ALL-EPHYSEAL, DOUBLE BUNDLE PCL RECONSTRUCTION FEMORAL TUNNEL MODELING

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OBJECTIVES

• Although posterior cruciate ligament tears are relatively rare in children, they are increasingly reported in adolescents with open physes who have significant growth remaining.
• Recent research on double bundle PCL reconstruction using modern techniques has shown risk of significant damage to the peripheral physs of the femur, a region with a high risk of growth disturbance.
• The purpose of this study was to develop recommendations for tunnel placement in anatomic, double bundle reconstructions of the PCL that would avoid iatrogenic injury to the physe, MCL, and MPFL.

METHODS

• Four skeletally immature knee cadaveric specimens between the ages 7 – 11 were used to create 3-D computer models from CT scan reconstructions.
• Tunnels were started in the anatomic footprints for the anterolateral bundle and the posteromedial bundles of the PCL.
• The orientation of the tunnels was based on several goals:
  1. Avoid the peripheral femoral physe.
  2. Create adequate spacing between the tunnels to avoid significant tunnel convergence (snowman effect) in the PCL footprint.
  3. Avoid articular cartilage of trochlear and medial condyle as well as the MCL.

RESULTS

• The AL Tunnel was directed anteriorly, and the PM tunnel was directed posteriorly.
• Both tunnels could be placed on the medial aspect of the PCL origin without damaging the physe, articular cartilage, or MCL, while still maintaining an adequate bone bridge between the two tunnels.

CONCLUSION AND CLINICAL SIGNIFICANCE

• Although traditional Double Bundle PCL techniques can damage the peripheral femoral physe, this computer-aided design model demonstrated that all-epiphyseal tunnels could be placed within the footprint of the PCL and allow for appropriate tunnel separation while avoiding the physe, allowing for double bundle reconstructions in those with open physes.
• For pediatric and/or adolescent patients with significant growth remaining, double bundle PCL reconstruction may be performed without damage to the femoral physe, MCL, or articular cartilage.

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