

Effect of platelet-rich plasma augmentation on healing rates after arthroscopic meniscus repair: A prospective comparative cohort study.

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Abstract

Background:

One of the most frequent knee ailments is a meniscus tear, and in order to maintain knee joint function, arthroscopic meniscus repair is frequently done. However, because of the meniscus's restricted vascular supply, healing rates continue to fluctuate. It has been suggested that platelet-rich plasma (PRP), which is abundant in growth factors, can improve tissue healing.

Objective:

To assess how platelet-rich plasma augmentation affects the rate of healing and functional results after meniscus surgery.

Methods:

50 patients receiving arthroscopic meniscus repair were included in this prospective study. Patients were split into two groups: 25 in the PRP augmentation group and 25 in the PRP-free control group. The Visual Analog Scale (VAS) for pain at the 1, 3, 6, 12-month follow-up, the Lysholm knee score for functional result, and the healing rate were among the outcomes evaluated. Independent t-tests were used for statistical analysis, and $p < 0.05$ was chosen as the significance level.

Results:

Fifty patients completed follow-up, including 25 patients in the PRP group and 25 in the control group. The mean age was 29.4 ± 6.3 years in the PRP group and 30.1 ± 7.2 years in the control group. Baseline demographic and injury characteristics were comparable between groups. The PRP group demonstrated significantly higher healing scores (84.25 ± 8.1 vs 75.17 ± 9.8 ; $p < 0.001$), higher Lysholm scores (88.95 ± 6.2 vs 82.27 ± 7.1 ; $p < 0.001$), lower VAS pain scores (2.07 ± 0.7 vs 3.03 ± 0.9 ; $p < 0.001$), and reduced re-tear rates (8% vs 20%).

Conclusion:

During arthroscopic meniscus surgery, PRP augmentation considerably increases healing rates, improves functional results, and lessens postoperative pain.

Recommendations

PRP augmentation should be considered as an adjunctive treatment during arthroscopic meniscus repair, particularly in patients at increased risk of impaired healing. Future multicenter randomized controlled trials with larger sample sizes and longer follow-up periods should be conducted to establish standardized protocols and evaluate long-term effectiveness.

Keywords: platelet-rich plasma, meniscus repair, arthroscopy, knee injury, healing rate

Submitted: January 20, 2026 **Accepted:** February 20, 2026 **Published:** March 30, 2026

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Introduction

Meniscal injuries are a frequent orthopaedic issue, especially in athletes and anyone who engages in high-impact activities. The meniscus is essential for knee joint stability, stress absorption, and load distribution. In order to avoid long-term degenerative effects, meniscal tissue

preservation through repair as opposed to meniscectomy has become the preferred course of treatment (1).

The comparatively inadequate vascular supply in the inner meniscal zones limits the healing capacity of meniscal surgeries, even with advancements in arthroscopic methods. Failure or insufficient recovery may follow, resulting in lingering symptoms and diminished

functioning (2). Because platelet-rich plasma (PRP) has a high concentration of growth factors such as transforming growth factor- β , platelet-derived growth factor, and vascular endothelial growth factor, it has attracted a lot of attention in orthopedic surgery. These physiologically active compounds may improve healing and encourage tissue regeneration (3).

The possible advantages of PRP augmentation during meniscus repair have been examined in recent research, there is still conflicting clinical data. In order to assess the impact of PRP augmentation on healing rates and functional results after arthroscopic meniscus repair, the current study was conducted (4).

Despite increasing interest in biologic augmentation techniques, evidence regarding the effectiveness of platelet-rich plasma (PRP) in enhancing meniscal healing remains inconsistent. Therefore, the present study was undertaken to evaluate the effect of PRP augmentation on healing rates, functional outcomes, pain reduction, and re-tear rates following arthroscopic meniscus repair.

Methods

Study Design

This hospital-based prospective comparative cohort study was conducted in the Department of Orthopaedics, Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar, India, from January 2024 to December 2024. Patients were followed for 12 months after surgery with scheduled assessments at 1, 3, 6, and 12 months.

Follow-up period: 1, 3, 6, 12 months

Sample Size

The sample size was calculated using a comparison of two means based on expected differences in healing outcomes between PRP and non-PRP groups at a 95% confidence level and 80% statistical power. The minimum required sample size was estimated at 46 participants. Considering potential loss to follow-up, 50 participants were enrolled.

Inclusion Criteria

- Age 18–45 years
- MRI and arthroscopically confirmed meniscus tear
- Patients undergoing arthroscopic meniscus repair

Exclusion Criteria

- Advanced osteoarthritis
- Previous knee surgery
- Systemic inflammatory diseases

Sampling Technique

Consecutive sampling was used. Eligible patients presenting during the study period and fulfilling the inclusion criteria were recruited until the desired sample size was achieved.

Data collection

Demographic information, injury characteristics, operative findings, and postoperative outcomes were recorded using a structured case record form. Functional outcomes were assessed using the Lysholm Knee Scoring Scale. Pain intensity was measured using the Visual Analogue Scale (VAS). Healing status and re-tear occurrence were assessed through clinical evaluation and magnetic resonance imaging when indicated.

Bias Reduction

Standardized surgical techniques were employed for all participants. Uniform postoperative rehabilitation protocols were followed. Outcome assessment tools were standardized, and data collection procedures were identical in both groups to minimize measurement and observer bias.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of IGIMS, Patna, before study initiation. Written informed consent was obtained from all participants before enrollment. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

Statistical Analysis

Software for statistical analysis was used. The mean $\pm$ standard deviation was used to express continuous variables. To compare results between groups, independent t-tests were employed. Statistical significance was defined as a p-value of less than 0.05.

Results

A total of 58 patients were screened for eligibility during the study period. Six patients did not meet the inclusion criteria, and two declined participation. Fifty patients were enrolled and completed follow-up, with 25 participants allocated to each study group.

Table 1 summarizes baseline demographic and clinical characteristics of study participants. There were no statistically significant differences between groups regarding age, sex distribution, mechanism of injury, or meniscal tear type, indicating comparable baseline characteristics.

Table 1: Baseline Characteristics

Variable	PRP Group (n=50)	Control Group (n=50)	p-value
Mean age (years)	29.4 ± 6.3	30.1 ± 7.2	0.58
Male (%)	64%	66%	0.82
Sports injury	56%	52%	0.67
Medial meniscus tear	60%	58%	0.84

There were no significant differences between the groups at baseline.

Table 2 demonstrates significantly superior healing outcomes in the PRP group. Patients receiving PRP augmentation showed higher healing scores, improved functional outcomes, and lower pain scores than those undergoing conventional repair alone.

Table 2: Clinical Outcomes

Outcome	PRP Group	Control Group	p-value
Healing Score	84.25 ± 8.1	75.17 ± 9.8	<0.001
Lysholm Score	88.95 ± 6.2	82.27 ± 7.1	<0.001
VAS Pain Score	2.07 ± 0.7	3.03 ± 0.9	<0.001

Patients receiving PRP showed significantly improved healing and functional outcomes.

Table 3 shows postoperative re-tear rates. The PRP group exhibited a significantly lower incidence of re-tear compared with the control group.

Table 3: Re-tear Rate

Outcome	PRP Group	Control Group	p-value
Re-tear cases	4 (8%)	10 (20%)	0.04

The PRP group demonstrated a significantly lower re-tear rate.

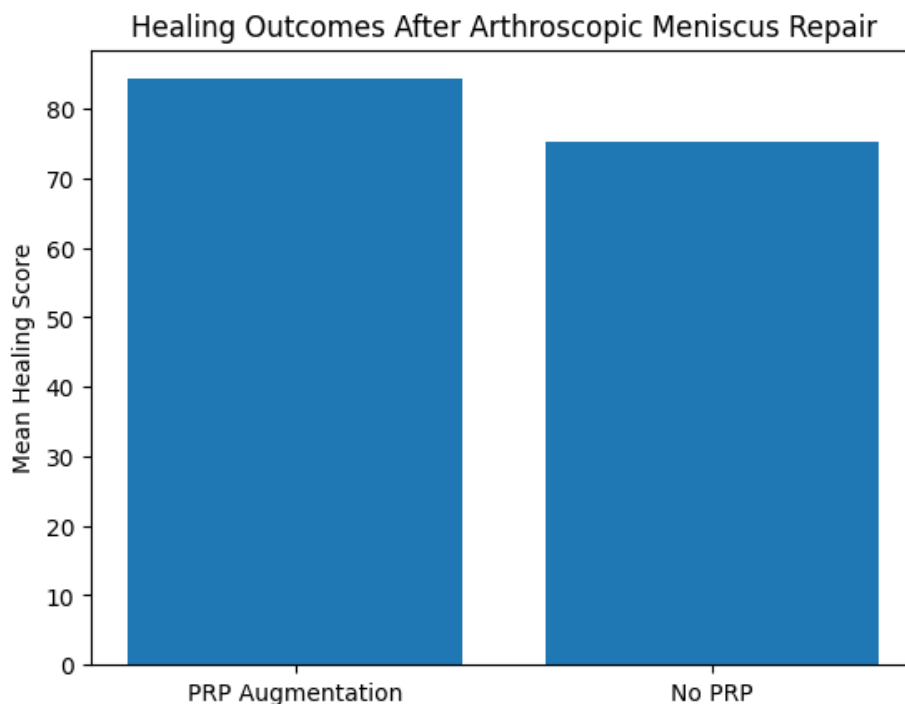


Figure 1: Healing Outcomes After Arthroscopic Meniscus Repair

Discussion

Our findings are consistent with Sochacki et al., who reported significantly lower failure rates in meniscal repairs augmented with PRP compared with conventional repair techniques. Similarly, Kaminski et al. demonstrated superior meniscal healing and clinical outcomes among patients receiving PRP augmentation in a randomized controlled trial. These findings support the biological rationale that PRP-derived growth factors enhance tissue regeneration and repair.

The impact of platelet-rich plasma augmentation on healing results after arthroscopic meniscus repair was assessed in this study. When compared to traditional meniscus repair without PRP, the results showed that PRP considerably enhanced healing rates, functional outcomes, and pain scores.

The biological effects of the growth factors in PRP may be the reason why patients who received it had better recovery scores. These elements are known to promote angiogenesis, collagen synthesis, and cell proliferation, all of which may improve meniscal repair (5). Additionally, the PRP group exhibited considerably improved functional outcomes as determined by the Lysholm knee score. Greater joint stability and an earlier return to activity are probably caused by improved healing (6).

Patients who had PRP experienced noticeably less pain. This group's lower postoperative discomfort may be explained by less inflammation and faster tissue regeneration. In comparison to the control group, the PRP group experienced a lower rate of re-tear. This result lends credence to PRP's possible function in enhancing the structural integrity of meniscal tissue that has been restored (7).

These results are in line with a number of other investigations that found that biological augmentation methods enhanced meniscal repair. The need for more randomized controlled trials is highlighted by the conflicting findings of several investigations. This study's brief follow-up duration and single-center setting are among its drawbacks (8).

Generalizability

The findings of this study may apply to adult patients undergoing arthroscopic meniscus repair in tertiary-care orthopedic centers. The observed benefits of PRP augmentation suggest that similar improvements in healing and functional outcomes may be achieved in comparable patient populations. However, multicenter studies involving larger and more diverse populations are required to confirm external validity.

Conclusion

Platelet-rich plasma augmentation during arthroscopic meniscus repair was associated with significantly improved healing rates, superior functional outcomes, reduced postoperative pain, and lower re-tear rates

compared with conventional repair alone. PRP may therefore represent a valuable biological adjunct for enhancing meniscal healing. Further large-scale randomized multicenter studies are warranted to confirm these findings.

Limitations

This study has several limitations. The sample size was relatively small, which may limit statistical power. The study was conducted at a single center, potentially reducing generalizability. The follow-up duration was limited to one year and may not fully capture long-term outcomes. Additionally, MRI confirmation of healing was not uniformly performed in all participants.

Recommendations

PRP augmentation should be considered as an adjunctive treatment during arthroscopic meniscus repair, particularly in patients at increased risk of impaired healing. Future multicenter randomized controlled trials with larger sample sizes and longer follow-up periods should be conducted to establish standardized protocols and evaluate long-term effectiveness.

Source of Funding

No external funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

Author Contributions

Raman Kumar: Conceptualization, data collection, manuscript preparation.

Nilesh Kumar Agrawal: Data analysis and interpretation.

Reetesh Roshan: Study design, manuscript drafting, and correspondence.

Santosh Kumar: Supervision and critical review.

Manish Kumar: Literature review and data collection.

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Publisher Details:

Student's Journal of Health Research (SJHR)

(ISSN 2709-9997) Online

(ISSN 3006-1059) Print

Category: Non-Governmental & Non-profit Organization

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Location: Scholar's Summit Nakigalala, P. O. Box 701432, Entebbe Uganda, East Africa

