

Comparison of Tibial Tunnel Techniques in Posterior Cruciate Ligament Reconstruction: C-Arm Versus Anatomic Fovea Landmark

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Summary:

PCL fovea landmark technique might be an alternative method to the fluoroscopic imaging technique for locating the anatomic tibial tunnel during trans-tibial PCL reconstruction

Abstract:

Background: Tibial insertion of the posterior cruciate ligament (PCL) is in the posterior half of the PCL fovea, or that the center of the PCL working fibers was 7 mm anterior to the posterior cortex. Intraoperative fluoroscopic images are usually used for the creation of the tibial tunnel during trans-tibial PCL reconstruction. However, intraoperative fluoroscopic identification of the tibial insertion area of the PCL is often impaired by tibial rotation and overlapping anatomic structures. Therefore, the definition of reliable, arthroscopically identifiable anatomic landmarks would be of great value for proper positioning of the tibial guide pin in arthroscopic trans-tibial PCL reconstruction. During our trans-tibial PCL reconstruction, a trans-septal portal is made just behind the PCL fibers and the margin of the PCL fovea can be palpated with the tip of the tibial guide.

Purpose/Hypothesis: The purpose of this study was to evaluate the accuracy of the posterior cruciate ligament (PCL) fovea landmark against conventional fluoroscopic pin placement retrospectively using three-dimensional computed tomography (3D CT). Our hypothesis was that accurate tibial tunnel preparation would be possible without intraoperative fluoroscopic imaging using reliable anatomic landmarks of the PCL fovea.

Methods: This retrospective comparison focused on the tibial tunnel locations determined in consecutive 26 patients using fluoroscopic imaging technique (group I) and in consecutive 23 patients using the PCL fovea landmark technique without the help of the fluoroscopy (group II) for the tibial tunnel formation. The 3D surface modeled tomography (CT) images that appropriately located the position of PCL fovea on the tibial plateau were used. Ratios between total length of the fovea and length of the tunnel center from the medial border (coronal) and posterior edge (sagittal) were evaluated.

Results: The ratios between sagittal tunnel length and total sagittal length for groups I and II were $35.4 \pm 12.2\%$ and $44.1 \pm 23.1\%$, respectively ($p=0.07$). The ratios between the coronal tunnel lengths and total coronal lengths for groups I and II were $47.3 \pm 9.2\%$ and $57.3 \pm 18.1\%$, respectively: group II showed more laterally positioned tibial tunnel than did group I ($p=0.03$).

Conclusions: More laterally located tibial tunnel was produced using a PCL fovea landmark technique. However, the differences in centers were small and probably not clinically relevant. Therefore, PCL fovea landmark technique might be an alternative method to the fluoroscopic imaging technique for locating the anatomic tibial tunnel during trans-tibial PCL reconstruction.

Level of Evidence: Level of evidence, 3, Retrospective comparative study

Key Words: Posterior cruciate ligament, Trans-septal portal, fluoroscopic imaging, PCL fovea