RESEARCH ARTICLE

Examining the Effect of Anterior Drawer and Lachman Test on Lysholm Score in Patients with Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon

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Abstract

Background and Objective: Anterior cruciate ligament (ACL) tear is a common knee ligament injury with severe complications such as restriction and instability in movement and disability. Arthroscopic reconstruction using hamstring tendon is a common therapeutic option. The outcome of ACL tear surgery is assessed by anterior drawer and Lachman tests where positive scores indicate the failure of the surgery. The present study aimed to assess the positivity of anterior drawer and Lachman tests on knee score of the patients underwent ACL tear surgery and to evaluate the relationship between the positivity of the tests with Lysholm score. **Materials and Methods:** The present study was conducted on 101 patients with ACL tear. The patients were treated with hamstring tendon using arthroscopic Endobutton fixation. The patients were evaluated with Lysholm score at the 3rd and 9th month post-surgery using anterior drawer and Lachman tests. Positivity of the first two tests was evaluated at the 3rd and 9th month. Lysholm score was also evaluated at the 3rd and 9th month. The changes in the scores of the two tests were compared **Results:** Anterior drawer and Lachman tests showed gradual positivity at the 3rd and 9th month follow-up examinations. However, the changes in the Lysholm score were not significant. Moreover, patients' satisfaction and their return to routine activities did not change significantly. The anterior drawer test showed greater changes compared with the Lachman test score. **Conclusion:** Our findings showed that the outcomes of the anterior drawer and Lachman test did not reliably ensure success of the surgery or patients' satisfaction and returned to the daily routine work. Lysholm score should also be taken into account in this regard.

Key words: Anterior cruciate ligament, drawer tests, Lachman, Lysholm score, reconstruction

INTRODUCTION

Anterior cruciate ligament (ACL) as a synovial joint is composed of collagen fibers with longitudinal arrangement. The ACL originates from deep within the notch of the distal femur. Its proximal fibers fan out along the medial wall of the lateral femoral condyle. The ACL attaches in front of the intercondyloid eminence of the tibia, being blended with the anterior horn of the medial meniscus.[1] ACL often resists against the anterior tibial displacement.[2] ACL tear is a common knee ligament injury mainly caused by trauma during labor, accidents, and sports. ACL tear is generally caused due to hyperextension mechanism, internal rotation of the tibia on femur or mechanism of knee flexion abduction internal rotation. This injury usually occurs in adolescence and middle age causes occupational problems and restricts daily activities.[3] Rapid swelling after trauma to the knee, inability to walk and severe pain in addition to probably hearing popping sound are signs of acute cruciate ligament tear. After the initial period, the knee gives way and becomes instable; moreover, quadriceps muscle atrophy occurs, which are all long-term signs of ACL tear.[4] Lachman test is the most sensitive diagnostic test used for ACL tear. Pivot Shift Test at rest or under anesthesia can be administered. Segond fracture in radiographic evaluation of patients shows the presence of ACL injury with high diagnostic accuracy. Magnetic resonance imaging (MRI) is also used

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as a proper diagnosis method with high precision.[5] Since untreated cruciate ligament tear leads to unpleasant results and causes morbidity, surgery is recommended in younger patients. On the other hand, untreated ACL tear increases the likelihood of medial meniscus tears and cartilage lesions. Different therapeutic approaches are used for reconstruction of cruciate ligament such as the patellar tendon, quadriceps tendon, four-layer hamstring tendon, iliotibial band, and industrial materials or allograft. Four-layer hamstring tendon is an appropriate therapeutic method considering the possible complications and clinical performance, which leads to acceptable results. It has been reported that the tendon lengthens after a while about a third of the original length of the tendon. Positive test results may be due to gradual lengthening of the tendon.[6] The present study aimed to examine positivity of test results. In addition, it was examined whether relevant test results affect the patient satisfaction and Lysholm score or not. Is positivity of test results correlated with changes in Lysholm score or not?

MATERIALS AND METHODS

Study design and subject

The protocols and experimental procedures of the study were approved by local ethics committee of Ahvaz Jundishapur University of Medical Sciences (AJUMS), Ahvaz, Iran, which were in complete agreement with the ethical regulations of human studies set by the Helsinki declaration (2013). After the enrolment of all subjects and before the start of the study, researchers completely and clearly explained all objectives and protocols of the study and possible benefits and side effects of the treatments to all participants, and then, all of the patients filled and signed a written consent form on their participation in the study.

This is a prospective clinical trial conducted on the patients (n = 101) with definitive diagnosis of ACL tear. The subjects were between 19 and 44 years old. The diagnosis of ACL was performed with MRI. Anterior drawer and Lachman test results were positive. If clinical findings did not fit with MRI, a diagnostic arthroscopy was performed for the patients if necessary. Substantial meniscus tear requiring treatment was not observed in these patients. The experimental procedures of the present study including interventions, data collections, and clinical assessments were performed in the Ahvaz Razi Hospital, an affiliated Hospital to AJUMS, Ahvaz, Iran.

Inclusion criteria

The patients with definitive ACL, age range of 18–45 years old, symptomatic patients who visited the Hospitals due to occupational constraints and daily limitations for diagnostic and therapeutic procedures.

Exclusion criteria

The patients with significant meniscal damage were excluded from the study.

Ethical considerations

Before surgery, the consent was obtained from the subjects. The subjects were also told to take follow-up procedures seriously.

Experimental procedures

Arthroscopic surgery was performed for the patients where the hamstring tendons were removed. Anterolateral and anteromedial portals were used for arthroscopy to include the relevant items. A lens with 30°C and 4-mm lens were used to view the joint. After the initial arthroscopy and diagnosing ACL tear, the spot on tibia and femoral condyle was prepared and the remains of previous ACL were removed.

Anteromedial proximal tibia was cut about 4 cm and anserinos muscle junction spot was specified. After separating the tendons from junction spot, two gracilis tendon and semitendinosus tendons were fully separated using a stripper. Then, the tendons were washed with serum and stitched. Beginning and end of the tendons were individually prepared for replacement. The tendons were folded from the middle section and a four-layer tendon was prepared. Two tibial cutting guides were replaced in anteromedial incision spot and anteromedial portal. Angle of the guide was adjusted as 55°. The guide was replaced on tibia approximately 7 mm anterior to the posterior cruciate ligament. Pin guide was replaced on this spot. Then, the Riemer was prepared based on thickness of four-layer tendon in tibial channel.

In the next step, graft incision site was specified using femoral guide about 10:30 on the right knee and 13:30 on the left knee and about 2 mm anterior to posterior margin of femoral condyle based on the guide. Initially, the channel was created using Riemer number 4, which included total thickness of condyle tissue in the area. Then, the second Riemer was created based on graft thickness with 35 mm length. Endobutton length was determined based on the remaining channels. Then, the tendon was pulled into the femoral and tibial channels with the help of loop guide and Endobutton. This section was drawn up on the femoral anteromedial cortex with the help of strings attached to Endobutton. Then, Endobutton flip test was performed. The tendon was drawn from the bottom part to ensure that it was placed at the right place. Flexion and extension movements were conducted frequently to ensure that the tendon was not shriveled inside the channels. Intraarticular tendon was reexamined with the help of arthroscopy. In the end, the knee was stretched at full extension. The exterior tendon was fixed with an absorbable interference screw in tibial tunnel

by applying tension. Interference screw size was selected about 2 mm larger than the Reimer diameter. Typically, exterior tendon was sutured to fascia and periosteum tibia using absorbable strings. Lachman and anterior drawer tests were immediately performed after the operation. It was ensured that all tests were negative. Dern was placed into the knee. The skin was sutured. Knee arthroscopic portals were stretched at full extension in the knee support. All patients were monitored for 24 h in the orthopedic ward. The patients received antibiotics. Quadriceps and hamstring strengthening exercises were started since the 1st day after surgery. After performing the exercises, all patients were examined a week later. Rehabilitation program was based on relative charts.

Anterior drawer and Lachman tests and Lysholm score were evaluated at the 3rd month. The results were recorded. Rehabilitation with physiotherapy was performed in these patients. The three tests were reevaluated in the 9th month. The results were examined. The results of the 3rd and 9th month follow-up periods were statistically evaluated. The results were compared between the two periods.

Data analysis

The collected data were analyzed with statistical package of SPSS (Windows, version 16) using independent t-test. For all statistical analyses, the significance level was set at 0.05.

RESULTS

The study was evaluated and followed up on 101 patients. In total, 93 men and 8 women were assessed in the study. None of the patients had post-operative complications such as infection, neural, or vascular damage. The subjects were between 19 and 44 years old [Table 1].

In early examination, anterior drawer test was positive in all patients. Examinations were performed during 3 months. The following results were obtained:

Lysholm score in 61 patients was excellent, in 35 patients was good, and in 5 patients was fair at the 3rd month. The test was repeated at the 9th month. The results were recorded. In these evaluations, 57 patients were diagnosed with Lysholm score as excellent criteria and 36 patients as good criteria and 8 patients as fair criteria [Table 2].

In knee examination, anterior drawer test was positive in 5 patients. None of the tested patients showed positive score in Lachman test at the 3rd month.

The tests were repeated at the 9th month, in the anterior drawer and Lachman tests, 14 patients had positive anterior drawer test result and 9 patients had positive Lachman test result after 9 months. It should be that none of the patients had a history of trauma to the knee again [Table 3].

According to statistical analysis, no changes were observed in Lysholm score despite the changes in anterior drawer and Lachman test results. In addition, changes in the two tests were statistically significant in the 3rd and 9th month.

DISCUSSION

Gradual increase in ACL was confirmed at post-operative period in several studies. The tendon was lengthened about one-third of the original length. The ACL suffered from necrosis after ligament insertion. The cells grow gradually after several months. Cruciate ligament behavior during the post-operative period cannot be predicted with certainty.[7] On the other hand, several studies reported increased vessel growth and cell proliferation in margin cruciate ligament graft. Cell growth and proliferation may never reach the primary level. This weakness in cruciate ligament tissue may lead to gradual positive test results.[8]

Appropriate rehabilitation procedures in patients with anatomical elements to strengthen the knee may have an important role in improving knee function. Therefore, no significant changes were observed in Lysholm score in evaluating performance of cruciate ligament treated by other anatomical elements such as the quadriceps, hamstring, and lateral ligaments. Probably, ACL not only prevents tibial displacement to anterior position to avoid instability in other directions such as valgus and varus but also play a major role in individual sense of stability toward the knee.[9] Therefore, relying on anterior drawer and Lachman test results as

Table 1: Demographic information of patients

Gender, *N* (%)		Age, mean±SD	
Man	**Woman**	**Man**	**Woman**
93 (92.08)	8 (7.92)	30.32±6.1	30±3.54

SD: Standard deviation

Table 2: Satisfaction of Lysholm score after 3 and 9 months

Score	*N* (%)	
	After 3 months	**After 9 months**
Excellent	61 (60.39)	57 (56.43)
Good	35 (34.65)	36 (35.64)
Fair	5 (4.95)	8 (7.92)

Table 3: The anterior drawer and Lachman tests score after 3 and 9 months

Test	*N* (%)	
	Positive result after 3 months	**Positive result after 9 months**
Anterior drawer test	5 (4.95)	14 (13.86)
Lachman test	0 (0)	9 (8.91)

indicators of treatment success is both unnecessary and not right.

Probable adhesion in the capsule and other soft tissue elements in the knee after surgical manipulation and inflammations create a sense of stability and improve knee function and stimulate sensory receptors in the joints properly in Lysholm score test results.[10]

Since Lysholm score generally and comprehensively evaluates several indicators such as pain, locking the knee, and swelling, these scores are used as the most important indices in evaluating surgical results and the patients' satisfaction. Relying on the knee instability tests alone cannot ensure the success of the treatment and knee function.[11] These tests mainly evaluate tibial displacement to the anterior position and do not evaluate other indicators. Accordingly, relying on these tests during the rehabilitation period and the post-operative period is not right.

CONCLUSION

Four-layer hamstring tendon therapy with Endobutton successfully treated ACL reconstruction. Relatively stable Lysholm score during 3 and 9 months periods suggested that most patients were satisfied with the treatment and were able to carry out normal activities and return to their initial level of activity. The anterior drawer and Lachman tests were carried out in addition to Lysholm score. Due to gradual positivity of the above tests, gradual lengthening of the tendon can be justified since none of the patients had a history of trauma to the knee again. On the other hand, positivity of knee instability to the anterior position does not ensure success of the operation due to gradual lengthening of the tendon, such coping mechanisms as changes in receptor sensitivity and strengthening soft tissue around the knee such as quadriceps and hamstring.

However, it is recommended that overall knee performance assessment with Lysholm score, overall performance of the patient in daily activities, returning to previous activity, and the patients' satisfaction be considered as indicators of treatment success. In our study, the follow-up period was 9 months, conducting further studies with longer follow-up periods are recommended. In addition, it is recommended to conduct studies on specific patient groups such as professional athletes to evaluate the effect of anterior and Lachman test results on Lysholm score.

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