

## Arthroscopic Anterior Cruciate Ligament Reconstruction Using Hamstring Tendon Graft: Comparison of All-Inside and Outside-in Techniques

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### Abstract

**Background:** Rupture of the anterior cruciate ligament (ACL) is one of the most common injuries in patients referred to the emergency and orthopedic clinics. Reconstruction of the anterior cruciate ligament (ACLR) is one of the knee surgery methods used nowadays.

**Objectives:** This study aimed to compare the results of the ACLR with the hamstring tendon using all-inside and outside-in techniques.

**Patients and Methods:** This descriptive analytical study was conducted on 40 patients with anterior cruciate ligament rupture referred to Imam Hossein hospital, Tehran, Iran, during 2009 - 2011, who were under the ACLR with the hamstring tendon graft using all-inside and outside-in techniques. The Tegner Lysholm knee score questionnaire was completed for the patients to study the current clinical and functional status of the knee. Data were analyzed by the SPSS software version 7. A  $P < 0.05$  was considered as statistically significant.

**Results:** The mean  $\pm$  SD of the Tegner Lysholm knee score scale in the outside-in and all-inside groups were  $91.5 \pm 3.6$  and  $88.4 \pm 2.1$ , respectively which was not statistically significant. It was also observed in both groups that 3 patients lost their ability to participate in sport activities.

**Conclusions:** There are no significant differences in the ACLR with hamstring tendon using the outside-in and all-inside techniques in terms of clinical and functional and also returning to the previous sport activity.

**Keywords:** Anterior Cruciate Ligament, All-Inside Techniques, Knee, Hamstring Tendon

### 1. Background

Rupture of the anterior cruciate ligament (ACL) is one of the most common injuries in patients referring to the emergency departments and orthopedic clinics. This damage causes the individual's functional knee stability greatly to reduce during the walking and weight bearing (1, 2). In addition, ACL tear similarly causes to muscle weakness, meniscus injury, the pain and osteoarthritis in long term (3). Reconstruction of the anterior cruciate ligament (ACLR) is one of the knee surgery methods used nowadays. Most patients with ACL tears are located in the active age group (4, 5). In recent years with the advent of arthroscopic knee surgery, many points of view regarding ACL repair have been changed (6). The arthroscopic ACL reconstruction is aimed to prevent erosion and osteoarthritis and regain normal kinematics of the knee and ligament stability (3, 6). The benefits of arthroscopic ACL repair, including minimizing soft tissue damage leading to fewer post-surgery complications, make this method a good replacement for open methods (6, 7). Several factors such as surgical techniques and the type of graft are effective in achieving the desired result after ACLR. Many researchers believe that these two factors have a great effect on the incidence of osteoarthritis

and functional results (8). The use of bone-patellar-bone-tendon or autograft hamstring tendon including semitendinosus and gracilis are discussed as the major graft harvesting methods in the ACLR (6, 9). The use of hamstring tendon has been as a standard method in ACLR for long years (10). The all-inside and outside-in techniques are used more than other techniques (11, 12). In the all-inside technique, the operation is done through a very small portal incision as in the conventional method on both sides of the patellar tendon. The graft harvesting in both methods has no difference; however, the length of graft in all inside technique is shorter than outside in. Allograft is used in this method to prevent further damage to the tissue. Similar to other methods of the ACLR, a bone tunnel is drilled into the femur and tibia to hold the new ligament in a fixed position (10-12). There are numerous studies that have compared the clinical and functional results of arthroscopic ACL repair by the outside-in method using the hamstring or bone patellar bone autograft. Brandsson et al. (13) studied the results of ACLR utilizing the two above-mentioned techniques. They found that both groups had no statistically significant difference before the operation in terms

of the average Lysholm, Tegner activity scale, patellofemoral joint pain and knee instability. After surgery, it was observed that the Lysholm scale and patellofemoral pain were significantly improved in both groups. Finally, they stated that both techniques have no significant difference in terms of the performance, instability and postoperative complications and the treatment with both methods leads to satisfactory results. In 1995, Aglietti et al. (9) evaluated the radiographic and clinical results of ACLR using both outside-in and all-inside techniques. In this study, 20 patients treated with a patellar tendon graft were enrolled. The patients were followed for an average of 14 months and the results were evaluated by clinical examination, using the KT-2000 and radiology. The IKDC scale was used for clinical assessment. Radiological criteria considered were as follows: the direction of tibial and femoral tunnels, the location of the anterior border of the exit hole of femoral tunnel in the joint and the femoral interference screw placement. The researchers found that the limitation of the range of flexion and extension of the two groups was the same. They also stated that both groups have no significant difference in terms of the performance and the knee instability (14, 15). It is a relatively new technique that its main advantages include the following. In this method, the tension of graft is in the same direction as screw, and it can theoretically increase the stability of the knee and reduce the risk of graft loosening (14, 15). In this method, the tunnel is not drilled in the bone, but the graft in both ends is placed in one socket. Indeed, this feature reinforces the less invasive property of ACL arthroscopic repair. Certainly, reducing the damage inflicted on the soft tissue can have a significant impact on the results and complications. On the other side, this method results in less damage to the bone leading to faster recovery and firmer healing of the graft-bone junction (14, 15). There are a few researches studies because the all-inside surgery technique is a new method.

## 2. Objectives

Considering the lack of studies regarding this area, especially in Iran, this study was conducted to compare the results of the reconstruction of ACL using all-inside and outside-in techniques by the hamstring tendon graft in Iran (11).

## 3. Patients and Methods

This descriptive analytical study was conducted on patients

with anterior cruciate ligament rupture referred to Imam Hossein hospital in Tehran, Iran, during 2009 - 2011 using all-inside and outside-in techniques with the hamstring tendon graft. Patients with a complete ACL tear who underwent the ACLR by a single surgeon using one of the two methods (20 patients with outside-in and 20 patients with all-inside) were randomly selected. The patients with the symptoms of other knee ligament damage, meniscus injury, the history of surgery and fracture in knee and surrounding area, congenital deformity of the limbs, and systemic diseases were excluded from this study. One year after the ACLR surgery, the patients were asked to come back for evaluation. After referring the patient, the demographic information such as age, sex and body mass index (BMI), and other information such as time between the rupture and surgery, returning to the previous career and postoperative complications were obtained by interviewing the patients, examination and according to the records, and inserted in the special information form. The Tegner Lysholm knee score questionnaire was completed for the patients to study the current clinical and functional status of the knee. We obtained a consent form from the participants. This study was confirmed by the ethical committee of Shahid Beheshti University of Medical Sciences. Data were analyzed using the SPSS software version 7,  $P < 0.05$  was considered statistically significant.

## 4. Results

Forty patients participated in this study. Two groups each comprising 20 patients with ACL rupture were evaluated at follow-up of one year after the ACL reconstruction. The mean  $\pm$  SD of the age in the outside-in group was  $29.5 \pm 6.4$  years and in the all-inside group was  $31.7 \pm 8.3$ . There were 17 and 15 men in the outside-in and the all-inside groups, respectively. The BMI values in the outside-in and all-inside groups were  $29.6 \pm 7.3$  and  $38.9 \pm 5$ , respectively. Table 1 shows information regarding demographics and variables in the two study groups. As can be seen in the table, the average time between surgical reconstruction and rupture in the outside-in group was  $6.5 \pm 11.4$  and in the all-inside group was  $7.3 \pm 9.2$ , which the difference was not significant. The Tegner Lysholm knee scores in the outside-in and the all-inside groups were  $91.5 \pm 3.6$  and  $88.4 \pm 2.1$ , respectively. It was also observed in both groups that 3 patients lost their ability to participate in sport activities that had already.

**Table 1.** Demographics and Variables in the Outside-in and All-Inside Groups<sup>a</sup>

Variable	Outside-In	All-Inside
BMI, kg/m <sup>2</sup>	29.6 $\pm$ 7.3	38.9 $\pm$ 5
Age, y	31.7 $\pm$ 8.3	29.5 $\pm$ 6.4
Average time between surgical reconstruction and rupture	6.5	7.3
Tegner Lysholm knee score	91.5	88.4
Ability of patients to participate in sport activities	17	17

<sup>a</sup>Values are expressed as mean  $\pm$  SD.

## 5. Discussion

The most important finding of the present study was that the reconstruction of ACL by hamstring tendon using both all-inside and outside-in techniques were not significantly different in terms of the functional and clinical as well as the return to previous activities. According to the cosmetic results of the all-inside technique surgery, it is cosmetically better compared to the previous methods. Although, this issue is less important in deciding on the choice of surgical technique compared to the issues outlined earlier. In this method, a less length of the graft is required for the repair compared to the previous methods. Not involving of the tibial cortex in the all-inside method theoretically may lead to a reduction in postoperative pain, which is not addressed in our study. However, since the all-inside technique is a relatively new method, there is a shortage of research studies about it. On the other hand, the study also focused on short-term results and as we currently know, the information about long-term results of the treatment with utilizing this method, particularly data from prospective and comparative studies are not available. Our results are in consistent with the other few following studies. Brandsson et al. (13) compared the results of ACL reconstruction by the two desired techniques utilizing a patellar tendon in 59 patients. The patients were followed up for two years, and it was found that the treatment was effective in the both groups; however, no significant difference was noted between the two groups in terms of the performance, instability and postoperative complications, and the treatment using both methods lead to satisfactory results. Aglietti et al. (9) compared the ACLR results clinically and radiographically with both the outside-in and all-inside techniques. In this study, the patients were treated with patellar tendon graft and followed up in average of 14 months. The results of clinical examination were evaluated using radiology and KT-2000. After investigation, the results revealed no significant difference between the two groups in terms of the instability and performance of the knee. Harner et al., Mascarenhas et al. (2, 12), found no significant difference between the two techniques in terms of the stability and performance. It should be noted that although the results showed no significant difference between the two methods, similar to our study, it should be noted that the results are short-term and the benefits of all-inside technique may in the long-term causes the patients who are treated with this method have better clinical and performance condition than the other group. Our study, like all other studies, has limitations and shortcomings, for instance, in our study the short-term results were assessed and the two groups were compared radiographically. The ACL reconstruction by a hamstring tendon using the outside-in and all-inside techniques in terms of returning to work and function showed the same and satisfactory results in the short-term, and for a more de-

tailed analysis, long-term studies with a larger sample size should be carried out.

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