

Research Article

Evaluation of Postoperative Knee Stability Following Arthroscopic Acl Reconstruction

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ABSTRACT

Objective: To determine the outcome of arthroscopic ACL reconstruction in terms of knee stability after six months follows up.

Study Design: A prospective observational study

Place and Duration of Study: The present study was performed at Department of Orthopedics Surgery, Allama Iqbal Teaching Hospital, Dera Ghazi Khan, Pakistan and the duration of this study was from January 04, 2024 to June 04, 2025.

Methods: A total of 200 patients (aged 18-55 years) with confirmed MRI unilateral ACL tears subjected to arthroscopic ACL reconstruction using Hamstring tendon auto-graft, who met the inclusion criteria. Demographic, clinical data and outcomes were analyzed by statistical approaches (P-value < 0.05 as significant). After six months, each patient's knee stability was evaluated using the Tegner-Lysholm scoring.

Results: The results demonstrated that out of 200 patients, 152 (76.0%) were males and 48 (24.0%) females with average age was 35.7±9.6 years. After six month, follow up excellent functional outcomes were recorded in 92 (46.0%) participants, good outcomes in 84 (42.0%) followed by fair outcomes in 18 (9.0%) and 6 (3.0%) had poor outcomes.

Conclusion: The study highlights the significance of graft selection in obtaining satisfactory postoperative knee function and provides insightful information about demographic factors influencing outcomes. An effective substitute for anterior cruciate ligament restoration is surgery utilizing an arthroscopic Hamstring tendon auto-graft ligamentization procedure.

Keywords: Meniscal Tears, Anterior Cruciate Ligament, Arthroscopy.

INTRODUCTION

The anterior cruciate ligament (ACL) is a major stabilizing structure of the knee joint, responsible for controlling anterior tibial translation and rotational movements^{1,2,3}. Injury to the ACL is common among young and physically active individuals and frequently occurs during sports activities, road traffic accidents, or falls^{4,5}. One of the most frequent injuries, particularly among sportsmen, is an anterior cruciate ligament injury⁶. If left untreated, ACL rupture resulting abnormal joint kinematics and knee instability, secondary meniscal injuries, articular cartilage degradation and development early osteoarthritis^{7,8,9}. The general population has

an annual incidence of 0.8 ACL injuries per 1000, with higher prevalence rate exist among female^{10,11}. Road traffic accidents account for 44% of all injuries, followed by sports-related injuries (32%) and falls from heights (24%)¹². The primary clinical indicators of an anterior cruciate ligament (ACL) damage include knee discomfort, a limp during exercise, and positive results on the Anterior Drawer, Lachman, and Pivot shift tests^{13,14,15}. The most preferred graft types for ACL reconstruction are hamstring tendon (semitendinosus-gracilis) grafts and bone-patellar tendon-bone (BPTB) grafts and bone-quadriceps tendon (BQT)^{16,17,18}. The selection of graft depends on patient attributes, surgeon's experience, preferences, tissue

availability, and anticipated functional demands^{19,20}. Hamstring tendon grafts are obtained from gracilis or semitendinosus tendons and are significantly preferred by surgeons for ACL reconstruction because of their exceptional tensile strength, encourage rapid postoperative recovery and lack of patellar morbidity^{21,22,23}. However, there are still little information is available in term of function outcomes of ACL reconstruction by using this approach²⁴. The present study aimed to explore functional outcomes of arthroscopic ACL reconstruction for knee stability and also determining the factors affecting the hamstring grafting technique.

Problem of Statement

Knee instability is a prime cause of Anterior Cruciate Ligament (ACL) disorders and is subject to precise surgical reconstruction. Despite advances in arthroscopic approaches for anterior cruciate ligament reconstruction, postoperative knee stability functional outcomes are inconsistent, and factors influencing the functional outcomes are still not comprehensively understood.

Rationale of Study

Athletes and people with active lifestyles frequently suffer anterior cruciate ligament (ACL) injuries, which frequently necessitate surgical reconstruction to restore knee stability and function. Although arthroscopic ACL reconstruction is a common procedure, results can differ based on graft selection, surgical technique, and rehabilitation regimens.

Materials and Methods

A prospective observational study was performed to explore the outcome of arthroscopic reconstruction of anterior cruciate ligament of 200 patients admitted in Department of Orthopedics surgery, Allama Iqbal Teaching Hospital Dera Ghazi Khan, Pakistan and the duration of this study was from January 04, 2024 to June 04, 2025.

Inclusion Criteria

Both Male and female genders, age ranging from 18 to 55 years were selected. The patient having clinically Lachman test positive and ACL tears confirmed by MRI were selected for Unilateral ACL reconstruction by following hamstring graft surgical technique.

Exclusion Criteria

Patient with multiligament injury or bony ACL avulsion, patient having revision case of ACL

surgery and patient with higher values of osteoarthritis on radiographs were excluded from the study.

Preoperative Assessment

Electrocardiograms (ECGs), urea and electrolytes (U&Es), full blood counts (FBC), chest radiographs, and anesthetic evaluation for either general or regional anesthesia were among the routine tests performed on patients with clinical and radiological diagnoses after their admission.

Data Collection

Clinical history, mechanism of injury and demographic data were documented. The arthroscopic ACL procedure is accomplished by removing the damaged ligament and reconstructing it with another part of a ligament obtained from the knee joint. After six months, each patient's knee stability was evaluated using the Tegner-Lysholm scoring scale in accordance with the operational criteria.

Statistical Analysis

The data were analyzed by using SPSS version-27.0. Quantitative variables were expressed as means $\pm$ standard deviations and qualitative variables were expressed in percentage and frequencies. Chi-square statistical test with a significance level of $p \leq 0.05$ and a 95% confidence level, was performed for post-stratification and exploring the validity of the applied surgical approach by determining the difference among Tegner-Lysholm scoring outcomes.

RESULTS

The demographic attributes (Fig 1) demonstrated that a total of 200 patients were included in the study. Out of these, males were predominant 152 (76.00%) and followed by 48 females (24.0%). The average age of the patients was 35.7 ± 9.6 years. The majority of patients, 94 (47.0%), were between the ages of 31 and 45, while 68 (34.0%) and 38 (19.0%) were between the ages of 18 and 30 and 46 and 55, respectively (Figure 2). Of the patients, 86 (43.0%) lived in rural areas and 114 (57.0%) in urban areas (Figure 3). The analysis of variance demonstrated that there were significant variance exist in term of education profile, as $F=11.981$; $P<0.071$; Table 1. The distribution of educational status showed that 56 (28.0%), 74 (37.0%), and 55 (27.5%) had middle, matric, or higher levels of education, respectively, while 15 (7.5%) were uneducated (Table 1). The results of (Table 2) represented

the quantitative distribution of socioeconomic status of the patients under investigation and described that 43 people (21.5%) were poor, whereas 64 people (32.0%), 69 people (34.5%), and 24 people (12.0%) were middle class, upper middle class, and high class, respectively. Of the patients, 151 (75.5%) experienced symptoms for less than two weeks, while 49 (24.5%) had more than two weeks. The distribution of knee joints affected showed that 107 patients (53.5%) had left knees and 93 patients (46.5%) had right knees (Table 3). Beside of these, overviewing the post follow up history, the results described that out of the 200 patients, there were observed remarkable

findings, having 92 (46.0%) had Excellent functional outcomes, 84 (42.0%) had good outcomes, 18 (9.0%) had fair outcomes, and 6 (3.0%) had bad outcomes in term of ACL reconstruction for knee stability. The result of analysis of variance (Table 4) demonstrated that higher values of variance were accounted for functional outcomes ($F=19.227$; $P<0.019$; Table 4), this suggesting that Tegner-Lysholm scoring scale is the important domain for categorizing the functional outcomes and interlinking the factors effecting on functional outcomes. However, higher variance is intending that variability in outcomes is encountered by graft selection.

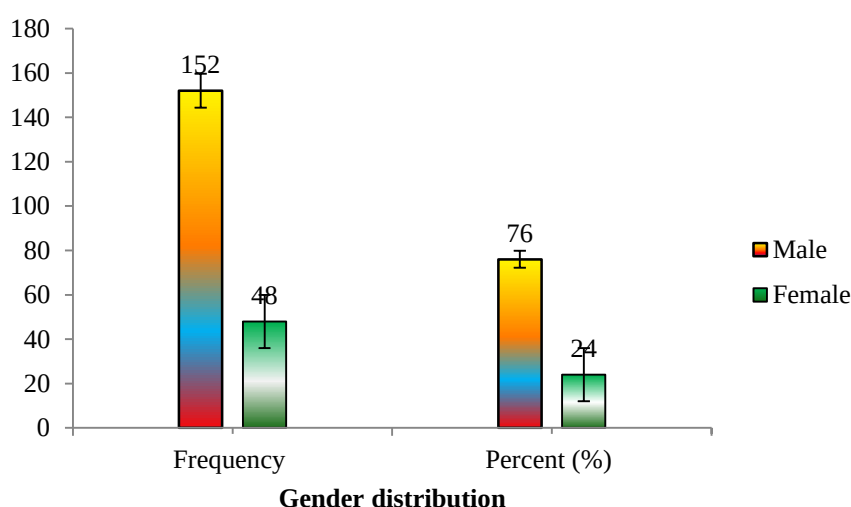


Figure 1: Exhibiting the Gender Distribution of Patients

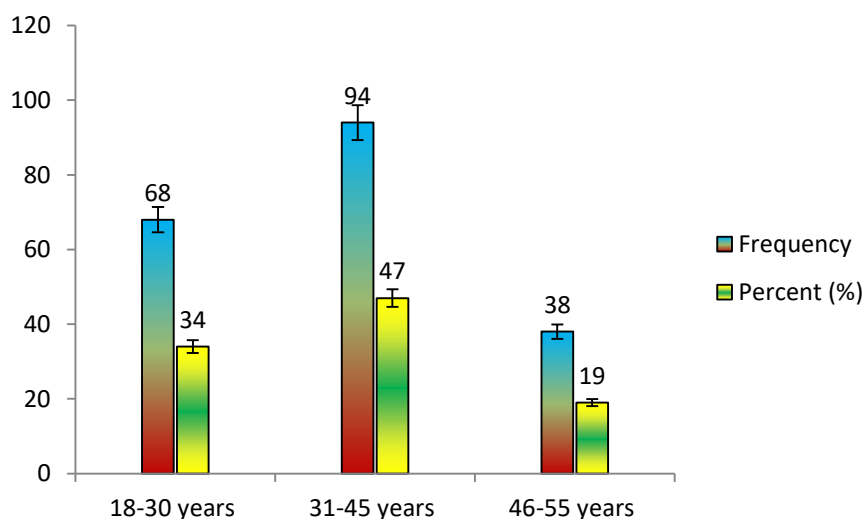


Figure 2: Exhibiting the of Age Groups of Patients

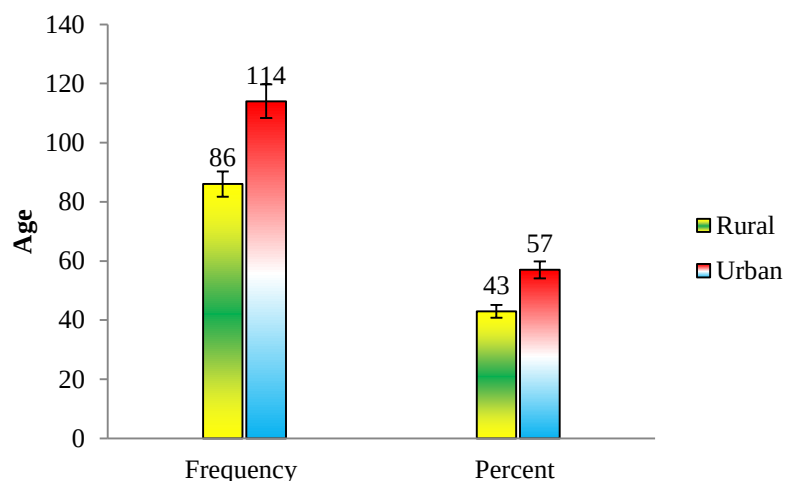


Figure 3: Exhibiting Frequency Distribution of Residence Profile of Patients

Table 1: Exhibiting Educational Eminence of Patients (N=200)

Educational status	Frequency	Percent
Illiterate	15	7.5
Middle	56	28.0
Matric	74	37.0
Intermediate or above	55	27.5
Total	200	100.0
<i>F & P-value</i>	11.981; P<0.071	

Table 2: Exhibiting Socio-Economic Eminence of Patients (N=200)

Socio-economic status	Frequency	Percent
Poor	43	21.5
Middle	64	32.0
Upper middle	69	34.5
High	24	12.0
Total	200	100.0
<i>F & P-value</i>	17.387; P<0.0176	

Table 3: Exhibiting Frequency Distribution of Knee Joint Involved

Knee joint involved	Frequency	Percent (%)
Right	93	46.5
Left	107	53.5
Total	200	100
<i>F & P-value</i>	13.564; P<0.0114	

Table 4: Exhibiting Frequency Distribution of Outcome

Outcome	Frequency	Percent (%)
Excellent	92	46.0
Good	84	42.0
Fair	18	9.0
Poor	6	3.0
Total	200	100.0
<i>F & P-value</i>	19.227; P<0.019	

DISCUSSION

Research on ACL reconstruction by grafting method is not surprising, because numerous researchers had focused this issue ⁽²⁰⁾. The developed countries also face this problem at

exponential rate than summit, hence gained convergent focus by orthopedic surgeon globally ⁽¹¹⁾. The primary objective of the current study was to introduce Arthroscopic technique of ACL reconstruction for stabilizing

the knee joint with rapid recovery and the factors influencing postsurgical outcomes⁽¹⁴⁾. However, it was observed that graft selection is major factor in ACL reconstruction; encounters graft rupture and reoperation rate significantly⁽¹⁷⁾. Moreover, considering the graft types, autografts are more frequently utilized than allografts or synthetic grafts in ACL restoration, which is typically carried out as a single-bundle treatment⁽¹⁹⁾. The three most common autograft, consisting of the hamstring tendon (semitendinosus-gracilis), bone-quadriceps tendon (BQT), and the BPTB graft⁽¹⁶⁾. Hamstring tendon graft is regarded as 'gold standard' in field of ACL reconstruction because of its high stiffness and strength, uniform graft size, and simplicity of harvesting⁽²¹⁾. In the present investigation hamstring tendon autograft method was adopted. Similar method was also adopted by Rovere et al²¹. However, Bone-quadriceps tendon graft interlinked with patellofemoral arthritis, anterior knee soreness, loss of terminal extension, patellar tendon shortening, and extensor weakness are among the donor-site morbidities⁽¹⁸⁾. Much of the studies reported that hamstring tendon graft approach has significant outcomes in clinical investigations following ACL reconstruction employing hamstring autograft⁽²³⁾. The arthroscopic average score of 90.1 points was between the ranges given for the hamstring tendon graft (80–94) and the patellar tendon graft (91–93). For the patellar tendon graft, comparable studies reported 48–97%, and for the hamstring tendon graft, 50–97%. As a result, this surgical technique could reliably accomplish the main goals of the ACL treatment⁽²⁴⁾. When employing the QTPB autograft, two particular problems that raise concerns include patella fractures and quadriceps tendon rips⁽¹⁸⁾. However, neither this research nor the earlier publications with short-term follow-up had these particular issues. Therefore, the clinical significance of these possible consequences is debatable. When a patient has a prolonged knee extension deficiency and undergoes surgical revision with arthroscopic debridement of the hypertrophied tissue and, if required, additional notch graft, MRI diagnosis is crucial⁽¹⁴⁾. Owing the methodological approaches, in the present investigation MRI diagnosis was compulsory for patient inclusion variable^(14, 5). Every patient who took part in the trial was able to extend their knees fully, and at the last follow-up, there were no detrimental impacts on knee function. This validates the prior clinical experience that, once

the mechanical barrier is eliminated, there is often no recurrence. On long-term follow-up, the majority of grafts do not appear to differ noticeably. The intra-articular ligamentization process that all grafts go through during reconstruction is most likely the cause of this⁽⁷⁾. The results demonstrated that, among the 200 patients included in this trial, 92 (46.0%) achieved excellent functional outcomes, 84 (42.0%) achieved good outcomes, 18 (9.0%) achieved fair outcomes, and 6 (3.0%) had poor outcomes. These findings were comparable to those reported by Paudel et al.¹¹, who found a mean Lysholm score of 93.2 ± 7.8 (range: 66–100) among patients undergoing ACL reconstruction. Twenty-eight patients (70%) were classified as excellent (91–100 points), nine (23%) as good (84–90 points), and three (7%) as fair (65–83 points), while no patient received a poor rating (<65 points). Similar findings were reported by Zhao et al.²³, who demonstrated that after a mean follow-up of 7.5 years, 83% of patients achieved very good outcomes, 12% had fair results, and 5% experienced treatment failure. Furthermore, Jia et al.²⁴ also reported comparable outcomes. 10.3% of patients experienced clinical failure after more than ten years of clinical follow-up⁽²³⁾. However, keeping the follow up history above cited literature in term of functional outcomes of ACL reconstruction for knee stability, Arthroscopic hamstring tendon autograft's ligamentization procedure is imperative approach in the field orthopedic surgery⁽²¹⁾. It was observed that numerous factors handicapped the functional out comes of ACL reconstruction. Graft selection, female genders, particularly above 50 years old, malnutrition, prolong hormonal disorders, high grade arthritis and diabetic history are the major factors effects on functional out comes of knee stability via ACL reconstruction⁽¹⁰⁾.

CONCLUSION

Arthroscopic ACL reconstruction by a hamstring tendon graft reflects promising functional outcomes and knee stability. This approach exhibits a reliable and effective option for ACL reconstruction.

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