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The Accuracy of Femoral Tunnel in Remnant Preserved Anatomic Double-Bundle Anterior Cruciate Ligament Reconstruction Analyzed Three-Dimensional Computed Tomography

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Summary:
The position of anteromedial and posterolateral bone tunnels in twenty-five knees of anatomical ACL reconstruction were evaluated using quadrant method with three-dimensional computed tomography. Remaining connected ACL remnants were preserved in thirteen of their knees using fluoroscopic assisted surgery. Tunnels of remnant preserved knee were located in anatomic ACL insertion.

Abstract:
Background:
The remnant of the anterior cruciate ligament (ACL) potentially contains blood supply, proprioceptive innervation and mechanical strength. Recent studies(1-3) have shown some advantages of the remnant preserved ACL reconstruction technique. However, the femoral side of the ACL remnant makes it difficult to confirm the location of the femoral insertion of the ACL, depth gauge and drill length.
Purpose:
The purpose of this study is to evaluate the accuracy of the remnant preserved ACL reconstruction technique.
Material and Method: The remaining connected ACL remnants were preserved in thirteen knees (preserved group) using fluoroscopic assisted surgery. The true lateral fluoroscopic views were obtained by figure four position. The insertion of the anteromedial (AM) and posterolateral (PL) bundle were confirmed by pointing out the tip of the guide pin from the far anteromedial (FAM) portal. Firstly, we inserted the depth gauge into the tunnel and then the other guide pin so as to confirm the location of the medial wall of the lateral femoral condyle. The tip of the drill bit was attached to the ACL insertion allowing the confirmation of the scale marks of the drill shaft on the lateral wall of medial femoral condyle. The drilled length was measured by comparing the length differences on the wall before and after drilling. The semitendinosus autografts were inserted into the bone tunnels without arthroscopic visualization. The remnants were removed from twelve knees (removed group) and we performed on three of them using the FAM technique, and on the nine of them were performed trans-tibial technique by means of arthroscopic visualization. The PL femoral tunnels were created through trans-tibial in all knees. Three-dimensional computed tomography scans were performed on each knee and the location of both AM and PL femoral tunnels were analyzed using quadrant method(4-7).
Results: The Average center of the AM and PL tunnels on the femur are 25.7 ± 4.9 % and 37.9 ± 6.0 % in preserved group, 29.4 ± 5.9 % and 37.6 ± 5.4 % in removed group respectively, from the proximal condylar surface (parallel to the Blumensaat line). The Average center from the notch roof (perpendicular to the Blumensaat line) are 27.7 ± 10.1 and 50.6 ± 13.3 in preserved group,16.6 ± 9.5 % and 49.2 ± 9.4 % in removed group respectively. The PL tunnels of

the femoral side tended to be located shallow.

Conclusion:

In the remnant preserved group, the bone tunnels were created without arthroscopic visualization. The PL tunnels tended to be anterior to maintain the bone septum between both AM and PL tunnels after the AM tunnels were created. Using fluoroscopic surgery, the location of the tunnels were created in the anatomic ACL insertion. The Remnant preserved anatomic double-bundle ACL reconstruction under fluoroscope is a useful technique.

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