



Prosthetic Anterior Cruciate Ligament Reconstruction: A Prospective Study

5-7 Year Results

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Introduction

- ◆ Over 100,000 new ACL injuries occur each year in the U.S.
- ◆ Ideal graft remains elusive
- ◆ Autogenous
 - Patella tendon vs. Hamstring
- ◆ Allograft
 - Cost, disease transmission, shortages





Introduction

◆ Synthetic Grafts

◆ Pros

- Avoids negative factors associated with autografts and allografts

◆ Cons

- High failure rates reported
- Functional results deteriorate with time





Introduction

- ◆ Good outcomes noted in our patients reconstructed with braided UHMWPE graft who had chronic isolated ACL insufficiency
 - Smith & Nephew Richards, Memphis, TN





Purpose

- ◆ Prospectively evaluate the long-term results of this synthetic graft reconstruction
- ◆ Identify factors related to the graft's success or failure
- ◆ Compare our results to overall results for this graft





Materials & Methods: Study Group

- ◆ 9 patients with symptomatic ACL insufficiency reconstructed between May 1991 & Feb. 1993
 - 8 chronic (> 26 weeks)
 - 1 subchronic (3-26 weeks)
- ◆ Avg age 32 (range 19 - 43)
- ◆ Right knee in 4, Left in 5





Materials & Methods: Study Group

- ◆ 7 of 9 had prior surgery on reconstructed knee
 - 3 prior medial meniscectomies (2 partial, 1 subtotal)
 - 4 diagnostic arthroscopies (2 with debridement of ACL remnant)
- ◆ Evaluation of joint surfaces done at time of reconstruction





Mechanism of Injury

Mechanism	#
Basketball	3
Racquetball	1
Football	1
Soccer	1
Field Hockey	1
Karate	1
PED vs. MVA	1





Surgical Procedure

- ◆ Anterior cruciate ligament reconstruction
- ◆ Synthetic Graft: Braided ultra-high molecular weight polyethylene (UHMWPE)
 - Smith & Nephew Richards (no longer manufactured)





Surgical Procedure

◆ Graft placement

- Standard tibial tunnel placement
- Graft routed “over the top” of the lateral femoral condyle
 - through distal lateral thigh incision

◆ Graft fixation

- Secured on femoral and tibial side with screw and washer





Associated Operative Findings

Medial Meniscal tears: 3/9

Lateral meniscal tears: 4/9

Medial compartment cartilage degeneration:

Mild - 2

Moderate – 3

Severe - 1





Postoperative Course

- ◆ All underwent aggressive rehabilitation
 - Early ROM, strengthening
 - Progressive return to general athletic activity
 - Sports specific activity by 4 months
- ◆ All returned to desired level of activity by 6 months



Materials & Methods: Data Collection



- ◆ All patients evaluated at 1 year post op
- ◆ 8 of 9 evaluated at 5-7 years (range 63 - 84 mos.)
 - 7 returned for exam
 - 1 phone interview
 - 1 lost to f/u at 18 mos.





Materials & Methods: Data Collection

- ◆ Objective Evaluation
 - Lysholm Knee Score
 - Tegner Activity Scale
 - Lachman , Pivot Shift
 - KT 1000, Cybex





Results

◆ Lysholm Knee Scoring Scale (normal knee=100)

- Preoperative mean Lysholm knee score: 73/100
- One year post op score: 94/100
- 5-7 year post op score: 93/100





Results

◆ Tegner Activity Scale

- Preoperative mean: 4.2 (lowest level recreational sports)
- One year post op = 5-7 year post op: 6.3 (Highest level recreational / some competitive sports)





Objective Analysis

- ◆ Lachman Exam (grade 1-3)
 - Preoperative mean: 2.2
 - One year post op: 0.3
 - 5-7 years post op: 0.7





Objective Analysis

- ◆ Pivot Shift Exam (grade 1-3)
 - Preoperative mean: 1.9
 - One year post op: 0.0
 - 5-7 years post op: 0.6





Objective Analysis

◆ KT- 1000 Arthrometer Testing

- Mean preoperative maximal manual displacement between affected and unaffected knees
 - 6.3 mm
- 1 year post op: 0.8mm
- 5-7 years post op: 2.5mm





Objective Analysis

◆ Cybex Testing

- Peak Quadriceps Torque difference between affected and unaffected limbs
 - 10% at 1 year post op
 - 7% at 5-7 years post op
- Peak Hamstring torque- no significant difference between limbs





Complications

- ◆ No graft ruptures nor failures
- ◆ No persistent effusions nor other major complications related to the graft
- ◆ 2 patients with tender medial hardware
 - This did not change objective result





Discussion

- ◆ Advantages of a Synthetic Graft
 - No donor site morbidity
 - No disease transmission
 - Does not require revascularization
 - Allows earlier aggressive rehab and return to sport





Synthetic Graft Results

- ◆ Most series have reported a high number of complications
 - Graft Failure (Rupture)
 - Objective increases in laxity
 - Recurrent effusions
- ◆ Complication and failure rates increase over time





Synthetic Graft Results

- ◆ Smith & Nephew Richards UHMWPE Lig
 - Manufacturer's study: 112 pts, 2-5 year f/u
 - 33.1% Complication Rate
 - Synovitis / Effusion 22
 - Device Rupture 15
 - Bursitis over screw 9
 - Failure of Fixation 3
 - Infection 3





Synthetic Graft Results

◆ Gore-Tex Ligament

- Mosely et al
 - 57 pts, 4 year f/u: 18% failure rate
- Karzel et al
 - 61 pts, 4 year f/u: 17% failure rate





Synthetic Graft Results

◆ Stryker Dacron Ligament

– Gillquist et al

- 70 pts, 5 year f/u: 23% failure rate

– Wilk & Richmond

- 84 pts, 2 year f/u: 20% failure rate

- 5 year f/u: 37.5% failure rate

- ***Only 10% failure rate noted in grafts placed in “over the top” position on femur





Synthetic Ligament Placement

◆ Montgomery et al – CORR 1988

– Evaluated Dacron Graft Wear

- Noted increased abrasion and fatigue wear at interface of graft with femoral tunnel
- Site of graft rupture





Synthetic Ligament Placement

- ◆ Fleming et al – Cadaveric Study(JOR,1992)
 - Compared “over the top”(OTT) and femoral tunnel (FT) placement
 - Findings:
 - No significant difference in AP Laxity
 - Higher tensile stress in FT graft at knee flexion >90
 - Increased graft tensioning caused overconstraint and graft stress in the FT position >> OTT position
 - Conclusion: OTT placement optimal for lifespan of prosthetic graft





Comparing Our Results With Overall Experience

- ◆ No failures at 5-7 year F/U
- ◆ No recurrent effusions
- ◆ Minimal deterioration in subjective and objective knee function over time
- ◆ All grafts placed in the OTT position vs. standard FT





Conclusions

1. Graft failure and functional deterioration did not occur in our study group over 5-7 years
2. Our results are consistent with decreased graft stress with OTT placement vs. a FT position
3. Successful long term results with minimal complications are possible with a synthetic ACL graft





Thank You





Synthetic Graft Breakdown

- ◆ Graft cycling against bone surface
- ◆ Most common site of observed rupture and wear:
 - Femoral Tunnel – Graft Interface

