

# Comparative Evaluation of Functional Outcome of Transtibial and Transportal Femoral Tunneling Techniques of Arthroscopic ACL Reconstruction

Tushar Ubale<sup>1</sup>, Ashish Assudani<sup>2</sup>, Pradeep A. Sangnod<sup>2</sup>, Ashish Gupta<sup>2</sup>, Samir Pilankar<sup>3</sup>, Satishchandra Kale<sup>4</sup>

## ABSTRACT

**Introduction:** The purpose of this study was to compare the clinical outcome of transtibial technique and transportal technique for drilling of femoral tunnel in arthroscopic ACL reconstruction using hamstring tendon autograft.

**Material and Methods:** The present study was conducted among 30 patients who were operated with the transtibial method of femoral tunnel drilling and 30 who patients were operated using the transportal method. All patients were examined clinically pre and post-operatively for functional outcome with lysholm knee score and IKDC score. Statistical data analysis was conducted using SPSS 18.0. Student t test and chi square test were used to compare the level of significance with p value  $\leq 0.05$  considered as statistically significant.

**Result:** The average IKDC scores of transportal patients were significantly higher than transtibial patients at 6 months follow up ( $p=0.001$ ). The average Lysholm scores of transportal patients were significantly higher than transtibial patients at 6 months follow up ( $p=0.047$ ).

**Conclusion:** The present study concluded that transportal technique offered better results post-operatively. However, on the contrary, literature reports that it is mainly dependent on the surgeons preference to decide any of the above approach with which he is more experienced or familiar.

**Keywords:** Anterior cruciate ligament; Transportal technique; Transtibial technique

## INTRODUCTION

The anterior cruciate ligament (ACL) plays a vital role in knee functions. It also stabilizes the tibial rotation and limits the anterior tibial translation. An ACL injury causes knee symptoms of instability, which can lead to meniscal tears or chondral injury, as well as osteoarthritis.<sup>1</sup>

Transtibial technique is extensively used for drilling of femoral tunnel in arthroscopic anterior cruciate ligament (ACL) reconstruction. Recent research suggests that this technique instability as the graft is placed in a non-anatomical position. Literature suggests that if the femoral tunnel is drilled by using an anteromedial portal (transportal technique), better knee stability can be achieved theoretically as the graft can be placed more anatomically.<sup>2</sup> The purpose of this study was to evaluate the clinical outcome of transtibial technique and transportal technique for drilling of femoral tunnel in arthroscopic ACL reconstruction using hamstring tendon autograft.

## MATERIAL AND METHODS

The present study was conducted during the period between May 2014 and December 2014 among 60 patients undergoing arthroscopic anterior cruciate ligament reconstruction at the

orthopaedic department at Municipal General hospital, Juhu, Mumbai. Ethical approval was obtained. Informed consent was taken from patients before the commencement of study. 30 patients were operated with the transtibial method of femoral tunnel drilling and 30 patients were operated using the transportal method. Sample size calculated at a-error (Type -1) of 0.05 and B-error (Type-2) of 0.2 assuming incidence of ACL injuries about 2.3% in our hospital, sample size thus calculated is 58 cases (rounded about 60 considering some dropouts in the follow up). All patients were followed up at 6 weeks, 3 months and 6 months from the date of surgery. All patients were then examined clinically with special tests ie. Lachman's test, anterior drawer test, pivot shift test and McMurray's test and the findings were recorded including any associated meniscal injuries. They were then evaluated using 2 different evaluation systems i.e. IKDC and Lysholm scores. All patients were operated by the same surgical team using single bundle hamstring grafts either 4-fold semitendinosus or 6-fold semitendinosus and gracilis graft. All patients were given similar post-operative rehabilitation programmes and were recalled after 6 weeks, 3 months and 6 months from the surgery. At all these follow-up visits, they were once again evaluated for functional outcome with lysholm knee score and IKDC score.

## STATISTICAL ANALYSIS

Statistical data analysis was conducted using SPSS 18.0. Student t test and chi square test were used to compare the level of significance with p value  $\leq 0.05$  considered as statistically significant.

## RESULT

Table-1 shows demographic details, equal number of patients (30 in each) were included in both groups. The average age of the patients who suffered from ACL tears in our study was in mid twenties i.e. 25.1 in transportal group and 24.7 in the transtibial group. The gender distribution in our study transportal

<sup>1</sup>Assistant Professor, <sup>2</sup>Resident, <sup>3</sup>Assistant Honorary, <sup>4</sup>Honorary, H.B.T. Medical college and Dr R.N. Cooper Municipal General Hospital, Mumbai, India

**Corresponding author:** Dr Pradeep A. Sangnod, Room No 311, RMO Quarters, Dr R.N. Cooper Hospital Campus, Ville Parle West, Mumbai-400056, India

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group and 86.6% males in the transtibial group. There was no significance difference in both group's sex distribution of males i.e. 90.0% males in the leant towards a majority (chi square= 0.16, p=0.68). Table-2 shows comparison of associated meniscal injuries in transportal and transtibial groups. The average IKDC scores of transportal patients were significantly higher than transtibial patients at 6 months follow up (student t-test, p=0.001) (table-3). The average Lysholm scores of transportal patients were significantly higher than transtibial patients at 6 months follow up (student t-test, p=0.047) (table-4).

**DISCUSSION**

The ACL injury is not only immediately problematic because of functional instability but it is the source of long term complications such as meniscus tears, failure of secondary stabilizers and early onset of osteoarthritis. Reconstruction of the ACL allows patients to resume their active life style and can delay the onset of osteoarthritis.<sup>3</sup> Transportal and transtibial (TT) techniques are the most widely used methods for drilling femoral tunnel in ACL reconstructions; yet, debate continues about the preferred method.<sup>4</sup> The present study was carried out to compare the clinical outcome of transtibial technique and transportal technique for drilling of femoral tunnel in arthroscopic ACL reconstruction using hamstring tendon autograft and functional outcome was evaluated with lysholm knee score and IKDC score. The IKDC was initially developed by a group of American and European knee surgeons as a ligament scoring system in 1987 as according to them, the available knee scoring systems had assigned numerical values to those factors that were not quantifiable; arbitrary scores were then being added together for parameters which were not strictly comparable with one another. However, the current modified form is simple and easy to use, qualification and evaluation sections and examines four areas (subjective assessment, symptoms, range of movement along with ligament examination).<sup>5</sup>

The Lysholm scale is one of the generally used scoring systems. First published in 1982, the Lysholm scale consists of eight questions, primarily aimed at the assessment of instability in younger patients. The system focuses on the patient's perception of function in those activities of daily living which are most important to the patient, and the patient's functional level at various intensities of athletic activity.<sup>6</sup>

The present study found that the average IKDC scores and Lysholm scores of transportal patients were significantly higher than transtibial patients at 6 months follow up. However, Astur DC et al<sup>7</sup> revealed that use of the transportal technique for arthroscopic reconstruction of the ACL increases the risk of injury to the lateral genicular artery and the insertion of the lateral collateral ligament, leading to greater likelihood of postsurgical complications such as osteonecrosis of the lateral femoral condyle and knee instability. Tashiro Y et al<sup>1</sup> performed the simulation of femoral tunnel drilling with the TT and the trans-AMP techniques using three-dimensional computer aided design models and revealed that a lower drill incident angle induced by the TT technique resulted in more ovalized apertures of two tunnels and led to a higher frequency of tunnel overlap. The trans-AMP group had tunnel places within the footprint and had less ovalization and overlap. Thus the study concluded

Femoral tunneling technique	Transtibial	Transportal
No. of patients	30	30
Average age±SD	24.7±1.95	25.1±1.62
Male patients	26 (86.6%)	27 (90%)
Female patients	4	3

**Table-1:** Demographic details of patients

Femoral Tunneling Technique	Associated Meniscal Injury			Total
	LM	MM	Nil	
Transtibial	0	9	21	30
	0.0%	30.0%	70.0%	100.0%
Transportal	6	7	17	30
	20%	23.3%	56.7%	100%
Total	6	16	38	60
	10.0%	26.7%	63.3%	100%

**Table-2:** Comparison of associated meniscal injuries in transportal and transtibial groups

IKDC Score	Transportal		Transtibial		P value
	Mean	±SD	Mean	±SD	
IKDC Pre	30.2	3.5	29.5	4.5	0.51
IKDC 6 weeks	54.4	6.3	45.0	10.0	<0.001
IKDC 3 months	65.2	7.7	52.9	14.3	<0.001
IKDC 6 months	70.2	9.9	58.3	16.0	0.001

**Table-3:** Comparison of average IKDC scores in transportal and transtibial groups

Lysholm Score	Transportal		Transtibial		P value
	Mean	±SD	Mean	±SD	
Lysholm Pre	49.5	11.6	47.2	11.8	0.45
Lysholm 6 weeks	62.7	5.6	56.6	11.5	0.012
Lysholm 3 months	72.4	6.6	66.9	12.6	0.038
Lysholm 6 months	83.4	9.5	77.8	11.7	0.047

**Table-4:** Comparison of average Lysholm scores in transportal and transtibial groups

that the trans-AMP technique was more useful in preparing femoral tunnels anatomically and avoiding tunnel ovalization and overlapping in double-bundle anterior cruciate ligament reconstruction.

Bedi A et al<sup>8</sup> evaluated the anatomic and biomechanical outcomes of anterior cruciate ligament (ACL) reconstruction with transtibial versus anteromedial portal drilling of the femoral tunnel and found that the anteromedial portal ACL reconstruction significantly controlled tibial translation more than the transtibial reconstruction with Lachman, anterior drawer and pivot-shift examinations of knee stability. Abebe ES et al<sup>9</sup> compared transtibial and two incision tibial tunnel-independent techniques and concluded that the tibial tunnel-independent technique allowed for more anatomic femoral tunnel placement compared with the transtibial technique.

Franceschi F et al<sup>10</sup> compared at a minimum follow-up of 5 years, functional and clinic-radiological outcomes of 2 similar groups of athletes who underwent anterior cruciate ligament reconstruction using arthroscopic single-bundle autologous hamstring graft by transtibial (TT) or an anteromedial portal (AMP) technique to drill the femoral tunnel and revealed that ACL reconstruction using a femoral tunnel drilled through an AMP provided better rotational stability and anterior translation

than drilling the femoral tunnel using the TT technique. Baghel A et al<sup>11</sup> compared functional and radiological outcomes of transtibial and anatomical medial portal ACL reconstruction technique and found that anatomical medial portal has better outcome with rotational and biomechanical stability of complex knee joint as compared to trans-tibial approach.

Electricwala A et al<sup>12</sup> compared transtibial and anatomical technique on the basis on stability using Lachman's and Slocum's tests and functional outcome using Lysholm knee score at 3,6 and 12 months and found equally good stability in both the anteroposterior and rotational plane in both the groups. Ambra LF et al<sup>13</sup> evaluated current trends and common practice of Brazilian orthopedic surgeons while selecting approaches for anterior cruciate ligament (ACL) reconstruction surgery and reported that surgeons' preferences for ACL reconstruction are variable, and are influenced by learning time and availability of tools rather than research evidence.

Several factors may influence ligament formation from grafts, such as isometricity, anatomical positioning, collaboration from the patient, response to healing, biomechanical strength, postoperative rehabilitation and vascularization. Data suggests that the ligament formation process occurs within approximately one year following the surgery.<sup>7,14</sup>

## CONCLUSION

The present study concluded that transportal technique offered better results as the average IKDC scores and Lysholm scores of transportal patients were significantly higher than transtibial patients. However, on the contrar, literature reports that it is mainly dependent on the surgeons preference to decide any of the above approach with which he is more experienced or familiar.

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