Original article

Arthroscopic Reconstruction of Anterior Cruciate Ligament by Hamstring Graft; Endobutton vs Rigidfix

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Abstract:

Introduction: Anterior cruciate ligament (ACL) tear is a common sport injury. In recent years hamstring ligaments have become the most widely used graft for ACL reconstruction. One important issue is type of femoral side graft fixation. We compared the clinical outcomes of two femoral side fixation methods, endobutton and Rigidfix.

Methods: From March 2014 to March 2016, 147 patients with ACL tear were treated by arthroscopic ACL reconstruction using autogenous quadruple hamstring graft. Femoral side fixation was performed with endobutton or Rigidfix. Demographic and perioperative data were collected from hospital documents. Patients were evaluated using objective and subjective International Knee Documentation Committee (IKDC) and Lysholm Knee Scores.

Findings: 87 (59%)cases (48 endobutton and 39 Rigidfix) were accessible for final evaluation. Mean duration of follow up was 18(range 17-22) months. There was no significant difference between two groups regarding age, gender, body mass index (BMI), damage mechanism, activity level and postoperative pain, limp, subjective IKDC and Lysholm scores. Pivot shift test was normal in all cases of both groups. Anterior translation of more than three millimeter in comparison with intact knee in 30o and 90o of flexion was seen in 3(6.25%) and 3(7.69%) of endobutton and Rigidfix cases,respectively.

Conclusion: There was no significant difference between endobutton and Rigifix using subjective scores. Rotary and anteroposterior stability was similar. Both fixation methods result in a stable knee.

Keywords: Anterior cruciate ligament, reconstruction, Endobutton, Rigidfix, Lysholm score, IKDC score

Introduction:

The anterior cruciate ligament (ACL) is a major stabilizer of the knee, especially in preventing hyperextension and gives rotary stability to the knee (1). The ACL tear incidence rate is about 200000 cases annually in USA (2). ACL tear is a common sport injury. In most athletes, torn ACL necessitates the ligament reconstruction surgery; subsequently, due to the surgery and rehabilitation, the athlete has to keep away from athletic activities for at least six months (3).

The ACL reconstruction can be done by arthroscopy or open surgery; however, today, arthroscopy is the method of choice. There are various tendon resources for ACL reconstruction, including autograft, allograft, and synthetic grafts. For autograft, quadriceps, patellar or hamstring tendons (semitendinosus and gracilis) are used (1). The use of quadruple hamstring ligaments has gained popularity in recent years (4).

There are various methods and devices for hamstring tendon graft fixation onto the bone tunnels. endobutton fixation is a reliable method, easily performable for the soft tissue grafts with usually desirable results (5, 6). Rigidfix is another method used for femoral side fixation, in which the graft is fixed inside the femoral canal by specially designed absorbable pins (7). There is no clear data that which of these devices would lead to better clinical outcomes (8). The present study was designed to compare the clinical outcomes of arthroscopic ACL reconstruction with autogenous hamstring graft fixed in femoral side by endobutton or Rigidfix.

Methods:

From March 2014 to march 2016, 147 patients with ACL tear were treated by single bundle arthroscopic reconstruction using autogenous hamstring graft by a single orthopedic surgeon. In all patient's femoral tunnel was made in anatomic location transportally to mimic the posterolateral bundle. Femoral side fixation was performed with endobutton (Conmed,NY,USA) or Rigidfix (DePuy, Warsaw, IN). In all patients tibial side fixation was performed with bioabsobable interference screw (Conmed,NY,USA). All patients followed uniform postoperative rehabilitation protocol.

Demographic and perioperative data were collected from hospital documents. Patients with incomplete medical records, multiligamentous injury or surgery and inaccessibility for final evaluation were excluded. All patients were called to come for final evaluation. We didn't have knee arthrometer such as KT1000/2000 so knee stability was assessed with clinical examination only. 87 cases (48 endobutton and 39 Rigidfix) were accessible for final evaluation using objective and subjective International Knee Documentation Committee (IKDC) and Lysholm Knee Scores.

Our institutional internal review board with ethical code IR.MAZUMS.IMAMHOSPITAL.REC.96.3030 approved this study. The collected data were analyzed using SPSS Statistics software (ver.21, IBM) using ANOVA, X2, and t tests, as well as descriptive statistics. P value <0.05 was considered as significant.

Findings:

From March 2014 to March 2016 147 patients with ACL tear were treated by arthroscopic reconstruction using autogenous quadruple hamstring graft. Nine patients were inaccessible, 48 patients didn't come and three patients had multiligamentous injury. 87 cases with mean age 27/5 (18-46) years were accessible for final evaluation.

48 cases, 39 males and 9 females with mean age 27/06 (18-38) years were in endobutton group. 39 cases, 33 Males and 6 females with mean age 28/62 (22-46) years were in Rigidfix group. Mean duration of follow up was 17/3(17-21) and 18/45(18-22) months in endobutton and Rigidfix groups respectively.

Results of the Fischer's exact test indicated that both groups were homogenous and had no difference in terms of the age, gender, BMI and damage type ($p>0.05$). The most common cause of injury was football in both groups.

In objective evaluation, anterior translation of tibia more than three millimeter in 30o and 90o of knee flexion (i.e. Lachmann and anterior drawer tests) was seen in 3(6.25%) and 3(7.69%) of endobutton and rigidfix groups, respectively. Pivot shift test was normal in all patients of both groups.

Mean postoperative subjective IKDC and Lysholm scores were 57/3 and 89 in the Endobutton and 59/8 and 89/9, in the Rigidfix group, respectively without statistically significant difference.

Discussion:

Since 1980, the bone-patellar tendon-bone (BPTB) graft has been a useful method. Use of quadruple hamstring graft has been expanded in the past decade (9,10). One of the major problems in hamstring tendon graft is fixation of these tendons in bone tunnels, for which various methods have been designed (11). The present study compares the clinical outcomes of arthroscopic ACL reconstruction using autogenous quadruple hamstring tendon fixed in femoral side by endobutton or Rigidfix.

Out of 147 patients 144 had the inclusion criteria but only 87(59%) were accessible and came for final evaluation. The mean age of the participants was 27.53 years. The male-to-female ratio was almost 4/1.Nearly 75% of the patients were athletes before the damage, while this value was reduced to 35.3% after the surgery. The ACL injury often occurs among the athletes, thus improvement and returning back to the athletic activities is of great importance. Stability in our cases did not mean guarantee for returning back to sport activities. In this regard, Burnham et al showed that the patient's fear from not being able to return back to the athletic activities after reconstruction has eventually led to not returning back to the athletic activities after ACL reconstruction. (12)

Objectively knee was rotary stable in all cases of both groups. Pivot shift test was normal in all cases. Anterior drawer test was less than three millimeters positive in stable knees. Lachman and anterior drawer tests more than three millimeters positive was seen in about 6.25% and 7.7% of cases in

endobutton and Rigidfix groups. Subjectively no patient complained about knee giving way or instability. Objective and subjective stability percentage shows the positive relationship between pivot shift test and subjective stability, i.e. normal pivot shift test is more important for determining knee stability than Lachman or anterior drawer test. About 31% in endobutton and 8% in Rigidfix group had some pain and discomfort. About 2.5% in endobutton group had occasional limping. Two (4.2%) in endobutton and five (12.8%) in Rigidfix group had occasional locking sensation. These complaints show that stability is not the only determinant of functional outcome of ACL reconstruction.

The mean final subjective IKDC and Lysholm scores were 59/8 and 89/9 in Rigidfix and 57/3 and 89 in endobutton groups. In Harilainen et.al. study these scores were 87.2 and 94, respectively (13).

In Madadi's study 120 patients undergoing arthroscopic ACL reconstruction with three fixation methods were investigated. Out of 8 patients with failure, 5 belonged to the endobutton group (14).

Our study has some limitations including about 40% missed patients for final evaluation, incomplete hospital documents (i.e. no preoperative IKDC and lysholm scores) and unavailability of arthometer. Associated mensci and articular damage treated by partial menisectomy, meniscus repair or microfracture was not included.

Conclusions:

Although the subjective IKDC and Lysholm scores in the Rigidfix group were higher than the endobutton group, no significant difference was observed between the two methods. The results of anterior drawer test, Lachman test and pivot shift test were not significantly different. Both fixation methods result in a stable knee.

Conflicts of Interest

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

References:

1. Irarrázaval S, Kurosaka M, Cohen M, Fu FH. Anterior cruciate ligament reconstruction. Journal of ISAKOS: Joint Disorders & Orthopaedic Sports Medicine. 2016 Jan 1;1(1):38-52.

2. Persson A, Fjeldsgaard K, Gjertsen JE, Kjellsen AB, Engebretsen L, Hole RM, Fevang JM. Increased risk of revision with hamstring tendon grafts compared with patellar tendon grafts after anterior cruciate ligament reconstruction: a study of 12,643 patients from the Norwegian Cruciate Ligament Registry, 2004-2012. The American journal of sports medicine. 2014 Feb;42(2):285-91.

3. Miller MD. Anterior Cruciate Ligament. Clinics in sports medicine. 2017;36(1): xiii.

4. Wu S, Zheng Y, Yan K, Lin W, Xu W, Kang J. Effectiveness Comparison of Anterior Cruciate Ligament Reconstruction by Long Fibular Muscle Tendon and Hamstring Tendon. Zhongguo xiu fu chong jian wai ke za zhi= Zhongguo xiufu chongjian waike zazhi= Chinese journal of reparative and reconstructive surgery. 2015 Nov;29(11):1358-63.

5. Tahmasbi M, Jalali MS, Shahriar KR. quadruple hamstring versus patellar tendon

grafts in reconstruction of anterior cruciate ligament. 2005 spring;4(3):31-39

6. Aydin D, Ozcan M. Evaluation and comparison of clinical results of femoral fixation devices in arthroscopic anterior cruciate ligament reconstruction. The Knee. 2016;23(2):227-32.

7. Kostov H, Kaftandziev I, Arsovski O, Kostova E, Gavrilovski A. Clinical Outcomes of Three Different Modes of Femoral Hamstring Graft Fixation in Anterior Cruciate Ligament Reconstruction. Macedonian Medical Review. 2014 Apr 1;68(1):44-7.

8. Ho W-P, Lee C-H, Huang C-H, Chen C-H, Chuang T-Y. Clinical Results of Hamstring Autografts in Anterior Cruciate Ligament Reconstruction: A Comparison of Femoral Knot/Press-Fit Fixation and Interference Screw Fixation. Arthroscopy: The Journal of Arthroscopic & Related Surgery. 2014;30(7):823-32.

9. Feagin JA, Curl WW. Isolated tear of the anterior cruciate ligament: 5-year follow-up study. The American Journal of Sports Medicine. 1976;4(3):95-100.

10. Zysk SP, Krüger A, Baur A, Veihelmann A, Refior HJ. Tripled semitendinosus anterior cruciate ligament reconstruction with Endobutton fixation: a 2-3-year follow-up study of 35 patients. Acta Orthopaedica Scandinavica. 2000;71(4):381-6.

11. Longo UG, Ciuffreda M, Casciaro C, Mannering N, Candela V, Salvatore G, et al. Anterior cruciate ligament reconstruction in skeletally immature patients: a systematic review. The bone & joint journal. 2017;99-b (8):1053-60.

12. Burnham JM, Wright V. Update on Anterior Cruciate Ligament Rupture and Care in the Female Athlete. Clin Sports Med. 2017;36(4):703-15.

13. Harilainen A, Sandelin J. A prospective comparison of 3 hamstring ACL fixation devices—Rigidfix, BioScrew, and Intrafix—randomized into 4 groups with 2 years of follow-up. The American journal of sports medicine. 2009;37(4):699-706.

14. Madadi F, Tavakolian J, Maleki A, Rahimi M, Zandi R, Bigdeli MR. Femoral Fixation in Anterior Cruciate Ligament Reconstraction (Comparsion between Three Different Fixation Techniqes). Iranian Journal of Orthpaedic Surgery. 2010;8(4):160-5.