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# A comparative study of the clinical and functional outcome of anterior cruciate ligament reconstruction using transportal and transtibial approach for femoral tunnel drilling

**Apoorva Vijaysinh Dodia[1,*], Aparna V. Dodia[2], Purvi A. Dodia[3]**

[1]Assistant Professor, Dept. of Orthopaedics, [2]Resident, Dept. of Radiodiagnosis, [3]Consultant Obstetrician and Gynecologist, [1]Shri M.P. Shah Govt. Medical College & Hospital, [2]Shri C. U. Shah Medical College, [3]Oshwal Multi-Specialty Hospital

***Corresponding Author:**
Email: apoorva_dodia@yahoo.co.in

## Abstract

**Background:** Traditionally there are two ways to drill a femoral tunnel – Transtibial method where the drilling is done through the already made tibial tunnel and Transportal method where the drilling is done through anteromedial portal or accessory anteromedial portal. Both the methods have their own set of advantages and disadvantages.

**Aims:** Aim of this study is to compare the functional and clinical outcomes of arthroscopic ACL reconsturction using transportal versus transtibial approaches for femoral tunnel drilling.

**Materials and Methods:** All patients operated with arthroscopic ACL reconstruction were screened using the inclusion and exclusion criteria, informed consent was taken and the willing patients were included. Patients were selected for either study group (transportal and transtibial groups) both prospectively and retrospectively from data dating back to 2010. 87 patients were included in the transportal group (group I) and 75 patients in the transtibial group (group II). Protocol was approved by Institutional review board. They were then evaluated using 5 different evaluation systems i.e. IKDC, Lysholm, Lower Extremity Activity Score (LEAS), Tegner and pain VAS at 3 months, 6 months and 1 year post surgery.

**Results and Conclusions:**

**In our series, Statistical analysis shows that:**

- There was significant difference in functional outcome on comparing the IKDC knee score of Group I and Group II at 1 year.
- There was significant difference in functional outcome on comparing the Lysholm knee score of Group I and Group II at 1 year.
- There was no significant difference in functional outcome on comparing the LEAS score of Group I and Group II at 1 year.
- There was significant difference in functional outcome on comparing the Tegner's score of Group I and Group II at 1 year.
- There was significant difference in functional outcome on comparing the Pain on VAS of Group I and Group II at 1 year.
- There was significant difference in the Physical Component Survey but not in the Mental Component Survey on comparing all 10 criteria of the SF-36 score of Group I and Group II at 1 year.
- There was no significant difference in functional outcome on comparing the average knee ROM of Group I and Group II at 1 year.
- The Percentage of cases who had a Lachman's test positive 1 year postoperatively was higher in Group II than Group I.

**Keywords:** Arthroscopic ACL reconstruction, Transportal femoral drilling, Transtibial femoral drilling, IKDC knee score, Lysholm knee score, LEAS score, Tegner's score, SF-36 score.

## Introduction

The autograft or allograft single bundle (SB) technique is considered the gold standard for arthroscopic anterior cruciate ligament (ACL) reconstruction.[1,2] Initially the most popular method for drilling of the femoral tunnel in arthroscopic ACL reconstruction was the transportal or two-incision technique in which a second incision is made anteromedially for the anteromedial portal (AMP) and the tunnel drilled from this incision.[3-7] Later on, the transtibial or one-incision technique for femoral drilling was introduced wherein the femoral tunnel is drilled directly through the tibial tunnel. The transtibial approach was believed to have the advantages of omitting the need of a second incision and reducing surgical time and morbidity.[4,5,6,8,9]

Recently, however, it has been postulated that the transtibial approach places the graft in a less anatomical position.[10,11,12] It is the belief of numerous authors that one of the main reasons for an ACL graft failure is improper femoral tunnel placement more-so, than improper tibial tunnel placement due to greater proximity of the femoral tunnel to the centre of axis of knee motion.[6,13]

Placing a graft too far anteriorly on the femur results in a vertically oriented graft. According to studies this could lead to excessive tension in the graft on flexion thereby leading to graft failure. Furthermore, the vertical placement of the graft fails to reproduce the normal oblique positioning of the ACL and this could limit the ability of the graft to restore the normal kinematics of the ACL.[7-10,14,15]

The transtibial approach has the disadvantage of the tibial tunnel dictating the position of the femoral tunnel whereas the transportal approach provides more freedom to the surgeon to drill the femoral tunnel in

such a way as to place the graft in an anatomical position.[5,9,16-20]

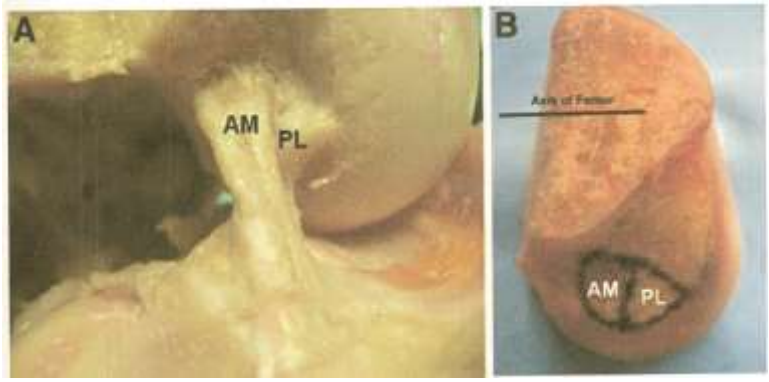


**Fig. 1: ACL attachment and impression on femoral side**

## Materials and Methods

All patients operated with arthroscopic ACL reconstruction were screened using the inclusion and exclusion criteria, informed consent was taken and the willing patients were included. Patients were selected for either study group (transportal and transtibial groups) both prospectively and retrospectively from data dating back to 2010. 87 patients were included in the transportal group (Group I) and 75 patients in the transtibial group (Group II). Protocol was approved by Institutional review board.

## Eligibility Criteria

All patients undergoing arthroscopic anterior cruciate ligament reconstruction surgery were screened according to the following inclusion and exclusion criteria.

**Inclusion Criteria:**

1) Patients with isolated anterior cruciate ligament tear.
2) Patients with ACL tear associated with injured menisci (lateral, medial or both).
3) Patients who met the above criteria were operated with single bundle autologous hamstring ACL grafts (either 4-fold semitendinosus or 6-fold semitendinosus and gracilis grafts).

**Exclusion Criteria:**

1) Patients with associated injuries of the collateral ligaments i.e. LCL and MCL injuries.
2) Other associated injuries like osteochondral defect requiring drilling or mosaicplasty, concomitant posterior cruciate ligament injury requiring its reconstruction, posterior cruciate ligament avulsion fracture requiring fixation, posterolateral corner repair.
3) Patients operated with arthroscopic ACL reconstruction using grafts other than autologous hamstring e.g. quadriceps, bone-patellar tendon-bone, allografts, synthetic grafts.
4) Arthroscopic ACL reconstruction using double bundle grafts.
5) Revision cases of ACL reconstruction.
6) Associated infection.

## Study Method

All patients who were planned for arthroscopic ACL reconstruction surgery from the OPD, who were willing and fit the inclusion criteria were included in the study. Firstly each patient was evaluated pre-operatively with personal details and specific information like mode of injury, duration from injury to surgery date etc. They were then examined clinically with special tests i.e. 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 5 different evaluation systems i.e. IKDC, Lysholm, Lower Extremity Activity Score (LEAS), Tegner and pain VAS.

## Aims and Objectives

Aim of this study is to compare the functional and clinical outcomes of arthroscopic ACL reconstruction using transportal versus transtibial approaches for femoral tunnel drilling.

## Observation and Discussion

One hundred and sixty-two patients who were operated were included in this study. Group I contains patients operated with the transportal technique which included 87 patients. Group II contains patients operated with the transtibial technique which included 75 patients.

All patients in our series underwent accelerated protocols of knee rehabilitation with early knee movement. Literature also states that after reconstruction of the ACL accelerated knee rehabilitation protocols are now common and not associated with an increase in complications or morbidity. This has led to the widespread practice of early reconstruction on the basis that it may shorten rehabilitation and allow an earlier return to the pre-injury level of muscle function and sporting activity.

1) The average age of the patients who suffered from ACL tears in our study was in the late twenties i.e. 29.63 years in the transportal group and 28.3 years in the transtibial group.
2) The gender distribution in our study leant toward a majority of males i.e. 84% males in the transportal group and 79% males in the transtibial group.
3) At 1 year postop the P-value <0.001 therefore there is a significant difference between the average IKDC score in between the groups.

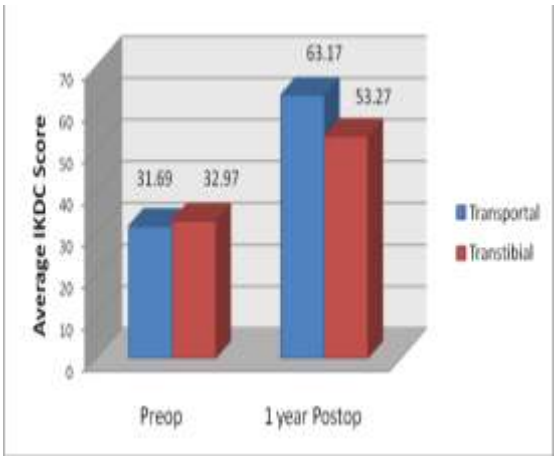


**Fig. 2: Comparison of average IKDC scores in between groups**

4) At 1 year postop the p-value <0.001 therefore there is a significant difference between the average Lysholm scores in between the groups.

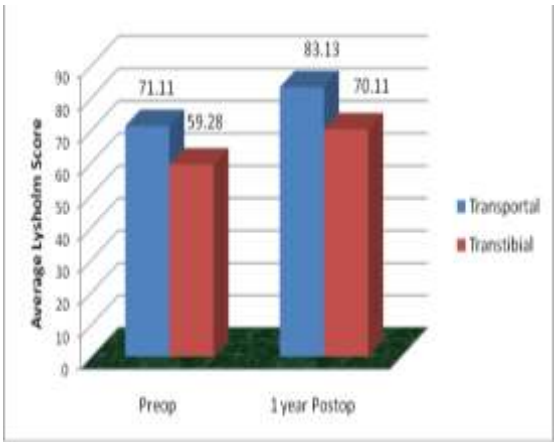


**Fig. 3: Comparison of average Lysholm scores between the groups**

5) At 1 year postop the p-value is 0.2, therefore there is no significant difference between the average LEAS scores in between the groups.

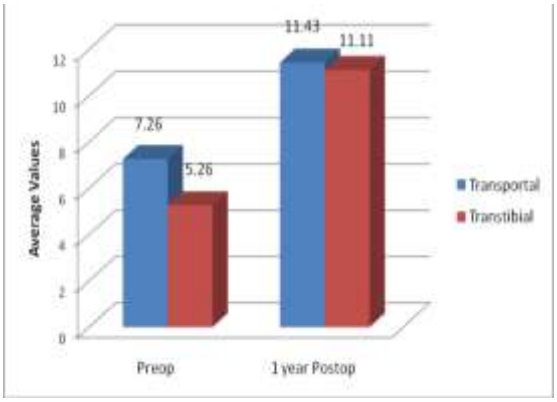


**Fig. 4: Comparison of LEAS between the groups**

6) At 1 year postop the p-value is 0.049 therefore there is a significant difference between the average Tegner's scores in between the groups.

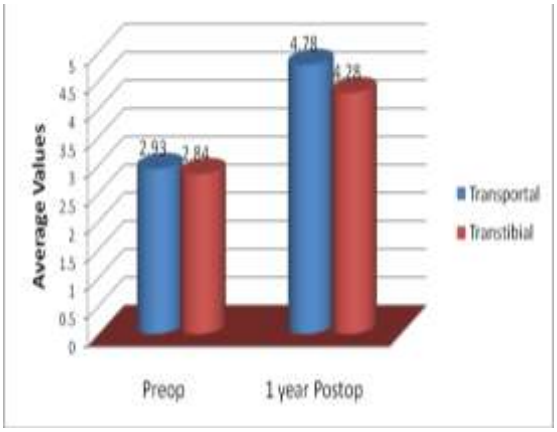


**Fig. 5: Comparison of average Tegner's scores between the groups**

7) At 1 year postop the p-value is 0.001 therefore there is a significant difference between the average pain on VAS scores in between the groups.
8) There is a significant difference in the values of Physical Functioning, Social Functioning, Pain and the Physical Component Summary between both groups but no significant difference between Role limitations due to Physical Health and Emotional Problems, Energy/Fatigue, Emotional Well Being, General Health and the mental component Summary.
9) At 1 year postop the p-value is 0.44 therefore there is no significant difference between the average Range of Motion in between the groups.

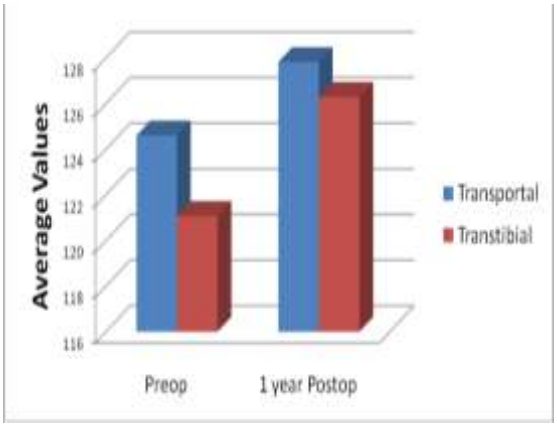


**Fig. 6: Comparison of average range of motion between the groups**

We encountered complications of: Instability in 20 cases (10 in Group I and 10 in Group II).

Limitations of study: All clinical tests for stability were performed by clinicians. Objective assessment using an arthrometer (KT-1000) was not done. Follow up duration is inadequate to assess long term instability and development of secondary osteoarthritis.

## Conclusion and Summary

Arthroscopic ACL Reconstruction using transtibial and anteromedial portal techniques are both effective modalities of treatment in patients with ACL deficient knees but the anteromedial portal technique gives superior results in terms of knee IKDC, Lysholm, Tegner's, Pain on VAS and SF-36 scores.

From our study we conclude that- The transportal group has a better functional outcome than the transtibial group.

## References

1. Eduard Alentorn-Geli, Gonzalo Samitier, Pedro Alvarez, Gilbert Steinbacher, and Ramon Cugat. Anteromedial portal versus transtibial drilling techniques in ACL reconstruction: a blinded cross-sectional study at two- to five-year follow-up; INTERNATIONAL ORTHOPAEDICS; Volume 34, Number 5(2010),747-754.
2. Duquin TR, Wind WM, Fineberg MS, Smolinski RJ, Buyea CM. Current trends in anterior cruciate ligament reconstruction. J Knee Surg. 2009;22:7-12.
3. Harner CD, Honkamp NJ, Ranawat AS. Anteromedial portal technique for creating the- anterior cruciate ligament femoral tunnel. Arthroscopy. 2008;24(1):113-115.
4. Harner CD, Fu F, Irrgang JJ, Vogrin TM. Anterior and posterior cruciate ligament reconstruction in the new millennium: a global perspective. Knee Surg Sports Traum Arthrosc. 2001;9:330-336.
6. Williams RJ, Hyman J, Petrigliano F, Rozental T, Wickiewicz TL. Anterior cruciate ligament reconstruction with a four strand hamstring tendon autograft. J Bone Joint Surg Am. 2004;86:225-232.
7. Arnold MP, Kooloos J, Kampen A. Single-incision technique misses the anatomical femoral anterior cruciate ligament insertion: a cadaver study. Knee Surg Sports Traumatol Arthrosc. 2001;9:194-199.
8. Chhabra A, Kline AJ, Nilles KM, Harner CD. Tunnel expansion after anterior cruciate ligament reconstruction with autogenous hamstrings: a comparison of the medial portal and transtibial techniques. Arthroscopy. 2006;22:1107-1112.
9. Giron F, Buzzi R, Aglietti P. Femoral tunnel position in anterior cruciate ligament reconstruction using three techniques. A cadaver study. Arthroscopy. 1999;15:750-756.
10. Hantes ME, Zachos VC, Liantsis A, Venouziou A, Karantanas AH, Malizos KN (2009) Differences in graft orientation using the transtibial and anteromedial portal technique in anterior cruciate ligament reconstruction: a magnetic resonance imaging study. Knee Surg Sports Traum Arthrosc 17(8):880-886.
11. Heming JF, Rand J, Steiner ME. Anatomical limitations of transtibial drilling in anterior cruciate ligament reconstruction. Am J Sports Med. 2007;35:1708-1715.
12. Loh JC, Fukuda Y, Tsuda E, Steadman RJ, Fu FH, Woo SL. Knee stability and graft function following anterior cruciate ligamentreconstruction: comparison between 11 o'clock and 10 o'clock femoral tunnel placement. Arthroscopy. 2003;19:297-304.
13. Paessler H, Rossis J, Mastrokalos D, Kotsovolos I. Anteromedial versus transtibial technique for correct femoral tunnel placement during arthroscopic ACL reconstruction with hamstrings: an in vivo study. JBone Joint Surg Br. 2004;86:S234.
14. Maria K. Kaseta MD, Louis E. DeFrate ScD; Reconstruction Technique Affects Femoral Tunnel Placement in ACL Reconstruction; ClinOrthopRelat Res (2008)466:1467-1474.
15. Amis AA, Jakob RP. Anterior cruciate ligament graft positioning, tensioning and twisting. Knee Surg Sports Traumatol Arthro[c] 1998;6Suppl 1:S2-12.
17. Gill TJ, Steadman JR. Anterior cruciate ligament reconstruction the two-incision technique. Orthop Clin North Am. 2002;33:727-7 vii.
18. Giron F, Buzzi R, Aglietti P. Femoral tunnel position in anterior cruciate ligament reconstruction using three techniques: a cadaver study. Arthroscopy. 1999;15:750-756.
19. Moisala AS, Jarvela T, Harilainen A, Sandelin J, Kannus P, Jarvinen M. The effect of graft placement on the clinical outcome of the anterior cruciate ligament reconstruction: a prospective study. Knee Surg Sports Traumatol Arthrosc. 2007;15:879-887.
20. Sommer C, Friederich NF, Muller W. Improperly placed anterior cruciate ligament grafts: correlation between radiological parameters and clinical results. Knee Surg Sports Traumatol Arthrosc. 2000;8:207-213.