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Novel Anatomical Single Bundle ACL Reconstruction Using a Rounded Rectangular Dilator

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Summary:
We have designed and developed an original rounded rectangular dilators and sizing block to perform novel anatomical single bundle ACL reconstruction. Compared with conventional anatomical single bundle ACL reconstruction, rounded rectangular femoral tunnel ACL reconstruction created a large femoral tunnel and improved anteroposterior, rotational laxity and clinical results.

Abstract:
Introduction: During the past 10 years, the main trend for ACL reconstruction has shifted to anatomic reconstruction, regardless of single bundle or double bundle techniques. There is no significant difference in the postoperative stability and clinical results between single and double bundle ACL reconstruction. Therefore, attention has returned to single bundle reconstruction with grafts that are placed at the center of anatomical footprint. It is widely accepted that the smaller hamstring autograft size (tunnel diameter < 8mm) is a predictor of poorer clinical results. However, the shortcoming of conventional anatomical single bundle ACL reconstruction is that the creation of a large anatomical bone tunnel is not possible because of roof impingement or breakage of posterior femoral bone tunnel. Furthermore several anatomical studies have reported that the femoral insertion of the ACL has a rounded rectangle shape, and we have also realized that the quadrupled semitendinosus tendons appear to be a rounded rectangular, rather than circular. Therefore, we created an original femoral dilator and sizing block and developed a new ACL reconstruction technique: “rounded rectangular femoral tunnel ACLR” (RFTR). This study aimed to compare the area of femoral tunnel and clinical results between conventional anatomical single bundle ACL reconstruction (ASBR) and RFTR. The hypothesis was that RFTR could have a larger femoral tunnel and improve clinical results.
Methods: Between May 2010 and Aug. 2015, 157 primary ACL reconstructions were performed. After implementation of inclusion criteria, 116 ACL reconstructions were analyzed (ASBR = 57 patients, 25 male, 32 female; age, 24.1±9.3 years; RFTR = 59 patients, 34 male, 25 female; age, 24.5±10.1 years). Both ACL reconstructions were performed using a semitendinosus graft (with or without the gracilis tendon). The evaluation items were area of the femoral tunnel, anteroposterior laxity with KT-1000, pivot-shift test, and Lysholm score. We determined the femoral tunnel size using a sizer during arthroscopy. The tunnel exists within the native ACL footprint, and we chose the maximum size possible without going beyond the lateral intercondylar ridge.
Results: RFTR created a bigger femoral tunnel area than did ASBR (average area, 52.7±4.8 mm2 vs 47.0±7.3 mm2; P<0.01). RFTR resulted in better anteroposterior stability and Lysholm score than did ASBR (average side-to-side difference for anterior tibial translation, 0.8±1.1 mm vs 1.8±1.2 mm; P<0.01); average Lysholm score, 98.9±2.4 vs 97.6±3.3; P<0.01). Differences in rotational laxity between groups were statistically significant (negative pivot shift, 93.3% vs 82.5%; P<0.01).
Conclusion: Compared with conventional anatomical single bundle ACL reconstruction, rounded rectangular femoral

tunnel ACL reconstruction created a large femoral tunnel and improved anteroposterior, rotational laxity and clinical results. This technique simple and can address the shortcomings of conventional anatomical single bundle ACL reconstruction.