Original Research Paper

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COMPARATIVE EVALUATION OF MECHANICAL AND FUNCTIONAL OUTCOME OF ADJUSTABLE VERSUS FIXED LOOP DEVICES IN ANTERIOR CRUCIATE LIGAMENT (ACL) RECONSTRUCTION

Dr. Manish Shukla	Assistant Professor, Department of Orthopaedics, M.L.N. Medical College, Prayagraj.
Dr Sadhak Raghaw	Junior Resident, Department of Orthopaedics, M.L.N. Medical College, Prayagraj.
Dr. Anmol Pasricha	Junior Resident, Department of Orthopaedics, M.L.N. Medical College, Prayagraj.
Dr. Anunaya Chauhan	Junior Resident, Department of Orthopaedics, M.L.N. Medical College, Prayagraj.
Dr. Rohit Yadav	Junior Resident, Department of Orthopaedics, M.L.N. Medical College, Prayagraj.

ABSTRACT **Background:** Depending on the severity of your ACL injury, treatment may include rest and rehabilitation exercises to help you regain strength and stability or surgery to replace the torn ligament followed by rehabilitation. With the advent of fixed- and variable-loop suspensory fixation devices for arthroscopic anterior cruciate ligament (ACL) reconstruction, a maximum number of grafts can be placed within the femoral tunnel. Although several biomechanical studies have been conducted comparing these two devices, only a few comparative clinical studies are available. **Aim:** To evaluate the functional outcome of adjustable versus fixed loop devices in Anterior Cruciate Ligament (ACL) reconstruction in terms of:Operative time, Duration of hospital stay,Types of injury, IKDC and LYSHOLM score Study Design: Hospital based Prospective cohort study. **Materials and Methods:** 100 cases were included in this study, in which 50 cases were treated arthroscopically by using CLF and remaining 50 cases were operated arthroscopically by using ALF. Clinical outcome was graded using the International Knee Documentation Committee. Functional outcome was evaluated by using Lysholm score up to 9 months. **Result:** The mean Lysholm knee score post-operative at 9 months in CLF group was 89.44±6.22 and in ALF group was 93.90 ± 5.40. The mean IKDC knee score post-operative at 9 months in CLF group was 84.30±5.92 and in ALF group was 87.84± 5.02. There were no statistically significant differences. **Conclusion:** We concluded that in femoral fixation of ACL graft both CLF and ALF techniques may provide secure fixation, equal reduction of graft laxity, and similar functional outcome in ACL deficient knee.

KEYWORDS : adjustable loop fixation, anterior cruciate ligament reconstruction, closed loop fixation.

INTRODUCTION

Injuries to the Anterior Cruciate Ligament(ACL) are the most frequent knee injuries seen by orthopaedic surgeons worldwide. ACL reconstruction is surgery to replace a torn ACL—a major ligament in knee. ACL injuries most commonly occur during sports that involve sudden stops and changes in direction — such as soccer, football, basketball and volleyball. ACL ruptures are one of the most common injuries. There are more than 150,000 ACL reconstructions performed every year.[1,2] For the fixation of femoral side grafts during ACL reconstruction, cortical suspension devices have been frequently used. ACL restoration requires the first anchoring of soft tissue in the femoral tunnel, and studies have demonstrated that cortical suspension devices provide the appropriate biomechanical qualities in terms of ultimate failure strength, displacement, and stiffness.[3-5] There are two types of cortical suspension devices available. 1. Adjustable Loop-length device, such as Ultrabutton or Tightrope, and 2. Fixed Loop-length device, such as Endobutton. The objective of this study was to compare the functional outcomes of arthroscopic ACL reconstruction using fixed-loop devices with that of variable-loop devices.

MATERIALS AND METHODS

Study Area

Department of orthopedics in MLN medical college and SRN hospital prayagraj, Uttar Pradesh.

Study Design

Hospital based Prospective cohort study.

Study Duration

Data collection was started first after the approval from Institutional Research Review Board and Ethical Committee up to october 2022 or till sample size is achieved, whichever is earlier. Then it will take one month for data processing and writing thesis.

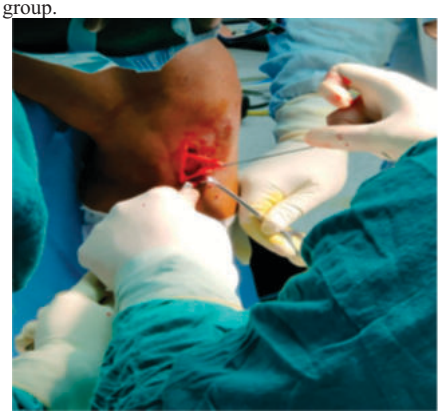
Inclusion Criteria

- Patient having radiological evidence of epiphyseal fusion.
- Patient having radiological evidence of ACL tear with or without meniscal tear.
- Patient having no signs of inflammation over affected knee.

Exclusion Criteria

- Multi-ligamentous injury.
- Bilateral knee involved
- Patient with advanced degenerative knee disease.
- Age >60 years.
- Patients with overlying skin infections over the knee or the ankle.
- Patients with chronic systemic medical diseases making them unfit for surgery

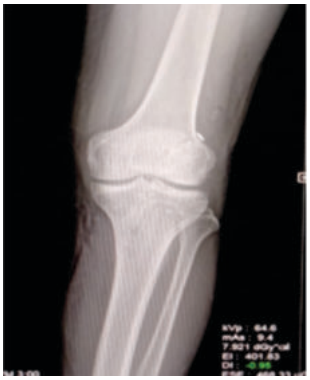
All patients with femoral fixation in ACL reconstruction were included as per the inclusion/exclusion criteria evaluated as per history, clinical examination and radiological picture done at the time of initial presentation.After arthroscopic confirmation of a complete ACL tear, ipsilateral semitendinosus and gracilis were harvested and prepared. The femoral tunnel was drilled at 110—120 of knee flexion via the accessory anteromedial portal. The tibial tunnel was made using the tibial jig set at 55. Diameter of the tunnels was decided based on the graft thickness. The graft fixation on the femoral side was done either with EndoButton(EB) or Ultrabutton(UB). While in the EB group the femoral tunnel was over-drilled by 10 mm above the desired intraosseous graft length, the same was not required in case of UB. The fixation on the tibial side was done using interference screw (bioscrew) in either group.



Stripping Of Hamstring Graft

Preparation Of Graft

Postoperative rehabilitation was similar for both groups. Full weight bearing ambulation and knee range of motion exercises were started within 48 hours after surgery. No rapid recovery protocol or continuous passive motion was applied to any of the patients. Patients were discharged home after 7 days, postoperatively. Patients were followed up regularly in the outpatient department at every 2 weeks till a total of 12 weeks, every month till next 2 months and every 3 months thereafter.



Postop Xray

OBSERVATION AND RESULTS

Table 1: Distribution Of Study Population According To

	Age			
Groups	Mean	Std. Deviation	t-test value	p-value
Adjustable Loop	35.20	3.88	1.040	0.144
Fixed loop	33.42	4.80		
Over-all	34.31	4.43		

There was no significant difference in mean age between Adjustable Loop and Fixed loop groups. The mean age among Adjustable Loop was 35.20±3.88 years, Fixed loop was 33.42±4.80 years and Over-all was 34.31±4.43 years.

Table 2: Distribution Of Study Population According To

Gender	Groups		Total
	Adjustable Loop	Fixed loop	
Male	30	32	62
	60.0%	64.0%	62.0%
Female	20	18	38
	40.0%	36.0%	38.0%
□2 value = 0.170, p-value = 0.680			

There was no significant difference in distribution of males and females between Adjustable Loop and Fixed loop groups. There were 62.0% males and 38.0% females.

Table 3: Distribution Of Study Population According To

Type of Injury	Groups		Total
	Adjustable Loop	Fixed loop	
No	6	4	10
	12.0%	8.0%	10.0%
Dual	5	5	10
	10.0%	10.0%	10.0%
Lateral	20	21	41
	40.0%	42.0%	41.0%
Medial	19	20	39
	38.0%	40.0%	39.0%
$\chi 2$ value = 0.450, p-value = 0.930			

There was no significant difference in type of injury between Adjustable Loop and Fixed loop groups. The most common type of injury was lateral (41.0%) followed by medial (39.0%) and Dual (10.0%).

Table 4: Distribution Of Study Population According To

	Duration after injury (in days)			
Groups	Mean	Std. Deviation	t-test value	p-value
Adjustable Loop	85.86	25.38	1.139	0.135
Fixed loop	79.84	30.57		

There was no significant difference in mean Duration after injury (in days) between Adjustable Loop and Fixed loop groups.

Table 5: Distribution Of Study Population According To

	Adjustable Loop		Fixed loop		t-test value	p-value
Lysholm knee scoring scale	Mean	Std. Deviation	Mean	Std. Deviation		
at 2 weeks	40.52	3.56	38.98	5.24	1.719	0.089
at 4 weeks	45.82	4.19	47.34	5.83	1.498	0.137
at 6 weeks	64.62	4.39	57.14	5.98	2.449	0.042*
at 3 months	72.42	4.96	66.94	6.42	1.325	0.045*
at 6 months	79.22	5.79	76.74	7.09	1.174	0.043*
at 9 months	93.90	5.40	89.44	6.22	1.322	0.189

The mean Lysholm knee scoring scale at 6 weeks, 3 months and 6 months was significantly more among Adjustable Loop group i.e. 64.62 ±4.39 , 72.42 ±4.96, 79.22±5.79 respectively as compared to fixed loop group.

Table 6: Distribution Of Study Population According To

	Adjustable Loop		Fixed loop		t-test value	p-value
IKDC scoring scale	Mean	Std. Deviation	Mean	Std. Deviation		
at 2 weeks	38.92	3.72	37.38	5.33	1.674	0.197
at 4 weeks	47.74	4.31	44.22	5.91	1.469	0.145
at 6 weeks	59.54	4.34	54.02	5.94	1.461	0.047*
at 3 months	71.34	4.76	63.82	6.27	1.365	0.045*
at 6 months	79.14	5.49	73.62	6.84	1.225	0.049*
at 9 months	87.84	5.02	84.30	5.92	1.404	0.164

The mean IKDC knee scoring scale at 6 weeks, 3 months and 6 months was significantly more among Adjustable Loop group i.e. 59.54 ± 4.34 , 71.34 ±4.76 , 79.14 ±5.49 respectively as compared to fixed loop group.

RESULT

The mean Lysholm knee score post-operative at 9 months in CLF group was 89.44±6.22 and in ALF group was 93.90 ± 5.40. The mean IKDC knee score post-operative at 9 months in CLF group was 84.30±5.92 and in ALF group was 87.84± 5.02. There were no statistically significant differences.

DISCUSSION

In this study, we compared Lysholm knee and IKDC score to assess the functional results of arthroscopic ACL restoration using closed- and adjustable-loop devices. We found very few comparative clinical trials despite the fact that there have been several biomechanical researches comparing the two fixation techniques.In present study, the mean age among Adjustable Loop was 35.20±3.88 years, fixed loop was 33.42±4.80 years and Over-all was 34.31±4.43 years.In our study, the most common type of injury was lateral (41.0%) followed by medial (39.0%) and Dual (10.0%).In present study, the mean Lysholm knee scoring scale at 6 weeks, 3 months and 6 months was significantly more among Adjustable Loop group.In present study, the mean IKDC knee scoring scale at 6 weeks, 3 months and 6 months was significantly more among Adjustable Loop group.All patients in the variable-loop group had their grafts re-tensioned following tibial fixation, and we found no difference in graft laxity between the groups. This might be understood in a number of ways: (1) Retightening lessens the

possibility of graft slippage. (2) Graft slippage may be offset by the additional grafts originally present in the tunnel since variable-loop designs enable more grafts to be pushed into the tunnel. (3) Greater force than what the knee feels after ACL restoration may be the source of the increased slippage seen in biomechanical investigations. This casts question on the applicability of the findings of biomechanical investigations in the therapeutic situation. Numerous biomechanical studies claim that increased graft slippage occurs in variable-loop designs compared to fixed-loop designs, but clinical studies like ours have not found this to be the case. This leads us to the reasonable conclusion that clinical scenarios are not accurately reflected in biomechanical studies.

CONCLUSION

The laxity of the graft and functional results after arthroscopic ACL reconstruction with fixed- and variable-loop devices were not significantly different, with the exception of a higher patient-reported outcome score in the variable-loop group at six weeks of follow-up. There was no discernible difference in the device's displacement between the two groups in our study, despite the fact that several biomechanical studies have indicated that variable-loop devices exhibit higher displacement than fixed-loop designs. Therefore, there is a need for further clinical comparison research in this area.

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