

# Clinical Comparison of Transfix and Tightrope Fixations in Patients with Arthroscopic Anterior Cruciate Ligament Reconstruction

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## Abstract

**Background:** Transfix and Tightrope are widely used devices for femoral graft fixation in arthroscopic anterior cruciate ligament (ACL) reconstruction. The purpose of the study is to reveal differences between Transfix and Tightrope fixation technique by evaluating clinical results of cases. **Materials and Methods:** 87 patients who underwent arthroscopic ACL reconstruction for ACL rupture between January 2013 and June 2017 by the same senior surgeon and in whom the fixation methods evaluated in this study had been employed were retrospectively reviewed. Transfix was used in 45 (52%) patients and ACL Tightrope was used in 42 (48%) patients. In the first group (Transfix) mean age was  $26,3 \pm 5.8$  (18-45) second group (Tightrope) mean age was  $26,7 \pm 6.1$  (17-46). Patients in both groups were retrospectively screened for anamnesis and physical examination records in the hospital registry system. In addition, IKDC(International Knee Documentation Committee) and Lysholm scores were calculated in the preoperative and postoperative follow-up period, and all findings were evaluated over a mean period of  $42.5 \pm 7.4$  (24-54) months. **Results:** Clinical evaluation and stability tests indicated that statistically no significant difference found between two groups. For the first group preoperative Lysholm scores was 47,3 and postoperatively 93 and second group scores were respectively 47,6 and 94 ( $P < 0.05$ ). IKDC scoring system for first group preoperatively there were 13 poor, 26 good and 6 fair knees ; postoperatively 2 fair, 27 good and 16 excellent .In the second group preoperatively 11 poor, 25 fair and 6 good knees and postoperatively 2 fair, 26 good and 14 excellent knees evaluated. **Conclusions:** In ACL reconstruction for fixation femoral graft, Transfix and Tightrope are frequently used implants. Therefore, both femoral fixation implants can be safely used in arthroscopic ACL reconstruction based on the experience and preference of the surgeon, provided that they are properly applied.

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What's already known about this topic?

Many types of grafts and graft fixation methods are used in ACL reconstruction. Arthroscopic ACL reconstruction surgery is highly successful in achieving knee stability with most of these graft fixation methods

What does this article add?

In the present study, which, to the best of our knowledge, is the first study in the literature that compared Tightrope and Transfix methods, similar clinical outcomes were obtained in clinical arthroscopic ACL reconstruction surgery using Tightrope and Transfix femoral fixations.

## 1.Introduction:

Anterior cruciate ligament (ACL) is most frequently injured ligament in the knee.[1] Owing to the increase in sports injuries, arthroscopic ACL reconstruction is one of the most common orthopedic procedure worldwide.[2]

Many types of grafts and graft fixation methods are used in ACL reconstruction. Arthroscopic ACL reconstruction surgery is highly successful in achieving knee stability with most of these graft fixation methods.[3,4] The different types of reliable and powerful graft fixation implants introduced in recent years as well as the developing pre- and postoperative rehabilitation programs are two factors that increase surgical success./ 5-7/ Most common femoral fixation methods are button implants, transfixation technique implants (such as Transfix and Aperfix), and biointerference screws[8,9]. The question regarding the implant that provides more stable and stronger graft fixation compared with others remains controversial/ 9-13]. ACL Tightrope (Arthrex Inc., Naples, FL, USA) and Transfix (Arthrex Inc., Naples, FL, USA) are the most commonly used implants in ACL surgery[8]. Tightrope implant allows the suspension of the graft from the lateral femoral condyle cortex using a button implant, whereas Transfix allows the suspension of the graft from the femur by being coiled around the transfix screw that is inserted through the lateral side of the lateral femoral condyle toward the condyle medulla.

Therefore, transfix and tightrope are different methods and different results can be encountered in terms of complications. For transfix such as nitinol wire breakage, screw missing the target and iliotibial band irritation and for tightrope the button may not flip,become jammed inside the femoral tunnel or may flip in soft tissue. [15-16]

ACL graft loosening and fixation failure are more common on the femoral side[17]. In addition, femoral side fixation methods are more diverse, whereas biointerference screws and staples are mostly used for tibial side fixation. Therefore, further information regarding the superiority of femoral side fixation methods compared with each other is required.

The aim of this study was to compare the clinical results of Tightrope and Transfix femoral fixations used in arthroscopic ACL reconstruction. We hypothesized that both implants can produce clinically good results.

## 2. Materials and Methods:

Clinical data of 126 patients who underwent arthroscopic ACL reconstruction for ACL rupture between January 2013 and June 2017 by the same senior surgeon and in whom the fixation methods evaluated in this study had been employed were retrospectively reviewed. The study protocol was approved by the Necmettin Erbakan University Meram School of Medicine Ethics Committee (application number 2019/2219) on 06 December 2019.

Of 126 patients, 96 patients who met the inclusion criteria were included in the study. Among these patients, 87 patients who completed the 24-month follow-up period and whose preoperative clinical evaluation as well as minimum 24-month clinical follow-up data could be obtained were included in the study.

Inclusion criteria of the study comprised closed epiphyses, primary surgery, intact other knee, and the hamstring tendon used as the graft for reconstruction. Exclusion criteria of the study comprised multiple ligament injuries, bilateral ACL reconstruction, meniscus repair, and >50% resection of any meniscus as well as degenerative cartilage changes in the knee and a history of fracture surrounding the knee.

The use of Transfix and Tightrope fixation methods was randomly decided according to the feasibility of the implant at the time of the surgery, without considering any other criteria. All surgeries were performed by the same senior surgeon with experience in knee sports injuries. Four-strand autologous hamstring graft was used in all patient's operations. (figure 1)

In the surgical procedure, standard knee arthroscopy was performed first and an intra-articular evaluation was performed. Following this, an oblique incision of 3-4 cm was made from the anteromedial side of the proximal tibia. The sartorial fascia was opened. Gracilis and semitendinosus tendons were lifted from the distal insertion site and sutured, and tendon grafts were removed using a closed graft receiver. Hamstring grafts were folded into two and prepared as four bands. For both implants, the tibial tunnels was performed with the aid of a guide. For Transfix fixation, the femoral tunnel was reamed with the aid of a guide using transtibial technique. With the help of a guide, a pin was inserted through the femoral lateral cortex, and the elastic wire was removed from the contralateral cortex with the help of the pin was inserted into the joint. The graft was pulled into the femoral tunnel with the help of the elastic wire, and the procedure was completed by inserting the Transfix pin through the lateral cortex. For Tightrope fixation, the femoral tunnel was reamed using the anteromedial portal to aim ACL footprint and performed anatomic ACL reconstruction. Tightrope sutures were passed through the lateral femoral cortex with the help of the sent pin and taken outside the skin (figure 2). The button of the implant was bypassed into the lateral femoral cortex under the guidance of fluoroscopy and its placement over the cortex was checked. The prepared graft was pulled into the femoral tunnel using ACL tightrope implant system and the graft was suspended. The other end of the graft from the tibial tunnel was fixed in both groups using bio-interference screws and staples as a standard (figure 3,4).

Of the 87 patients, Transfix was used in 45 (52%) patients and ACL Tightrope was used in 42 (48%) patients. In the first group (Transfix) mean age was  $26,3 \pm 5.8$  (18-45) second group (Tightrope) mean age was  $26,7 \pm 6.1$  (17-46). All the patients were male. Patients in both groups were retrospectively screened for anamnesis and pre- and postoperative physical examination (anterior drawer, Lachman, and pivot shift tests) records in the hospital registry system and data were recorded. In addition, IKDC and Lysholm scores were calculated in the pre- and postoperative follow-up period, and all findings were evaluated over a mean period of  $42.5 \pm 7.4$  (24-54) months (Table 1).

The SPSS 20.0 (Chicago IBM Corp. 2017) statistical software was used for data analysis. Data were evaluated using Kolmogorov-Smirnov test and chi-square test. Pre- and postoperative data of both groups were analyzed using the t-test. p value < 0.05 was considered statistically significant in all analyses.

## 3. Results:

No significant difference was observed between the groups in anterior drawer, Lachman, and pivot shift tests performed in the pre- and postoperative periods as part of physical examination tests (postoperative P values: P = 0.883, P = 0.927, and P = 0.991, respectively) (Table 2).

Postoperative Lysholm and IKDC scores were significantly better in both groups compared with the preoperative scores ( $P < 0.05$ ). When the two groups were compared, no significant difference was observed (preoperative,  $P = 0.789$  and postoperative,  $P = 0.832$  for IKDC score; preoperative,  $P = 0.846$  and postoperative,  $p = 0.331$  for Lysholm score) (Tables 3 and 4).

#### 4. Discussion:

ACL injury is one of the most common orthopaedic injuries in the knee. Providing of knee stability is important for preventing osteoarthritic changes in the knee joint with ACL deficient knees. Now a lot of grafts types and graft fixation method is used in modern orthopaedics surgery. The development of new graft fixation methods allows to use multiple strand hamstring grafts and the increased popularity of the hamstring graft. [18].

Although there are several biomechanical and clinical studies conducted with different femoral graft fixation implants in the literature, their superiority to one another has not clearly been demonstrated. However, most of the different implants currently used are associated with good clinical outcomes if the correct surgical procedures are performed. [9,11,13] In the present study, we obtained good clinical outcomes using the Transfix and Tightrope methods.

Hurley et al. evaluated 11 studies in their meta-analysis study and compared 3 different fixation methods. These methods are separated as cortical button, cortical pin and interference screw. They reported that there was no difference in failure rate, knee stability, functional outcomes or incidence of revision procedures and their findings suggest that graft fixation method should be decided based on surgeon preference and experience. [19]

In another meta-analysis study, Browning et al. evaluated 41 studies which comparing the suspensory and aperture fixation methods of a quadrupled hamstring tendon autograft in ACL reconstruction. There were no differences in IKDC, Lysholm, Lachman, Pivot-shift outcomes between suspensory and aperture fixation techniques. But they determined that they found two main findings in their study. The first one is the final laxity of knee as measured arthrometer is significantly better in suspensory fixation group and the second one is graft rupture rate is lower in suspensory group than aperture group. [20]

Aydm et al. retrospectively evaluated 100 patients and compared three different fixation materials: Endobutton, Transfix, and Aperfix.[21] The results of physical examination tests, IKDC, SF-36 knee scoring, Lysholm, and Tegner scores were evaluated during a mean follow-up period of 40 months, with a minimum follow-up period of 12 months. They reported that these three methods showed significant improvement in knee instability symptoms and tests, but did not demonstrate any significant superiority over each other. In addition, they stated that the clinical outcomes of arthroscopic ACL reconstruction are independent from the graft fixation material on the femoral side.

In our study, the Transfix and Tightrope fixation methods were evaluated in terms of physical examination, instability tests, and clinical outcomes over a minimum follow-up period of 24 months, and the pre- and postoperative comparisons revealed that both were reliable fixation methods. To the best of our knowledge, this is the first study in the literature that compared Transfix and Tightrope fixations in terms of clinical outcomes.

In a study by Nataraj et al. which is one of the studies that is similar to our study, 132 patients were evaluated[22]. Clinical outcomes of the Endobutton (68 patients) and femoral transfixation (64 patients) methods were compared at different time points over a 24-month follow-up period. Both methods were determined to be successful based on pre- and postoperative evaluations, with no clinically significant difference observed between both groups. In contrast to the present study, patients with meniscus tears that required intervention were included in this study. In the present study, patients who underwent meniscus repair or meniscectomy for  $>50\%$  resection of the meniscus volume were excluded from the study because we believe that these procedures may affect clinical outcomes. This exclusion helped in avoiding changes in clinical scoring caused by meniscus-related issues.

Price et al. 24 patients treated with the Endobutton (11 patients) and Transfix (13 patients) methods were evaluated over a 24-month follow-up period[23]. In the study, no significant difference was observed between both groups in terms of clinical scores. Furthermore, it was stated that the rate of additional intervention (such as implant removal due to implant loosening or lateral knee pain and fracture of interference screw on tibial side) during the postoperative follow-up period was higher in patients treated with Transfix compared with those treated with Endobutton. In the present study, although two patients treated with Transfix reported lateral knee pain in the postoperative 12-month follow-up period, these complaints showed significant improvement over the 24-month follow-up period. No other complication that would require intervention was encountered during the follow-up period.

In the present study, we retrospectively compared two different methods “Tightrope and Transfix” that are used for femoral side graft fixation, provided that the same tibial side graft fixation method is employed and a four-strand hamstring graft is used. The results demonstrated that there is no significant difference between Tightrope and Transfix in terms of clinical outcome.

The most important limitation of our study is its retrospective design, despite data being prospectively collected. In addition, the lack of use of measuring devices for evaluating instability can be considered as another limitation.

## 5.Conclusion:

In the present study, which, to the best of our knowledge, is the first study in the literature that compared Tightrope and Transfix methods, similar clinical outcomes were obtained in clinical arthroscopic ACL reconstruction surgery using Tightrope and Transfix femoral fixations. Therefore, both femoral fixation implants can be safely used in arthroscopic ACL reconstruction based on the experience and preference of the surgeon, provided that they are properly applied.

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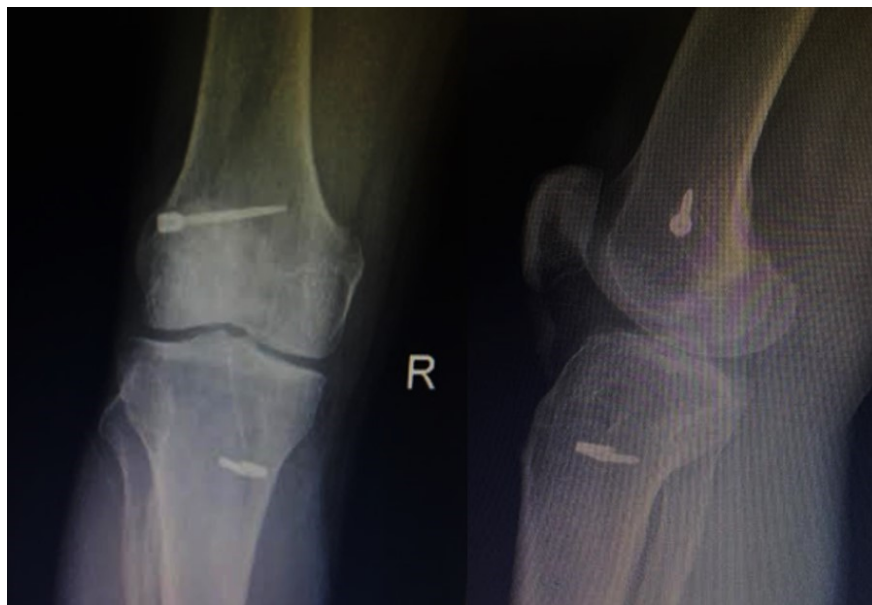
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