Section: Orthopaedic

Original Research Article

CLINICAL OUTCOMES OF PLATELET RICH PLASMA THERAPY IN MENISCAL TEARS SECONDARY TO SPORTS INJURIES OF SOUTH INDIAN POPULATION IN A TERTIARY MEDICAL CENTER IN INDIA

Prabhakar Singh Raju[1], T. Gopi.[2], Karthik Shanmugavel Karuppiah[3], Keerthana G[4], A Hemanth Kumar[5]

[1]Department of Orthopaedic, Tamilnadu Government Multi Super Specialty Hospital, Chennai, Tamilnadu, India.
[2]Department of Orthopaedic, Tamilnadu Government Multi Super Specialty Hospital, Chennai, Tamilnadu, India.
[3]Department of Orthopaedic, Tamilnadu Government Multi Super Specialty Hospital, Chennai, Tamilnadu, India.
[4]3rd Year, MBBS, Govt. Thiruvallur Medical College, Thiruvallur, Tamilnadu, India.
[5]CRMI, MBBS, Government Kilpauk Medical College, Chennai, Tamilnadu, India.

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Corresponding Author:
Dr. A Hemanth Kumar,
Email: hemanthk222@gmail.com.

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Abstract

Background: Aim: This study aims to assess the efficacy and observing clinical outcomes of plasma rich platelet therapy (PRP) in meniscal tears caused by contact sports in the South Indian population. **Material and Methods:** A group of 54 cases of isolated meniscal tears were treated with PRP and proper rehabilitation given over the course of 12 months. The pre-op and post-op pain were measured among three scores namely Numeric Pain Rating Scale, Knee Injury and Osteoarthritis Score and Lysholm Score. **Results:** The PRP therapy provided positive clinical outcomes in terms of its improvement in pain tolerance and uninhibited functional outcomes. **Conclusion:** This single-center prospective study conclusively demonstrates that PRP presents an intriguing orthobiologic approach for managing meniscal injuries. This therapy has shown positive outcomes in terms of healing and clinical improvement with substantial enhancements in patient-reported pain levels and functional outcomes have been observed, supported by pertinent data. Additionally, long-term follow-up studies are needed to assess the sustainability of PRP's effects and potential complications.

INTRODUCTION

From once being labelled as a functionless remain of leg muscle, extensive scientific investigations in recent decades have described the meniscus as one of the most crucial structures of the knee. The incidence of meniscal injuries is on the rise and can be attributed to the increased participation of youth in sporting activities.[1] Previous research has established a strong relationship between meniscal tear and cartilage deterioration.[2] The therapeutic results vary significantly depending on the specific tear pattern. arthroscopic meniscal repair and meniscectomy have traditionally been the most commonly used treatment methods.[3]

In recent years there has been growing interest in the preservation of meniscal integrity in both isolated and concomitant knee injuries. accordingly, a more conservative approach for the treatment of meniscal injuries has been recommended in recent decades, especially in stable or degenerative meniscal injuries, as arthroscopic repair or meniscectomy may also increase the risk of KOA. there has been a spreading interest in the application of platelet rich plasma (PRP) in the treatment of meniscal injuries in recent years; however, only a few studies have been reported.[4] Hence, additional data from across the world is required in analysing the therapeutic efficacy of PRP therapy in sports injuries.

MATERIALS AND METHODS

This is a prospective study of 54 cases of isolated meniscal, sports-related injuries that were reported and followed up at the department of arthroscopy and sports medicine over the course of 12 months from January 2023 to January 2024. Our study comprised of patients aged between 18 and 45 years, who exhibited grade I, II, and III meniscal injuries (as per the Reicher classification) confirmed via

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magnetic resonance imaging (MRI), resulting from participation in contact sports. Additionally, patients with meniscal injuries who did not show improvement following conservative treatment for a minimum of 6 weeks were also incorporated. Individuals with a prior history of PRP treatment, degenerative meniscal injuries, concurrent fractures, any known past history of blood related disorders (any type of anaemia, idiopathic thrombocytopenic purpura, haemophilia, etc.) or other ligament injuries were excluded from study.

Platelet Rich Plasma Preparation

27ml of peripheral venous blood is collected in a sterile vacutainer, to which 3ml of acid citrate phosphate buffer is added as an anticoagulant.

The sample is then subjected to two spin sequences of centrifugation:

1. The vacutainer was centrifuged at 2800rpm for 10 minutes, leading to the separation of the supernatant fluid and buffy coat, which is then transferred to another vacutainer.
2. The supernatant plasma is then centrifuged at 3200 rpm for 10 minutes.

This process ultimately yields approximately 4ml of PRP and the procedure is illustrated as given in Figure 1,[5] and the real time sample is attached as Figure 2.

In our institution, we conducted a pre-injection complete hemogram for all patients to assess the platelet count, which fell within the normal range of 1.7 to 4.7 lakhs/cu.mm, and the white blood cell count ranged from 8600 to 11800 cells/cu mm. Following the final centrifugation, a substantial concentration of platelet-rich cells (up to 3 to 4-fold increase) was observed within the vacutainer, which was subsequently confirmed at our blood the white blood cell count in the PRP was notably lower. [Table 1]

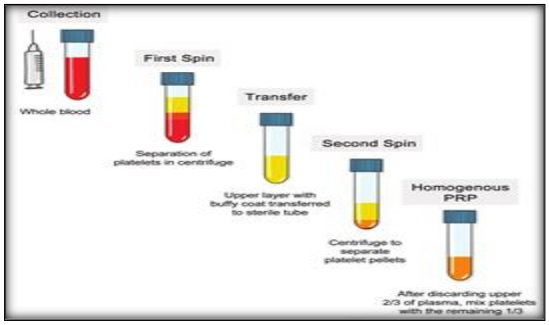

Figure 1: Sequential steps of PRP extraction technique

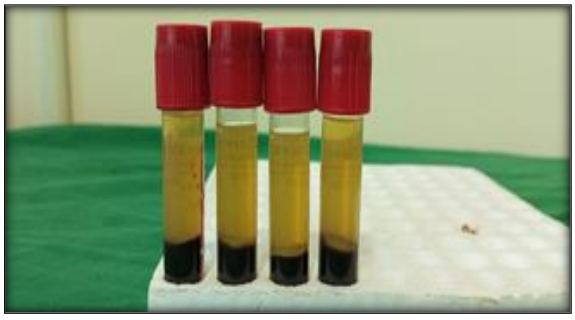

Figure 2: PRP extracted from the patient

Procedure of PRP Application

Under ultrasound (5-15 MHz frequency probe used) guidance in sterile condition, with knee flexed at 90 degrees, meniscus was identified as hypo echoic shadow. Intraarticular peri-meniscal administration of PRP into the knee joint was carried out using a 25-gauge needle, employing either a lateral or medial approach depending on the meniscal involvement. When the needle touches a specific wall or point, it is retracted by 1 mm. This precise needle manipulation may be used to ensure accurate placement of the PRP injection. These changes in resistance are indicative of the presence of meniscal tissue. Specifically, when the needle encounters increased resistance, it suggests the presence of meniscal tissue. conversely, when there is a loss of resistance, it indicates a change in tissue properties, which corresponds to the meniscus "red zone.". The reason for omission of local anaesthesia is the concern that it could negatively influence the effectiveness of the PRP. This concern is tied to potential pH modifications caused by the local anaesthetic. Subsequently, knee cycling was performed to facilitate even distribution of PRP throughout the joint. This procedure involved two PRP injections, spaced two weeks apart, for each patient. [Figure 3 and Figure 4]

Figure 3: Applicaton of PRP under ultrasound guidance on a 27-year-old male patient with anterior horn meniscal tear

Figure 4: Ultrasound image of the procedure with the meniscus being marked with a white colored star

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Post Procedure Protocol

Following prp injection, patients were instructed to report in case of increased tenderness, swelling, itchiness of sudden spike in body temperature. oral paracetemol is given thrice daily as an analgesic for the initial two days and ice application for the subsequent 48 to 72 hours is advised.

Table 1: Platelet and WBC levels measured post centrifugation

	PATIENT VALUES BEFORE PRP PREPARATION(AVERAGE)	AFTER 1ST SPIN (AVERAGE)	AFTER 2ND SPIN (AVERAGE)
PLATELETS	1,70000-4,70000/ Cu Mm	30000- 64000/Cu Mm	4,91000-15,40000/Cu Mm
WHITE BLOOD CELLS	8600-11800 cells/ cu mm	1700-3500 cells/Cu Mm	NIL TO 440 CELLS/CU MM

RESULTS

The strategy is aimed at rebuilding strength, stability, and function in the injured knee. strengthening regimen begins with static isometric exercises, gradual progressive weight-bearing and day to day activities is a common approach we performed in the rehabilitation process after PRP injections. This approach is patient-centered and emphasizes gradual progression to ensure that the injured area is not overstressed during the recovery process. it's designed to prevent exacerbation of the injury and to promote healing while avoiding discomfort.

The phases of approach may include the following components:

1. **Initial recovery and healing (weeks 1-2)**

- During the initial weeks, the aim is on allowing the injured knee to heal. activities are limited to those that do not stress the meniscus or jeopardize the healing process.
- Weight-bearing activities and movements are controlled, and individuals use assistive devices like crutches/walkers if necessary.
- Physical therapy exercises focus on gentle range of motion, strengthening of supporting muscles, and minimizing joint stiffness.

2. **Controlled rehabilitation (weeks 3-4)**

- As healing progresses, physical therapy is intensified. range of motion exercises are expanded, and resistance exercises for muscle strengthening are introduced under supervision.
- Low-impact activities like swimming or stationary cycling permitted, depending on individual progress.

3. **Progressive activity resumption (weeks 5-6)**

- With proper guidance, patients gradually resume more activities of daily living. weight-bearing exercises are increased, and the emphasis remains on controlled movements and gradual load increase.

4. **Gradual return to sports (weeks 6-8)**

- Depending on the individual's progress and responsiveness to treatment, a gradual return to sports activities is initiated.
- Sports-specific training, drills, and simulations are introduced, keeping in mind the need to maintain proper form and minimize the risk of re-injury.
- Individualized training and rehabilitation programs address specific sport-related movements and demands. they were back to their regular sports over 3- 4 months period.

Findings

In our study, the sample mainly consisted of male participants (85%) and the mean age was 34 years. The study also found that in terms of contact sports, football and kabaddi players were predominant (n = 54). Additionally, right sided involvement and lateral meniscal injuries (35 cases) were predominant in this series (79%). There was also a combined involvement of body and posterior horn of lateral meniscus in 4 cases and in medial meniscus of 2 cases. None of the patients have also gone through complications throughout the process.

The efficacy of intraarticular PRP injection was evaluated using both clinical and functional assessments. clinical outcomes were gauged using the numeric pain rating scale (NPRS) as referenced in literature.[6] functional outcomes, on the other hand, were evaluated using the knee injury and osteoarthritis outcome score (KOOS),[7,8] and the Lysholm scale.[9,10] [Table 3]

The numeric pain rating scale (NPRS) is a patient-centric numerical scale used to quantify the severity of pain. the KOOS, on the other hand, is a subjective measure utilized to assess both symptoms and functional capabilities in individuals experiencing knee issues. Additionally, the Lysholm knee score consists of patient-reported subscales designed to evaluate symptoms and functional aspects of knee injuries. we did not observe any complications after PRP injection in our series.

Table 2: Clinical data about type of meniscal injuries

	LATERAL MENISCUS				MEDIAL MENISCUS			
GRADE	ANTERIOR HORN (NO OF CASES)	BODY (NO OF CASES)	POSTERIOR HORN (NO OF CASES)	COMBINED	ANTERIOR HORN (NO OF CASES)	BODY (NO OF CASES)	POSTERIOR HORN (NO OF CASES)	COMBINED
I	1	1	2	0	0	1	1	0
II	2	5	16	2	1	3	6	1
III	0	1	4	1	0	0	5	1

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Table 3: Comparison of scoring systems about the clinical outcome and their intervention

OUTCOME	PRE-INJECTION SCALE	3 MONTHS POST INJECTION SCALE	6 MONTHS POST INJECTION	1 YEAR POST INJECTION
NUMERIC PAIN RATING SCALE (NPRS)	9	6	2	1
KNEE INJURY AND OSTEOARTHRITIS OUTCOME SCORE (KOOS)	64 ± 8.4	83 ± 2.5	87 ± 3.7	89 ± 5.6
LYSHOLM KNEE SCORE	62	75	96	98

DISCUSSION

Numerous studies have investigated the efficacy of PRP therapy in meniscal tears. While findings are generally positive, variations in PRP preparation, patient characteristics, tear severity, and outcome measures make direct comparisons challenging. intraarticular PRP injections have demonstrated promising and effective pain relief for patients with meniscal injuries. The healing progress of the meniscus was assessed using MRI scans conducted three months post-PRP injection, revealing significant and favourable advancement in healing.[11,12] Remarkably, our study indicated that 85- 92% of patients were able to resume their regular activities without experiencing any symptoms. nonoperative choices include rest, immobilization, weight bearing limitation, physical therapy, therapeutic exercise, and intraarticular injections, steroid or hyaluronic acid. No drugs or therapies have proven to result in clinically relevant benefits at 12-months of follow-up in comparison with arthroscopic partial meniscectomy. existing literature showcases the positive contributions of fibroblast growth factor, transforming growth factor B1, bone morphogenic proteins, and platelet-derived growth factor to meniscal regeneration.[13,14] It serves as an autologous source of these growth factors, making it a valuable therapeutic option for meniscal injuries. in contrast, earlier studies have shown favourable outcomes for procedures such as arthroscopic needling or partial meniscectomy- as it's reserved as a final resort for patients with unstable meniscus lesions.[15]

Notably, in our current study, we utilized leukocyte-poor PRP, which mitigates the potential for leukocyte-induced pain.[16] Clinical and functional benefits of percutaneous platelet-rich plasma injections for meniscal lesions of our study is consistent with the findings described by Blanke et al. for intrasubstance meniscus injuries as it provided the insights into the positive effects of PRP.[17] The standardization of PRP parameters remains a challenge due to the inherent variability in an individual's circulating blood products. Despite these challenges, ongoing research is dedicated to better understanding PRP's mechanisms of action, Refining preparation techniques, and identifying optimal treatment protocols. Researchers are working to establish guidelines for PRP application based on specific injury types, patient profiles, and desired outcomes. However, due to the personalized nature of PRP therapy, tailoring treatments to individual patients remains an essential aspect of achieving successful outcomes. The methodologies for platelet-rich plasma preparation have been a subject of ongoing debate and research since the introduction of this therapy. this debate arises from the need to establish standardized protocols that can consistently produce PRP with predictable and optimized therapeutic properties. different preparation methods can result in PRP products with varying concentrations of platelets, growth factors, and other bioactive substances,[18] and we confirmed the effectiveness through MRI follow-up adds to the growing body of evidence supporting the use of it in meniscal injuries.

CONCLUSION

This single-centre prospective study conclusively demonstrates that PRP presents an intriguing ortho-biologic approach for managing meniscal injuries. This therapy has shown positive outcomes in terms of healing and clinical improvement with substantial enhancements in patient-reported pain levels and functional outcomes have been observed, supported by pertinent data. Additionally, long-term follow-up studies are needed to assess the sustainability of PRP's effects and potential complications. Intra-articular PRP injections offer a viable alternative to surgical intervention, as it has potential to play a significant role for managing stable meniscal injuries in sportspersons is noteworthy.

Conflict of Interest

On behalf of all authors, this manuscript has not been published elsewhere and is not under the consideration by another journal; and all the authors have approved and agreed with its submission.

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