



Effectiveness of Platelet-Rich Plasma on Improve Clinical Outcomes After Knee Arthroscopy: A Systematic Review

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KEYWORDS	ABSTRACT
joint function, knee arthroscopy, platelet-rich plasma, pain reduction, tissue regeneration	This systematic review aims to evaluate the effectiveness of Platelet-Rich Plasma (PRP) in improving postoperative outcomes in knee arthroscopy. The review was conducted following PRISMA guidelines, with studies published between 2020 and 2024 sourced from Scopus, PubMed, and Crossref databases. Keywords such as "platelet-rich plasma," "PRP," and "knee arthroscopy" were used to identify relevant articles. After applying inclusion and exclusion criteria, 10 studies were selected. The review synthesized data on study objectives, PRP protocols, and clinical outcomes. Results showed that PRP significantly improved postoperative recovery compared to traditional treatments like hyaluronic acid, with patients experiencing reduced pain and better functional outcomes, as measured by the KOOS and IKDC scores. PRP also demonstrated potential for cartilage regeneration, especially when used alongside mesenchymal stem cells. However, variations in PRP preparation methods and patient selection impacted the outcomes. The findings suggest that PRP is a promising adjunctive therapy in knee arthroscopy, offering enhanced clinical outcomes due to its regenerative and anti-inflammatory properties. Standardization of PRP preparation protocols and further long-term studies are needed to optimize its clinical application.

DOI: 10.58860/ijsh.v4i2.285

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INTRODUCTION

Knee arthroscopy is one of the most commonly performed orthopedic procedures worldwide with estimates suggesting that approximately four million knee arthroscopies are conducted annually, resulting in a total cost of around \$15 billion (van der Burgt et al., 2021). Knee arthroscopy offering minimally invasive treatment for a variety of joint disorders, including meniscal tears, ligament injuries, and degenerative changes. This procedure has become the gold standard for diagnosing internal derangements of the knee due to its ability to provide direct visualization of joint structures, which is essential for accurate diagnosis and treatment planning (Dhall et al., 2021; Gyawali et al., 2020).

Despite its widespread use and significant advancements in surgical techniques, optimizing postoperative recovery and enhancing long-term clinical outcomes remain challenges for orthopedic surgeons. One of the most frequently reported local complications following knee arthroscopy is arthrofibrosis, characterized by excessive scar tissue formation leading to joint stiffness and reduced range of motion. The incidence of arthrofibrosis post-arthroscopy has been documented to range from 1.3% to 10% in patients undergoing total knee arthroplasty (TKA) after prior arthroscopy (Oganesyan et al., 2022; Sax et al., 2022). This condition can necessitate additional interventions, such as manipulation under anesthesia (MUA) or even revision surgeries, to restore function (Oganesyan et al., 2022; Sax et al., 2022). Furthermore, the presence of arthrofibrosis is often linked to prolonged rehabilitation and increased pain levels (Flury, 2023).

Another significant concern is the risk of infection, which, although relatively low, remains a critical complication. Studies have indicated that the incidence of postoperative infections following knee arthroscopy is approximately 0.5% to 1% (Jurin et al., 2020; Stępień et al., 2022). The risk factors for infection can include the surgical technique employed, the patient's comorbidities, and the use of tourniquets during the procedure (Jurin et al., 2020; Sherman et al., 2022). Infections can lead to severe outcomes, including septic arthritis, which may require further surgical intervention (Jurin et al., 2020; Stępień et al., 2022).

Among the array of adjunctive therapies proposed, Platelet-Rich Plasma (PRP) has garnered increasing attention for its potential to accelerate healing and improve outcomes in musculoskeletal interventions. PRP is an autologous blood product that is enriched with platelets and growth factors, which are believed to promote healing and tissue regeneration. The preparation of PRP involves centrifugation of the patient's blood to concentrate the platelets, which can then be injected into the knee joint to alleviate pain and improve function (Dulic et al., 2021; Patel et al., 2022). The efficacy of PRP in knee osteoarthritis has been a subject of extensive research. Studies have shown that intra-articular injections of PRP can lead to significant improvements in pain and functional outcomes compared to placebo treatments (Belk et al., 2021; Patel et al., 2022).

Furthermore, PRP has been shown to have a better safety profile compared to corticosteroids and hyaluronic acid, making it an attractive option for patients seeking non-surgical interventions (Gorbatenko et al., 2022; Sdeek et al., 2021). However, the clinical evidence surrounding its efficacy remains inconclusive, with studies reporting varied outcomes due to differences in PRP preparation protocols, application methods, and patient selection criteria.

This inconsistency highlights the need for a systematic evaluation of the existing literature to better understand the role of PRP in improving clinical outcomes following knee arthroscopy. While previous reviews have addressed the efficacy of PRP in broader musculoskeletal contexts, focused analyses specific to knee arthroscopy are limited. Given the increasing utilization of PRP in orthopedic practice, a thorough assessment of its impact on pain relief, functional outcomes, and structural repair in post-arthroscopy settings is crucial to guide clinical decision-making and inform evidence-based practice.

The novelty of this research lies in its specific focus on the post-arthroscopy setting, where PRP's therapeutic effects have not been comprehensively analyzed across studies. This review aims to fill that gap by providing a detailed synthesis of the available evidence on the efficacy of PRP in knee arthroscopy patients. The objective of this systematic review is to critically appraise and synthesize current research findings on the effectiveness of PRP in enhancing clinical outcomes after knee arthroscopy. By identifying consistent trends and highlighting gaps in the evidence, this review aims to provide a comprehensive understanding of PRP's therapeutic potential and its implications for postoperative care in orthopedic surgery.

The benefits of this research are manifold. By critically appraising the existing literature, this systematic review will provide a clearer understanding of PRP's role in improving clinical outcomes, including pain relief, functional recovery, and structural repair after knee arthroscopy. This research will also offer insights into the potential for PRP to reduce complications like arthrofibrosis and infection, which could lead to better postoperative management strategies. Ultimately, this review will guide clinical decision-making, allowing orthopedic surgeons to make more informed choices regarding the use of PRP, and support evidence-based practices in orthopedic care.

METHOD

The protocol was developed in accordance with the guidelines established by the Cochrane Collaboration for systematic reviews, and aligns with the recommendations set forth in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) Statement (Page et al., 2021). This study follows a systematic review design to analyze the available evidence on the effectiveness of PRP in improving clinical outcomes after knee arthroscopy.

The review includes studies focusing on patients undergoing knee arthroscopy for conditions such as osteoarthritis, meniscal injuries, or cartilage defects. The sample consists of patients treated with PRP, comparing them to those receiving standard care such as hyaluronic acid injections, mesenchymal stem cell therapy, or traditional arthroscopic procedures without PRP.

A literature search was conducted in January 2025, using articles from reputable international journals sourced from databases like PubMed, Crossref, and Scopus. Keywords such as "platelet-rich plasma", "PRP", and "knee arthroscopy" yielded 125 documents. Only articles published in English between 2020 and 2024 were included in the analysis. Boolean operators (AND, OR) and wildcard characters (*) were strategically applied to refine results and capture variations of terms.

The systematic review process began with a comprehensive search and selection of relevant articles. At least two researchers independently reviewed each article to ensure accuracy and minimize potential bias. An initial screening based on titles and abstracts identified studies relevant to the research question. Articles deemed potentially relevant were then subjected to a full-text evaluation. After applying the inclusion and exclusion criteria, a total of 10 articles were selected. Relevant data were extracted from these articles, including information such as the title, authors, publication year, study objectives, sample characteristics, research methods, PRP preparation protocols, application techniques, and key clinical outcomes.

Subsequently, a narrative synthesis was conducted to summarize the results and identify recurring patterns, themes, and implications related to the effectiveness of PRP in reducing pain, enhancing joint function, and promoting tissue regeneration following knee arthroscopy. This systematic approach allowed for a rigorous synthesis of the evidence to address the research question comprehensively. The inclusion and exclusion criteria for this systematic review are outlined in Table 1.

Table 1. Inclusion and exclusion criteria

Inclusion	Exclusion
Article that discusses the effectiveness of Platelet-Rich Plasma (PRP) in improving clinical outcomes after knee arthroscopy	Articles that are not related to the effectiveness of Platelet-Rich Plasma (PRP) in improving clinical outcomes after knee arthroscopy
Research article	Non-research article
English documents	Non-English documents
Published year 2020-2024	Published outside 2020-2024
Available in full text	Not available full text
Open access	Non-open access
Research conducted in many countries	
Quantitative, qualitative, experimental research methods	Systematic review, literature review, non-research, meta-analysis

RESULT AND DISCUSSION

Based on the search results using predetermined keywords and inclusion criteria, a total of 125 potential articles were initially retrieved from multiple databases: Scopus (n=60), PubMed (n=14), and Crossref (n=51). Following the title screening process, 93 articles with relevant titles were identified.

At this stage, 72 articles were excluded for the following reasons: duplicate articles (n=10), articles not published between 2020 and 2024 (n=35), articles not available in open access (n=12), and non-original articles (n=15).

Subsequent screening of abstracts resulted in 21 articles, with 8 abstracts excluded for not matching the set criteria. A full-text assessment of 13 articles was then performed to determine eligibility, resulting in the inclusion of 10 studies in the systematic review. These studies provide a comprehensive understanding of the effectiveness of Platelet-Rich Plasma (PRP) in improving clinical outcomes after knee arthroscopy, focusing on pain reduction, joint function enhancement, and tissue regeneration.

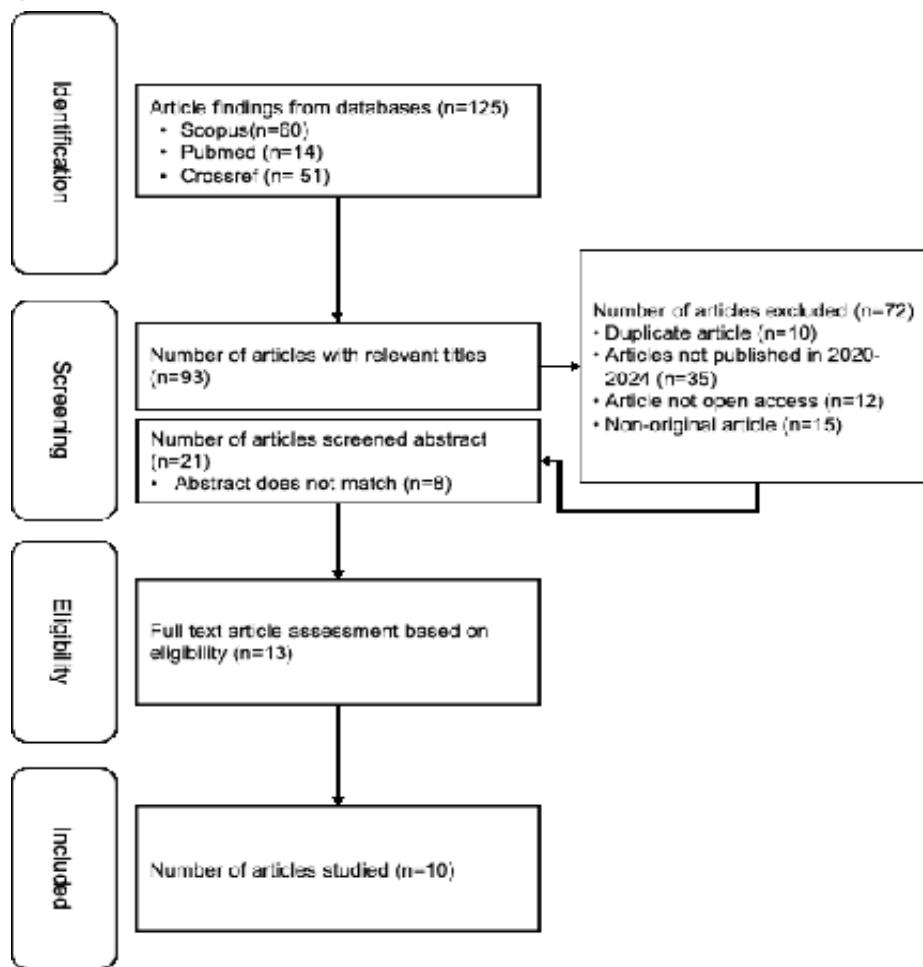


Figure 1. Article extraction process flowchart

Table 2. Document Extraction Result

Title, Authors, Year	Aim	Sample	Method	Result
“Autologous Micro-Fragmented Tissue Associated with Arthroscopy in Moderate–severe Knee Osteoarthritis: Outcome at Two Year Follow-Up” (Giorgini et al., 2022a)	To evaluate clinical outcomes of aMFAT with arthroscopy for knee osteoarthritis and identify patient benefits	50 consecutive knees	a retrospective analysis of patients receiving aMFAT with arthroscopy, assessing outcomes via PROMs and statistical analysis	Improvements in pain and function were observed at 2 years post-treatment, with 92% of patients avoiding knee replacement

Title, Authors, Year	Aim	Sample	Method	Result
“The Effects of Autologous Stem Cells from Bone Marrow and Adipose Tissue on Patients with Knee Osteoarthritis” (Leung et al., 2023)	To assess the impact of autologous stem cells on knee osteoarthritis.	103 patients (159 knees)	retrospective analysis of patient-reported outcomes, including VAS and KOOS, JR scores, following stem cell injections	Significant improvements in pain and function were observed at 3, 6, 12, and 24 months post-treatment.
“Knee Osteoarthritis: Clinical and MRI Outcomes After Multiple Intra-Articular Injections with Expanded Autologous Adipose-Derived Stromal Cells or Platelet-Rich Plasma” (Khoury et al., 2023a)	To compare outcomes of aSC and PRP injections in knee osteoarthritis patients.	50 patients in total: 27 received aSC injections and 23 received PRP injections	A retrospective analysis comparing LP-PRP and aSC injections in knee OA patients, with data collected from medical records and patient-reported outcomes.	Both groups improved at 6 months, but aSCs showed significantly greater improvements in pain and KOOS scores at 12 and 24 months, with reduced disease progression in the aSC group.
“Clinical and Functional Outcome of Meniscal Injuries Treated with Platelet-Rich Plasma: A Single-Center Case Series” (Medina-Porqueres et al., 2022a)	to evaluate the clinical and functional outcomes of meniscal injuries treated with platelet-rich plasma (PRP) therapy.	30 patients	The study used platelet-rich plasma (PRP) injections for treating meniscal injuries, assessing clinical and functional outcomes through various scoring systems pre- and post-treatment.	The results indicated significant improvements in clinical and functional outcomes after PRP treatment, with no recorded complications.
“A Comparative Study of Osteoarthritis Knee Arthroscopy Versus Intra-Articular Platelet Rich Plasma Injection: A Randomised Study” (N. Singh et al., 2022)	To compare the efficacy of arthroscopy and PRP injection for knee osteoarthritis	70 patients	Patients were randomly allocated to two groups: one receiving arthroscopy and the other receiving PRP injection, with outcomes assessed using WOMAC and VAS scores	PRP showed greater reduction in WOMAC and VAS scores compared to arthroscopy, especially at 3 and 6 months
“A Single-Blinded Randomized Controlled Trial of Mesenchymal Stem Cell Therapy for the Treatment of Osteoarthritis of the Knee with Active Control” (Ruane et al., 2021)	To compare the effectiveness of BMAC and HA in treating knee osteoarthritis.	30 patients	a single-blinded randomized controlled trial design, comparing BMAC and HA treatments, with outcome measures assessed over time.	BMAC showed significant improvements in pain and function compared to HA, but no statistically significant differences between groups.

Title, Authors, Year	Aim	Sample	Method	Result
“Autologous Platelet-Rich Fibrin Matrix–Augmented Repair for Parameniscal Cysts: Surgical Technique” (Screpis et al., 2021a)	To enhance healing of parameniscal cysts and reduce recurrence	N/A	The method involves harvesting and preparing an autologous platelet-rich fibrin matrix (APRFM) to augment meniscal repair during surgery	the use of autologous platelet-rich fibrin matrix (APRFM) may enhance the healing of meniscal tears associated with parameniscal cysts, potentially reducing recurrence
“Adjunctive Platelet-Rich Plasma and Hyaluronic Acid Injection After Arthroscopic Debridement in Kellgren-Lawrence Grade 3 and 4 Knee Osteoarthritis” (Tirtosuharto et al., 2022a)	To investigate the effects of PRP and HA after arthroscopic debridement in knee osteoarthritis	21 patients	Retrospective cohort study with arthroscopic debridement and subsequent PRP or HA injections	PRP improved pain symptoms, but no treatment was superior for overall WOMAC scores
“Platelet-Rich Plasma and Adipose-Derived Mesenchymal Stem Cells in Association with Arthroscopic Microfracture of Knee Articular Cartilage Defects: A Pilot Randomized Controlled Trial” (Venosa et al., 2022a)	to assess the effects of PRP and AD-MSCs on cartilage repair in knee defects	38 patients, with 19 in each treatment group	monocentric randomized controlled trial design, involving arthroscopic microfracture and injections of PRP or PRP plus AD-MSCs	No significant difference in clinical outcomes was found between the two groups, but the PRP + AD-MSCs group showed better histological cartilage quality
“Chondromalacia Patellae: Current Options and Emerging Cell Therapies” (Zheng et al., 2021a)	To evaluate current treatments and explore emerging cell therapies for chondromalacia patellae (CMP)	N/A	Methods include MRI for diagnosis and MSC-based cell therapy for treatment.	Results indicate improved cartilage repair and reduced pain with MSC therapies, though some studies showed no significant clinical changes.

The Effects of PRP on Clinical Parameters

The application of Platelet-Rich Plasma (PRP) in clinical settings, particularly following arthroscopy, has garnered significant attention due to its potential effects on pain reduction, improved joint function, and tissue regeneration. PRP is derived from the patient's own blood and is enriched with platelets that release growth factors and cytokines, which are crucial for healing and tissue repair (Y. Liang et al., 2022; Tirtosuharto et al., 2022b).

Numerous studies have demonstrated that PRP injections can lead to significant pain relief in patients with knee osteoarthritis (OA) and other joint disorders. For instance, a randomized controlled trial indicated that patients receiving PRP injections reported greater pain reduction compared to those

treated with hyaluronic acid (HA) (Hughes, 2023) (Dr. D. Singh et al., 2020). This is particularly relevant in the context of knee OA, where pain management is a primary concern. The anti-inflammatory properties of PRP, attributed to its high concentration of growth factors, contribute to this pain alleviation, enhancing the overall patient experience post-surgery (Lewis et al., 2022; Venosa et al., 2022b).

In terms of joint function, PRP has been shown to improve functional outcomes significantly. Studies have reported that patients receiving PRP therapy after arthroscopic procedures exhibited better scores on functional assessment scales, such as the Knee Injury and Osteoarthritis Outcome Score (KOOS) and the International Knee Documentation Committee (IKDC) score (Giorgini et al., 2022b) (“A Single-Blinded Randomized Controlled Trial of Mesenchymal Stem Cell Therapy for the Treatment of Osteoarthritis of the Knee with Active Control,” 2021). The regenerative capabilities of PRP are further supported by its role in promoting cartilage repair and regeneration, which is critical in the context of joint surgeries where cartilage damage is prevalent (Tirtosuharto et al., 2022b; Zheng et al., 2021b).

Moreover, the combination of PRP with other treatments, such as hyaluronic acid or mesenchymal stem cells (MSCs), has been explored to enhance therapeutic outcomes. For example, adjunctive PRP therapy following arthroscopic debridement has shown promising results in improving joint function and reducing pain in patients with advanced knee OA (“A Single-Blinded Randomized Controlled Trial of Mesenchymal Stem Cell Therapy for the Treatment of Osteoarthritis of the Knee with Active Control,” 2021) (Tirtosuharto et al., 2022b). The synergistic effects of these treatments may lead to improved healing and recovery times, making PRP a valuable component in postoperative rehabilitation protocols (W. Liang et al., 2024; Venosa et al., 2022b).

In conclusion, the integration of PRP into clinical practice following arthroscopy presents a multifaceted approach to managing pain, enhancing joint function, and promoting tissue regeneration. The evidence supports its efficacy in improving clinical parameters, making it a promising option for patients undergoing arthroscopic interventions.

Mechanisms of Action of PRP in Post-Arthroscopy Healing

Platelet-rich plasma (PRP) has gained significant attention in the realm of postoperative healing, particularly following arthroscopic procedures. Its mechanisms of action primarily revolve around the concentration of growth factors and cytokines that facilitate tissue repair and regeneration. PRP is derived from the patient's own blood, enriched with platelets that release bioactive molecules crucial for healing processes, including angiogenesis, collagen synthesis, and modulation of inflammation (W. Liang et al., 2024; Screpis et al., 2021b; Tirtosuharto et al., 2022b).

One of the key mechanisms by which PRP promotes healing is through the release of growth factors such as platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF- β), and vascular endothelial growth factor (VEGF) (Y. Liang et al., 2022; Screpis et al., 2021b). These factors play a vital role in stimulating cellular proliferation, migration, and differentiation, which are essential for tissue regeneration. For instance, PDGF is known to enhance the recruitment of mesenchymal stem cells (MSCs) to the site of injury, thereby promoting cartilage repair and reducing inflammation (Y. Liang et al., 2022; Venosa et al., 2022b). Additionally, the anti-inflammatory properties of PRP help in modulating the local inflammatory response, which is crucial in the context of postoperative recovery (Hughes, 2023; Lewis et al., 2022).

Clinical studies have demonstrated the efficacy of PRP in improving outcomes following arthroscopic procedures, particularly in patients with knee osteoarthritis and cartilage defects. For example, PRP injections have been shown to significantly reduce pain and improve functional outcomes compared to hyaluronic acid injections in patients undergoing knee arthroscopy (Hughes, 2023;

Tirtosuharto et al., 2022b). Moreover, the adjunctive use of PRP in combination with other techniques, such as microfracture, has been associated with enhanced cartilage repair and better clinical results (Y. Liang et al., 2022; Venosa et al., 2022b). This synergistic effect underscores the potential of PRP to augment traditional surgical techniques, leading to improved healing and recovery times.

Furthermore, the preparation and application of PRP are critical factors influencing its effectiveness. Variability in the concentration of platelets and the presence of leukocytes can affect the therapeutic outcomes (Medina-Porqueres et al., 2022b). Standardization of PRP preparation protocols is essential to maximize its clinical benefits and ensure reproducibility across different studies (Medina-Porqueres et al., 2022b).

In summary, PRP acts through multiple mechanisms to enhance postoperative healing following arthroscopy, primarily by delivering a concentrated source of growth factors that promote tissue regeneration and modulate inflammation. Its clinical application has shown promising results, particularly in the context of knee osteoarthritis and cartilage repair, highlighting its potential as a valuable adjunct in orthopedic surgery.

Comparison of PRP with Other Therapies

Platelet-rich plasma (PRP) therapy has emerged as a promising treatment modality for various musculoskeletal conditions, particularly knee osteoarthritis (OA). This therapy utilizes the patient's own blood components, specifically concentrating platelets that release growth factors and cytokines, to promote healing and tissue regeneration. When comparing PRP to other therapeutic options, such as hyaluronic acid (HA) injections and mesenchymal stem cell (MSC) therapies, several key differences and similarities arise.

Research indicates that PRP injections can be more effective than HA in reducing pain and improving function in patients with knee OA. A study by Hughes demonstrated that PRP injections provided superior clinical outcomes compared to HA, with significant pain reduction lasting up to 12 months post-treatment (Hughes, 2023). Similarly, Lewis et al. found that leucocyte-poor PRP injections were effective for symptomatic early OA of the knee, highlighting the growing acceptance of PRP as a viable treatment option (Lewis et al., 2022). However, the variability in PRP preparation techniques and the lack of standardization in treatment protocols remain significant challenges in establishing its efficacy (Medina-Porqueres et al., 2022b).

In contrast, MSC therapies, particularly those derived from adipose tissue or bone marrow, have shown promising results in cartilage repair and regeneration. For instance, a study by Venosa et al. reported that combining MSCs with arthroscopic microfracture techniques led to improved clinical outcomes in patients with cartilage defects (Venosa et al., 2022b). Furthermore, Khoury et al. compared the clinical outcomes of adipose-derived stromal cells with PRP, finding that both therapies had beneficial effects on knee OA, although the specific advantages of each treatment varied (Khoury et al., 2023b). This suggests that while PRP is effective, MSC therapies may offer additional regenerative benefits due to their paracrine effects and ability to differentiate into various cell types (Venosa et al., 2022b).

Moreover, the adjunctive use of PRP with other treatments, such as HA, has been explored. Tirtosuharto et al. demonstrated that combining PRP with HA following arthroscopic debridement resulted in improved outcomes for patients with advanced knee OA (Tirtosuharto et al., 2022b). This combination approach may leverage the benefits of both therapies, potentially enhancing the overall therapeutic effect.

Despite the promising results associated with PRP and MSC therapies, it is essential to recognize the limitations and variability in patient responses. The heterogeneity in study designs, patient populations, and treatment protocols complicates direct comparisons between these therapies. For

instance, while PRP has been shown to be effective in reducing pain, the degree of improvement can vary significantly among individuals, influenced by factors such as the severity of OA and the specific PRP preparation method used (Medina-Porqueres et al., 2022b).

In conclusion, PRP therapy offers a compelling option for the management of knee OA, particularly when compared to HA and MSC therapies. While PRP demonstrates superior efficacy in pain reduction and functional improvement, MSC therapies may provide additional regenerative benefits. The integration of these therapies into a comprehensive treatment plan, considering individual patient factors and preferences, may yield the best outcomes for those suffering from knee OA.

PRP Clinical Implications

Platelet-rich plasma (PRP) has emerged as a significant therapeutic option in the management of osteoarthritis (OA) and various cartilage injuries, primarily due to its regenerative properties. PRP is derived from the patient's own blood and contains a high concentration of platelets, which release growth factors and cytokines that are crucial for tissue repair and regeneration (Y. Liang et al., 2022). The clinical implications of PRP therapy are substantial, particularly in enhancing healing processes and improving functional outcomes in patients with knee osteoarthritis and other joint injuries.

The application of PRP in treating articular cartilage injuries has been extensively studied. For instance, a narrative review highlighted that PRP injections can stimulate cartilage repair by promoting chondrogenesis and reducing inflammation within the joint (Y. Liang et al., 2022). Furthermore, clinical studies have demonstrated that PRP is more effective than traditional treatments such as hyaluronic acid in alleviating pain and improving joint function over extended periods (Hughes, 2023; Lewis et al., 2022). This is particularly relevant given the chronic nature of OA, where conventional therapies often provide only temporary relief.

Despite the promising outcomes associated with PRP, challenges remain regarding the standardization of preparation techniques and treatment protocols. Variability in individual patient responses and the methods used to prepare PRP can lead to inconsistent results (Medina-Porqueres et al., 2022b). A study indicated that the lack of consensus on optimal PRP preparation parameters complicates the interpretation of clinical outcomes, suggesting that further research is needed to establish standardized protocols that maximize therapeutic efficacy (Medina-Porqueres et al., 2022b).

Moreover, the integration of PRP with other treatment modalities, such as arthroscopic procedures and microfracture techniques, has shown potential to enhance the overall effectiveness of cartilage repair strategies. For instance, combining PRP with microfracture has been proposed as a method to improve healing outcomes in patients undergoing surgical interventions for cartilage defects (Venosa et al., 2022b). This combination therapy leverages the regenerative properties of PRP to augment the healing response initiated by microfracture techniques, thereby potentially leading to better long-term results.

In addition to its direct effects on cartilage repair, PRP also plays a role in modulating the inflammatory environment of the joint. The anti-inflammatory properties of PRP can help mitigate the progression of OA by reducing synovial inflammation and improving joint lubrication (Tirtosuharto et al., 2022b). This is particularly important in the context of OA, where inflammation is a key driver of disease progression and symptom exacerbation.

In conclusion, PRP represents a promising therapeutic approach in the management of knee osteoarthritis and cartilage injuries, with its ability to promote healing and reduce inflammation. However, the variability in preparation techniques and the need for standardized protocols highlight the necessity for ongoing research to optimize its clinical application. As the field of orthobiologics continues to evolve, PRP's role in conjunction with other treatment modalities may further enhance its

therapeutic potential, offering hope for improved outcomes in patients suffering from degenerative joint conditions.

CONCLUSION

The study demonstrates that Platelet-Rich Plasma (PRP) holds considerable promise for improving clinical outcomes after knee arthroscopy, particularly in terms of reducing pain, enhancing joint function, and promoting tissue regeneration. The growth factors, such as PDGF and TGF- β , contribute to its effectiveness, positioning PRP as a superior option compared to traditional treatments like hyaluronic acid, with enhanced results when used in combination with other therapies. However, challenges such as variability in preparation methods and the lack of standardization need to be addressed. Future research should focus on optimizing preparation protocols and validating the long-term benefits of PRP. In conclusion, this study highlights PRP as a valuable addition to postoperative care, offering a comprehensive approach to recovery and tissue regeneration, with significant potential for future clinical applications.

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