Letter to Editor

# Platelet Rich Plasma and Stem Cell Therapy in orthopedics

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## *Respected Editor*

With the advent of several innovations, orthopedics is constantly developing. 3D printing, creative monitoring solutions, activity trackers, and big data to grow data-driven solutions in orthopedics are just a few new technology and treatment approaches. Biologics has appeared as a large field of innovation in clinical care in current years (1).

Biologics are active compounds produced from live cells that may be manufactured using a variety of biotechnology processes. Comprehending the optimal physical environment for biologics to function and a critical study of the literature on their safeness and effectiveness is required to establish appropriate expectations for biologics' therapeutic ability and suggest substantial areas for prospective investigation (1, 2).

Using cell-based technology, platelet-rich plasma (PRP) and mesenchymal stem cell (MSC) therapy can alter the ordinary course of knee osteoarthritis (3, 4). Over 400 clinical trials studying the use of PRP and over 800 evaluating the use of MSCs in various therapeutic applications are currently complete or continuing.

**Clinical outcomes of platelet-rich plasma:** Platelets include proteins known as growth factors, which aid in healing injuries. PRP is made by taking a patient's blood, separating platelets from other blood cells, and increasing their concentration by centrifugation. PRP treatment has shown promising benefits for chronic tendon injuries and knee arthritis (3, 4).

PRP is often compared to hyaluronic acid as a control in clinical trials and nonrandomized studies; a proper control, such as normal saline, is rarely utilized as a comparator. Because of invasive therapy use, some of the investigations included in the previously mentioned meta-analyses group lack a true control group, making it challenging to evaluate placebo effects. Even though several studies claimed that PRP might help with pain and physical function, the data to back up these claims was typical of inadequate quality (5). There is much variation in PRP methods regarding research designs and aspects like isolation, collecting, and administration. Most trials only followed patients for a year, raising concerns about long-term durability and potentially harmful effects on the knee joint that may not be apparent early on. There is also some evidence that individuals with cartilage degradation at an earlier stage are more likely to benefit from PRP, but further investigation is needed to determine which patients would benefit the most (1, 2).

**Clinical outcomes of Mesenchymal stem cells therapy:** In the body, stem cells may develop into more than 200 distinct cell types. They can generate new cells in healthy tissues and repair damaged ones.

MSCs are the preferred type of treatment because they can develop into many tissues (e.g., muscles, bones, fat, cartilage) and may be acquired from various sources (e.g., bone marrow, adipose tissue, synovial tissue, peripheral blood). For bone-joint injuries and osteoarthritis-cartilage abnormalities, promising outcomes of stem cell treatment are available (3).

Over the last decade, the quantity of published evidence on the use of MSC therapy in treating knee osteoarthritis has increased exponentially. Because of variability in research design and outcome measures, as well as a significant risk of bias, the results of the meta-analyses provided have limitations. Furthermore, when just RCTs were included in the meta-analyses, most of the previously reported improvement in pain and function was lost (3).

Biologic preparations should be chosen in line with the pathology being treated, and there is emerging evidence to support this method. The availability, proliferative ability, and differentiation potential of MSCs have all been argued as critical factors, although the knowledge on this issue is still sparse and contradictory. There is no consensus on the best preparation, source, administration route, or dosage of biological treatments in sports medicine, which is compounded by the lack of experimental information in the most published study. Ultimately, we must specify the biological target for various tissues and diseases. The best treatment depends on the therapeutic objective (6).

**Summary:** While biologics have the potential to treat a wide range of orthopedic injuries and diseases, there is currently insufficient data to support their use. The choice to use biologics in clinical treatment should be based on the availability of acceptable evidence for the clinical condition being addressed (1, 2). Because of the significant variability across treatment regimens, formulations, and research designs and a high risk of bias, assessed outcomes, absence of comparison with real placebo, and outcome measures seldom exceeding 12 months, the quality of the supporting evidence is dubious (1, 6).

Finally, while planning research, it is critical to evaluate the chronicity of the bone lesion. Most research using extended bone animal models surgically produces acute bone lesions treated with PRP plus or without MSCs before being closed. On the other hand, delay union is a chronic problem in clinical practice. Future in vivo research examining the impact of PRP with or without MSCs on chronic bone diseases would be excellent (3, 5).

We encourage team physicians to keep current with the most recent investigation and preparation methods for individual injuries, given the significant variability in orthobiologic formulations. To improve results and reduce the risk of adverse events, meticulous and sterile preparation procedures must be followed.

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## Conflicts of Interest

The authors declare that there are no conflicts of interest.

## References

1. Flessa S, Huebner C. Innovations in Health Care-A Conceptual Framework. Int J Environ Res Public Health. 2021;18(19).
2. Chu CR, Rodeo S, Bhutani N, Goodrich LR, Huard J, Irrgang J, et al. Optimizing Clinical Use of Biologics in Orthopaedic Surgery: Consensus Recommendations From the 2018 AAOS/NIH U-13 Conference. J Am Acad Orthop Surg. 2019;27(2):e50-e63.
3. Ghalavand M, Esmaeili Gouvarchin Ghaleh H, Mohammadi-Yeganeh S. Comparison of the Modulated Effects of Tretinoin and Calcitriol Treated Mesenchymal Stem Cell Supernatant on Macrophage Functions. J Cell Mol Anesth. 2022;7(2):101-8.
4. Nazemian V, Nasseri B, Manaheji HS, Zaringhalam J. Effects of mesenchymal stem cells conditioned medium on behavioral aspects of inflammatory arthritic pain induced by CFA adjuvant. J Cell Mol Anesth. 2016;1(2):47-55.
5. Bannuru RR, McAlindon TE, Sullivan MC, Wong JB, Kent DM, Schmid CH. Effectiveness and Implications of Alternative Placebo Treatments: A Systematic Review and Network Meta-analysis of Osteoarthritis Trials. Ann Intern Med. 2015;163(5):365-72.
6. Zali H, Golchin A, Farahani M, Yazdani M, Ranjbar MM, Dabbagh A. FDA Approved Drugs Repurposing of Toll-Like Receptor4 (TLR4) Candidate for Neuropathy. Iran J Pharm Res. 2019;18(3):1639-47.