

# Functional outcome of anterior cruciate ligament reconstruction in Nepalese females: A prospective observational study

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## ABSTRACT

**Introduction:** The increased risk of Anterior Cruciate Ligament (ACL) injury in the female population is multifactorial. Arthroscopic ACL reconstruction using hamstring autograft is an established and widely practiced surgery for the ACL-injured knee. The purpose of this study was to evaluate the functional outcome of anatomic single-bundle anterior cruciate ligament reconstruction using hamstring and peroneus longus autograft in Nepalese female patients.

**Methods:** This was a prospective observational study of 35 female patients with ACL injuries who underwent arthroscopic ACL reconstruction using hamstring and peroneus longus autografts, as per the surgeon's convenience, at the National Trauma Center, NAMS, from June 2024 to May 2025. Functional outcomes were assessed using the Tegner Lysholm score.

**Results:** The Mean age of the patient was 37.9 years. The most common mode of injury was a fall injury. A hamstring graft was used in 25.7% of patients, and the graft size was 8 mm in all cases. The peroneus longus graft was used in 74.28% of cases, and the size of the graft ranged from 8 to 9 mm, with a mean size of 8.33mm. The mean preoperative Tegner Lysholm score was  $60.76 \pm 1.23$ , and the postoperative score at 6 months was  $91 \pm 2.43$  ( $p=0.0001$ ). Fourteen (40%) patients had an excellent outcome, and 21 (60%) had a good result.

**Conclusion:** Arthroscopic anatomic anterior cruciate ligament reconstruction using hamstring autograft and peroneus longus is an effective method for ACL reconstruction in female patients with ACL injury and gives an excellent to good functional outcome.

**Keywords:** Anterior Cruciate Ligament, hamstring graft, peroneus longus graft, Tegner Lysholm Score

## INTRODUCTION

Globally, most of the literature on ACL reconstruction has focused predominantly on male populations, primarily due to higher rates of sports participation. However, with the increasing involvement of females in sporting activities over recent decades, numerous articles have been published on the outcomes of anterior cruciate ligament reconstruction (ACLR) in females as well. It is also important to note that there is an increased risk of ACL injury in the female population as well [1]. Most of the available studies on functional outcome are from the Western world. Although our patients are not from a sporting background, they come from rural settings where their daily activities are no less demanding than sporting activities.

Arthroscopically assisted ACL reconstruction using a hamstring graft is the favored technique in patients presenting with knee instability resulting from ACL rupture[2]. There is an increased tendency to use the

peroneus longus graft in females, especially in the Indian subcontinent, though the long-term results are still awaited.

The purpose of this study was to evaluate the functional outcome of arthroscopic ACL reconstruction in Nepalese females. Understanding the effectiveness of ACL reconstruction in this subgroup is crucial to strengthen the gap between the Western female population and the Nepalese population by citing failure rates or functional deficits, especially in the case of rural Nepalese female populations.

## METHODS

It was a prospective observational study conducted at National Trauma Center, Bir Hospital, Kathmandu from June 2024 to May 2025, after approval from the Institutional Review Board of NAMS (Ref 1401/80/81).

All female patients aged 18 years or older and  $\leq 50$  years, regardless of their activity level, with a symptomatic ACL injury confirmed by MRI, were included in the study after providing informed consent. Patients with multiligament injuries, those with comorbidities, and those failing to comply with regular follow-up were excluded from the study.

Detailed history and examination findings were noted. After spinal anaesthesia, the limb was assessed for the Lachman and Pivot shift test. Diagnostic arthroscopy was performed through standard portals, and arthroscopic findings were noted. The graft was harvested from the ipsilateral limb and prepared on the ACL graft master. Femoral insertion of ACL was identified posterior to the median ridge and cleared with a radiofrequency probe. An accessory anteromedial portal was made, and a beathpin was inserted under the guidance of the femoral offset aimer, hooked at the posterior end of the lateral femoral condyle, with the knee flexed at 120 degrees. Beathpin was over-drilled with a 4 mm cannulated drill bit, and the depth was measured. The femoral tunnel

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was drilled with an endofemoral drill bit equal to the size of the graft.

Then the knee was kept at 90-degree flexion, and the tibial tunnel was made with the help of the ACL tibial elbow aimer placed just anterior to the posterior border of the anterior horn of the lateral meniscus. The graft was looped through an appropriately sized endobutton and inserted through the tibial tunnel. Fixation was done in the femoral tunnel by an end button, graft tensioning was done, and the graft was fixed in the tibia by a bioscrew with the knee flexed at 15 degrees of flexion.

The ACLR rehabilitation protocol was followed with application of a long knee immobilizer immediately after surgery and discontinued after 5 weeks. Isometric exercises of muscles around the knee and ROM exercises starting from the 2nd postoperative day, with a delay in flexion of more than 90 degrees for 5 weeks in case of a simultaneous meniscus repair procedure. Full weight-bearing is delayed until the 5th week.

Stitch removal was done at 2 weeks. Patient was followed up at 6 weeks, 3 months, and 6 months. The Tegner Lysholm Score was used for functional assessment at 6 months. The Lysholm Knee Score is an 8-item patient-reported questionnaire that assesses symptoms such as pain, swelling, and instability, as well as functional activities like stair climbing and squatting. A higher score (0-100) indicates better knee function. Outcome is graded as Excellent if the total score is between 95-100, Good if 84-94, Fair if 65-83, and Poor if <64[3].

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 11.5 software package.

## RESULTS

A total of 36 female patients underwent ACL reconstruction during this study period. A patient was lost to follow-up, and 35 were included. The age of patients ranged from 18 years to 50 years, with a mean age of 37.9 years. Mode of injury was fall injury in 18 (51.4 %), Road traffic accident in 10 (28.5 %), and Sports injury in 7 (20.1 %). Mean duration from injury to surgery ranged from 1 to 24 months, with a mean duration of 5.7 months. Twenty-one patients (60 %) had associated meniscal injury, of which 1 (2.8%) had a medial meniscus root tear and 2 (5.7 %) had a ramp tear. Out of 21 patients with meniscal tears, 14 (66.6%) underwent meniscal repair, and 7 (33.3%) underwent partial meniscectomy. A total of 5 (14.2 %) had an associated chondral lesion. Hamstring graft was used in 9 (25.7%), and the size of the graft is 8 mm in all patients. The peroneus longus graft was used in 26 cases (74.28%) and the size of the graft ranged from 8 to 9 mm with a mean size of 8.33mm. (Table 1)

**Table 1: Baseline characteristics of the patient**

Variable	N (%)
<b>Age group</b>	
15-25	5(14.28)
26-35	7(20.00)
36-45	15(42.85)
46-55	8(22.87)
<b>Associated intra-articular injury</b>	
ACL alone	9(25.80)
ACL+meniscus	21(60.00)
ACL+ chondral injury	5(14.20)

The mean preoperative Tegner Lysholm score was  $60.76 \pm 1.23$ , and the postoperative Tegner Lysholm score at 6 months was  $91 \pm 2.43$ . (Table: 2)

**Table 2: Association of Preoperative Tegner Lysholm score and Post-operative Tegner Lysholm score**

Variable	Preoperative Tegner Lysholm score	Postoperative Tegner Lysholm score	P-value
Tegner Lysholm score	$60.76 \pm 1.23$	$91 \pm 2.43$	0.0001

Fourteen patients (40%) had an excellent outcome, and 21 (60%) had a

good outcome.

**Table 3: Pre-operative and postoperative Tegner Lysholm Score grading**

Score grading	Preoperative Score		Postoperative score	
	Number	Percentage	Number	Percentage
Poor (<65)	28	80%	0	0%
Fair (65-83)	7	20%	0	0%
Good (84-90)	0	0%	21	60%
Excellent (>90)	0	0%	14	40%
Total	35	100%	35	100%

## DISCUSSION

A large amount of research has been performed in the female population to evaluate whether females have a similar increased risk of re-ruptures and inferior outcomes following ACL reconstruction [4]. Some studies reported inferior outcomes with increased anterior-posterior laxity, increased rates of re-ruptures, and decreased rates of return to sports when females are reconstructed with hamstring grafts as compared with patellar tendon bone grafts [5].

The average age of patients presenting in our study with ACL injury is 37.9 years, which is quite an older age group as compared to the survey by Ott et al, where most of the patients presenting with ACL injury belong to the age group of 12-18years [6]. The disparity in age group may be due to the involvement of athletes by Ott et. al[6]. Our study age group differs from that of Figuera et al., where the average age of patients is 23.3 years. The reason is the same as the involvement of athletes[7].

The majority of our patients (51.4%) had a history of fall injury while working as main cause of ACL injury, whereas the study by Ott.et .al, Noojin et al, and Salmon et al showed that sporting activity is the leading cause of ACL injury[6,8,9].

Peroneus longus graft was used in 74.28% of our patients. In contrast to our study, Western study by Ott.et .al, Noojin et al, Salmon et al, Tan et al, and Figuera et al all used BPTB and Hamstring graft as a prime graft source [6-9]. Even in the context of Nepal, studies by Thapa et al and Pokharel et.al. used the Hamstring graft as the prime graft[10,11] However, the graft harvested by using a hamstring graft by Pokharel et al is  $7 \pm 0.5$ mm, which is smaller in size as compared to our study, which is 8.33mm[11]. The inadequacy of graft size while using hamstring in Nepalese female patient with short stature is a matter of discussion and even a topic of further research in our context.

Mean preoperative Tegner Lysolm score was  $60.76 \pm 1.23$ , and postoperative score at 6 months was  $91 \pm 2.43$  ( $p=0.001$ ). 14 patients (40%) had an excellent outcome and 21 (60%) had a good outcome. This finding was comparable with study done by Pokharel et al and Thapa et al. [10,11]. However, these authors included both male and female patients in their study.

ACL reconstruction failure is shown in study by Ott.et .al, Noojin et al, Salmon et al, Tan et al, Figuera et al in their study [6,8,9]. This may be due to longer follow up of the patient in their study and we have shorter duration of follow up. Nevertheless the Tegner Lysolm score calculated by these authors were comparable to our study.

Short duration of follow up, with surgeon based graft selection resulting in lack of randomization, small sample size are our limitation. While this study encourages prospective design and focuses on the understudied female population, we recommend long-term follow-up and larger multicenter studies.

## CONCLUSION

One hundred percent of patients achieved excellent to good functional outcome following arthroscopic anatomic anterior cruciate ligament

reconstruction with hamstring autograft and peroneus longus, and it is an effective method for ACL reconstruction in the female population.

## DECLARATIONS

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### Author Contributions

SB did the Concept of research, Design of research, Literature search, Data collection, Data analysis, Data Interpretation, BB drafted the manuscript, and all authors reviewed the manuscript and approved the final version of the manuscript. All authors agreed to be accountable for all aspects of the research work.

### Ethical Approval

IRB-NAMS approved this research with the reference number of 1401/080/81.

### Consent/Assent

Informed written consent was obtained from all participants prior to data collection.

### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### Conflicts of Interest

None

### Source of Funding

None

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