

Outcome of Autologous Peroneus Longus Graft in Anterior Cruciate Ligament Reconstruction

Hasan Masud MD^{1*}, Amjad Ali MD², Apel Chandra Saha³, Syed E. Shaude⁴

Abstract

Background: The ACL is essential for maintaining knee stability and optimal performance in competitive sports. To restore knee stability after a rupture, ACL reconstruction (ACLR) is the most commonly performed surgical procedure. Objectives: The objective of this study was to determine the outcome of the autologous peroneus longus graft in ACL reconstruction.

Methods: This prospective study was carried out in the Department of Orthopedic Surgery, Bangladesh Specialized Hospital, Sir Salimullah Medical College & Hospital, and City Hospital, Dhaka follow up period July 2017 to April 2022. A total of 120 male and female patients who were presented with symptomatic single leg ACL insufficiency and clinically diagnosed as ACL injury attended at OPD. The patients were evaluated using KT arthro-meter for residual laxity. Statistical analyses of the results were obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-27).

Results: In this study, the highest number of patients was 40(33.33%) were observed in 20-25 years. The lowest, 4(3.33%) were observed in 4th and 5th decade. The mean age was 25.13 ± 5.90 years with range from 16 to 45 years. The patients were male 72(60%) and 48(40%). Here, the causes of injury; sports activity 100(83.33%), RTA 16(13.33%) and others 4(3.33%) cases. Thickness of the graft was 7.5-8 mm in 35% of cases. All the patients were evaluated at the end of 4 weeks, 6 months and one year, 2nd and 3rd Year.

Conclusion: PLT has a greater ultimate tensile load, more thickness and length, less graft harvesting time, and almost no donor site morbidity and has a good functional outcome of the knee, making it an effective and safe autograft option.

Keywords: Autologous Peroneus Longus; Anterior cruciate ligament reconstruction (ACLR); Graft

Introduction

In addition to its basic instability, the knee joint mostly relies on soft tissue for support. The knee's robust capsule, intra- and extra-articular ligaments, and stabilizing muscles enable it to perform well as a thrust, balance, and support mechanism [1]. The primary knee stabilizer during key activity is the ACL, an intracapsular extra-synovial structure with a synovial envelope [2]. It is essential for rotational knee stability and anterior-posterior stability when the knee joint moves in several planes. Due to its anatomical makeup, exposure to outside forces, and functional demands, the anterior cruciate

Affiliation:

¹Professor, Department of Orthopaedic Surgery Bangladesh Specialized Hospital Limited (BSH), Dhaka, Bangladesh

²Ex-Consultant, Department of Orthopaedic Surgery National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh

³Assistant professor, Department of Orthopaedic Surgery, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh

⁴Chief Coordinator, Department of Research and Development, International Network of Doctors Journal, Dhaka, Bangladesh

*Corresponding Author:

Hasan Masud, Professor, Department of Orthopaedic Surgery, Bangladesh Specialized Hospital Limited (BSH), Dhaka, Bangladesh.

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ligament is the knee ligament that sustains injuries the most commonly [3].

Chronic ACL rupture may be isolated or combined (anterolateral or anteromedial instability). True isolated injury is rare, because associated meniscal and collateral ligament injuries are frequently caused by the original trauma or by subsequent episode of giving way [4]. Although some patient functions well with an isolated ACL-deficient knee, most patients experience pain and recurrent episodes of instability in combined injuries. Thus, ACL injuries are associated with long term clinical sequelae that include meniscal tears, chondral lesions and an increased risk of early onset post-traumatic osteoarthritis (OA) [5]. Conservative treatment of complete ACL tear in anterolateral or anteromedial instability often results in repeated symptoms of instability and early degenerative changes of the knee joint. Some people can compensate for the injured ligament with Conservative treatment but associated injuries to the knee contribute to disappointing result of conservative treatment [6].

Methodology

This prospective study was carried out in the Department of Orthopedic Surgery, Bangladesh Specialized Hospital, Sir Salimullah Medical College & Hospital and City Hospital, Dhaka follow up period July 2017 to April 2022. About 120 male and female patients who were presented with unilateral knee complaints and clinically diagnosed as ACL injury attended at OPD. After taking consent and matching eligibility criteria, data were collected from patients on variables of interest using the predesigned structured questionnaire by interview, observation. Statistical analyses of the results were be obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-26). In the first 2 weeks, knee flexion was started up to 90° along with quadriceps and hamstrings strengthening exercises, ankle pump exercise, active straight leg raising with knee brace with complete extension. In the following 3–6 weeks, full range of knee flexion. A total 120 patients were enrolled in the study and followup for 4 weeks, 6 months and one year, 2nd and 3rd Year.

Inclusion Criteria:

Symptomatic single leg ACL insufficiency, Injury occurring more than one month before the reconstruction, no previous reconstruction of ACL, no associated insufficiency of PCL and instability during activities of daily living.

Exclusion Criteria:

Associated other ligament injuries like medial collateral ligament, lateral collateral ligament and bony injuries like fractures of ipsi-lateral femur, tibia, patella treated either surgically or non-surgically, acute anterior cruciate ligament tear, any evidence of osteoarthritic changes of the affected knee or ankle.

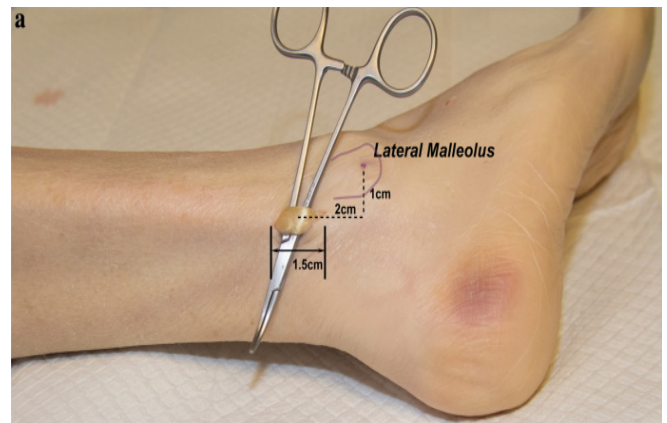


Figure 1: Low to moderate risk of nerve damage during peroneus longus tendon autograft harvest. [Origin by: He J et al. 2022].



Figure 2: Making incision for peroneus longus tendon harvest.

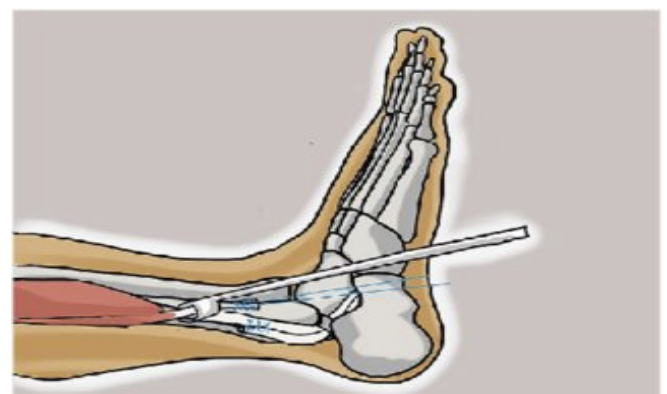


Figure 3: Tenotomy of peroneus longus tendon with tendon stripper. [Origin by: Rhatomy S et al. 2020]

Surgical Technique:

PL and peroneus brevis tendon (PB) were exposed taking care not to injure the sural nerve. PL and PB were levered out of the skin window. Then both peroneus tendons were sutured distally. After exposing the distal PL, a stripper was used to harvest the tendon to about 4–5 cm below the fibular head to avoid peroneal nerve injury (Figure 1-4).

The point where tendon stripper was halted while harvesting the graft was loss of resistance while simultaneously pulling force on distal end of stump and advancing the tendon stripper forward. The point of loss of resistance was marked on skin and was observed that it was around 4–5 cm on average from the fibula head in the patients (Figure 5).

The tendon was doubled up longitudinally through the middle to obtain a 2-strand autograft, and its ends were whip-stitched with a No. 2 polyester suture (Figure 6 and 7).



Figure 4: Exposure of peroneus longus tendon.



Figure 5: Retrieval of peroneus longus tendon after tenotomy.



Figure 6: Peroneus longus graft preparation.

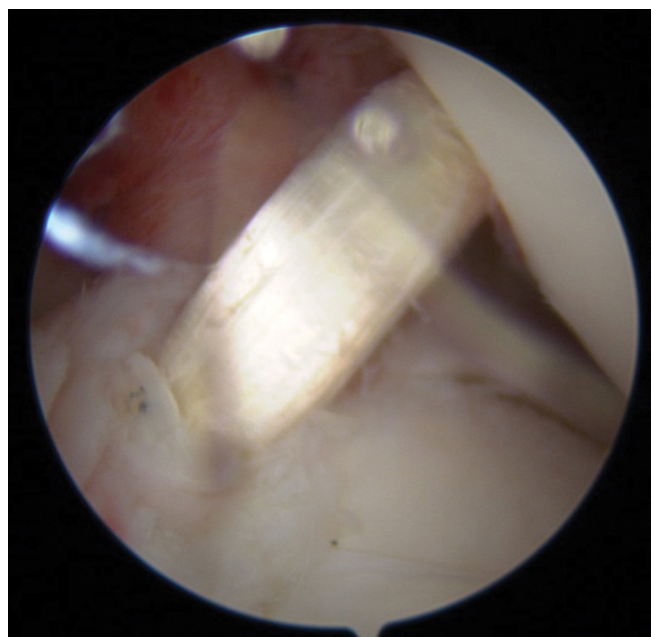


Figure 7: After graft placement in femoral and tibial tunnel.

Table 1: Distribution of the study population by age, sex and causes of injury.

Variables	n	%
Distribution of age		
16-20	28	23.33
21-25	40	33.33
26-30	32	26.67
31-35	12	10
36-40	4	3.33
41-45	4	3.33
Sex		
Male	72	60
Female	48	40
Causes of Injury		
RTA	16	13.33
Sports	100	83.33
Trauma	4	3.33
Total	120	100

After the preparation of the femoral and tibial tunnels, the tendon was passed and graft was secured at anatomical sites of femur and tibia using Endobutton /Bioscrew. Ankle eversion strengthening exercises were advised to patients after 3 weeks. Statistical analyses of the results were obtained by using window-based Microsoft Excel and Statistical Packages for Social Sciences (SPSS-26).

Table 2: Distribution according to thickness of the graft.

Thickness of the graft	n	%
7.5-8mm	42	35
8.1-8.5mm	18	15
8.6-9mm	36	30
>9mm	24	20
Total	120(100)	

Table 3: IKDC knee scoring scale.

	Preop	%	6 months	%	12 months	%
Normal	0	0	40	33.3	56	46.7
Nearly normal	0	0	32	26.7	40	33.3
Abnormal	48	40	32	26.7	24	20
Severely Abnormal	72	60	16	13.3	0	0

Table 4: Lysholm knee scoring scale.

Grade	Pre-operative n(%)	6months n(%)	1 year n(%)
Excellent	0(0)	48(40)	56(46.7)
Good	0(0)	40(33.3)	40(33.3)
Fair	32(26.7)	32(26.7)	24(20)
Poor	88(73.3)	0(0)	0(0)
Total	120(100)	120(100)	120(100)

Table 5: AOFAS analysis.

AOFAS	Pre-op	6 months	12 months
Mean ± SD	100.00±00	92.08±4.78	94.70±3.45

Results

Table1 shows distribution of patients by age. The highest number of patients was 40(33.33%) were observed in 20-25 years. The lowest, 4 (3.33%) were observed in 4th and 5th decade. The mean age was 25.13±5.90 years with range from 16 to 45 years. The causes of injury was highest in sports in 100(83.33) patients.

Preoperative and postoperative evaluation

The Lachman test, Pivot shift test, Lysholm knee scoring scale, and international knee documentation committee (IKDC) scoring scale were used for the objective and clinical examination of the knee. The American Orthopedic Foot and Ankle Society Score (AOFAS) was used for both clinical and subjective evaluation of the ankle, and the Medical Research Council (MRC) Scale was used to grade the peroneus longus muscle power (Eversion & Plantar flexion). Scores from preoperative and postoperative clinical and subjective evaluations at six and twelve months were compared.

Discussion

Several grafts are used in the restoration of the anterior cruciate ligament (ACL). Success rates for using autografts, synthetic grafts, and allografts have varied. In terms of autografts with broad acceptance, the hamstring and bone patella tendon transplants are currently top choices. The tensile properties of these grafts are demonstrated to be superior to the natural femur-ACL-tibia complex (2160 N) with comparable stiffness (maximum loads of 2977 N for BPTB and 4140 N for quadrupled HT) [7]. Despite the fact that these grafts are frequently utilized, there are still debates on which graft is best due of certain obstacles. Reports of certain problems following HT autograft and BPTB harvesting have been made. The most popular BPTB autograft is linked to postoperative complaints of anterior knee pain and kneeling difficulty [8]. A BPTB autograft ACL has a higher incidence of osteoarthritis, according to a meta-analysis of research. When hamstring autograft was taken into account, there was an electromechanical delay and weakening in the knee flexors [10]. Harvesting HT could be detrimental to postoperative rehabilitation for ACL surgery because it shields the repaired ACL from the quadriceps' anterior drawer force [11]. Additionally, it might prevent vigorous knee flexion [12]. The tendon of the quadriceps, fascia lata, and peroneus longus are among the additional autografts. Peroneus longus tendon (PLT) autograft is utilized as a new advancement in the field of ACL reconstruction offers an alternative to the traditional autograft. The ultimate tensile strengths of doubled PLT, quadrupled HT, and native ACL were determined to be 4,268 ± 285, 4,090 ± 265, and 2,020 ± 264 N, respectively, in a recent work by Shi et al. [13] Because of its advantages, doubled PLT graft is a strong option for ACL reconstruction because its strength and mean thickness are almost identical to those of the native ACL [14]. For these factors, we performed ACL restoration on our patients using the peroneus longus tendon. The autograft of the peroneus longus tendon had a great functional result and negligible donor site morbidity.

Limitations of the Study

The present study was conducted in a very short period due to time constraints. The small sample size was also a limitation of the present study.

Conclusion

PLT has a greater ultimate tensile load, more thickness and length, less graft harvesting time, and almost no donor site morbidity and has a good functional outcome of the knee, making it an effective and safe autograft option. Furthermore, complications associated with hamstring graft like thigh hypotrophy, anterior kneeling pain, hypoaesthesia due to injury to infrapatellar branch of saphenous nerve can be prevented.

Recommendation

PL autograft can be a promising graft of choice in the reconstruction of the ACL and can be much more beneficial in simultaneous multi-ligament injury repair in the knee joint.

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