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MID-TERM FUNCTIONAL OUTCOMES OF ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION WITH ANTEROMEDIAL PORTAL TECHNIQUE

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Abstract:
The goal of this study was to assess the influence of midterm clinical and functional results following ACL restoration using an autogenous hamstring tendon graft using an anteromedial portal technique. Between 2014 and 2018, 177 patients underwent arthroscopic ACL reconstruction in this clinic, with a mean follow-up of 42,63 months. The mean age was 31.1±7,86 (16–54), and the mean time between rupture and surgery was 20.7±41,1 (1–288). The mean BMI was 28.9±2.8 kg/m2 (19-43 kg/m2). Activities of the patients were evaluated with Tegner Activity Scale and IKDC (International Knee Documentation Committee) for pre-injury, pre-surgery, and post-surgery last follow-up. The IKDC score of the patients, which was 55.35 (35-88) for pre-surgery, was found as 85.05 (range 58–100) in the last follow-up. Tegner activity score of the patients, which was 3.49 (1-8) for pre-surgery, was found as 5.46 (range 3–8) in the last follow-up. Arthroscopic ACL reconstruction using autogenous hamstring tendon graft has a low complication rate and can be preferred in terms of the functional outcomes.

Keywords: ACL injury, reconstruction, BMI, IKDC

1. Introduction

The most common knee injury is anterior cruciate ligament (ACL) injury, which affects approximately 1 in 3000 people (Radford et al. 2005; Mikami et al. 2004). With the increased interest in sports in recent years, such injuries have become more frequent (Kayaalp ME 2020; O'Neill 2001). In most patients treated conservatively for ACL rupture, recurrent instability events are likely (Marzo and Warren 1991). As a result, surgical treatment has become more typical in young, active patients who participate in sports and have ACL rupture. The rate of knee stability and patient satisfaction is about

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90% following ACL reconstruction (Freedman et al. 2003). Surgical management plays a critical role in restoring the proprioceptive mechanism impaired by an ACL injury, thus decreasing the risk of osteoarthritis (Adachi et al. 2002).

Although various grafts and techniques have been described for ACL reconstruction, the most popular method today is arthroscopic repair performed with an autogenous hamstring tendon graft (Eriksson, Anderberg, et al. 2001). Conventional transtibial femoral tunnel drilling is not convenient for anatomical reconstruction and, since the starting point depends on the location of the tibial tunnel, it is difficult to place a suitable tunnel on the femur (Lee et al. 2012). This brings to mind that transtibial single-bundle ACL reconstruction may cause insufficiency in ACL reconstruction (Jepsen, Lundberg-Jensen, and Faunoe 2007; Aglietti et al. 2007; Kanamori et al. 2002).

The purpose of this study was to determine the effect of mid-term clinical and functional outcomes following ACL reconstruction with an autogenous hamstring tendon graft via an anteromedial portal technique.

2. Material and Method

The institutional review board (IRB) approval was obtained from the ethics committee of the local hospital in accordance with the retrospective study format. This study included 177 patients who underwent arthroscopic ACL reconstruction in this clinic between 2014 and 2018 and had a mean follow-up of 42,63 months. Patients who had previously undergone ACL reconstruction in the same knee, those with a history of cartilage damage or fracture, those with posterior cruciate ligament, medial-lateral collateral ligament, or posterolateral corner injury and those who had meniscus repair were excluded from the study.

There were 163 (92%) male patients and 14 (8%) females among these patients. 93 (53%) patients underwent right knee reconstruction and 84 (47%) underwent left knee reconstruction. The mean age was 31.1±7.86 (16–54), and the mean time between rupture and surgery was 20.7±4.1 (1–288). The mean duration of follow-up was 4263±161 (1–39 months). The mean BMI was 28.9±2.8 kg/m2 (19-43 kg/m2) (Table 1).

Table 1: Demographic and clinical information of the patients.

Gender (Male/Female)	163/14
Side (Right/left)	93/84
Age (years)	31.1±7.86
BMI (kg/m^2)	28.9±2.8
Trauma-surgery duration (weeks)	20,7±4,1
Follow-up duration (months)	42.63±16.1
Return to sports (months)	6.39±4.99

Following surgery, 118 of 162 patients returned to the sport. The time for these patients to start sports again was found as 6.39 months (6 months –24 months). The mean time to

return to work was 7.2 months (3 -12 months). There were 23 patients older than 40 years of age and the mean age was found as 44.21(40-54). 19 patients had a history of sports before surgery, and they returned to sports activities after a mean of 8.9 months (6-18 months).

Diagnostic arthroscopy was mainly performed for arthroscopic single tunnel ACL reconstruction. Gracilis and semitendinosus tendon grafts were harvested. For the preparation of the femoral tunnel, the knee was moved to 90 degrees of flexion, and the guidewire inserted from the anteromedial portal was placed over the top, 2mm in front of the posterior cortex, and the femoral tunnel was opened (Howell et al. 1999). To create the tibial tunnel, a tibial guide was inserted into the anterior horn of the meniscus, 6 mm anterior to the posterior cruciate ligament.

The harvested graft was carried through the tunnels and the distal portion of the graft was secured to the tibial tunnel using a bioabsorbable screw and strengthened with U-staples. Post-operative rehabilitation was referred to physiotherapy for the patients. The International Knee Documentation Committee (IKDC) knee score, the Tegner activity scale, and the Lysholm assessment scores were utilized to assess patients pre-and postoperatively.

3. Results

All of the patients (100%) had a complaint of pain before surgery, 129 patients (72%) had knee buckling, 116 patients (65%) had tripped and 62 patients (35%) had a swelling complaint. While no complaint was seen in 161 (90%) of the patients who were followed for a mean of 42.5 (12–83) months after surgery, 16 (9%) patients had complaints of locking of the knee and pain with exercise force. When the patients were evaluated clinically before surgery and in the last follow-up, the mean pre-surgery Lysholm score was 55.69 (32-88) and it was found as poor in 141 patients, as moderate in 36 patients, and good in 2 patients.

In the last follow-up, the mean Lysholm score was 94.3 (range 65–100) and it was found as perfect in 123 patients, good in 36 patients, and moderate in 20 patients. Lysholm score in the last follow-up was found to be significantly good when compared with the pre-surgery ($p<0,001$). Activities of the patients were evaluated with Tegner Activity Scale and IKDC (International Knee Documentation Committee) for pre-injury, pre-surgery, and post-surgery last follow-up. The IKDC score of the patients, which was 55.35 (35-88) for pre-surgery, was found as 85.05 (range 58–100) in the last follow-up. Tegner activity score of the patients, which was 3.49 (1-8) for pre-surgery, was found as 5.46 (range 3–8) in the last follow-up (Table 2).

Table 2: IKDC, Lysholm, and Tegner pre-operative and post-operative activity scores of the patients

	Pre-operative	**Post-operative**	**Mean Difference**	***p*-value**
IKDC score	55.35	85.05	29.7	p<0.05
Tegner activity score	3.49	5.46	1.97	p<0.05
Lysholm score	55.69	94.32	38.63	p<0.05

None of the cases were found to have anterior knee pain. No extension limitation was found in any of the patients in their physical examination during the last follow-up. Effusion was found in 10 patients. The joint puncture was performed in 5 patients since their complaints did not resolve and joint fluid results were normal. They recovered with symptomatic treatment. The other 5 patients were found to have a high leukocyte rate in joint fluid and a large amount of (more than 70%) PMNL. Appropriate antibiotics treatment was started according to culture results after arthroscopic washing, debridement, and operation. It was found that these cases had poor IKDC, Lysholm scores, and satisfaction, they had low performance and laxity on their knees; in the second arthroscopy, the ligament was found to rupture again in one, while it was found to resorb completely in the other one. These two patients have included the revision ACL program following symptomatic treatment.

While mean pre-operative flexion degree was found as 128° (range 115°–130°), it was found as 135° (range 125°–140°) in the last follow-up. Knee range of motion was measured as 120° in 6 patients; however, it did not cause any activity limitation. In 7 (4%) patients, there was a mild stinging complaint in the U staple area, which is used in the determination of the distal part of graft; however, it did not cause any problems in doing sports or in their daily liA mild Mild feeling of numbness was found in 16 (9%) patients on whom the anatomical method was applied. It was found that this did not affect the daily physical activities of patients.

4. Discussion and Conclusion

An anterior cruciate ligament (ACL) tear is one of the most common knee joint injuries after a sports injury (Garrick 2004). Quality of life suffers as a result of ACL injuries, and the individual becomes more vulnerable to potential knee joint injuries as a result of the inadequacy of ACL injuries. In patients with an ACL tear, the rate of participation in sports activities is very low due to pain and swelling in the knee. Meniscal injury and chondral injuries develop frequently in the knee joint due to recurrent instability attacks, and this leads to osteoarthritis development (Yercan and Aydogdu 1999; Fu et al. 1993; Kessler et al. 2008).

Today, with the increase in the participation of advanced age groups in sports activities, the number of ligaments has been gradually increasing in this age group. In this age group, individuals' activity levels should be considered before deciding on surgical treatment. With the emergence of the long-term results of ACL reconstruction in patients older than 40 years of age, age is no longer considered a stand-alone criterion for

surgical treatment. Treatment options can be arranged according to arthritic changes in the knee, occupation, and other comorbid diseases in addition to age (Reider, Davies, and Provencher 2014).

When Lysholm, Tegner Aktivite, and IKDC (International Knee Documentation Committee) scores were compared to preoperative values in patients who had ACL reconstruction and were over 40 years of age, our rates of return to sport were comparable to other age groups and literature data. Today, the general objective in terms of surgical treatment time is to restore full range of motion control following anterior cruciate ligament injury reconstruction. The mean period between injury and procedure in our subjects was 20.58 months (Harner et al. 1996).

Graft selection is still controversial in ACL surgery. Although the graft to be used in ACL reconstruction should have the characteristics of a normal anterior cruciate ligament, no graft today fully carries the characteristics of a normal ACL. Autografts used are often bone-patellar tendon-bone grafts and hamstring tendon grafts. Bone-patellar tendon-bone autograft use can cause many complications, such as quadriceps muscle weakness, loss of full extension, pre-operative anterior knee pain, patella fracture during surgery, and patellar tendon rupture (Burks and Leland 1988; Gorschewsky et al. 2005). Donor site morbidity of hamstring tendons is much lower when compared with bone-patellar tendon-bone graft (Harter et al. 1988). Hamstring tendons have a biomechanical advantage over patellar tendons. In biomechanical studies conducted with hamstring tendon grafts, they are stronger than the 10 mm bone-patellar tendon-bone graft (Hamner et al. 1999). In repairs with a hamstring tendon graft, atrophy in the quadriceps muscle is prevented, and problems such as limitation of movement and extension loss are less common after surgery (Graham and Parker 2002)

In addition to being suitable for the desired sizes, shortening the surgical time, and having low post-surgery morbidity, autograft also has undesired effects such as disease transportation, rejection of the graft due to its immunogenic characteristics, resorption in the tunnel, being costly (Indelli et al. 2004). For these reasons, we used autograft in our study. The Lysholm scoring systems were used to find out the subjective complaints and satisfaction levels of our patients. In a study by Prodromos et al. the mean Lysholm score was found to be 94.5 in patients who were followed for a mean of 54.4 months after surgery performed by using the endobutton method with a hamstring tendon graft (Prodromos et al. 2005). In their study, conducted by using the same technique, Eriksson et al. reported that the Lysholm score increased to 91 points after surgery from 71 points before surgery (Eriksson, Hamberg, et al. 2001). In our study, the mean pre-operative Lysholm score of 55.69 (32–88) was found to be 94.3 (65–100) in the last follow-up.

According to cadaver studies, double band ACL reconstruction can provide more anatomical knee kinematics than anatomical single band ACL repair (Schutte et al. 1987). In addition, in an in vivo study conducted by Tashman et al., it was shown that ACL single band reconstruction restored anteroposterior knee stability, while it did not restore rotational stability of the knee joint (Tashman et al. 2004). We did not encounter such results in our follow-ups. When we review the literature, we can see that single-band

ACL reconstruction performed with current techniques gives good and perfect results between 75% and 90% (Hui et al. 2011; Biau et al. 2009). When we examined the Lysholm scores used in the clinical evaluation of the patients and the Tegner Activity Scale and IKDV (International Knee Documentation Committee) scores used in activity evaluation, we found that the values at the last follow-up. were significantly better than the pre-operative values.

As a conclusion, arthroscopic ACL reconstruction utilizing autogenous hamstring tendon graft has a low complication rate and is a surgical technique that can be preferred in terms of satisfactory functional outcomes.

Conflict of Interest Statement

The authors declare no conflicts of interests.

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