

Anatomic, Physeal Sparing Anterior Cruciate Ligament Reconstruction in the Skeletally Immature

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Summary:

This case series evaluates an anatomic, physeal sparing ACL reconstruction technique in four patients that has preliminarily proven to be effective, both objectively and subjectively, in the skeletally immature.

Abstract:

Background:

With the growing incidence of anterior cruciate ligament (ACL) injuries in the pediatric population, there has been interest in developing a technique to reconstruct the ligament without disturbing the physes. Previously described all epiphyseal reconstructions spare the growth plates but do not restore the native orientation of the ACL. This case series evaluates an all-epiphyseal technique where the graft is more anatomically placed, particularly on the tibial side.

Methods:

Four skeletally immature patients, one female and three males with an average age of 10.3 ± 2 yrs. (8.4-12.2 yrs.), underwent soft tissue allograft anterior cruciate ligament reconstruction using an all-epiphyseal approach. Two patients had acute ACL tears (< 4 weeks old) and two patients had chronic tears. One of the chronic tear patients had an acute lateral meniscal tear. All reconstructions were performed with an arthroscopically assisted approach by the senior author (CHB). The femoral tunnel was drilled parallel to the physis in the epiphysis of the lateral femoral condyle. The tibial tunnel was drilled from inside to outside using a retrograde drill to the level of the physis. A 2mm guide pin traversing the tibial physis was used to guide the tibial retrograde drill. Intraoperative C-arm imaging confirmed that drilling did not violate the physes. The tibial sided graft was fixed to the anterior tibial cortex over a button. The femoral side was secured with an absorbable interference screw placed from outside to inside. All patients underwent radiographic and MRI evaluation at final follow-up. Subjective and objective measures included KT-1000 testing as well as International Knee Documentation Committee (IKDC) subjective and objective and Lysholm scoring.

Results:

Mean follow-up was 2.3 ± 0.55 yrs. (1.6-2.9 yrs.). All patients had stable knees and no evidence of limb length discrepancy or angular deformity. Pre-operative KT-1000 testing demonstrated a mean side to side difference of 6mm. Post-operative KT-1000 testing revealed a mean side to side difference of 1.4 ± 0.75 mm (0.5-2.0mm). The mean IKDC subjective knee score was 95.7 ± 1.5 (93.8-96.9). The mean Lysholm knee score was 95.5 ± 5.7 (88-100). IKDC objective knee form ratings were A (normal) for the two acute patients, B (nearly normal) for one chronic patient, and C (abnormal) for the one chronic ACL/lateral meniscus repair patient. MRI at two years post operation demonstrated no meniscal or chondral injuries, intact ACL grafts, and no evidence of asymmetric physeal arrest. All patients returned to pre-injury activity levels.

Conclusions:

This anatomic, all-epiphyseal anterior cruciate ligament reconstruction has preliminarily proven to be effective, both objectively and subjectively, in the skeletally immature. In this series the acutely reconstructed patients had better knee scores. Further follow-up and larger series are needed to confirm long-term efficacy.