to the ideal location for the isometric point from 10 o′clock (in right knee) and 13:30 (in left knee) to 10:30 (in right knee) and 14 o′clock (in left knee) in the frontal plane. This study was performed to compare operative methods and the radiologic results of femoral tunnels made through the tibial tunnel(trans-tibial approach) and the anteromedial portal.

Methods: From January 2003 to May 2004, one-hundred reconstructions of anterior cruciate ligament were performed. Group I (femoral tunnel through tibial tunnel) was composed of 50 cases and group II (femoral tunnel through anteromedial portal) was consisted of 50 cases. The study was performed to compare the radiographic results of femoral tunnels made through the tibial tunnel and the anteromedial portal and operative methods.

Results: In operative methods at Group II, femoral tunnel was made more easily at isometric point than Group I, a good visual field was achieved because 100° flexion of knee, they can be reduced risk of posterior cortical breakage and tunnel-graft mismatching and decreased divergence of femoral interference screw in radiology ($P<0.05$). The angle between femoral tunnel and longitudinal axis of ACL was increased at Group II.

Conclusions: Anteromedial portal technique was more useful in ACL reconstruction for femoral tunnel toward 10 o′clock to 10:30(in right) or 1:30 to 2 o′clock(in left).

P13-80

Avoiding tunnel collisions between fibular collateral ligament and ACL posterolateral bundle reconstruction

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Objectives: Double bundle anterior cruciate ligament (DB-ACL) reconstructions are a recognized technical alternative to primary ACL reconstruction which could restore knee kinematics closer to the normal knee. However, with this procedure, the posterolateral (PL) ACL tunnel is placed more horizontal and closer to the primary posterolateral corner (PLC) structures.

The purpose of this study was to evaluate the risk of tunnel collisions of the FCL and PL-ACL tunnels during a combined DB-ACL reconstruction and FCL reconstruction.

Methods: Thirty-six 4th generation synthetic femurs (Pacific Research Laboratories, Vashon, WA) were utilized. Eighteen femurs were medium size while other eighteen were large size, with a lateral condylar width of 2.8 and 3.6 cm respectively. Each femur was anchored to a custom-made device to ensure reproducibility of the reconstruction tunnel directions.

The femoral PL-ACL bundle attachment point was anatomically located on the lateral condyle and the correct insertion site was confirmed through a lateral X-ray view. Two different exit points of the guide-wire on the lateral femoral cortex were chosen on each femur. This was performed to simulate different PL-ACL tunnel trajectories that could be obtained through the accessory anteromedial portal. In this way, an anterior (A) or a posterior (P) PL bundle tunnel was created for each femur with an angulation of 30° and 32°, respectively, in the anteroposterior x-ray view and 53° and 30°, respectively, in the lateral view. At this point, a 7 mm reamer was passed over the guide-wire and a PL-ACL tunnel was then created breaching the lateral cortex of the femur.

A similar technique was used to direct the FCL femoral reconstruction tunnel. The neutral position (0, 0) was considered when the guide-wire was placed parallel to the distal and posterior condylar line. After the neutral position, different guide-wire orientations were created using 20° intervals in both the coronal and axial planes. At this point, a 9 mm tunnel was reamed over the guide-wire at a depth of 25 and 30 mm. Each tunnel was then filled using an epoxy resin augmented with BaSo4 and a CT was performed on each synthetic specimen. Furthermore, 3D images were obtained and the distance between the PL tunnel and the FCL tunnel was calculated. Furthermore, different tunnel collisions were observed and recorded.

Results: No collisions were observed when the FCL tunnel was reamed parallel to the condylar line and with an axial deviation of 20° and 40°. This was observed for both PL-ACL orientation and for both 25 and 30mm FCL tunnel depth. However, when the FCL tunnel was reamed in neutral position with no coronal and axial deviation (0,0), tunnel collision occurred at the femoral notch and close to the PL-ACL tunnel origin. This was observed for both medium and large femurs and for 25 and 30 mm FCL tunnel depths. A collision rate of 92% was observed when the FCL tunnel was directed proximally at 20° and 40° of axial angulations, for both 25 and 30 mm FCL tunnel depths. However, with regard to the two PL-ACL tunnel orientations, the collision rate decreased from 100% using an anterior PL-ACl tunnel to 83% using a posterior PL-ACL tunnel.

Conclusions: Our results show that the risk of tunnel collision during a combined DB-ACL and FCL reconstruction could be reduced. This could be obtained directing the FCL tunnel anteriorly with axial angulations of 20° or 40° and limiting proximal angulation of the tunnel.

P13-82

Anatomic double bundle ACL reconstruction using a bone-patellar tendon-bone autograft: a cadaveric study

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Objectives: Conventional double bundle anterior cruciate ligament (ACL) reconstruction are using hamstrings autografts.

This article describes the feasibility of an original arthroscopic double bundle ACL reconstruction technique using a bone patellar tendon bone (BPTB) autograft. The aim of the study was to state the reproducibility of the BPTB graft harvesting, the relationships of the femoral tunnels, and to settle technical keypoints for its use. It is a descriptive anatomical study.

Methods: Dissections were performed and measurements taken on 10 fresh frozen cadaveric knees after arthroscopic ACL double bundle reconstruction procedure. A rectangular patellar bone block (12 mm), with a double strand patellar tendon (5 and 7 mm), and a double tibial bone block was harvested. The femoral anteromedial tunnel was made using an all-inside technique, by the anteromedial portal. The femoral posterolateral tunnel was made using an outside-in technique, with a 30° degrees divergence between both tunnels. A single tibial tunnel was drilled. The graft was passed through the tibial tunnel, and the bundles were separately tensioned and fixed with three bioabsorbable interference screws. The femoral AM bone block was fixed by the anteromedial portal. Secondly, the tibial bone block was fixed in an oblique manner in order to mimic the ACL orientation with the knee at 30° of flexion. The femoral PL bone block was fixed at the end with the knee in full extension.

Results: No complications occured while harvesting the graft. The reconstruction was always performed. The divergence between femoral tunnels was between 30 and 35°. The cortical bone bridge was always intact, between 1 and 2 mm. Some difficulties occured in 4 cases to put the two blocks into their femoral tunnels. There was a fracture of the PL bone block in one case, during the fixation by the screw. No iatrogenic injury was seen in the lateral side of the femoral condyle.

Conclusions: This technique with a BPTB autograft for double bundle ACL reconstruction is feasible in a cadaveric model, but technically demanding. Bone-tendon-bone fixation allows a good primary fixation and tunnel filling. For BPTB graft users this technique is an alternative to double bundle reconstruction with hamstring tendons.

Nevertheless, donor site iatrogenic risks and comparative clinical results have to be evaluated in further studies.

P13-98

ACL femoral tunnel length comparing anteromedial portal versus outside-in technique

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Objectives: Resurgent interest in anatomic ACL reconstruction has led to arguments in favor of independent drilling (AM portal or outside-in