Posterior cruciate ligament reconstruction: superior ultimate tibial fixation strength with four-strand quadriceps graft and sheath and screw design

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Introduction:
Despite numerous fixation techniques for posterior cruciate ligament reconstruction (PCL), residual posterior laxity continues to be a problem for a number of patients. The purpose of the study was to evaluate and compare the tibial fixation strength of a quadriceps tendon graft via an expansion technique with either a simple interference screw or a screw and sheath design placed proximally within the tibial tunnel.

Methods:
Sixteen paired knees from 8 fresh cadaveric specimens were chosen. We then harvested a 10mm quadriceps tendon graft with a 10mm catamaran blade to be used for the posterior cruciate reconstruction. The tendon graft was kept in continuity with the patella to facilitate future biomechanical testing. The knee was then disarticulated. For one knee of the matched pair (n=8), a standard whip stitch (Group 1) of the quadriceps graft was performed. In the contralateral knee (n=8), the graft was separated into four strands (Group 2), which were then whip stitched individually. A guide pin was placed for the tibial tunnel, utilizing the Arthrex PCL guide set at 70°. Following confirmation of guide pin placement with fluoroscopy, a 10mm half round reamer was used to drill the tibial tunnel. In Group 1 (the single whip stitch), the graft was passed and fixed proximally in the tibia with an Arthrex Peek Interference Screw. In Group 2 (the four-strand quadriceps graft), the graft was passed and fixed proximally within the tibial tunnel using the Arthrex GraftBolt screw and sheath design. Biomechanical pull out studies were then completed, utilizing the MTS 858 Bionix® Test System. The tibia was mounted and secured at a 45° angle in order to simulate the anatomic trajectory of and forces upon the PCL. A constant load was applied to the graft until graft or fixation failure occurred. Ultimate fixation strength just prior to failure was measured for each specimen.

Results:
The mean ultimate fixation strength prior to failure was found to be 211.6 N in Group 1 (SD = 104.5 N). In contrast, in Group 2, the mean fixation strength was calculated to be 268.3 N (SD = 102.5 N, p = 0.0967). All grafts failed at the site of

fixation via graft pull out from the tibial tunnel as opposed to intrasubstance graft rupture.

Conclusions:

Overall, superior ultimate fixation strength was noted with the four-strand quadriceps graft and screw and sheath design in comparison to those with a standard graft and a simple interference screw. Therefore, the four-strand quadriceps graft in combination with proximally based tibial fixation is a potential viable option for PCL reconstruction, which may ultimately lead to less residual posterior laxity previously seen with other fixation methods.