landing mechanics during a drop vertical jump (DVJ) between patients who receive ACL reconstruction alone (ACL group) and patients who receive ACL reconstruction with LET (ACL+LET group)

Methods

- Knee kinetics and kinematics during the DVJ (Figure 1)
- 6 and 12 months post surgery
- Primary outcome:
  - Peak knee abduction moment
- Secondary outcomes:
  - Peak knee abduction angle
  - Peak knee internal rotation moment and angle
  - Peak knee flexion moment and angle
  - Peak vertical ground reaction force

Participant Eligibility:

- Between 15 and 25 years old
- An ACL deficient knee with instability
- No history of ACL reconstruction on either knee
- No multiligament injury where two or more ligaments required reconstruction
- No articular cartilage defect that required treatment other than debridement

Outcome Measures

- Peak vertical ground reaction force
- Peak knee flexion moment and angle
- Peak knee abduction angle
- Peak knee internal rotation moment and angle
- Peak vertical ground reaction force

Procedures

- 11 camera motion capture system with two force plates
- Passive reflective marker set (Figure 2)
- 29 markers for static trials
- 2 static trials (2 on force plate, 1 on box); 5 dynamic trials
- Marker (200Hz) and force plate (1200Hz) data are filtered at 14Hz and 50 Hz, respectively, then used to calculate external joint moments using inverse dynamics (Figure 3)
- Excellent test re-test reliability (eg, peak knee abduction moment ICC = 0.90)

Preliminary Results

- 28 patients (15 ACL, 13 ACL+LET) completed 6 and 12 month testing
- Mean and 95% confidence intervals for the primary outcome suggests no difference between groups (Figure 4)

References


Figure 1. Patient completing DVJ test

Figure 2: Anterior view of marker placement. 5 additional markers are placed posteriorly (right scapula, T10, sacrum, and both heels)

Figure 3. 1. Stick figure of patient completing the DVJ. Note the primary and secondary data depicted graphically below; 2. Close up view of knee abduction moment (positive) and adduction moment (negative); 3. The peak knee abduction moment between initial contact and toe off is shown.

Figure 4. Mean differences with 95% confidence intervals between groups in the peak knee abduction moment at 6 and 12 months.