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Clinical Evaluation of Transfix and Tightrope Fixations in Patients Undergoing Arthroscopic Reconstruction of the Anterior Cruciate Ligament

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Introduction : The normal kinematics of the knee are disrupted by anterior cruciate ligament (ACL) injuries, which also increase the risk of secondary injuries such meniscal tears and osteoarthritis of the knee. The most frequent and well-liked procedure to regain knee stability is surgery. ACL reconstruction involves the use of numerous graft types and graft anchoring techniques. With the majority of these graft fixation techniques, arthroscopic ACL restoration surgery is quite successful in achieving knee stability.(1)(2) The development of pre- and postoperative rehabilitation programmes, as well as the various types of dependable and potent graft fixation implants established in recent years, are two elements that boost surgical success.(3) (4)

The most popular implants used in ACL surgery are the ACL Tightrope and Transfix from Arthrex Inc., Naples, FL, USA. While 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, Tightrope Implant allows the suspension of the graft from the lateral femoral condyle cortex using a button implant. Hence, transfix and tightrope are two different techniques, and as a result, various problems may be experienced. For tightrope, the button may not flip, become blocked inside the femoral tunnel, or flip in soft

tissue. For transfix, problems like nitinol wire breakage, screw missing the target, and iliotibial band discomfort may occur. Therefore, further information regarding the superiority of these fixation methods compared with each other is required.

This study tries to compare the clinical outcomes of femoral fixations made using tightrope and transfix for use in arthroscopic ACL restoration.

Materials and Methods :

Retrospective analysis was performed on the clinical records of 96 patients from Nalanda Medical College & Hospital, Patna - Bihar who underwent arthroscopic ACL repair for ACL rupture between January 2013 and June 2017 under the care of the senior surgeons of the same designation and in whom the fixation techniques examined in this study had been used. A total of 73 participants that met the inclusion criteria were chosen for the study out of a total of 96 patients. Among these individuals, 51 patients were included in the study who underwent surgery, completed the required 24-month follow-up period, and whose preoperative clinical evaluation and at least 24-month clinical follow-up data could be acquired.

Closed epiphyses, initial surgery, an undamaged other knee, and the hamstring tendon utilised as a graft for reconstruction were inclusion criteria for the study. Multiple ligament injuries, bilateral ACL reconstruction, meniscus repair, >50% resection of any meniscus, degenerative cartilage abnormalities in the knee, and a history of knee fractures were among the study's exclusion criteria. Without taking into account any other factors, the adoption of the Transfix and Tightrope fixation methods was chosen at random based on the implant's viability at the time of the surgery.

A group of senior surgeons having same designation with expertise in knee sports injuries carried out each procedure. In all patient surgeries, a four-strand autologous hamstring graft was employed. In the surgical technique, a typical knee arthroscopy was carried out initially, followed by an intra-articular assessment. Immediately after, a 3–4 cm oblique incision was performed starting from the anteromedial side of the proximal tibia. Sartorial fascia was opened then and tendon grafts were removed using a closed graft receiver, and the semitendinosus and gracilis tendons were extracted from the distal insertion site. Hamstring grafts were made as four bands after being folded in half.

The tibial tunnels were constructed using a guide for both implants. The femoral tunnel was reamed utilising a guide and transtibial method for Transfix fixation. A guide was used to help put a pin into the lateral cortex of the femur, and the pin was then used to remove the elastic wire from the opposing cortex and place it into the joint. The treatment was finished by inserting the Transfix pin through the lateral cortex after the elastic wire assisted in pulling the graft into the femoral tunnel.

Tightrope fixation :

In order to achieve anatomic ACL reconstruction and aim the ACL footprint for Tightrope fixation, the femoral tunnel was reamed using the anteromedial portal. With the aid of the sending pin, tightrope sutures were inserted through the lateral femoral cortex and taken outside the skin. Under the assistance of fluoroscopy, the implant's button was bypassed into the lateral femoral cortex and its location over the cortex was examined. Using the ACL tightrope implant system, the prepared graft was inserted into the femoral tunnel and hung. Both groups fixed the other end of the graft from the tibial tunnel using bio-interference screws and staples as a benchmark.

Patients in both groups had to undergo their pre- and postoperative physical examination (anterior drawer, Lachman, and pivot shift tests).Their records retrospectively reviewed for anamnesis in the hospital records department, and data were documented. Additionally, pre- and postoperative follow-up IKDC and Lysholm ratings were computed, and these data were assessed over a period of 54 months. The statistical software SPSS 20.0 (provided by Public Health Foundation of India- PHFI) was used to analyze the data. The chi-square test or Fisher’s exact test were used to analyse the data as per requirement. Both groups' pre- and postoperative data were examined using the t-test. In all analyses, a p value less than 0.05 was regarded as statistically significant.

Results :

ACL Tightrope was employed in 25 (49%) and Transfix in 26 (51%) of the 51 patients, respectively. All the patients were male. Age range was 21 years to 48 years. Mean age for transfix group was 31± 5.3 while it was 35± 6.8 in the Tightrope group.

	ANTERIOR DRAWER TEST				LACHMAN TEST				PIVOT SHIFT TEST			
	Preoperative		Postoperative		Preoperative		Postoperative		Preoperative		Postoperative	
	+	−	+	−	+	−	+	−	+	−	+	−
Transfix	22 (84.6%)	4 (15.4%)	2 (7.7%)	24 (92.3%)	23 (88.4)	3 (11.6%)	3 (11.6%)	23 (88.4)	24 (92.3%)	2 (7.7%)	1 (3.8%)	25 (96.2%)
Tightrope	20 (80%)	5 (20%)	2 (8%)	23 (92%)	24 (96%)	1 (4%)	0 (0%)	25 (100%)	24 (96%)	1 (4%)	1 (4%)	24 (96%)
P value	0.72		1		0.60		0.23		1		1	

Table -1 : Pre- and postoperative distribution of Anterior drawer, Lachman, and pivot shift tests between the Transfix and Tigtrope groups (n=51)

Anterior drawer test, Lachman test and Pivot shift tests were done for both the groups (Transfix and Tigtrope) for both the preoperative and postoperative period and the scores were compared.

Above table depicts that there is no significant difference between both groups (Transfix and Tigtrope) in terms of clinical scores.

IKDC SCORE			
PREOPERATIVE	**Poor**	**Normal**	**P value**
Transfix	10(38.4)	16(61.5%)	0.77
Tightrope	8(32%)	17(68%)	
POSTOPERATIVE			
Transfix	2(7.7)	24(92.3%)	0.66
Tightrope	3(12%)	22(88%)	

Table -2: Comparison of IKDC scores in the pre- and postoperative periods between the Transfix and Tigtrope groups (n=51)

*For the ease of analysis , ‘poor’ and ‘abnormal’ scores were clubbed together into one category (Poor) and “near normal” and ‘normal’ were clubbed together in one category i.e. ‘Normal’.

LYSHOLM SCORE			
	PREOPERATIVE	**POSTOPERATIVE (Follow-up period)**	**P value**
TRANSFIX	46	92	0.006
TIGHTROPE	47	94	

Table-3: Comparison of Lysholm scores in the pre and postoperative period in between the Transfix and Tigtrope groups (n=51)

The lysholm score shows significant improvement when the preoperative scores were compared to the post-operative scores in both the Transfix and Tigtrope groups (from 46 to 92 and 47 to 94).

Discussion :

ACL injury is one of the most frequent orthopaedic knee problems. In such cases, providing knee stability is crucial for preventing osteoarthritic changes in the knee joint. In contemporary orthopaedic surgery, a variety of graft types and graft fixation techniques are employed. The use of multiple strand hamstring transplants is now possible thanks to novel graft fixation techniques and the growing acceptance of hamstring grafts.(5) Although there have been a number of biomechanical and clinical studies using various femoral graft fixation implants, it has not been made apparent which one is better. However, if the appropriate surgical procedures are carried out, the majority of the various implants now in use are linked to positive clinical outcomes.(6)(7)(8)

In the present study, pre- and postoperative comparisons showed that both the Transfix and Tightrope fixation methods were trustworthy fixation techniques. Also, 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. To the best of our knowledge, this is the first study in the state of Bihar that contrasted clinical results between

Transfix and Tightrope fixations. In our study, we were able to achieve positive clinical results using the Transfix and Tightrope procedures.

However, Hurley et al. in their meta-analysis study, reviewed 11 papers and contrasted 3 different fixation techniques, which were interference screw, cortical button, and cortical pin. Their findings imply that the choice of graft fixation method should be made depending on the preference and experience of the surgeon. They reported that there was no difference in failure rate, knee stability, functional outcomes, or incidence of revision procedures.(9)

Browning et al. examined 41 papers that compared the suspensory and aperture fixation methods of a quadrupled hamstring tendon autograft in an additional meta-analysis research. The results of the suspensory and aperture fixation approaches in the IKDC, Lysholm, Lachman, and pivot-shift tests were identical. But they also found that the suspensory fixation group's final laxity of the knee, as determined by an arthrometer, is noticeably better, and the suspensory group's graft rupture rate is lower than that of the aperture group.(10) Aydın et al. in their study claimed that while none of the three treatments (Endobutton, Transfix, and Aperfix) significantly outperformed the others, they did significantly improve the symptoms and tests related to knee instability.(11)

One of the studies (Nataraj et al) that is comparable to our study where 132 patients were assessed over the course of a 24-month follow-up period, the clinical results of the Endobutton (68 patients) and femoral transfixation (64 patients) procedures were contrasted at various time periods.(12) Based on pre- and postoperative evaluations, both approaches were deemed successful; no clinically significant differences were seen between the two groups.

Limitations :

Despite data being collected prospectively, our study's most significant disadvantage is its retrospective design. Another restriction is that there are no measuring tools available for assessing instability.

Conclusion :

Similar clinical outcomes were achieved in clinical arthroscopic ACL reconstruction surgery using Tightrope and Transfix femoral fixations in the current investigation, which, to the best of

our knowledge, is the first study in the state of Bihar. Therefore, depending on the surgeon's preference and experience, both femoral fixation implants can be utilised safely in arthroscopic ACL restoration as long as they are appropriately implanted. Further clinical trials are required to generate more scientific evidence.

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