Platelet-Rich Plasma for Knee Osteoarthritis: A Scoping Review of Protocol Heterogeneity

Milka Rosario Nuñez[1], Qing Zhao Ruan, MD[2], Christopher L. Robinson, MD, PhD[3], Jamal J. Hasoon, MD[4]

(1) Universidad Iberoamericana (UNIBE), Santo Domingo, DR (2) Brown University, Providence, RI, USA (3) Division of Pain Medicine, Johns Hopkins University, Baltimore, MD, USA (4) Anesthesia, Critical Care & Pain Medicine, UTHealth Houston, Houston, TX, USA.



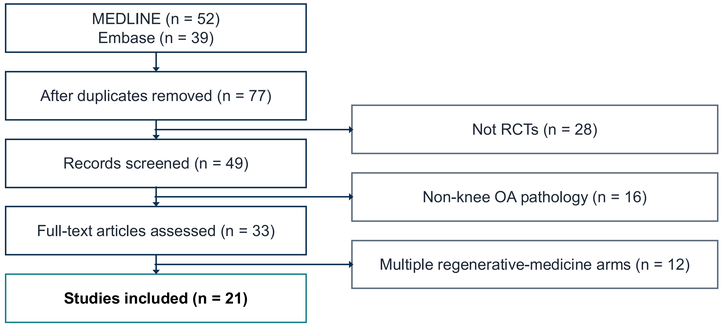
INTRODUCTION

Intra-articular platelet-rich plasma (PRP) is a promising treatment for knee osteoarthritis (OA), but its preparation and administration lack standardization. This review assessed how PRP protocols vary across randomized controlled trials and summarized reported outcomes and adverse events.

METHODS

- Scoping review following PRISMA and PRISMA-ScR guidance
- MEDLINE and Embase searched through February 15, 2026, for English-language RCTs comparing intra-articular PRP with hyaluronic acid, corticosteroids, radiofrequency ablation, or saline
- Extracted: study characteristics, demographics, Kellgren–Lawrence grade, PRP protocols, follow-up, adverse events, conclusions
- Outcomes classified as superior, non-inferior, or inferior based on comparative benefit

STUDY SELECTION



TABLE

First author, year	PRP conc. (× baseline)	Volume (mL)	Regimen	Leukocyte	Centrifuge setting	Comparator	Conclusion
Anwar 2025	*NR*	*NR*	Single ×1	*NR*	1000 g, 10 min	RFA	Superior
Bains 2025	*NR*	3	Single ×1	*NR*	*NR*	Triamcinolone + lidocaine	Non-inferior
Bennell 2021	1.6–5×	5	Weekly ×3	Poor	1500 g, 5 min	Saline placebo	Inferior
Cerza 2012	*NR*	5.5	Weekly ×4	*NR*	*NR*	HA	Superior
Chu 2022	4.3×	5	Weekly ×3	Poor	3200/3300 rpm, 5/3 min	Saline placebo	Non-inferior
Dorio 2021	3×	1.4–5	Bi-weekly ×2	*NR*	1500/2300 rpm, 12/10 min 10-min interval	Plasma, saline	Inferior
Elawamy 2021	>3×	5–6	Single ×1	*NR*	3500/4000 rpm, 10/7 min	RFA	Inferior
Elksniņš-Finogejevs 2020	*NR*	8	Single ×1	*NR*	1800 rpm, 8 min	Triamcinolone 40 mg	Superior
Filardo 2012	5×	*NR*	Weekly ×3	Rich	1480/3400 rpm, 6/15 min	HA	Non-inferior
Filardo 2015	4.6 ± 1.4×	*NR*	Weekly ×3	Rich	1480/3400 rpm, 6/15 min	HA	Non-inferior
Fossati 2024	1.8×	*NR*	Bi-weekly ×3	*NR*	3500 rpm, 5 min	HA	Non-inferior
Ghorbani 2024	*NR*	5	×3 in 1 month	*NR*	1600/2800 rpm, 15/7 min	HA	Superior
Gormeli 2017	5.2–5.2×	5	Weekly ×1–3	*NR*	1500/3500 rpm, 6/12 min	HA	Superior
Montañez-Heredia 2016	1.15–9.80×	*NR*	q15 days ×3	*NR*	Double spin, rpm NR	HA	Non-inferior
Nunes-Tamashiro 2022	2.5–5×	*NR*	Single ×1	*NR*	1200 rpm, 10 min	Triamcinolone; saline	Non-inferior
Patel 2013	2–3×	8	Single vs q3 wkly ×2	Poor	1500 rpm, 15 min	Saline placebo	Non-inferior
Paterson 2016	*NR*	3	Weekly ×3	*NR*	2000/3000 rpm, 5/3 min	HA	Non-inferior
Smith 2016	*NR*	4–7.1	Weekly ×3	Poor	1500 rpm, 5 min	Saline placebo	Non-inferior
Spaková 2012	4.5×	3	Weekly ×3	*NR*	3200/1500/3200 rpm, 15/10/10 min	HA	Superior
Tschopp 2023	~500 × 10^3/μL	3	Single ×1	Poor	1500 rpm, 5 min	HA; steroid; saline	Inferior
Yoshioka 2024	475.4 ± 106.7 × 10^3/μL	6	Weekly ×3	Poor	2100 rpm, 8 min	Saline placebo	Non-inferior

Table 1. PRP preparation protocols and conclusion grading in the included randomized trials (n = 21), listed by first author. NR = not reported in the trial. Conc.: platelet concentration. Leukocyte: poor/rich = leukocyte-poor/leukocyte-rich PRP. Centrifuge: for double or triple spins, values are listed in order of spin. Conclusion: superior = PRP outperformed the comparator; non-inferior = equivalent; inferior = worse than the comparator or equivalent to placebo. HA: hyaluronic acid; RFA: radiofrequency ablation; rpm: revolutions per minute.

RESULTS

- 21 randomized trials included; 17 showed PRP at least equivalent to the comparator (6 superior, 11 non-inferior, 4 inferior)
- Protocols varied widely: platelet concentration from 1.15× to nearly 9.85× baseline, spin speed 1500–4000 rpm, spin time 5–22 min, volume 1.4–8 mL; three weekly injections were most common
- Often not reported: leukocyte type (13 of 21), injection guidance (9), platelet concentration (7)
- No major adverse events; transient pain and swelling were most common

DISCUSSION / CONCLUSIONS

- PRP appears safe and may benefit patients with knee OA; many trials found pain and function comparable to or better than corticosteroids and hyaluronic acid
- Higher platelet concentrations, repeated injections, and image guidance were associated with more favorable outcomes, but protocol variability limits firm conclusions
- Inconsistent preparation and reporting remain key limitations
- Future studies should use standardized protocols and reporting

REFERENCES

1.Bains SS, et al. J Arthroplasty. 2025;40:S59–S64. doi:10.1016/j.arth.2025.03.013.
2.Bennell KL, et al. JAMA. 2021;326:2021–2030. doi:10.1001/jama.2021.19415.
3.Bensa A, et al. Am J Sports Med. 2025;53:745–754. doi:10.1177/03635465241246524.
4.Cerza F, et al. Am J Sports Med. 2012;40:2822–2827. doi:10.1177/0363546512461902.
5.Chu J, et al. Knee Surg Sports Traumatol Arthrosc. 2022;30:4063–4071. doi:10.1007/s00167-022-06887-7.