

ORIGINAL RESEARCH

Evaluation of functional outcome following arthroscopic anterior cruciate ligament reconstruction using Peroneus Longus graft

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ABSTRACT:

Introduction: An anterior cruciate ligament (ACL) is the most commonly injured ligament in sports persons. ACL reconstruction is a common ligament reconstruction to restore functional knee stability. we conducted the present study to evaluate the functional outcomes in arthroscopic anterior cruciate ligament (ACL) reconstruction using peroneus longus in persons presenting to PGIMS, Rohtak.

Material & method : A prospective Study of 27 patients of aged 15-45 years having MRI proven anterior cruciate ligament injury was conducted at Department of Orthopaedics, Pt. B.D. Sharma PGIMS, Rohtak (Haryana) from April, 2021 to May, 2022 after ethical clearance. Exclusion criteria included Patient refusal, Patients less than 15 years of age, Patients having any other pathological disease like osteoarthritis, Patients with any psychiatric disorder, Revision ACL Surgery and Multi ligament knee injury. Final outcome was assessed as per Tegner Activity Scale, Lysholm score, IKDC, subjective score, AOFAS Score. Follow-up done at 0 week, 3 week, 3 month and 6 month.

Result: The mean age at the time of surgery was 27.73 ± 7.06 years. Maximum number of patients were observed to be lying in the second decade of life as per this study. Male preponderance was found in the present study. The total Tegner score improved significantly from a mean and SD of 1.37 (0.85) at 0 week to 7.33 (1.06), the total Lysholm score improved significantly from a mean and SD of 33.70 (11.72) at 0 week to 88.70 (8.57) postoperatively, total IKDC improved significantly from a mean and SD of 29.27 (2.18) at 0 week to 42.23 (2.26) postoperatively and total AOFAS improved from a mean and SD of 18.70 (11.46) at 0 week to 121.33 (17.27) postoperatively. On pair wise comparison for individual scores using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months.

Keywords: ACL, Arthroscopy, Peroneus, Autograft

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Introduction :

Anterior cruciate ligament (ACL) is the most commonly injured ligament in sports persons which predisposes the knee to chronic instability, further meniscal and chondral damage and an impaired quality of life. ACL reconstruction is a common ligament reconstruction to restore functional knee stability. ACL reconstruction is performed using different grafts. Allografts, autografts and synthetic grafts have been used with variable success rates. The hamstring and patella bone tendon grafts are the forerunners among

the autografts with wide acceptability. The other autografts being quadriceps, patellar tendon, fascia lata etc¹.

Recently, the Peroneus Longus tendon (PL) has become a viable option of graft for knee ligament reconstruction. It can be used in its totality or only its anterior half. It has been widely implemented in orthopaedic procedures such as reconstruction of the medial patella femoral ligament, spring ligament and deltoid ligament. Peroneus Longus has synergistic function with good clinical outcome and minimal donor

site morbidity, but other studies did not concur due to donor site morbidity². Therefore, measurements of knee stability are one of the most important determinants of success following an ACL reconstruction. In view of the paucity of the literature on this subject, we conducted the present study to evaluate the functional outcomes in arthroscopic anterior cruciate ligament (ACL) reconstruction using peroneus longus in persons presenting to PGIMS, Rohtak.

Material & Method:

A prospective Study of 27 patients of aged 15-45 years having MRI proven anterior cruciate ligament injury was conducted at Department of Orthopaedics, Pt. B.D. Sharma PGIMS, Rohtak (Haryana) from April, 2021 to May, 2022 after ethical clearance. Exclusion criteria included Patient refusal, Patients less than 15 years of age, Patients having any other pathological disease like osteoarthritis, Patients with any psychiatric disorder, Revision ACL Surgery and Multi ligament knee injury. Final outcome was assessed as per Tegner Activity Scale, Lysholm score, IKDC, subjective score, AOFAS Score. Follow-up done at 0 week, 3 week, 3 month and 6 month.

Surgical technique: With prior informed consent, a preoperative anesthetic evaluation was done. All the surgeries were done after appropriate cardiological and medical evaluation and optimization. Patients were laid in supine position under spinal anaesthesia. Tourniquet was applied in the thigh and inflated without elevation and exsanguination. Operative site was cleaned and draped. Standard anterolateral and anteromedial portal was made. Diagnostic arthroscopy for ACL rupture was performed and followed by peroneus longus tendon harvesting. Peroneus tendon harvesting was done in ipsilateral leg. The incision location was marked at 2-3

cm above and 1 cm behind the lateral malleolus. The incision was made through the skin, subcutaneous tissue, and superficial fascia. Peroneus longus and peroneus brevis tendon was identified. The location of tendon division was marked at 2-3 cm above the level of lateral malleolus. Distal part of the peroneus longus tendon was sutured with end-to-side suture to Peroneus brevis. Peroneus longus tendon was stripped proximally using tendon stripper until 4-5 cm below the fibular head to avoid peroneal nerve injury. The intercondylar notch was cleared from fibrous tissue to facilitate good visualization during preparation of the tunnels. ACL fibers were preserved as a reference for graft insertion. The femoral tunnel and the tibial tunnel was drilled independently using anteromedial portal technique. Graft tendon was implanted and tensioned using graft tensioner to prevent graft loosening in the future. Graft tendon fixation proceeded using graft fixation in femoral side with closed loop endobutton and using graft fixation in tibial side with bio absorbable screw.

Data analysis : Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0

Observations :

Demography-

In this study, age of patients varied from 15 years to 45 years. The Average duration of injury (weeks) was 2.76± 5.55 weeks. The mean age at the time of surgery was 27.73 ± 7.06. Maximum number of patients were observed to be lying in the second decade of life as per this study. Approximately, 30% patients belonged to 31-40 years, 50% patients belonged to 21-30 years and 20% patients belonged to 11-20 years.

Table I: Showing age distribution and Mean age

Sr. No	Age group (in years)	Number of patients	Percentage
1	11-20	6	20
2	21-30	15	50
3	31-40	9	30
	Total	30	100
Mean ± SD: 27.73 ± 7.06		Median (IQR) : 29 (21.75-32)	

Male preponderance was found in the present study. Among 30 patients, 16 (53.3%) of the patients were males and 14 (46.7%) were females and males. In this study, it was observed that right side (also the dominant side) was involved in 20 (66.7%) patients and left side (non dominant) in 10 (33.3%) .

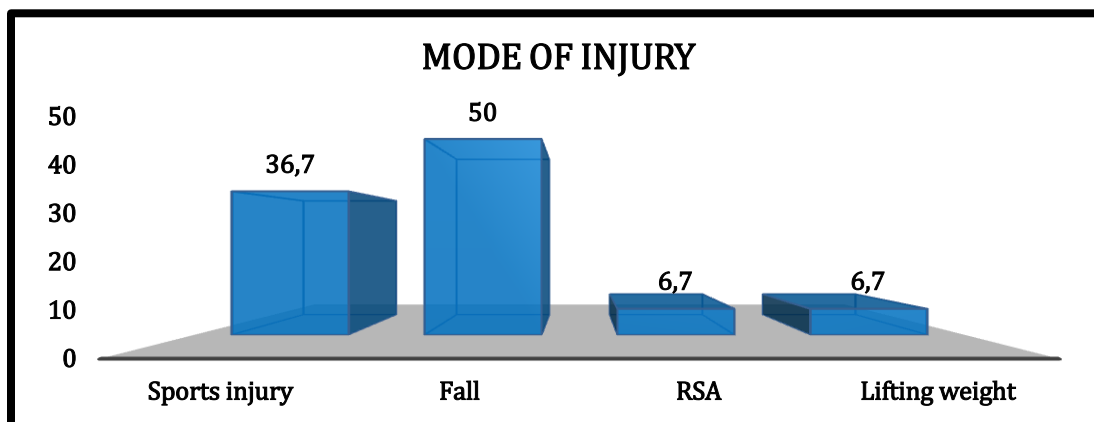
Mode of Injury-

Table and Graph I shows the distribution of study population according to mode of injury. Most common cause of injury was observed to be history of fall accounting for 50% (15 patients) followed by sports injury 36.7% (11 patients); RSA and lifting weight 6.7% each (2 patients in each group).

Table II: Showing mode of injury

Sr. No	Mode of injury	No of patients	Percentage
1	Fall	15	50
2	Sports injury	11	36.7
3	RSA	2	6.7
4	Lifting weight	2	6.7
5	Total	30	100

RSA: Road side accident



Graph I: Showing mode of injury

Table III shows the anthropometric parameters of study population. On the anthropometric examination, we observed the mean height of study population was 16 ± 6.08 cm, the weight to be 75.49 ± 9.16 kg and mean BMI to be 27.47 ± 3.56 kg/m².

Table III Showing anthropometric measures

Height (in cms)	Mean \pm SD: 165.93 ± 6.08	Median (IQR) : 166 (161.0-171)
Weight (in kg)	Mean \pm SD: 75.49 ± 9.16	Median (IQR) : 73.30 (69.11-82.05)
BMI (kg/m²)	Mean \pm SD: 27.47 ± 3.56	Median (IQR) : 27.48 (24.49-29.20)

Clinical Test: Clinical diagnosis made by Lachman and ADT. 17 show grade 2 and 13 patients show grade 3 positive Lachman test with mushy endpoint. 20 patients show grade 2 and 10 patients show grade 3 ADT Positive as shown in table and graph 6.

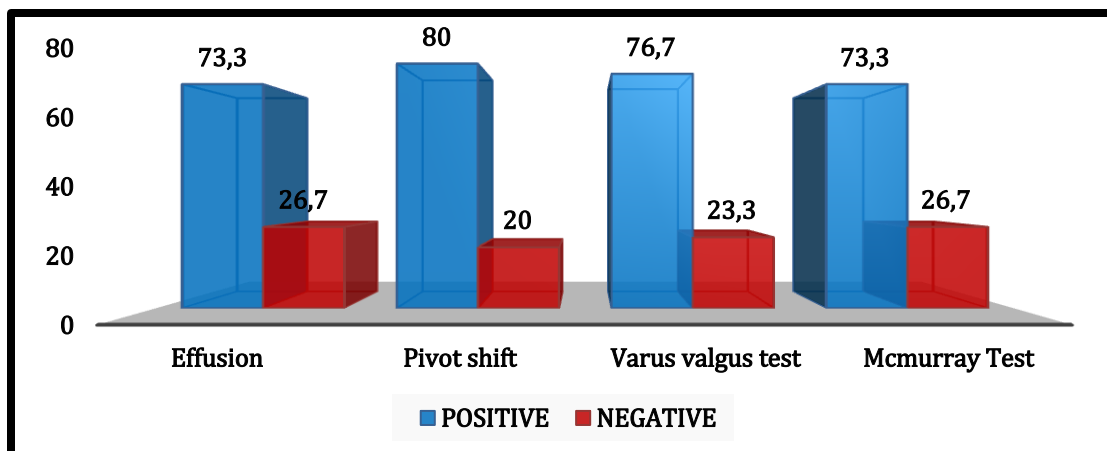
Table IV: Clinical Test

	Grade 2		Grade 3	
	No. of patients	Percentage	No. of patients	Percentage
Lachman Test	17	56.7	13	43.3
ADT	20	66.67	10	33.3

In this study 22 patients show joint effusion .pivot shift, varus valgus test and mcmurray test also performed which are shown in table and graph V.

Table V: Clinical finding

	Positive		Negative	
	No. of patients	Percentage	No. of patients	Percentage
Effusion	22	73.3	8	26.7
Pivot shift	24	80	6	20
Varus valgus test	23	76.7	7	23.3
Mcmurray Test	22	73.3	8	26.7

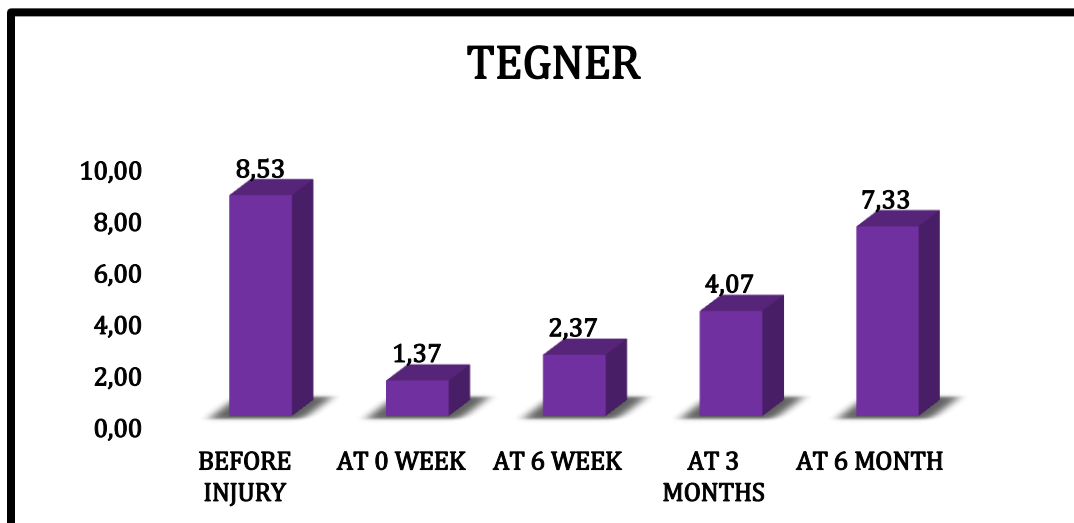


Graph II: Show clinical finding

TEGNER SCORE : The total tegner score improved from a mean and SD of 1.37 (0.85) AT 0 WEEK to 7.33 (1.06) postoperatively with the p-value 0.001, as shown in Table VI.

Table VI: TEGNER Score (Intra Group)

Sr. No	Parameters	Mean ± SD
1	Before Injury	8.53 ± 1.63
2	0 Week	1.37 ± 0.85
3	6 Week	2.37 ± 0.71
4	3 Months	4.07 ± 0.58
6	6 Month	7.33 ± 1.06
	P Value	0.001*, significant



Graph III: Showing TEGNER score at various interval.

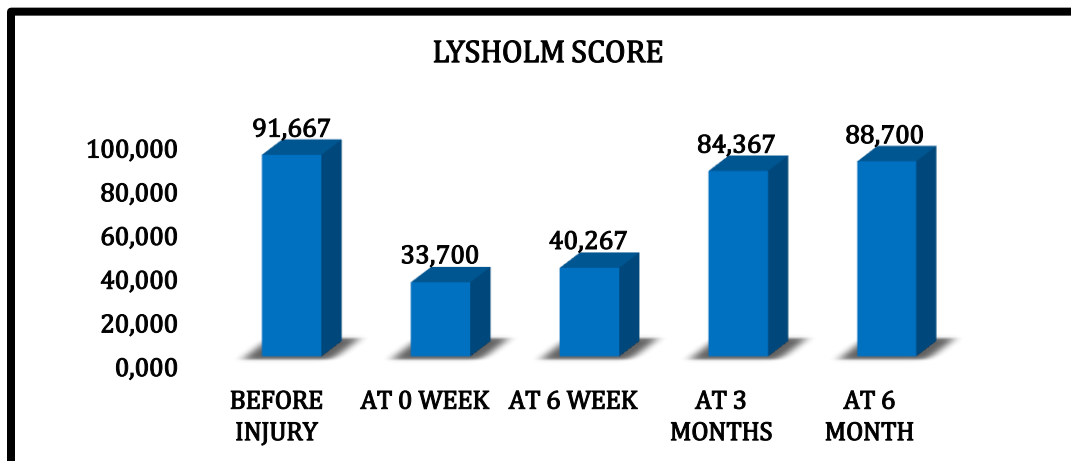
Table VII: PAIR WISE COMPARISON OF TEGNER between various intervals of time

	Before injury	At 0 week	At 3 week	At 3 months	At 6 month
Before Injury	-	0.001*, sig	0.001*, sig	0.001*, sig	0.001*, sig
At 0 Week	-	-	0.001*, sig	0.001*, sig	0.001*, sig
At 3 Week	-	-	-	0.001*, sig	0.001*, sig
At 3 Months	-	-	-	-	0.001*, sig
At 6 Month	-	-	-	-	-

LYSHOLM SCORE: The total Lysholm improved from a mean and SD of 33.70 (11.72) at 0 week to 88.70 (8.57) postoperatively with the p-value 0.00, as shown in Table VIII.

Table VIII: LYSHOLM Score (Intra Group)

Sr. No	Parameters	Mean ± SD
1	Before Injury	91.667 ± 12.25
2	At 0 Week	33.700 ± 11.72
3	At 6 Week	40.267 ± 17.59
4	At 3 Months	84.367 ± 13.67
6	At 6 Month	88.700 ± 8.57
	P Value	0.001*, sig



Graph IV: Bar Diagram showing Lysholm score

Table IX: PAIR WISE COMPARISON OF LYSHOLM SCORE between various intervals of time

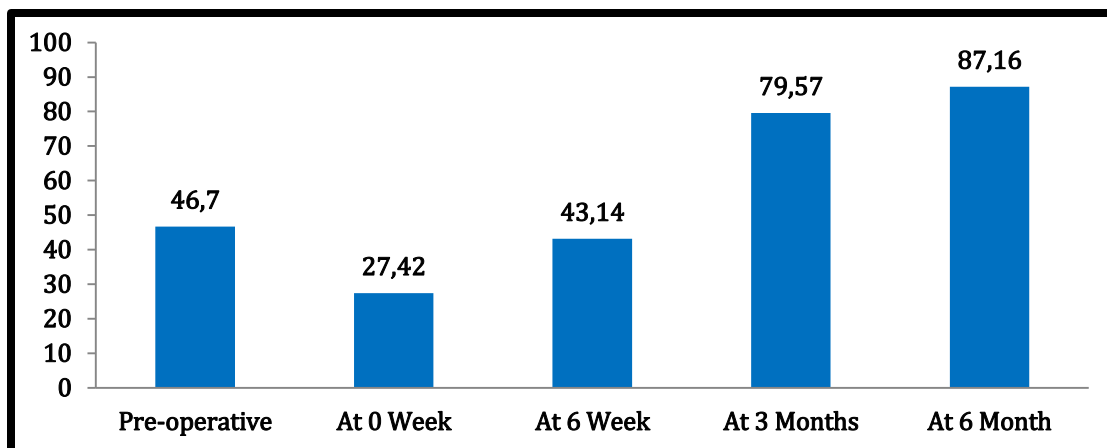
	Before injury	At 0 week	At 3 week	At 3 months	At 6 month
Before Injury	-	0.001*, sig	0.001*, sig	0.001*, sig	0.019*, sig
At 0 week	-	-	0.033*, sig	0.001*, sig	0.001*, sig
At 3 week	-	-	-	0.001*, sig	0.001*, sig
At 3 months	-	-	-	-	0.283,ns
At 6 month	-	-	-	-	-

Ns: Non significant, sig: significant

IKDC SCORE: The total IKDC improved from a mean and SD of 27.42 (5.12) At 0 week to 87.16 (5.41) postoperatively with the p-value 0.001, as shown in Table X.

Table X: IKDC Score (Intra Group)

Sr. No	Parameters	Mean ± SD
1	Pre-operative	46.70 ± 3.48
2	At 0 Week	27.42 ± 5.12
3	At 6 Week	43.14 ± 5.36
4	At 3 Months	79.57 ± 4.8
6	At 6 Month	87.16 ± 5.41
	P Value	0.001*, sig



Graph V: Pair wise comparison of IKDC SCORE between various intervals of time

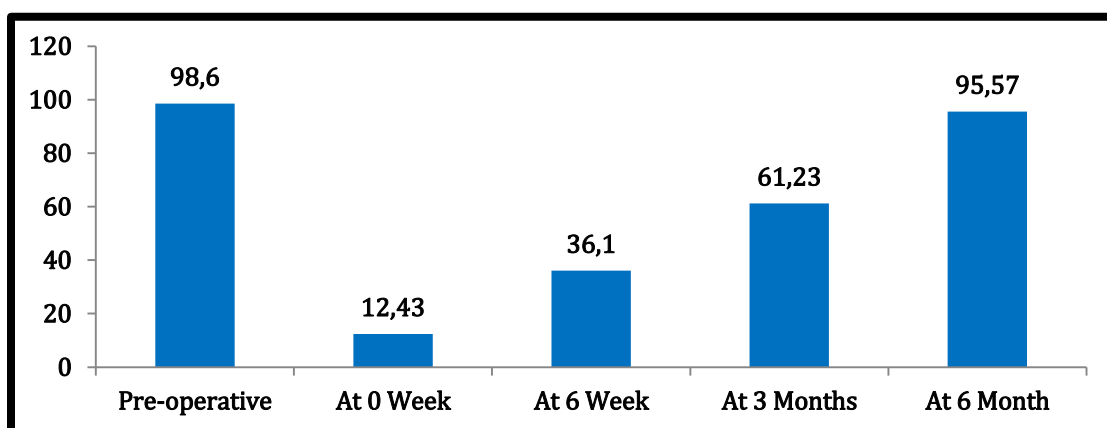
On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months

ANKLE PERFORMANCE SCORE

AOFAS SCORE: The total AOFAS improved from a mean and SD of 12.43 (8.93) at 0 week to 95.57 (3.9) postoperatively with the p-value 0.001, as shown in Table 14.

Table XI: AOFAS Score (Intra Group)

Sr. No	Parameters	Mean ± SD
1	Pre-operative	98.60 ± 2.06
2	At 0 Week	12.43 ± 8.93
3	At 6 Week	36.1 ± 13.03
4	At 3 Months	61.23 ± 8.62
6	At 6 Month	95.57 ± 3.9
	P Value	0.001*, sig



Graph VI: Bar Diagram showing AOFAS score

On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months.

Discussion :

The proposed novel option is the use of the surgical procedure by performing anterior cruciate ligament replacement utilising the peroneus longus tendon. This

is due to the numerous knee joint issues with patellar and hamstring tendon grafts in ACL reconstruction. According to experts, the peroneus longus tendon (PLT) can be used for reconstruction because its muscle

graft strength is almost comparable to that of the ACL, with minimal or no decrease in ankle function. The purpose of this prospective study was to evaluate and research made to strengthen previous studies regarding peroneus longus tendon graft as a choice³.

In this study, age of patients varied from 18 years to 40 years. The mean age at the time of surgery was 27.73 ± 7.06 . This data nearly matched with observation Rhatomy S et al^{3,4}. It can be correlated with the fact that incident of injury most frequently in adolescent population, and found to be maximum in second and third decade in present study in accordance with previous literature. Male preponderance was found in the present study. It was observed that right side (also the dominant side) was involved in 20 (66.7%) patients and left side (non dominant) in 10 (33.3%) patients. Anghong C et al also similarly observed that the involved sides of ankle were 14 (58.3%) for right and 10 (41.7%) for left.⁵

Among Most common cause of injury was observed to be fall accounting for 15 cases (50%) followed by 11 (36.7%) cases of history of sports injury I, History of road side accident accounted for 2 (6.7%) and lifting weight for 2 (6.7%). Joshi S et al found that among 48 patients, 19 (39.58%) of them had injuries due to road traffic accidents, 17 (35.41%) due to sports, 7 (14.5%) assault, and 5 (10.41%) domestic accidents. The average duration of injury (weeks) was 2.76 ± 5.55 weeks.⁶

Joshi S et al observed that majority of patients had injury 1-3 months prior to surgery. The total Tegner score improved from a mean and SD of 1.37 (0.85) at 0 week to 7.33 (1.06) postoperatively with the p-value 0.00.⁸ On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months. Gobbi et al reported a lesser reduction in Tegner scores with a value to 1.6.⁷ However, post-operative Tegner scores were similar (6 as compared to 6.51 in present study). Lee et al also reported similar Tegner scores at final follow up (6 ± 1.6). The total Lysholm improved from a mean and SD of 33.70 (11.72) at 0 week to 88.70 (8.57) postoperatively with the p-value 0.001. On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months. Trung DT et al observed that the function Lysholm scores improved from 59 to 94.27 postoperative 6 months.⁹

Rhatomy S et al³ (2020) observed that mean Tegner-Lysholm score pre-operative was 67.80 ± 15.29 and post-operative was 89.70 ± 8.34 . The total IKDC improved from a mean and SD of 46.70 (3.48) at 0 week to 87.16 (5.41) postoperatively with the p-value 0.001. On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of

interval of time except between at 3 months and at 6 months. Anghong C et al also observed improvement on similar terms as the mean pre-operative and postoperative IKDC scores were found to be 45.5 ± 13.8 and 58.6 ± 20.8 scores.⁵ Khajotia BL et al executed a study on 25 patients of ACL reconstruction with peroneus longus graft showed IKDC score was normal or near normal in 21 patients and only 4 patients were rated as abnormal or severely abnormal. Mean IKDC Score was 83.53.¹⁰ Rhatomy S et al (2020)³ observed the improvement viz mean IKDC score pre-operative was 54.66 ± 14.02 and post-operative was 95.69 ± 3.35 . There were significant differences between preoperative and 2-year postoperative score in IKDC score. Wiradiputra AE et al, during follow up of a single case observed that at 10- months post-operative follow-up, the IKDC assessment was 100%.¹¹ The total AOFAS improved from a mean and SD of 12 (8.93) at 0 week to 95.57 (3.9) postoperatively with the p-value 0.00. On pair wise comparison using Wilcoxon paired t test, significant differences were seen among pairs of interval of time except between at 3 months and at 6 months. Anghong C et al observed that mean pre-and postoperative AOFAS scores were 100.0 ± 0.0 and 96.0 ± 9.6 , respectively at 4-month follow-up ($p = 0.06$). Trung DT et al however observed no difference between the AOFAS scale of preoperative and postoperative. He J et al however observed that AOFAS was slightly decreased at last post-operative follow-up for patients with PLT autograft compared with pre-operative scores (mean difference of 0.31, 95% CI 0.07-0.54, $p = 0.01$).¹² Wiradiputra AE et al, during follow up of a single case observed that the AOFAS assessment was 100% at 12-months follow-up and the patient presented good ankle motoric power with no complaint regarding the ankle function. Sahu M et al⁹ observed median of AOFAS score at 6 week, 3 month, and 6 month post-ACLR follow-ups to be 88, 98 and 100. Statistically significant increase in AOFAS score was observed at 3 month and 6 month as compared to 6 week follow-ups with $p=0.001$.

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