

THE ROLE OF PLATELET RICH PLASMA (PRP) IN ARTHROSCOPIC REPAIR OF KNEE MENISCAL TEARS

Fariya Sulthana, *Department Of Medical Education,*
 Government Medical College, Karimnagar

ABSTRACT

This research examines the impact of platelet-rich plasma (PRP) on the healing of knee meniscal injuries, functional outcomes, postoperative pain, and surgical complications. Meniscus tears are prevalent in orthopedics. Rehabilitation may be impeded by the meniscus's limited vascularization, especially in avascular areas; nevertheless, arthroscopic surgery maintains the meniscus's structural integrity and knee biomechanics. PRP, an autologous blood concentrate rich in growth factors and cytokines, may expedite tissue regeneration. The study compares arthroscopic meniscal repair with conventional repair regarding pain alleviation, knee function, healing, return to activity, and postoperative complications. The treatment and healing of knee meniscal injuries should be enhanced by PRP.

Keywords: *Platelet-rich plasma (PRP); Arthroscopic meniscal repair; Knee meniscal tears; Meniscus healing; Growth factors; Biological augmentation.*

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1. INTRODUCTION

The crescent-shaped fibrocartilaginous knee menisci offer proprioception, lubrication, load distribution, stress absorption, and joint stability. Menisci are often torn in young athletes and older individuals with degenerative joint conditions. Unlike meniscectomy, arthroscopic meniscal repair conserves meniscal tissue, improves knee biomechanics, and diminishes the likelihood of osteoarthritis in repairable lesions. Meniscal repairs exhibit restricted healing potential, even with surgical intervention and anchoring devices, especially in the avascular interior where intrinsic regenerative capacity is negligible.

In orthopedic surgery, PRP possesses the capability to regenerate tissue. Platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), vascular endothelial growth factor (VEGF), insulin-like growth factor (IGF), and epidermal growth factor (EGF) are prevalent growth factors and cytokines present in the blood platelets of patients. These bioactive compounds facilitate angiogenesis, extracellular matrix synthesis, cellular proliferation, and the regulation of inflammation for tissue repair. PRP may enhance healing, reduce postoperative discomfort, expedite functional recovery, and decrease the failure rate of arthroscopic meniscal repair.

The efficacy of PRP in meniscal repair has been investigated in clinical research and systematic reviews; nevertheless, variations exist in surgical techniques, platelet concentration, leukocyte content, activation, tear features, and PRP preparation methods. The function and repair of the meniscus may enhance despite previous studies indicating no significant difference between conventional methods and PRP augmentation. To address arthroscopic knee meniscal concerns, PRP data must be regularly evaluated. Understanding the therapeutic potential, clinical indications, limitations, and future directions of evidence-based orthopedic treatment may enhance patient results.

2. MATERIALS AND METHODS

A prospective observational study investigated the use of platelet-rich plasma (PRP) augmentation for the arthroscopic repair of knee meniscal injury. Clinical and functional outcomes were evaluated between arthroscopic meniscal surgery without PRP and PRP augmentation.

Study Duration

11 months were spent on the investigation.

Study Population

Fifty patients with substantial knee injuries who were scheduled for arthroscopic meniscal surgery participated in the experiment. Participants were selected based on predetermined inclusion and exclusion criteria.

Inclusion Criteria

Patients who satisfied these criteria were studied:

- Age 18-50.
- Traumatic meniscal tear.
- Recommended for arthroscopic meniscal repair.

Exclusion Criteria

The following conditions eliminated patients:

- Advance knee osteoarthritis.
- Previous knee surgery.
- Systemic diseases can impair tissue healing.

Group Allocation

Patients were enrolled in two equal groups:

- **PRP Group (n = 25):** PRP-augmented arthroscopic meniscal repair was done.
- **Control Group (n = 25):** Traditional arthroscopic meniscal repair without PRP was performed.

Surgical Procedure

All patients received routine arthroscopic meniscal repair. The intervention group got intraoperative platelet-rich plasma to improve meniscal healing, while the control group received normal repair without PRP. Non-covered: PRP preparation, injection volume, and repair mechanism.

Outcome Measures

After surgery, individuals were clinically and radiographically assessed. Some primary and secondary results were:

- Clinical and radiographic evaluations assessed meniscal recovery.
- Assess pain using the Visual Analogue Scale (VAS).
- Function was assessed using the Lysholm Knee Scoring System.

Statistical Analysis

Valid statistics were utilized to analyze the data. Student's t-test examined continuous variables, while Chi-square examined categorical variables. A p-value below 0.05 represented statistical significance.

3. BACKGROUND OF THE STUDY

Burden of Meniscal Injuries

Meniscal tears are typical intra-articular knee injuries in orthopedics that cause pain, disability, and limited movement. Young athletes suffer greater sports injuries than degenerative rips in middle-aged and older persons. Meniscal injuries are rising worldwide due to sports and recreation. If untreated, these injuries impair knee function and raise degenerative joint disease risk. Successful meniscal tissue preservation is a priority for orthopedic surgery.

Anatomical and Functional Importance of the Meniscus

Fibrous meniscus connects the tibia and femur in a crescent. It does many vital knee physiological and biomechanical functions.

Load Transmission: The menisci are loaded 50–70% during normal activity and 90% during knee flexion. This distribution lowers joint stress and cartilage pressure.

Shock Absorption: The fibrocartilaginous meniscus absorbs walking, running, and leaping compression to protect cartilage.

Joint Stability: After ligament damage, menisci align the tibial plateau and femoral condyles to stabilize the knee.

Lubrication and Nutrition: Meniscus synovial fluid nourishes cartilage and decreases knee friction.

Protection Against Osteoarthritis: To protect articular cartilage, the meniscus evenly distributes loads and reduces contact stress. Lost meniscus increases early osteoarthritis risk.

Evolution of Meniscal Treatment

Complete or partial meniscectomy corrected meniscus tears. Meniscectomy relieved symptoms, however longitudinal studies showed early osteoarthritis, joint space limitation, and cartilage loss.

Orthopedics prioritizes meniscal protection. Arthroscopy is favored for knee biomechanics, native tissue preservation, and less degenerative joint alterations. Repair success depends on meniscus biological recovery.

CHALLENGES IN MENISCAL HEALING

Limited Blood Supply

The primary impediment to meniscal recovery is vascularity. Three vascular zones are present in the meniscus:

- **Red-Red Zone:** Well vascularized with excellent healing potential.
- **Red-White Zone:** Moderately vascularized with intermediate healing capacity.
- **White-White Zone:** Completely avascular with very limited regenerative ability.

The failure of avascular repairs is more prevalent as a result of inadequate biological healing.

Poor Cellular Regeneration

Spontaneous healing is exceedingly uncommon due to the fact that the inner meniscus contains minimal metabolic activity and a scarcity of reparative cells.

High Repair Failure Rates

The repair of complex or persistent rips remains a hazardous endeavor, despite the advancements in arthroscopic methods and fixation devices. Scientists have been motivated to investigate biological augmentation techniques for tissue regeneration as a result of these constraints.

Biological Augmentation in Meniscal Repair

Biological methods for meniscal regeneration have been developed in recent advances in regenerative orthopedics. Among them:

- Platelet-Rich Plasma (PRP)
- Platelet-Rich Fibrin (PRF)
- Bone marrow aspirate concentrate (BMAC)
- Mesenchymal stem cells
- Growth factor therapy
- Tissue-engineered scaffolds

Among these approaches, PRP is the most clinically relevant due to its autologous nature, low cost, simplicity of preparation, and minimal immunological risk.

Platelet-Rich Plasma (PRP)

Platelet-rich plasma, an autologous blood product with a significantly higher platelet content than regular blood, is generated by centrifuging venous blood. PRP contains physiologically active proteins and cytokines that facilitate tissue regeneration and repair.

The primary growth factors in PRP are as follows:

- Platelet-Derived Growth Factor (PDGF)
- Transforming Growth Factor-beta (TGF- β)
- Vascular Endothelial Growth Factor (VEGF)
- Insulin-Like Growth Factor (IGF)
- Epidermal Growth Factor (EGF)

Factors that foster growth include:

- Cell proliferation

- Fibroblast migration
- Angiogenesis
- Collagen synthesis
- Extracellular matrix production

In avascular locations, the repair of meniscal tissue may be enhanced by the combination of these biological responses.

Clinical Importance of PRP in Arthroscopic Meniscal Repair

Arthroscopic meniscal repair employs platelet-rich plasma (PRP) to circumvent the meniscus's restricted repair capacity. Numerous advantages are indicated by clinical research, including:

- Improved meniscal healing rates
- Reduced postoperative pain
- Faster biological recovery
- Better functional knee outcomes
- Lower risk of repair failure
- Preservation of native meniscal tissue
- Potential reduction in future osteoarthritis

These advantages are believed to be attributable to the capacity of platelet-derived growth factors to accelerate tissue regeneration and mitigate inflammation.

Existing Evidence and Research Gap

The utilization of platelet-rich plasma (PRP) to enhance meniscal healing has been the subject of numerous clinical trials and systematic reviews; however, the outcomes are inconsistent. Some trials demonstrate minimal impact, while others indicate that healing and functional outcomes improve.

Potential explanation for the fluctuation:

- Differences in PRP preparation techniques
- Variations in platelet concentration
- Presence or absence of leukocytes
- Differences in tear morphology
- Patient age and activity level
- Surgical techniques employed
- Duration of follow-up

The clinical effect of PRP augmentation is challenging to ascertain due to these inconsistencies, underscoring the necessity of additional prospective clinical research.

Rationale of the Present Study

This investigation investigated the enhancement of platelet-rich plasma (PRP) in patients who underwent arthroscopic meniscal repair. This was accomplished by assessing the restorative properties of PRP and the restricted healing potential of meniscal tissue. In order to ascertain the efficacy of PRP as a biological therapy for meniscal preservation, the study compared the healing rates, postoperative distress, and functional recovery of PRP-augmented repair to conventional repair.

4. RESULTS AND DISCUSSION

Table 1: Baseline Characteristics

Parameter	PRP Group	Control Group	p-value
Mean Age	29 ± 4	30 ± 5	0.58
Male (%)	72%	68%	0.75

Table 2: Healing Outcomes

Outcome	PRP Group	Control Group	p-value
Healing Rate (%)	82%	62%	<0.05
Failure (%)	18%	38%	<0.05

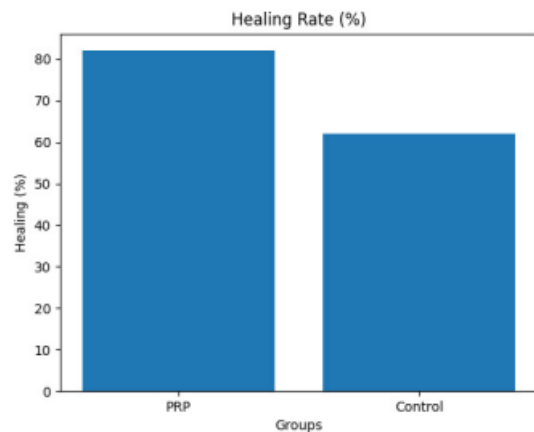
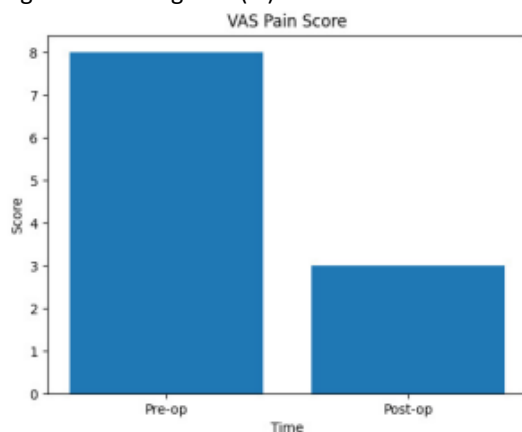
Table 3: Clinical Outcomes

Outcome	PRP Group	Control Group	p-value
VAS Score	3 ± 1	5 ± 2	<0.01
Lysholm Score	88 ± 6	72 ± 7	<0.01

DISCUSSION

The PRP group demonstrated superior clinical outcomes and healing rates in arthroscopic meniscal repair compared to the control group, as this investigation focused on PRP augmentation. The biological enhancement benefits were evident in the PRP group's 82% quicker healing rate than the control group's (62%). Growth factors, including PDGF, TGF- β , and VEGF, are present in PRP, which enhances the healing process. The comparatively avascular meniscus is restored by these constituents, which stimulate angiogenesis, collagen formation, and cellular proliferation.

The VAS scores of the PRP group were substantially lower, suggesting that they experienced less discomfort. PRP's enhanced tissue regeneration and anti-inflammatory properties may mitigate nociceptive stimulation. Patient satisfaction and knee function were preferable in the PRP group, as evidenced by their significantly higher Lysholm knee score.

**Figure 1: Healing rate (%)****Figure 2: VAS pain score**

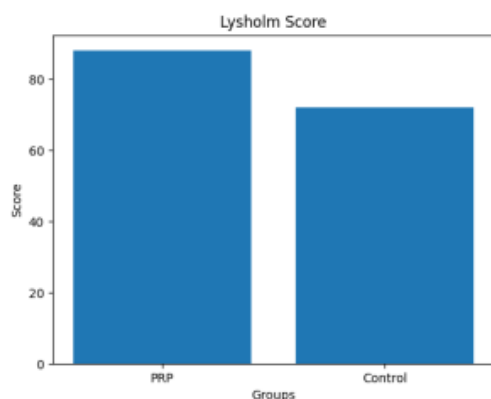


Figure 3: Lysholm score

These results corroborate prior research that has demonstrated that PRP augmentation enhances the healing and outcomes of meniscal repair. Nevertheless, the variable outcomes of other research may be attributed to tear features, patient selection, and PRP preparation methods. The results of this study are promising, despite the presence of numerous flaws. The sample size and causation were restricted by the observational method. There was no provision of long-term surveillance to assess the risk of re-tear and the lifespan of the repair. In order to verify these findings and formulate treatment recommendations, additional randomized controlled trials with larger sample sizes and standardized PRP methodologies are required. In general, PRP appears to be both safe and advantageous for the repair of meniscus.

5. CONCLUSION

Platelet-rich plasma (PRP) has the potential to enhance the functional outcomes, repair failure rates, and tissue regeneration in arthroscopic knee meniscal injury repair. Meniscal regeneration is facilitated by platelet-rich plasma (PRP), which contains a high concentration of bioactive substances and growth factors. This promotes cellular proliferation, angiogenesis, collagen formation, and extracellular matrix remodeling. Clinical studies have yielded favorable outcomes, but their conclusions have been inconsistent due to variations in patient selection, preparation, and treatment of platelet-rich plasma (PRP). PRP may be advantageous for individuals who undergo modern arthroscopic meniscal surgery, as indicated by statistics. More meticulously conducted randomized controlled studies with uniform PRP formulations and long-term follow-up are required to provide unambiguous treatment recommendations. Lastly, platelet-rich plasma (PRP) has the potential to preserve the functionality of the knee joint, enhance the biological recovery of repaired menisci, and reduce the likelihood of degenerative joint variations.

REFERENCES

- [1] Ragunathan Narayanaswamy and ISI. Arthroscopic Meniscal Repair With Second-Generation Platelet-Rich Fibrin Clot Augmentation. *Arthrosc Tech* [Internet]. 2022;11(9):e1569–75.
- [2] Petrie KA, Pratapneni A, Jabara J, Lansdown DA. Operative Techniques : Orthobiologics in the Treatment / Augmentation of Meniscal Injuries. *Oper Tech Orthop* 2025;35(2):101187.
- [3] Griffin JW, Hadeed MM, Werner BC, Diduch DR, Carson EW, Miller MD. Platelet-rich Plasma in Meniscal Repair : Does Augmentation Improve Surgical Outcomes ? *Clin Orthop Relat Res*. 2015;473:1665–72.
- [4] Belk JW, Kraeutler MJ, Thon SG, Littlefield CP, Smith JH, Mccarty EC. Augmentation of Meniscal Repair With PlateletRich Plasma A Systematic Review of Comparative Studies. *Orthop J Sport Med*. 2020;8(6):1–9.
- [5] Liang J, Tu M, Li H, Chen W. Efficacy and Safety of PlateletRich Plasma for Patients With Meniscal Injury A Systematic Review and Meta-analysis of Randomized. *Orthop J Sport Med*. 2025;13(10):1–16.

- [6] Migliorini F, Cuozzo F, Cipollaro L, Oliva F, Hildebrand F, Maffulli N. Platelet - rich plasma (PRP) augmentation does not result in more favourable outcomes in arthroscopic meniscal repair : a meta - analysis. J Orthop Traumatol [Internet]. 2022;23(8):1–9.
- [7] Rafal Kaminski , Krzysztof Kulinski, Katarzyna KozarKaminska, Monika Wielgus, Maciej Langner, Marcin K. Wasko, Jacek Kowalczewski and SP. A Prospective, Randomized, Double-Blind, Parallel-Group, PlaceboControlled Study Evaluating Meniscal Healing, Clinical Outcomes, and Safety in Patients Undergoing Meniscal Repair of Unstable, Complete Vertical Meniscal Tears (Bucket Handle) Augmented wit. Biomed Res Int. 2018;1–9.
- [8] Dai W, Zhang H, Lin Z, Shi Z, Wang J. Efficacy of plateletrich plasma in arthroscopic repair for discoid lateral meniscus tears. BMC Musculoskelet Disord. 2019;20(113):1–7.