

Original Research Article

A study to compare the functional outcome of anterior cruciate ligament reconstruction using autologous tendon graft with or without platelet rich plasma augmentation

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ABSTRACT

Background: Reconstructing the anterior cruciate ligament (ACL) poses significant challenges, particularly in achieving secure attachment between the tendon and bone. Bone integration within the bone tunnel determines the outcome, influenced by graft type and fixation method. Platelet rich plasma (PRP) may enhance the ligamentization process of the graft, facilitating improved incorporation within bone tunnels. This synergistic approach could mitigate tunnel enlargement and graft failure over time.

Methods: A prospective comparative study (August 2023-June 2024) involved 80 patients (18-45 years) with acute complete ACL tears. Patients were divided into two groups: Group A (n=40) received 6 ml PRP injection during arthroscopic ACL reconstruction, while Group B (n=40) underwent surgery without PRP. Follow-ups occurred at 6 weeks, 3 months, and 6 months

Results: At 6 months, PRP group's SNQ values indicated improved tendon-bone healing. Lysholm scores showed significant improvements at 3 (14.49%) and 6 months (10.67%) ($p < 0.05$). IKDC scores demonstrated similar trends, with significant differences at 3 (12.67%) and 6 months (7.08%) ($p < 0.05$).

Conclusions: The use of PRP improved Lysholm score, IKDC score and SNQ value to certain extent but we did not find any statistically significant benefit in the PRP group.

Keywords: Anterior cruciate ligament, IKDC score, Lysholm score, Platelet rich plasma, SNQ value

INTRODUCTION

The anterior cruciate ligament (ACL) plays a key role in knee stability by restricting forward movement of the tibia and moderating rotational and valgus forces.¹ When injured, the knee often becomes unstable, leading to functional limitations and increasing the long-term risk of joint degeneration. While non-surgical treatment may be appropriate for individuals with lower physical demands, reconstruction is usually preferred for younger, more active patients.² Although arthroscopic ACL reconstruction is widely considered the standard of care, its success is not absolute. One ongoing challenge is the slow and sometimes incomplete healing of the graft,

particularly where it connects to bone.³ This delay can affect recovery timelines and overall surgical outcomes. In response, recent studies have begun to explore biological methods to support and speed up the healing process.⁴ Among these, platelet-rich plasma (PRP) has drawn significant interest.⁵ Derived from the patient's own blood, PRP contains concentrated growth factors that may enhance graft remodeling and encourage better integration within the bone tunnels potentially lowering the risk of failure and supporting an earlier return to physical activity.

To radiologically assess the graft maturation (signal/noise quotient value in MRI) after platelet-rich plasma augmentation and compare it with the maturation of

traditionally used graft. To compare and assess IKDC score at 3 and 6 months postoperatively. To compare and assess Tegner Lysholm score at 3 and 6 months postoperatively.

METHODS

It is a prospective comparative study of 40 patients of either sex in the age group between 18 to 45 with acute complete ACL tears which were confirmed with MRI was conducted during the period between August 2023 to June 2024 in the department of Orthopaedics, SMS Medical College and attached group of hospitals, Jaipur, Rajasthan. Patients attending the OPD of Orthopaedics department, satisfying the inclusion/ exclusion criteria, were enrolled in the study. Demographic Data, Brief medical history was taken, along with Clinical Examination.

Inclusion criteria

Preoperative diagnosis of ACL rupture. Young active adults in age group of 18-45 years. Patient must be willing to undergo MRI scans postop. at 3 and 6 months. Patients willing to participate in the study.

Exclusion criteria

Meniscus injuries of the affected knee joint that needed repair. Osteoarthritis of the affected knee joint. Multiple ligament injuries or knee joint infections.

Ethical approval

Ethical approval was obtained from the ethical committee of medical ethics of SMS medical college, Jaipur. (Ref. No. 883/MC/EC/2023).

Statistical analysis

SPSS (Statistical Package for Social Sciences) version 20. IBM SPASS statistics (IBM corp. Armonk, NY, USA released 2011) was used to perform the statistical analysis

Data was entered in the excel spread sheet. Descriptive statistics of the explanatory and outcome variables was calculated by mean, standard deviation for quantitative variables, frequency and proportions for qualitative variables. Chi square test was used to test the significance between qualitative variables. Unpaired t test was applied to test the significant mean difference between two quantitative variables. Paired t test was applied to test the significant mean difference for quantitative variables at different time periods. The level of significance was set at 5%.

RESULTS

Mean age of patients in PRP group was 31.28 year as compared to 31.7 year in control group (NS group). There was no significant difference between the two groups.

Majority of the patients in PRP group were males whereas in NS group the number of male and female patient was nearly equal. Subjects in PRP group are more affected on left side (average 55%) as compared to NS group in which left side (average 52.5%) was more commonly affected. The most common mode of injury in our study was road traffic accidents in both groups with average of 40% & 47.5 % in PRP group and NS group respectively. In our study, most of the patients in PRP group presented at an average of 2.45 weeks as compared to 2.58 weeks after injury in NS group. There was no significant difference noted in 2 groups.

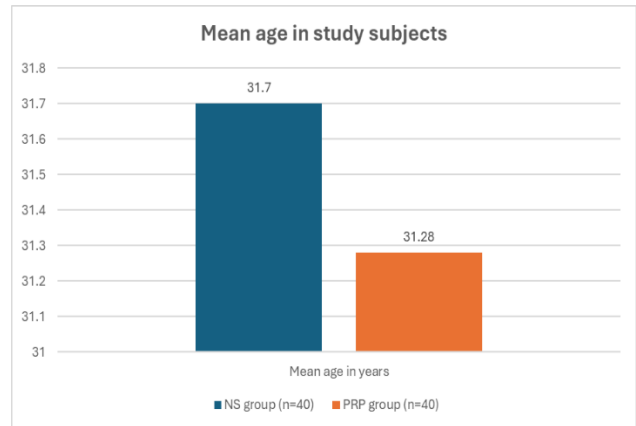


Figure 1: Mean age in study subjects.

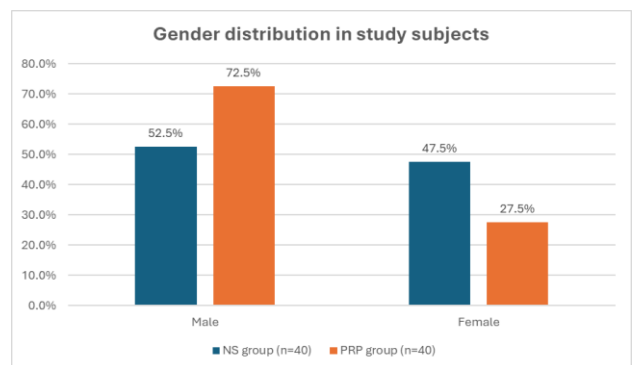


Figure 2: Gender distribution in study subjects.

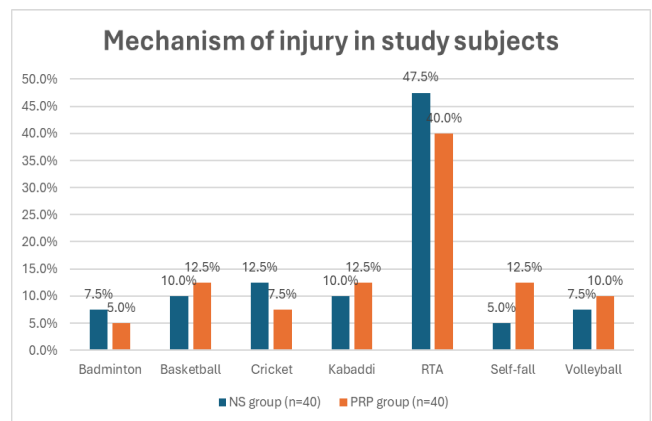


Figure 3: Mechanism of injury in study subjects.

The SNQ value at femoral end was lower in PRP group as compared to NS group at 3 and 6 months. At tibial end, SNQ value of PRP group was significantly lower as compared to NS group. There was no significant difference in the Lysholm scores of the PRP group and normal saline groups before surgery; however, there was a

significant difference at 3 and 6 months postoperatively ($p < 0.05$). There was no significant difference in the IKDC scores of the PRP group and the normal saline groups before surgery, whereas a significant difference was observed at 3 and 6 months postoperatively ($p < 0.05$).

Table 1: SNQ score in study subjects.

	NS group (n=40)	PRP group (n=40)	P value
Femoral end			
SNQ 3 month	12.36±1.54	11.53±2.13	0.06
SNQ 6 month	18.04±2.85	16.94±2.74	0.08
Tibial end			
SNQ 3 month	9.87±2.07	8.84±2.33	0.04
SNQ 6 month	12.06±2.19	10.80±2.73	0.03

Table 2: Lysholm score in study subjects at different time interval.

Lysholm score	NS group (n=40)	PRP group (n=40)	P value
Preop	38.75±2.89	38.58±2.74	0.78
3 months	56.45±2.14	64.63±3.83	<0.001
6 months	63.70±3.09	70.50±3.83	<0.001

Table 3: IKDC score in study subjects at different interval.

IKDC score	NS group (n=40)	PRP group (n=40)	P value
Preop	47.13±2.76	48.78±3.25	0.14
3 months	54.98±4.18	61.95±3.69	<0.001
6 months	62.50±3.09	66.93±3.91	<0.001

DISCUSSION

Most studies have shown that the ligamentization phase, where the graft's structural and biomechanical characteristics may become similar to those of an intact ACL, with the development of Sharpey fibers that show integration with the bone tunnels lasts at least 4 to 6 months.⁶ The possibility to accelerate and improve the integration process and therefore also knee stability is highly desirable nowadays, it is extensively recognized that platelet-derived GFs play a central role in tissue's healing and regeneration processes.⁷ The study demonstrated that PRP promotes tendon-bone healing of grafts, with lower SNQ values at the femoral and tibial ends compared to normal saline but were not statistically significant.

SNQ values

Femoral end

PRP group (11.53±2.13, 16.94±2.74) vs. control (12.36±1.54, 18.04±2.85) at 3 and 6 months ($p = 0.06, 0.08$).

Tibial end

Significant difference between PRP and control groups at 3 and 6 months ($p < 0.05$) Significant improvements in Lysholm scores (14.49%, 10.67%) and IKDC scores (12.67%, 7.08%) in PRP group compared to control at 3 and 6 months ($p < 0.05$).⁸ This study has some limitations. Authors did not use any commercially available PRP preparation system to prepare PRP. The PRP was injected into the graft and tibial tunnel without activation and in liquid form which could have resulted in wastage of some amount of PRP while inserting the graft i.e., application modality adopted in the present study may not be the optimal.

The findings of the present study prompted us not to continue with this clinical application of PRP. Much field to cover still remains. The current application of autologous platelet derived growth factors does not allow us to specifically isolate the factors related to the process and we are most likely applying a mixture of factors that apparently do not participate in or influence the graft maturation.⁹ It is also not clear to us whether isolated application at the time of ACL reconstruction is enough or whether it would be even more effective to repeat

application of these factors during the postoperative recovery and rehabilitation process.¹⁰

CONCLUSION

In the study patients who underwent ACL reconstruction with quadruple hamstring grafts, one group with intraoperative PRP use versus a control group (NS group), followed up with MRI and functionally assessed by IKDC score and Lysholm knee score. The use of PRP improved Lysholm score, IKDC score and SNQ value to certain extent but we did not find any statistically significant benefit in the PRP group. Hence, we do not recommend routine application of PRP while doing arthroscopic ACL reconstruction.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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