EDITORIAL

Platelet-Rich Plasma: Are We Ahead of the Evidence?

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Platelet-rich plasma (PRP) has undoubtedly attracted the attention of the world of regenerative medicine and holds the promise of revolutionizing tissue repair. The idea is simple: applying the body's own healing capability, in a concentrated and precise manner, on the part of the body that is needed.[1-3]

From orthopedics to aesthetic medicine, PRP's potential to accelerate tissue repair, reduce inflammation, and boost regeneration sounds almost too good to be true.

Despite years of investigation and a growing body of scientific literature, PRP is often a complementary procedure that promises more than it really delivers. The process of transforming a biological concept into a reliable clinical tool has always been accompanied by many dos and don'ts, leaving many clinicians hesitant about its evident practical value.[4,5]

The constant gap between its hypothetical promise and evident practical outcomes stems from a set of issues: variable product quality, poor evidence, side effects, regulatory uncertainty, therapeutic efficacy and doubts about cost-effectiveness or worthwhileness. Perhaps the main problem is the considerable variation in PRP preparation methods. There is no single PRP. Instead, a wide range of preparation protocols have been used, each with different platelet and white blood cell (WBC) counts, growth factor content, and activation method.[2,6]

The role of WBCs, especially neutrophils in the PRP matrix is increasingly recognized as a double-edged sword, complicating the standardization of clinical protocols. On the other hand, pro-inflammatory characteristic of neutrophil has been historically noted as detrimental factor. Conversely, recent evidence suggests that the inflammatory response triggered by WBCs may be beneficial for the remodeling phase of healing.[7,8]

Variations in blood fractionation methodologies, namely single- versus double-spin centrifugation, changes the cellular composition and growth factor kinetics of the final product. This persistent lack of unified protocols compromises the interpretability of clinical outcomes, as published studies reporting the successful results often fail to provide a detailed compositional profile of the specific PRP employed. This variability complicates evidence-based clinical decision-making, leaving surgeons with a profound difficulty in optimizing treatment for specific patient needs, often leading to inconsistent clinical efficacy and therapeutic unpredictability.[7,8]

The extensive body of PRP literature presents a complex challenge. A considerable portion of these studies suffers from methodological limitations, including small sample sizes, inadequate control groups, or the use of variable outcome endpoints. This variability prompts a critical question for clinical application: How can we reconcile these heterogeneous outcomes to establish a predictable therapeutic approach with optimal efficacy.[2,5,9]

This isn't surprising when you consider how complex surgical outcomes are; they're influenced by a confluence of factors including technique, post-operative rehabilitation protocols, and patient-specific factors, complicating the interpretation of therapeutic efficacy. Furthermore, the substantial contribution of the placebo effect, a well-documented phenomenon particularly pronounced in regenerative medicine, introduces a significant confounder. Consequently, many studies face challenges in disentangling the true therapeutic benefit from patient expectation, leading to ambiguity regarding the true driver or the precise source of observed improvements. Thus, despite the apparent promise of PRP for specific applications such as osteoarthritis and tendinopathies, its efficacy in areas like fracture healing and complex wound repair remains critically uncertain largely owing to the paucity of rigorous, large-scale clinical trials needed to draw robust conclusions. This evidentiary gap, compounded by regulatory complexities, leaves clinicians without clear guidance and impedes the translation of promising preclinical findings into reliable clinical practice.[10,11]

PRP's autologous origin and in-clinic processing present a substantial regulatory challenge, defying simple classification as either a drug or a medical device. This

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international variability in regulatory approaches creates a complex and often restrictive environment, hindering research initiatives and contributing to inconsistent clinical adoption. Consequently, a polarization is evident among practitioners: some surgeons embrace extensive PRP utilization, while others adopt a more conservative stance due to the unresolved regulatory ambiguities.[2,7,9,12]

Furthermore, the economic viability of PRP warrants significant consideration. The substantial costs associated with specialized kits and the time-intensive nature of its application necessitate robust justification through clear and measurable patient outcomes. Without compelling evidence of cost-effectiveness, particularly within resource-constrained healthcare environments, PRP is at risk of becoming an exclusive treatment, inaccessible to the broader patient population.[13,14]

Safety is generally considered a primary strength of PRP therapy, largely owing to its autologous nature, which makes serious complications infrequent. However, vigilance remains essential. Potential adverse events encompass improper technique, contamination, and localized inflammatory reactions at the injection site. Regarding long-term implications, although no definitive evidence currently links PRP to cancer development, ongoing vigilance and transparent reporting of adverse events are essential.[2,6]

Consequently, PRP's future progression depends on shifting from general optimism to a more precise, evidence-guided approach. To advance the field, we urgently require standardized methodologies for classifying PRP products and detailing their preparation protocols. Establishing a consensus on key outcome metrics is also essential. Research efforts must pivot from a general question of efficacy ('Does PRP work?') to a specific one: 'Which specific PRP formulation is optimal for a particular condition? Ultimately, only through rigorous, well-designed clinical trials that mirror real-world scenarios can we translate PRP's promise into practice, and firmly establish it as a valuable surgical tool.

Conclusion

In conclusion, there is still a significant gap between the promise of PRP and its proven results. We must move beyond the current 'one-size-fits-all' approach. Standardizing how we prepare PRP and identifying exactly which patients benefit most are not just academic goals; they are essential steps to stop this therapy from being misused for financial gain. Moving forward, we must replace commercial hype with scientific discipline. By prioritizing rigorous, evidence-based data over premature adoption, we can bridge the gap between laboratory potential and real-world clinical results. Ultimately, our duty to our patients is to ensure that every application of PRP in surgery is grounded in verified, evidence-based results. By doing so, we uphold our commitment to safe medical practice and ensure that clinical integrity remains our highest priority.

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