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Review Article

Clinical efficacy of platelet rich plasma injections for knee osteoarthritis: a review

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ABSTRACT

Osteoarthritis (OA) of knee is a leading cause of global disability, with a rapidly increasing prevalence. This review synthesizes evidence on the clinical efficacy of platelet rich plasma (PRP) injections for managing knee OA, compared to placebo, hyaluronic acid (HA), corticosteroids (CSC), and other therapies. Recent high-quality meta-analyses and systematic reviews demonstrate that intra-articular PRP injections provide superior and clinically significant improvements in pain visual analog scale (VAS) and functional outcomes (WOMAC scores) at 3, 6, and 12-month follow-ups compared to these alternatives. The therapeutic benefit of PRP is highly dependent on platelet concentration, with high-concentration preparations (>800,000 platelets/μL) proving essential for achieving sustained long-term efficacy. Furthermore, a regimen of 2-3 injections is more effective than a single administration. While combination therapy (PRP+HA) may offer superior short-term relief, PRP monotherapy yields equal or better long-term results. PRP also exhibits an excellent safety profile, comparable to placebo and superior to repeated corticosteroid use. PRP, particularly high-concentration delivered in a series, represents an effective, durable, and safe biological treatment for mild to moderate knee OA, outperforming traditional conservative options. Standardization of protocols and cost-effectiveness analyses are recommended for wider clinical adoption.

Keywords: Platelet rich plasma injection, Osteoarthritis, Knee osteoarthritis, Hyaluronic acid, Corticosteroids, Conservative management

INTRODUCTION

Knee osteoarthritis (OA) is a degenerative joint disease-causing pain, functional impairment, and reduced quality of life among older adults worldwide. According to the global burden of disease 2021 study, compared with 2020, cases of OA are projected to increase 74·9% (59.4-89.9) for knee and 78.6% (57.7-105.3) for hip by 2050. OA accounted for 4.55% of years lived with disability (YLDs) globally and 3.63% of YLDs in India. By comparison, the global number of YLDs for total OA increased by 134·0% (131.8-136.0) from 9.28 million (4.34-20·3) in 1990 to 21.7 million (10.2-47.6) YLDs in 2020.[1-3] With the burden of OA being on the rise, OA has significant implications on the individuals affected, the healthcare system, and also broader socioeconomic repercussions on the society. Osteoarthrosis is a condition that develops slowly but eventually causes considerable morbidity. Early-stage illness necessitates ongoing pain management to maintain the patient's daily activities. Early on in the course of this ailment, conservative therapies such as nonsteroidal anti-inflammatory drugs, physical therapy, physiotherapy, corticosteroid administrations, and extracorporeal shockwave treatments are thought to be the foundation of therapy.[4,5] In recent years, PRP injections have emerged as a biological treatment option aimed at modulating inflammation and promoting tissue repair. The anti-inflammatory, immunomodulatory, and anabolic properties may mitigate

the degenerative processes of knee OA and improve symptoms and function of the treated joints.[7]

When injected intra-articularly, PRP may act on multiple OA-related targets, improving pain and potentially delaying disease progression.[6]

Several systematic reviews, meta-analyses and RCTs have attempted to assess the comparative efficacy of PRP compared to placebo. Steroids, HA, combination therapy and other conservative management, based on its functional improvement (WOMAC score) and pain reduction (VAS score). Intra-articular PRP injections have emerged as a promising regenerative therapy, leveraging platelets' growth factors to modulate inflammation and promote tissue repair. This review aims to generate evidence on the clinical effectiveness of PRP in managing knee OA and serves as a foundation for exploring its economic implications, thereby informing potential policy modulation and healthcare decision-making.

EFFICACY OF PRP VERSUS OTHER INTERVENTIONS

The literature review of efficacy of PRP vs. other interventions tabulated in Table 1 below.

Table 1: A summary of reviewed literature.

Title and authors	Test	Control	Findings
PRP injections for the treatment of knee OA: The improvement is clinically significant and influenced by platelet concentration: a meta-analysis of randomized controlled trials (Bensa et al)[8]	PRP	Placebo	Pain reduction: PRP significantly reduces pain (VAS scores) at 3, 6, and 12 months. Functional improvement: WOMAC scores show clinically relevant improvements at all timepoints (1-12 months). Platelet concentration: High concentration (>800,000platelets/µl): Achieves clinically significant pain relief (VAS) at 3, 6, and 12 months. Sustains functional improvement (WOMAC) at 12 months. Low concentration (<800,000 platelets/µl): Fails to meet MCID for pain relief beyond 6 months. Functional benefits decline by 12 months.
Efficacy and safety of CSC, HA, and PRP and combination therapy for knee OA: a systematic review and network meta-analysis (Qiao et al)[9]	PRP	CSC, HA, and combination therapy	PRP outperforms HA, CSC, and placebo in WOMAC and VAS outcomes at 3, 6, and 12 months. VAS score: PRP+HA>PRP>CSC>HA>placebo at 3 months PRP+HA showed best outcome at 6 months. PRP>PRP+HA>HA>placebo>CSC at 12 months WOMAC score: PRP>PRP+HA>HA>placebo>CSC at 3 months PRP>CSC>HA>Placebo at 6 months PRP> PRP+HA>HA placebo>CSC at 12 months PRP has a safety profile comparable to placebo, with no increased risk of treatment-related adverse events.
Comparison between intra-articular infiltrations of placebo, steroids, hyaluronic and PRP for knee OA: a Bayesian network meta-analysis (Migliorini et al)[10]	PRP	Placebo, steroids, HA	WOMAC score: PRP>placebo>CCS>HA at 3-months PRP>HA>CSC>placebo at 6-months PRP>placebo>HA>CCS at 12-months VAS score: PRP>CCS>HA>placebo at 3 months PRP>CCS>placebo>HA at 6 months PRP>CCS>placebo>HA at 12 months
Comparison of HA and PRP in knee OA: a systematic review (Xu et al)[6]	PRP	HA	PRP shows potential advantages compared to HA for the KOA patients, based on the analysis of VAS score, WOMAC score, IKDC score, KOOS score and EQ-VAS score

Continued.

Title and authors	Test	Control	Findings
Efficacy of hydrolysed collagen injections compared to PRP and HA in the treatment of patients with symptomatic knee OA: a retrospective clinical study (Glinkowski et al)[11]	Hydrolysed collagen (CHG)	HA and PRP.	WOMAC score: At 12-month: CHG group showed a 56% improvement in the WOMAC total score, compared to 22.5% for the HA group and 47% for the PRP group. At 12 months, physical function improved by 58% with CHG, 24.4% with HA, and 51% with PRP. Similarly, improvement in stiffness at 12 months was 44% for CHG, 30% for HA, and 27% for PRP. VAS score: Pain reduction was also greatest in the CHG group, with a 52% decrease at 12 months, versus 16% in the HA group ($p<0.05$) and 35% with PRP.
Platelet rich plasma compared to visco-supplementation in the treatment of knee OA: A systematic review and meta-analysis of randomised controlled trials with 6 month and 12 month follow-up (Bagheri et al)[12]	PRP	Viscosupplementationin i. e., HA	WOMAC and VAS score: PRP had a significant benefit over HA based on the WOMAC and VAS at 6 months and at 12 months. Platelet concentration: PRP had a statistically significant benefit over HA for platelet counts corresponding to 'greater than baseline to 1,250,000 platelets/μL' for the WOMAC score and platelet counts corresponding to 'between 750,000 and 1,250,000 platelets/μL' for VAS score.

KEY POINT OF UNDERSTANDING

Recent meta-analyses and systematic reviews have shown that PRP injections offer significant and superior clinical benefits compared to traditional treatments for knee OA. As per Table 1, when it comes to relieving pain and improving joint function, PRP consistently outperforms placebo, HA, and CSC at different stages: at 3 months, 6 months, and 12 months. Findings from studies like those by Qiao et al and Migliorini et al confirm that PRP ranks higher than these alternatives at all measured timepoints. While combining PRP with HA may provide slightly better short-term pain relief (especially at 3 to 6 months), PRP alone delivers equal or better results over the long term. One key reason for PRP's lasting effects is its ability to address the underlying joint environment especially beyond 6 months.

However, the effectiveness of PRP largely depends on its platelet concentration. Only high-concentration PRP (above 800,000 platelets/μL) has been shown to maintain meaningful pain relief and functional improvements up to 12 months. The best outcomes are seen with 2-3 PRP injections spaced 2 to 4 weeks apart, rather than a single injection. Safety-wise, PRP minimal to no adverse events and is as safe as placebo or HA and CSC, which may contribute to cartilage breakdown if used repeatedly.

Most side effects, like mild pain or swelling after injection, are temporary and self-resolving.

CONCLUSION

Therefore, PRP especially in high concentrations and given as a series of injections proves to be more effective, longer-lasting, and safer biological treatment for mild to moderate knee OA compared to conservative treatments. While PRP is safe and effective, standardization of protocols and cost-effectiveness studies are needed to optimize its clinical application.

Recommendations

Patient selection

PRP is recommended as a biological treatment for patients with mild to moderate knee OA.

PRP preparation

High concentration is critical

Use a high concentration PRP preparation (specifically >800,000 platelets/μL) to ensure long-term efficacy.

Dosage regimen

Administer 2 to 3 injections, spaced 2 to 4 weeks apart, rather than a single injection for optimal and sustained results.

Comparative efficacy and combination therapy

PRP is recommended over traditional treatments like HA, CSC, and placebo, as it provides superior and clinically significant improvements in pain and function that are sustained at 3, 6, and 12 months. When PRP combined with HA may offer slightly better short-term relief (3-6 months), PRP alone is equally or more effective in the long term (12 months).

Safety

PRP is recommended as a safe treatment option, with a safety profile comparable to placebo and HA.

Future directions

Cost-effectiveness studies are recommended to inform broader healthcare policy and decision-making regarding its adoption.

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