

GRAFT SELECTION in ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Bone-Patella Tendon-Bone vs. Hamstring Grafts

Is the graft chosen for ACL reconstruction important? YES!

The graft chosen should

- 1) Provide adequate fixation to allow rehabilitation,
- 2) Allow anatomic re-creation of the ACL in both size and location
- 3) Have adequate initial strength to survive the uncertainties of graft regeneration.

Bone-Patella Tendon-Bone (BTB) grafts has the best initial fixation by using interference screws to produce rigid bone-to-bone fixation. Hamstring fixation is soft tissue to bone via sutures and is less rigid.

Both BTB and Hamstring grafts should allow re-creation of the ACL in both size and location although this is largely dependent on the experience and expertise of the surgeon.

Both BTB and Hamstring grafts need to undergo regeneration or they will fail. The initial fixation and tensioning of the graft both affect the biology of healing. In this respect BTB graft has an advantage and theoretically has the best chance of functional regeneration.

Patella Tendon Grafts

Advantages:

Excellent initial and long-term fixation
Better overall stability

Disadvantages:

Increased anterior knee pain
Two incisions (plus arthroscopy portals)

Hamstring Grafts

Advantages:

Lower incidence of anterior knee pain and crepitus
Single incision (plus arthroscopy portals)

Disadvantages

Less secure initial and long-term fixation
Increased knee laxity after reconstruction

Aglietti et al., AJSM 22: 211, 1994

In prospective studies comparing BTB vs. Hamstring grafts it was found that both grafts are good choices in ACL reconstruction but that BTB graft provides more overall knee stability than hamstring grafts.

Otero et al., arthroscopy, 1993

Gold Standard

At present the "Gold Standard" ACL reconstruction is BTB Graft
Johnson R.J., The Knee, Dec. 1999, Cleveland Clinic Foundation

We use the Patella Tendon graft in the majority of patients requiring ACL reconstruction because we believe it gives the best guarantee of a successful outcome. This is based both on reviewing the scientific literature and extensive Orthopaedic experience.

Recent Literature on Fixation

"Biomechanical comparison of hamstring and patellar tendon graft anterior cruciate ligament reconstruction techniques: The impact of fixation level and fixation method under cyclic loading"

Scheffler SU, Sükamp NP, Göckenjan A, Hoffmann, RFG, and Weiler A.

Arthroscopy: The Journal of Arthroscopic and Related Surgery, Volume 18, No 3 (March), 2002: pp304-315

Excerpt taken from the above article (page 312, paragraph 4):

"However, a crucial factor for direct tendon graft fixation with interference screws was the tibial fixation site. When direct graft fixation was achieved without a bone block (HST_{RCI}), the sustained loads during cyclic loading significantly decreased with consistent failure of the reconstruction by graft pullout from the tibial tunnel. These findings are in agreement with other studies that found similar modes at comparable load magnitudes.^{16,19,33} The use of a bone block in the tibial tunnel significantly improved the anterior stiffness as seen in the HST_{BIO} and PAT groups. The second bone block in the femoral tunnel (PAT) provided additional increase in anterior stiffness compared with single or no bone-block constructs.

In all its respective groups (HST_{BIO}, HST_{RCI}, PAT), the dominant failure site remained at the tibial tunnel. These findings imply that either a completely reconstructed knee joint or at least the tibial fixation site should be mechanically tested when evaluating the tensile properties of ACL reconstruction techniques with interference fit fixation. Caution should be used when testing the femoral fixation site only as it possibly overestimates the tensile properties of the knee after complete reconstruction.^{18,19,26,33}

One explanation for the low fixation strength in the tibial tunnel might be the lower bone density normally found in the tibial bone compared to the femur.³⁴ In the HST_{RCI} group, slippage of the tendon out of the tibial tunnel occurred with the interference screw left in place and with no apparent tendon lacerations at loads around 200N, and 7 of 8 specimens failed at loads of 300N. These observations suggest that the use only of a metal interference screw with its round-headed soft-threaded design did not provide sufficient direct soft tissue fixation in the tibial bone to withstand loads that might be experienced during postoperative bilitation."

Acknowledgment

We thank Dr Robert Johnson for allowing us to use his paper on ACL Reconstruction and Graft Selection in preparing this article.