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Comparison of the Accuracy and Reproducibility of the Femoral Tunnel Location Between Anterior and Posterior Viewing During Outside-In Anterior Cruciate Ligament Reconstruction

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Summary:
Accuracy and reproducibility of the femoral tunnel location could be improved with a TS portal viewing using a 30° arthroscope

Abstract:
Background: During outside-in anterior cruciate ligament (ACL) reconstruction, anteromedial (AM) or anterolateral (AL) portals are usually used for the viewing of the femoral foot print. However, observing the posterior portion of the ACL femoral foot print (AM bundle footprint) using an AM or AL portal could be difficult due to blocking by remnant ACL or ridge on the medial wall of the lateral femoral condyle. In this view point, using a 70 o arthroscope through posterolateral (PL) portal, posterior part of the ACL footprint could be seen directly. However, this view could be a little distorted because the wall of the ACL insertion should be seen from posterior to anterior direction. The posterior trans-septal portal (TS) could allow direct visual access to the posterior part of the ACL femoral footprint through the posteromedial (PM) portal.
Purpose/Hypothesis: The purpose of this study was to compare the accuracy and reproducibility of the femoral tunnel location between three different viewing techniques (observed through an AL or AM portal using a 30° arthroscope (A group) vs. PL portal using a 70° arthroscope (PL group) vs. TS portal using a 30° arthroscope (TS group) by 3D CT in outside-in ACL reconstruction. The hypothesis of this study was that femoral tunnel locations would be more accurate and reproducible in the posterior viewing group (PL and TS), and the TS viewing technique would be the best because it offers the most direct view of the medial wall of the lateral femoral condyle.
Materials and Methods: One-hundred and six outside-in ACL constructions patients were recruited. Patients were divided into three groups according to the viewing techniques (36 A vs. 35 PL vs. 35 TS patients). Femoral tunnel locations were evaluated with a quadrant method and anatomic coordinate axes measurement (ACAM) method in the medial wall of the lateral femoral condyle using 3D reconstructed CT. The accuracy and reproducibility of the femoral tunnel locations were compared between three techniques.
Results: The accuracy of the tunnel location was higher in the TS group by the quadrant method (A group vs. TS group: $p<0.001$, PL group vs. TS group: $p<0.001$) as well as the ACAM (A group vs. TS group: $p<0.001$, PL group vs. TS group: $p=0.02$). The reproducibility of the femoral tunnel position in the TS group was the highest and femoral tunnel locations of the TS group were more compactly distributed compared with those of the A and PL group (standard deviation: A group [4.68%], PL group [3.75%], and TS group [1.34%] by the quadrant method; A group [5.18%], PL group [3.85%], and TS group [1.92%] by the ACAM method).
Conclusion: Accuracy and reproducibility of the femoral tunnel location could be improved with a TS portal viewing using a 30° arthroscope and anterior and PL portal viewing using a 70° arthroscope showed no difference.
Keywords: Anterior cruciate ligament, Outside-in technique, Femoral tunnel location, Accuracy, Reproducibility