



## Anatomic Anterior Cruciate Ligament Reconstruction by Using Quadriceps Tendon Autograft

### Kuadriseps Tendon Otogrefti Kullanılarak Anatomik Ön Çarpraz Bağ Rekonstruksiyonu

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Dear Editor,

The anterior cruciate ligament (ACL) injuries are common knee injuries especially in people younger than 30 years of age and those who are physically active. These injuries are mostly seen with high incidence rates in adolescents playing pivoting sport activities such as football and basketball. Because of their larger pelvic diameters, young women have a 35 times higher risk of ACL injury than men in pivoting sports (1-3). The goals of ACL reconstruction are to regain stability and unrestricted function as well as to protect joint health in the long term. Current treatments for ACL injury are moderately successful and most individuals are able to return to their preinjury level of sports activity (4, 5). But after beginning recreational activities, ACL rerupture is the most common problem and, for this reason, it requires further analysis so as to decide the best option for ACL reconstruction injury methods and appropriate graft choices.

A 25 years-old man with knee instability was referred to our orthopaedic clinic. He was a football player and had an injury history about one month ago with forced rotation in his right knee. In physical examination, he had moderate pain and suprapatellar effusion. His McMurray, varus-valgus, and posterior drawer tests were negative. But he had positive anterior drawer and lachmann tests. The Lysholm knee score was 64 while his Cincinnati score was 52. The Tegner score was 3,6. Magnetic resonance imaging (MRI) showed ACL rupture in the right knee with no accompanying injuries. We performed an arthroscopical anatomic single bundle ACL reconstruction by using the autogen quadriceps tendon. No accompanying injuries were detected during arthroscopic surgery. After the surgery, we used a knee brace with an angle-adjustable hinge for 4 weeks. Within 2-14 postoperative days, we obtained full extension, minimized swelling, active quadriceps control, and 90 degrees of flexion. Within 2-6 weeks, we increased flexion to 135 degrees. We obtained full range of motion within 6-9 weeks in addition to increased functional

activities, improved muscle strength, and endurance within 9-12 weeks. After 12 weeks, we asked the patient to start light sport activities. 6 months after the surgery, the patient resumed pivoting activities. At the end of 6 months, the Lysholm knee score was 86, Cincinnati score was 78, and Tegner score was 5.8. The graft was intact on MRI and the femoral tunnel enlargement was 0.68 mm.

ACL reconstruction requires optimal graft selection that accommodates patient's personal needs best. Numerous grafts, including allograft and autograft options, have been described including consisting soft tissues alone and allowing osseous healing. ACL has two bundles: Anteromedial (AM) and posterolateral (PL). These two bundles are the main stabilisators against translational and rotational forces. ACL moves through a normal range of motion with the AM bundle resisting translation and the PL bundle resisting rotation. So ACL reconstruction may have better results with a versatile grafts that can provide stability like the native ACL and allow graft incorporation and healing. The quadriceps tendon autograft is a versatile option as it has the advantage of osseous healing.

The quadriceps tendon inserts directly onto the anterior half of the patella and has an average thickness of 8 mm, which is about twice the thickness of the patellar tendon and more closely replicates the dimensions of the native ACL. Also the quadriceps tendon has shown similar biomechanic properties of the intact ACL.

The osseous and soft tissue components allow many fixation options for the quadriceps tendon graft. Osseous and soft tissue components can both be fixed with interference screws. Suspensory fixation for a bone plug within the femoral tunnel (ENDOBUTTON (Smith and Nephew, Andover, MA)) has been used successfully to this day. On the tibial side, suspensory fixation may be used alone while it may also be used to reinforce interference screw fixation.

Although ACL reconstruction have focused on hamstring, patellar tendon, and ACL reconstruction, it has also shown excellent stability in follow-ups with the central third quadriceps tendon (6). Good outcomes with quadriceps autografts have been shown in follow-up not only for primary ACL reconstruction but also for revision surgery as well (7, 8).

Complications related specifically to graft harvests include weakness, patella fracture, donor site-related pain as well as cosmetic consequences of an additional incision proximal to the patella. The quadriceps tendon is a hypervascular region with an inherent risk of bleeding and careful attention should be paid to hemostasis. The risk of fracture is similar to those of patellar tendon and quadriceps tendon grafts, with an incidence of 0,2% to 2,0% for patellar tendon and 1,2% for quadriceps tendon (6). Quadriceps tendon harvesting is not as deleterious to the extensor mechanism as patellar tendon harvesting. Studies have concluded that quadriceps tendon harvest results in less decrease in extensor mechanism strength than patellar tendon harvesting (9). Lee et al. have found excellent stability with quadriceps tendon grafts with a muscle recovery rate of 89% 2 years after surgery (6). Anterior knee pain is a common problem after quadriceps and patellar tendon harvesting. When compared with patellar tendon, less anterior knee pain occurs with quadriceps tendon harvesting while the latter has not shown any patellar tendon shortening or infrapatellar contracture associated with patellar tendon autograft (10).

In order to understand the anatomy of the ACL and restore this anatomy back to its native outlook, the graft options are as important as fixation methods for incorporation and healing after reconstruction. We think that the quadriceps tendon is an appropriate graft for ACL reconstruction because its anatomic and biomechanical characteristics are similar to the native ACL. Also, it can be used to for revision ACL reconstruction surgery. There are still controversies about determining the best graft option for ACL reconstruction. Longer term clinical results are needed to decide the

best option with regards to physical activity of patients. We believe that single bundle anatomical ACL reconstruction with quadriceps tendon autograft is a good treatment option especially for physically active patients.

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