

Functional outcome of transtibial versus transportal drilling technique for arthroscopic anterior cruciate ligament reconstruction

Abstract

Introduction: The anterior cruciate ligament is a vital structure for biomechanical stability of the knee. The aim of our study was to find out the clinical effect of transtibial and transportal technique for drilling femoral tunnel during arthroscopic ACL reconstruction.

Material and methods: 120 consecutive cases with symptomatic ACL tear undergoing arthroscopic anterior cruciate ligament reconstruction were selected in this prospective study. Sixty cases were done by transtibial method of femoral tunnel drilling and sixty by transportal method. Functional outcome by mean of IKDC and Lysholm scores used to evaluate patient's findings pre and post-operatively.

Result: The mean IKDC and Lysholm scores of transportal group patients were substantially greater in comparison to transtibial patients at 6 months follow up.

Conclusion: The functional outcome of transportal technique offered better results post-operatively.

Keywords: arthroscopy, knee, anterior cruciate ligament, transportal technique, transtibial technique

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Introduction

The anterior cruciate ligament (ACL) is a pivotal structure for normal mechanical functioning of the knee. It controls tibial rotation and restricts anterior tibial translation. A Hyperextension injury causing ACL leads to instability, meniscal tears, chondral injury, over and above osteoarthritis.¹

Transtibial technique is widely practised for drilling of femoral tunnel in arthroscopic anterior cruciate ligament (ACL) reconstruction. Current studies propose that transtibial technique results in instability as the graft is in a non-anatomical position. Recent Research recommends drilling of the femoral tunnel using an anteromedial portal i.e. transportal technique, provides superior knee stability as the graft is placed in more anatomic position.² The purpose of this study is to find out the clinical effect of transtibial and transportal technique for drilling femoral tunnel during arthroscopic ACL reconstruction using autologous hamstring tendon graft.

Material and methods

Between December 2016 and December 2017, 120 patients with symptomatic ACL tear undergoing arthroscopic anterior cruciate ligament reconstruction were consecutively selected. We prospectively gathered their data. There were 60 patients under each category of transtibial and transportal technique of femoral tunnel drilling. All patients gave written consent to be a part of this study.

Patients underwent surgery using single bundle hamstring grafts by 4-fold semitendinosus graft method. All of them underwent same post-operative rehabilitation program. We asked Patients to follow up at 6 weeks, 3 months and 6 months after surgery. At each visit,

patients were tested clinically by Drawer's, Lachman's, pivot shift and McMurray's test and the findings recorded. Functional outcome by mean of IKDC and Lysholm scores used to evaluate patient's findings.

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 ≤ 0.05 considered as statistically significant.

Results

In our study of 120 patients undergoing arthroscopic ACL reconstruction, the mean age of patients in Transtibial group was 23.8 ± 1.59 years and for Transportal group was 24.8 ± 1.54 years (Table 1). In addition, the age distribution did not differ significantly between Transtibial and Transportal groups. 108 males and 12 females respectively were included in the study.

Table 1 Demographic detail of patients

Femoral tunneling technique	Transtibial	Transportal
No. of patients	60	60
Average age \pm SD	23.7 ± 1.59	24.8 ± 1.54
Male patients	54	54
Female patients	6	6

Table 2 highlights associated meniscal injuries in transportal and transtibial groups. In addition, at 6 months follow up, the mean IKDC and Lysholm scores were significantly higher in transportal patients in contrast to transtibial patients (Table 3 & 4).

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

Femoral tunneling technique	Associated meniscal injury			Total
	LM	MM	Nil	
Transtibial	0	12	48	60
	0%	20%	80%	100.00%
Transportal	0	13	47	60
	0%	21.66%	78.33%	100%
Total		25	95	120
	0%	20.80%	79.16%	100%

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

IKDC score	Transportal		Transtibial		P value
	Mean	±SD	Mean	±SD	
IKDC Pre-operative	29.2	3.7	29.1	4.1	0.48
IKDC 6 weeks	54.7	6.1	45.9	9.7	0.001
IKDC 3 months	63.2	7.1	54.9	13.2	0.001
IKDC 6 months	68.2	9.1	57.3	15.4	0.001

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

Lysholm score	Transportal		Transtibial		P value
	Mean	±SD	Mean	±SD	
Lysholm Pre	48.4	11.1	46.8	10.9	0.46
Lysholm 6 weeks	62.3	5.4	55.4	10.1	0.01
Lysholm 3 months	71.8	6.3	65.4	11.8	0.031
Lysholm 6 months	82.2	8.9	76.7	10.6	0.42

Discussion

Injury to ACL causes functional instability and results in longstanding problems such as meniscus injuries, absence of secondary stabilizers and early onset of osteoarthritis of knee. Arthroscopic ACL reconstruction permits resumption of active life style and delays the commencement of osteoarthritis.³ Femoral drilling techniques i.e. Transtibial and transportal are the most widely practiced methods in ACL reconstruction but the debate continues about the preferred method.⁴ This study aimed to compare the clinical outcome of two techniques of femoral tunnel drilling during ACL reconstruction using hamstring tendon graft and functional outcome assessed with Lysholm knee score and IKDC score. A group of American and European knee surgeons developed the IKDC as a ligament scoring system. According to the surgeons, the available knee scoring systems had allotted numerical values to factors that were not computable; arbitrary scores added together for parameters, which were not severely comparable with each other. Nevertheless, the current revised form is simple and comprehensible, qualification and evaluation sections and examines four areas (subjective assessment, symptoms, range of movement along with ligament examination).⁵

The Lysholm scale is commonly used scoring systems. The Lysholm scale consists of eight queries, primarily focused at the

evaluation of knee instability in younger patients. The method emphasizes on the patient's view of function in activities of daily living which are most important to them and their functional level at several intensities of athletic activity.⁶

The current study established that at 6 months follow-up the mean IKDC and Lysholm scores of transportal groups were considerably greater than transtibial groups. Astur DC et al.⁷ showed that the transportal technique increases the risk of jeopardizing the lateral genicular artery and the lateral collateral ligament, leading to increased possibility of postsurgical complications such as instability of knee and osteonecrosis of the lateral femoral condyle. Bedi A et al.⁸ assessed the anatomic and biomechanical results of anterior cruciate ligament (ACL) reconstruction with transtibial versus anteromedial portal drilling of the femoral tunnel and concluded that the knee stability test i.e. Lachman, Anterior Drawers and pivot-shift demonstrated greater controlled tibial translation with the anteromedial portal technique over and above the transtibial technique.

Tashiro Y et al.¹ carried out the simulation of femoral tunnel drilling with the Transtibial and the transportal techniques using three-dimensional computer aided design models and discovered that a lower drill incident angle made by the transtibial technique resulted in more oval appearing apertures of two tunnels and resulted in a greater incidence of tunnel overlap. In addition, the transportal group resulted in tunnel placement at the footprint of ACL and fewer oval appearance and overlap. Consequently, the study established that the transportal technique was significantly beneficial in anatomical preparation of femoral tunnels and evading tunnel overlap and ovalization in double-bundle anterior cruciate ligament reconstruction. The two-incision tibial tunnel- independent technique permitted for précised anatomic femoral tunnel placement compared with the transtibial technique as shown by Abebe ES et al.⁹

Franceschi F et al.¹⁰ estimated 5 years follow-up; functional and clinico-radiological results of two similar groups of athletes undergoing anterior cruciate ligament reconstruction by transtibial or an anteromedial portal technique to drill the femoral tunnel. It revealed that ACL reconstruction using a femoral tunnel bored through an anteromedial portal allowed improved rotational stability and anterior translation than the transtibial technique. Baghel A et al.¹¹ compared functional and radiological outcomes of transportal and transtibial technique and established that anatomical medial portal has superior outcome in terms of rotational and biomechanical stability of complex knee joint as matched to transtibial approach.

Ambra LF et al.¹² assessed recent inclinations and common practices of Brazilian orthopedic surgeons while choosing methods for anterior cruciate ligament reconstruction surgery and reported that surgeons' preferences for ACL reconstruction are variable, and are affected by learning time and availability of tools rather than research evidence.

Numerous aspects may influence ligament reconstruction related to graft i.e. isometricity, anatomical location, and support from the patient, reaction to healing, biomechanical stability, postoperative rehabilitation protocol and vascularization. Literature indicates that the incorporation of the ligament takes place within around one year after the surgery.^{7,13}

Conclusion

The transportal femoral drilling technique presented superior results in terms of the average IKDC and Lysholm scores in contrast to transtibial technique.

Data availability

The data used to support the findings of this study are included within the article.

Acknowledgments

None.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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