

CT and MRI Based Preop Evaluation of Femoral and Tibial Tunnels in ACL Reconstruction

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Abstract: *This study aimed to assess the effectiveness of preoperative CT scans in determining femoral and tibial tunnel lengths, comparing these with intraoperative measurements in ACL reconstruction patients, conducted at Dr. D. Y. Patil Medical College, Hospital, and Research Institute, Kolhapur, the prospective observational study included forty-eight patients aged 18-50 years. Data collection involved patient histories, clinical examinations, routine radiological exams, and 3D CT scans. Tunnel lengths were measured in millimetres using preoperative CT scans for surgical planning. Results showed that most subjects were aged 31-40 years (52.08%, n=25) and predominantly male (72.92%). The mean preoperative femoral tunnel (FT) length was 37.04 mm (SD = 3.16), and the mean intraoperative length was 37.47 mm (SD = 3.48), with no significant difference ($p = 0.05099$). The mean preoperative tibial tunnel (TT) length was 18.79 mm (SD = 4.03), and the intraoperative length was 19.59 mm (SD = 3.22), also with no significant difference ($p = 0.05506$). Preoperative CT scans provide accurate measurements of femoral and tibial tunnel lengths, closely matching intraoperative measurements, which is crucial for optimal graft fixation and successful ACL reconstruction.*

Keywords: Anterior Cruciate Ligament, ACL Reconstruction, Femoral Tunnel, Tibial Tunnel, Computed Tomography (CT)

1. Introduction

Anterior cruciate ligament reconstructions (ACLRs) fail at a small but not at an insignificant rate. Despite advances, failure rate after ACLR ranges from 0.7% to 10%.¹ Graft location, and therefore tibial and femoral tunnel placement, is considered critical for the success of anterior cruciate ligament (ACL) reconstructive surgery.¹ Postoperative plain radiographs provide a reliable and valid way to assess anatomic graft placement.² Radiographs can assist in predicting risk factors for potential graft failure and poor outcome. These risk factors include inappropriate tunnel placement, excessive varus or valgus alignment, and increased extension or hyperextension with possible graft impingement.

2. Aim of the Study

Radiological Assessment of Tibial and Femoral Tunnels in Patients Undergoing ACL Reconstruction and Its Impact on Fixation Modalities

The study is intended in Dy Patil Medical College Hospital and Research Institute, Kadamwadi, Kolhapur, under D Y Patil Educational Society Deemed to Be University, Kolhapur

3. Objective

- Pre Operative Assessment of Length of Tunnels in ACL reconstruction
- Compare Intraoperative Tunnel Length
- Study Choice of Fixation Modalities

Research Question

HOW DOES PRE OPERATIVE CT BASED TUNNEL LENGTH CORRELATE WITH INTRAOPERATIVE CHOICE OF DEVICE IN ACL RECONSTRUCTION PATIENTS ?

4. Methodology

Study period: 2 years

Study design: CROSS SECTIONAL OBSERVATIONAL STUDY

Sample size: 50

Methods of Collection of Data (including sampling procedure):

Collection of data for patients presenting with ACL ligament injury as follows:

- History by verbal communication.
- Clinical examination, both local and systemic.
- Routine radiological examination and a 3D CT scan.
- Baseline investigations and others.
- Diagnosis – Clinical and Radiological
- Pre operative CT for tunnel lengths in mm
- Written informed consent will be taken for surgical procedure for inclusion in the study.

Hypothesis

Sample Procedure

All the patients who are satisfying inclusion criteria in the study period August 2022 to April 2024 and coming to Dr. D. Y. Patil Hospital and Research Institute, Kolhapur. will be included in the study, sample size will be taken according to hospital records.

Inclusion Criteria

- Age above 18 - 50
- Patients with ACL reconstruction

Exclusion Criteria

- Multi ligament injury

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- Revision ACL
- Medically unfit patient for surgery

Ethical consideration

- Clearance will be taken from the institutional ethical committee before beginning with the study
- Written, informed consent will be taken from parent / guardian of patient

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Consent

I, Mr/Mrs/Ms Gender Age:residing at do hereby confirm that:

- 1) I have been asked by the student/researcher of D Y Patil Medical College, Hospital and Research Centre, Kolhapur ("the Medical College") whether I wish to participate in a study (research) under the aegis of the Medical College.
- 2) Purpose and methods of the research in simple language. (It should be written by investigator).
- 3) Expected duration of participation & frequency of contact, number of participants type of data collection & methods.
- 4) Any alternate procedure or treatment should be informed
- 5) The nature of the study being undertaken by the student/ researcher, as well as the extent of my participation in it, have been duly explained to me in a language that I understand;
- 6) The potential risks and consequences associated with this study have also been duly explained to me in a language that I understand;
- 7) I also understand that my participation in this study is only for the benefit of advancement in the field of medical research and that at no point in time is my participation being solicited for any pecuniary gain by the researcher or the Medical College;
- 8) I have also been explained that I am in no way obliged to participate in the study and that, once I have agreed to participate in the study, I am still free to withdraw from participation in the study at any point in time upon notifying the Medical College in writing in the prescribed form without assigning any reason;
- 9) There will be no financial transaction between myself, the researcher and/or the D Y Patil Medical College for my participation in that study;
- 10) I have been explained that any data collected out of my participation in the study will only be used for academic purposes and/or for further medical research;
- 11) I have also been reassured that any publication of the data collected during the course of the study or any publication of its conclusions, shall be done on a 'no names' basis and shall under no circumstances reveal my personal identity. Any personal details likely to reveal my personal identity shall at all times remain confidential;

By affixing my signature/thumb print hereto, I am therefore freely and voluntarily signifying my consent, intent and willingness to participate in the study of the student researcher for the purposes of the postgraduate dissertation under the egis of the Medical College. I also certify that my right to privacy has not been infringed in any manner.

[Signature/Thumb Print of Participant]

Date:

Witnessed By:

(1) Name:

Title/Capacity:

Signature:

Name of Project investigator: _____

Address: _____ Contact Number: _____

Signature of investigator:

Name of Project Co- investigator: _____

Address: _____ Contact Number: _____

Signature of investigator:

Helpline Numbers:

Contact Details of Member Secretary:

Institutional Ethics Committee

Consent Form

संमतीपत्र

डॉ. डी. वाय. पाटील मेडीकल कॉलेज आणि डॉ. डी. वाय. पाटील हॉस्पिटल व रिसर्च इन्स्टिट्यूट, कोल्हापूर.

मी. श्री./सौ./कु./श्रीमती

ज्याचे वय आहे, यांचा मी नातेवाईक/पालक आहे.

राहणार

या पत्राद्वारे खात्री देतो/देते की,

१. मला डी. वाय. पाटील मेडीकल कॉलेजच्या द मेडीकल कॉलेज वैद्यकीय डॉक्टर संशोधक यांच्याकडून विचारले गेले की, मेडीकल कॉलेजच्या सहकार्याखाली संशोधन अभ्यासात माझी भाग घ्यायची इच्छा आहे का?

२. वैद्यकीय डॉक्टर संशोधक यांच्याकडून केल्या जाणाऱ्या संशोधन अभ्यासाचे स्वरूप व त्या मध्ये माझ्या सहभागाचा कालावधी याविषयी व्यवस्थितपणे मला समजणाऱ्या भाषेत सांगितले आहे.

३. संशोधन अभ्यासा दरम्यान उद्भवणारे धोके आणि त्यांचे परिणाम मला समजावून व समजणाऱ्या भाषेत सांगितले आहेत.

४. मला हे सुद्धा माहित आहे की, माझा अभ्यासातील सहभाग हा फक्त वैद्यकीय संशोधन क्षेत्राच्या प्रगतीकरिता फायदा होण्यासाठी आहे, ना की मेडीकल कॉलेज किंवा संशोधन कर्त्याकडून पैश्याच्या फायद्याकरिता.

५. मला याची पण कल्पना दिली आहे की, मी कोणत्याही स्थितीत सहभागासाठी बांधील नाही आणि एकदा मी अभ्यासात सहभागासाठी सहमती दिली तरी मी माझा अभ्यासातील सहभाग कोणत्याही वेळी विहित नमुन्यात मेडिकल कॉलेज ला लेखी अर्ज करून कोणतेही कारण नमूद न देता रद्द करू शकतो.

६. माझ्यामध्ये आणि संशोधनकर्ते आणि किंवा डी. वाय. पाटील मेडिकल कॉलेज यांच्यात अभ्यासात सहभागासाठी कोणताही आर्थिक व्यवहार असणार नाही.

७. मला याची पण कल्पना दिली आहे की, माझ्या अभ्यासातील सहभागातून जी काही माहिती गोळा केली जाईल त्याचा वापर फक्त शैक्षणिक हेतू आणि किंवा पुढील वैद्यकीय संशोधनाकरिताच होईल.

८. मला याची पण खात्री दिली आहे की, अभ्यासाच्या काळात गोळा केलेल्या माहितीचे सार्वजनिक प्रसारण किंवा त्यांचा परिणामांचे सार्वजनिक प्रसारण नाव न जाहीर करता केले जाईल. कोणत्याही परिस्थितीत माझी स्वतःची ओळख दाखवली जाणार नाही. कोणतीही वैयक्तिक माहिती माझी वैयक्तिक ओळख दाखवण्याची शक्यता असेल तर नेहमीच गुप्त राखली जाईल.

९. या संमती पत्रातील मजकूर आणि त्याचा परिणाम मला समजणाऱ्या भाषेत व्यवस्थित समजावून सांगितले आहे.

रुग्णाचे नाव

नातेवाईक/पालक