All-Soft Tissue Quadriceps Tendon Autograft for Anterior Cruciate Ligament Reconstruction: Short to Intermediate-Term Clinical Outcomes

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Background

- ~200,000 ACL reconstructions performed yearly\(^1\)
- Reconstruction with autograft or allograft tendons

**Patellar Tendon Autograft**
- Gold Standard
- Harvest-site morbidities
  - Risk of patellar fracture
  - Anterior knee pain
- Graft-tunnel mismatch
  - Technical difficulty in anatomic reconstructions

**Hamstring Tendon Autograft**
- Commonly utilized autograft
- Similar long-term outcomes to PT
- Less harvest site morbidity than PT
- Challenges
  - Increased risk of weakness of terminal flexion and graft laxity
  - Cross-sectional area and volume can vary greatly between patients.
Quadriceps Tendon Autograft

- Used in ~2.5-11% of ACL reconstructions\textsuperscript{2,3}
- Robust graft with a large volume that is both reproducible and predictable
- Higher percentage of native tendon remains after harvest
- Initial studies show similar clinical results with less harvest site-morbidity when compared to alternative grafts
Autograft Quadriceps Tendon Harvest
Hypothesis

1. All-soft tissue quadriceps tendon autograft in ACL reconstruction yields similar short- to intermediate-term clinical outcomes and morbidity compared to alternative grafts

2. Suspensory Fixation of the autograft will have the necessary strength and security to maintain knee stability.
Materials and Methods

Study Design
- Prospective, observational, non-inferiority study
- 200 consecutive patients were prospectively followed (Sept 2011-Jan 2014)
  - Both primary and revision ACL reconstruction included

Procedure
- Reconstructions performed by a single surgeon using an
  - all-soft tissue QT autograft
  - minimally invasive harvest with suspensory fixation
- Young, athletic patient population; aggressive rehabilitation protocol and no functional bracing
Outcome Measures

- International Knee Documentation Committee (IKDC) Subjective knee forms
  - Preoperative and ≥1 year postoperative
- KT-1000 Arthrometer testing
  - 6 weeks, 3 months, 6 months
- Complications
  - Hematoma formation
  - Arthrofibrosis
- Re-ruptures (graft failure)
Results

- **Patient Characteristics**
  - 200 total patients; 182 primary, 18 revision

<table>
<thead>
<tr>
<th></th>
<th>mean ± stdev</th>
<th>Range</th>
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<tbody>
<tr>
<td>Age (years)</td>
<td>18.2 ± 4.6</td>
<td>27 (8, 35)</td>
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<tr>
<td>% Male</td>
<td>60%</td>
<td>-</td>
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<tr>
<td>Follow up interval (years)</td>
<td>2.4 ± 0.7</td>
<td>2.5 (1.2, 3.7)</td>
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- **IKDC Data**

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<th>n</th>
<th>mean ± stdev</th>
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<tr>
<td>Preoperative</td>
<td>200</td>
<td>43.6 ± 14.9</td>
<td>77.1 (3.4, 80.5)</td>
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<tr>
<td>Postoperative</td>
<td>129</td>
<td>86.0 ± 13.6</td>
<td>66.7 (33.3, 100)</td>
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*statistically significant increase from preoperative to postoperative (p < 0.0001)

Response Rate: 65%
Distribution of Difference: Pre-IKDC – Post-IKDC
With 95% Confidence Interval for Mean
Paired Profiles for Pre-IKDC vs. Post-IKDC
Side-to-side KT-1000 Results

- Percent of patients w/ score ≤ 3mm
  - 6 weeks postop: 98.4%
  - 3 months postop: 96.1%
  - 6 months postop: 92.7%

- No statistically significant change in mean difference at any time interval
Complication Results

Relationship between complications and age

- Arthrofibrosis
  - $15.9 \pm 2.9$ vs $18.3 \pm 4.7$ $p=0.009$
- Graft Failure
  - $16.8 \pm 1.7$ vs $18.3 \pm 4.7$ $p=0.016$

No statistically significant relationship exists between graft failure and graft size

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<th>Complication</th>
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<tr>
<td>Arthrofibrosis</td>
<td>11 (5.5%)</td>
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<tr>
<td>Hematoma</td>
<td>5 (2.5%)</td>
</tr>
<tr>
<td>Graft failure°</td>
<td>13 (6.5%)</td>
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°Days until re-rupture: $455 \pm 235$
Discussion

- IKDC scores similar to published data on PT and HT autografts\textsuperscript{5-18}
- KT-1000 results suggest suspensory fixation appropriately supports the reconstruction
- Failure rate of 6.5\% likely influenced by study population
  - consistent with studies of PT and HT autografts in young, athletic patients\textsuperscript{19}
Conclusions

- All-soft tissue quadriceps tendon autograft is a viable alternative graft choice for both primary and revision ACL reconstruction.
- This study is ongoing and continues to enroll patients to increase the cohort size for future analysis.
- A large RCT directly comparing clinical outcomes of the QT autograft with alternative grafts would be helpful to further confirm the findings of this study.
References