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Assessment of functional outcome of anterior cruciate ligament reconstruction in early and delayed presentation

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Abstract

Introduction: Surgical techniques of anterior cruciate ligament reconstruction have evolved over the past 3 decades along with debate regarding the timing of surgery. There is no consensus in the literature regarding the optimal time of surgical intervention.

Methods: A prospective comparative study was conducted on 30 patients who were diagnosed with an anterior cruciate ligament tear. Patients were equally categorised into 2 groups (15 patients) based on a presentation from time of injury as - early presentation group (<3 weeks from injury) and the delayed presentation group (>3 weeks from injury). All these patients underwent reconstruction with Semitendinosus Gracilis or Peroneus longus autografts by the same surgeon where standard surgery and rehabilitation protocols were followed. Functional outcome after ligament reconstruction was assessed using the IKDC and Lysholm scores preoperatively and postoperatively at 6weeks, 3 months and 6 months.

Results: The functional outcome of the knee showed better improvement in the delayed presentation group than the early presentation group in both IKDC and Tegner Lysholm scores in the initial follow-up. Both the groups also recovered with a good range of movement but the delayed group scored better than the early presentation group. But the difference was insignificant at the end of 1 year.

Conclusion: The functional outcome and range of motion after reconstruction of the anterior cruciate ligament is better after the healing of the soft tissue and bony contusion.

Keywords: Anterior cruciate ligament, arthroscopy, delayed, early, reconstruction

Introduction

The anterior cruciate ligament (ACL) is one of the important stabilizing structure in the knee joint. The two main components of the ACL include the anteromedial bundle and the posterolateral bundle [1-3]. The ACL provides rotational stability to the knee with varus or valgus tension.

The ACL is the most frequently injured ligament in the knee. ACL tears occur in professional athletes by non-contact mechanisms such as rotational forces whereas by a direct blow to the knee in road traffic accidents. There is no age or gender predilection reported in ACL injury. However, it has been proposed that women have an increased risk of ACL injury. The increased angulation of the valgus in the knee may also contribute to the increased risk of ACL injury [4, 5].

Reconstruction of the ACL has always been considered a standard surgical procedure. However, over the last few decades, ACL reconstruction has undergone many modifications with discussions on the form of graft, procedure and the timing of reconstruction. Early surgical intervention has been advocated by many to minimise the risk of further meniscal lesions in the affected knee by restoring tibiofemoral stability [6]. Delayed ACL reconstruction can result in hindrance to recovery due to increased muscle atrophy and decreased muscle strength. On the other hand, delayed reconstruction is said to minimise the occurrence of postoperative arthrofibrosis by ensuring the recovery of surrounding soft tissues from initial damage [7]. The optimal time for surgery is still up for debate based on current existing literature.

Objectives

Primary objective

To compare the functional outcomes of early and delayed reconstruction of the ACL tear with respect to optimum time of intervention.

Materials and Methods

Study design: Prospective comparative study

Study setting: The study population included patients of 18 to 60 years of age who underwent ACL reconstruction for acute and chronic ACL injury from October 2018 to March 2020 in the department of orthopaedics in a tertiary care super specialty hospital attached to a medical college.

Sample size: Purposive sampling technique was adopted. A total of 31 patients were operated on for ACL tear but one patient developed screw loosening and he was excluded from the study. So, 30 patients were finally included in the study. 15 patients each were included in the early presentation (less than 3 weeks) and late presentation group (more than 3 weeks).

Inclusion criteria: All patients with partial or complete ACL tears with signs of knee instability presenting early and delayed who are undergoing ACL reconstruction were included in this study.

Exclusion criteria: Patients with ACL re-injury, posterior cruciate ligament injury, periarticular fractures, ipsilateral lower limb fractures and evidence of knee osteoarthritis were excluded from the study.

Data collection: After Institutional Ethical Committee (IEC) approval, patients who were operated on with ACL reconstruction, meeting the inclusion criteria were included after obtaining detailed consent. Institutional and standard operating approaches, post-operative care and rehabilitation protocol were followed. All standard tools which have good inter-observer reliability were used for evaluation.

A detailed history and thorough clinical examination were done for each patient. The diagnosis was confirmed with standard clinical tests like Lachman test (LT), Anterior drawer test (ADT), Pivot shift test (PST) followed by Magnetic Resonance Imaging (MRI) of the knee joint.

Tegner Lysholm Knee Scoring Scale and International knee documentation committee (IKDC) scores were used preoperatively and postoperatively at the intervals of 6 weeks, 3 months and 6 months to know the functional outcome of the knee.

Diagnostic arthroscopy followed by ACL reconstruction was done either with Semitendinosus Gracilis or Peroneus longus autografts. All the patients were operated on by the same surgeon.

Patients were discharged 5 days post-surgery after check dressings. Both groups were treated with the same standard physiotherapy protocol.

In the first 2 weeks, knee flexion was started up to 90° along with quadriceps and hamstrings strengthening exercises. Later ankle pump exercises, active straight leg raising with knee brace followed by toe-touch weight-bearing with knee brace in extension supported by a walker were begun. In the following 3-6 weeks, full range of knee flexion, stationary cycling, weight-bearing as tolerated were initiated. Walker was weaned off depending on quadriceps strength. By 6-12 weeks, the knee brace was discontinued, and partial squatting

was started. After 6 months patients could return to sports activity.

LT, ADT, PST were repeated after surgery at all follow-ups to check for ligament laxity. PST was done only at 6 months follow-up.

Statistical data analysis

Data collected were tabulated in Microsoft Excel and assessed by SPSS software. Descriptive statistics were analysed using mean, standard deviation, frequency and percent. Inferential statistics were analysed using t-test, chi-square test and ANOVA. P-value of <0.05 was considered to be statistically significant.

Results

Among the 30 patients selected for this study, male predominance was seen in both groups. The mean ages were 30.73 ± 8.25 and 36.66 ± 10.38 in the early and delayed presentation groups respectively. A majority (50%) of the patients were injured in road traffic accidents, followed by self-fall (33.3%) and sports-related injuries (16.7%). The mean duration between injury and presentation to the hospital was 14.26 ± 5.16 days in the early presentation group and 134 ± 121.40 days in the delayed presentation group.

Most patients with early presentation presented with complaints of pain (86.7%), clicking sensation (80.0%) and swelling (73.3%) while patients with delayed presentation reported giving away sensation (93.3%) and locking (66.7%). No associated injuries were seen in 46.7% of patients. However, lateral meniscal tears were noted in 13.3% of patients with the early presentation while medial meniscal tears were more common (33.3%) in patients with delayed presentation.

The IKDC scores were compared preoperatively and postoperatively. Preoperatively in the early group, there were 8 patients and 7 patients in the severely abnormal and abnormal category respectively. But in the delayed group there were 1, 6 and 8 patients in the severely abnormal, abnormal and near-normal category. This can be because of pain and restriction of movement because of various causes like haemarthrosis and contusion to the bone. At the end of 6 months, there were more patients in the normal category in the delayed group (12 patients) than in the early group (10 patients). (Table 1, 2)

Table 1: Preoperative IKDC score in both early and delayed presentation group

Pre-operative	Early (n=15)	Delayed (n=15)
Severely Abnormal(D)	8 (53.3%)	1 (6.7%)
Abnormal(C)	7 (46.7%)	6 (40%)
Nearly normal(B)	0 (0.0%)	8 (53.3%)
Normal (A)	0 (0.0%)	0 (0.0%)
Total	15 (100%)	15 (100%)

Table 2: Post-operative IKDC score in both early and delayed presentation group at 6 months

6 months follow up	Early (n=15)	Delayed (n=15)
Severely Abnormal(D)	0(0.0)	0(0.0%)
Abnormal(C)	1(3.3%)	0 (0.0%)
Nearly normal(B)	4(13.35%)	3 (10%)
Normal(A)	10(33.3%)	12(39.6%)
Total	15 (100%)	15 (100%)

When preoperative and postoperative Tegner Lysholm scores were compared, 10 patients scored good and 3 patients scored

excellent in the delayed group. But whereas in the early group, 9 and 1 patients scored good and excellent respectively. So overall, patients in the delayed group rehabilitated better than the early group. (Table 3)

Table 3: Tegner Lysholm scores in both the group's preoperatively and 6 months postoperatively

		Early(n=15)	Delayed (n=15)	P- value
Pre-operative	Poor	13 (86.7%)	11 (73.3%)	P=0.36
	Fair	2 (13.3%)	4 (26.7%)	
6 weeks post-operative	Poor	11 (73.3%)	9 (60.0%)	P=0.44
	Fair	4 (26.7%)	6 (40.0%)	
3 months post-operative	Poor	3 (20.0%)	3 (20.0%)	P=0.88
	Fair	3 (20.0%)	2 (13.3%)	
	Good	9 (60.0%)	10 (66.7%)	
6 months post-operative	Poor	1 (6.7%)	0 (0.0%)	P=0.43
	Fair	4 (26.7%)	2 (13.3%)	
	Good	9 (66.7%)	10(60.0%)	
	Excellent	1 (6.7%)	3 (20.0%)	

Clinical tests for laxity include Anterior Drawer Test (ADT), Lachmann Test (LT) and Pivot Shift Test (PST). All three tests were carried out preoperatively while PST was avoided in the immediate post-operative visit at 6 weeks and 3 months. (Table4, 5)

Table 4: Clinical test for Laxity – Pre-operative

Pre-operative		Early (n=15)	Delayed (n=15)
ADT	Grade 0	1 (6.7%)	2 (13.3%)
	Grade I	2 (13.3%)	2 (13.3%)
	Grade II	2 (13.3%)	7 (46.7%)
	Grade III	10 (66.7%)	4 (26.7%)
LT	Grade 0	1 (6.7%)	1 (6.7%)
	Grade I	2 (13.3%)	2 (13.3%)
	Grade II	2 (13.3%)	9 (13.3%)
	Grade III	10 (66.7%)	3 (20%)
PST	Grade 0	3 (20.0%)	8 (53.3%)
	Grade I	0 (0.0%)	0 (0.0%)
	Grade II	0 (0.0%)	4 (0.0%)
	Grade III	12 (80.0%)	3 (20.0%)

Table 5: Clinical test for Laxity – 6 months post-operative

6 months post-operative		Early (n=15)	Delayed (n=15)
ADT	Grade 0	10 (66.7%)	9 (60%)
	Grade I	5 (33.3%)	5 (33.3%)
	Grade II	0 (0%)	1 (6.7%)
LT	Grade 0	12 (93.3%)	10 (60%)
	Grade I	3 (6.7%)	5 (40%)
PST	Grade 0	15 (100%)	15 (100%)

Knee ROM was observed to be consistently improving in both groups. Throughout the whole follow-up up to 6 months, the delayed group always showed better ROM compared to the early group. In the initial follow-up of the first 6 weeks, there was a significant recovery in the delayed group. But at the end of 6 months follow-up, the difference was not significant. (Figure 1)

Discussion

Almekinders *et al.* study regarding ACLR noted that patients who had undergone early reconstruction within one month from injury had limitations in knee ROM during early rehabilitation; however, there was no difference in knee ROM between patients who underwent early or delayed surgery after 1 year of follow-up [8]. In this study, we have made similar observations where the ROM improvement was

limited in the early presentation group when compared to the delayed presentation group.

A study done by D Ferguson showed statistically significant results for the Tegner activity scale for early surgery, but the magnitude of the effect is minimal to determine the superiority of early or delayed reconstruction of a ruptured anterior cruciate ligament [9].

Meighan *et al.*, in their study reported that there is no significant functional advantage gained by early reconstruction of the ACL compared to delay. RCTs demonstrated that the timing of surgery after ACL tears has no influence on the final functional outcome, risk of retears, or residual instability [10]. However, in our study, it is evident that there is no significant difference in the functional outcome of ACL reconstruction by delaying the surgery. Earlier interventions could reduce disability which is usually seen in the waiting period before surgery and encourage patients to return to regular routines earlier.

Toby O Smith *et al.* study found there was no difference in clinical outcome between patients who underwent early compared to delayed ACL reconstruction [11]. This study had similar results where the delayed group was marginally better than the early group in the initial follow-up but results were insignificant at the end of 1 year.

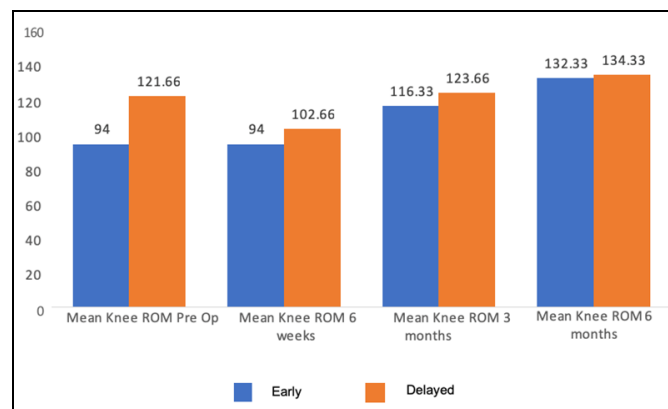


Fig 1: Shows the mean range of motion (ROM) preoperatively and postoperatively at 6weeks, 3months and 6 months.

Conclusion

The functional outcome of delayed reconstruction is better than early reconstruction of the anterior cruciate ligament in the initial follow-up but both resulted in the same at the end of 1 year. The range of motion was better in the delayed group than in the early group.

Conflicts of interest statement: None declared.

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