Annals of Case Reports and Clinical Studies
Review Article (ISSN: 2834-5673)

Beyond PRP: Emerging Blood Derived Biologics in Facial Aesthetic and Regenerative Surgery- A Comprehensive Literature Review

Riya D Parwani[1], Upasa Sarma Medhi[2], Abhinn Miglani[3*], Shalini Sahoo[4], Ritika[5], Lara Mishra[6], Tanishka Taori[7]

[1]Sharad Pawar Dental College, Wardha, Maharashtra

[2]Department of Oral & Maxillofacial Surgery, Institute Of Dental Sciences , Bhubaneswar, Odisha

[3]Department of Oral & Maxillofacial Surgery, Institute Of Dental Sciences, Bhubaneswar, Odisha

[4]Department Of Public Health Dentistry, Institute Of Dental Sciences, Bhubaneswar, Odisha

[5]Department of Oral & Maxillofacial Surgery, ITS Dental College, Muradnagar, Ghaziabad, Uttar Pradesh

[6]Department of Oral & Maxillofacial Surgery, Institute Of Dental Sciences, Bhubaneswar, Odisha

[7]Department Of Conservative Dentistry And Endodontics, Rishiraj College Of Dental Science And Research, Bhopal

Citation: *Riya D parwani, Upasa Sarma Medhi, Abhinn Miglani, Shalini Sahoo, Ritika, Lara Mishra, Tanishka Taori. Beyond PRP: Emerging Blood-Derived Biologics in Facial Aesthetic and Regenerative Surgery—A Comprehensive Literature Review. Ann Case Rep Clin Stud. 2026;5(8):1-8.*

Received Date: 06 June 2026; **Accepted Date:** 08 July 2026; **Published Date:** 09 August 2026

***Corresponding author:** Abhinn Miglani, Institute Of Dental Sciences, , Bhubaneswar, Odisha, India

ABSTRACT

Emerging blood-derived biologics show a generally favorable but heterogeneous evidence base in facial aesthetic and regenerative surgery, with the strongest and most consistent support for platelet-rich plasma (PRP) in skin rejuvenation and periorbital rejuvenation, while evidence for chronic wound repair and bone augmentation is more mixed and, in some contexts, insufficient. In periorbital rejuvenation, PRP improved patient satisfaction over saline, platelet-poor plasma, mesotherapy, and adjunctive laser approaches, with meta-analytic benefit reported as $p = 0.001$, whereas a randomized trial in photoaged facial skin found significant wrinkle-score and texture improvement over placebo. This topic matters because facial biologics are increasingly used across dermatologic and surgical settings, yet product heterogeneity, variable comparators, and inconsistent follow-up limit translation.

Across broader aesthetic and reconstructive uses, PRP and related concentrates were repeatedly associated with improved skin quality, wound healing, fat graft survival, and soft-tissue healing, but results depended on indication and formulation; platelet-rich fibrin (PRF) appeared especially promising for soft tissue healing and dry-socket reduction while hard-tissue regeneration remained less certain. Newer platelet-derived products extended the field beyond PRP: injectable PRF showed favorable clinical results in dermatologic practice, and platelet exosome-based topical therapy improved skin health score by 224.2 ± 112.8 at 6 weeks with significant reductions in redness, wrinkles, and melanin production. Overall, the literature supports clinical promise but not yet standardization, and the principal gap is the absence of harmonized preparation, dosing, and long-term comparative evidence across biologic classes.

Keywords: Biologics, Facial, Aesthetic, Regenerative, Surgery

1. INTRODUCTION

Facial aesthetic and regenerative surgery increasingly relies on biologically active adjuncts intended to improve tissue quality, accelerate healing, and enhance procedural outcomes. Among these, autologous platelet concentrates and related blood-derived products have moved from experimental adjuncts toward common clinical use because they are minimally invasive, relatively accessible, and enriched with growth factors implicated in tissue repair, collagen production, angiogenesis, and cell migration [1, 2]. PRP remains the most established of these biologics, but the field now includes PRF, plasma rich in growth factors, injectable PRF, adipose- and platelet-combined strategies, and platelet-derived exosome products, each proposed to offer distinct structural or signaling advantages [1,3].

Despite broad enthusiasm, the literature has long been constrained by heterogeneous preparation methods, inconsistent delivery protocols, and variable outcome measures. Some studies emphasize subjective aesthetic improvement, whereas others incorporate histology, imaging, or objective skin metrics, making cross-study interpretation difficult [3, 4, 5]

In reconstructive settings, the evidence is similarly uneven: platelet concentrates appear to improve soft-tissue healing and post-extraction recovery, but their role in hard-tissue regeneration is less certain

[3]. In facial aesthetics, a growing set of studies suggests improvements in wrinkles, texture, pigmentation, and patient satisfaction, yet the degree to which these benefits extend beyond PRP to newer biologics remains uncertain [1, 6].

A synthesis focused specifically on blood-derived biologics is therefore needed to clarify which formulations have the most credible clinical support, which indications show the clearest benefit, and where translational uncertainty persists. The present review addresses this gap by integrating evidence on PRP and emerging derivatives in facial rejuvenation and regenerative surgery, with attention to comparative effectiveness, mechanistic plausibility, and the limits imposed by methodological heterogeneity.

2. METHODS

2.1 Search Strategy

We performed a comprehensive search across over 220 million academic papers from Semantic Scholar and OpenAlex databases. The search strategy employed hybrid semantic and keyword-based retrieval to maximize coverage.

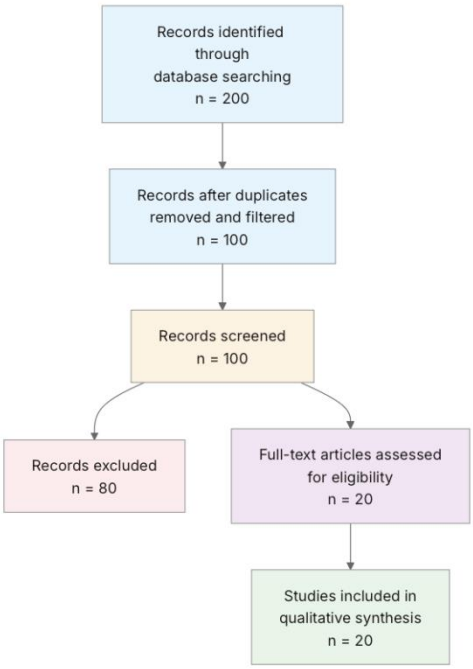
Search queries included:

- "Emerging blood-derived biologics in facial aesthetic regenerative surgery review"
- "Platelet rich plasma facial aesthetics regenerative surgery biologics"
- "Platelet lysate exosomes growth factors facial rejuvenation surgery"
- "Autologous blood products and regenerative injectables in aesthetic medicine"
- "Blood derived biologics wound healing facial plastic surgery review"

2.2 Study Selection

Initial database searching identified 200 records. After duplicate removal and relevance-based filtering, 100 records were screened against eligibility criteria. Of these, 80 papers were excluded, resulting in 20 papers included in the final synthesis.

PRISMA Flow Diagram



Eligibility criteria included:

- **Human Study:** Does the study involve human participants or human-derived clinical tissue, rather than only animal or in vitro models?
- **Blood Biologic:** Does the study investigate a blood-derived biologic such as PRP, PRF, platelet lysate, platelet-rich fibrin matrix, autologous serum, conditioned serum, or blood-derived extracellular vesicles?
- **Facial Context:** Does the study focus on facial aesthetic treatment, facial rejuvenation, facial wound/scar healing, or facial reconstructive surgery?
- **Clinical Outcome:** Does the study report at least one clinical, histologic, imaging, or patient-reported outcome relevant to efficacy or safety?
- **Comparative Data:** Does the study include a comparator group, pre-post assessment, or explicit baseline-to-follow-up evaluation?
- **Novel Biologic:** Does the study examine an emerging biologic beyond standard PRP alone, such as PRF, platelet lysate, exosomes, or other derivative formulations?

- **Surgical Regeneration:** Does the study involve regenerative surgery, perioperative healing, or procedural augmentation in a facial surgical setting?
- **Longitudinal Follow-up:** Does the study report follow-up of at least 2 weeks or a clearly stated post-treatment observation period?

All included studies met the stated eligibility criteria.

2.3 Data Extraction and Synthesis

Data extraction focused on the following variables:

- Biologic Type
- Clinical Setting
- Study Design
- Population/Model
- Intervention Details
- Comparator
- Outcomes Measured
- Key Findings
- Follow-up
- Evidence Gap

Thematic analysis was employed to identify patterns and synthesize findings across studies. Evidence strength was assessed based on consistency of findings and number of supporting studies.

3. RESULTS

3.1 Characteristics of Included Studies

Study (Year)	Study Design	Biologic/Platelet Product	Clinical Setting	Primary Outcome(s)	Follow-up
Alam et al. (2018)	Randomized controlled trial (RCT)	Platelet-rich plasma (PRP)	Photoaged facial skin	Wrinkle reduction, skin texture, patient satisfaction	Not specified
Rigotti et al. (2016)	Randomized controlled trial (RCT)	Platelet-rich plasma (PRP)	Facial rejuvenation	Comparative rejuvenation efficacy	Not specified
Miron et al. (2017)	Systematic review	Platelet-rich fibrin (PRF)	Regenerative dentistry, extraction sockets	Soft tissue healing, dry socket prevention, periodontal outcomes	Not specified
Samadi et al. (2018)	Systematic review	Platelet-rich plasma (PRP)	Aesthetic and regenerative medicine	Wound healing, wrinkle improvement, scar reduction, patient satisfaction	Variable
Siawasch et al. (2024)	Systematic review and meta-analysis	Autologous platelet concentrates (PRP, PRGF, L-PRF)	Alveolar ridge preservation	Bone dimensional changes, healing, postoperative pain	Not specified
Blanco et al. (2024)	Narrative review	Autologous platelet concentrates (APCs)	Alveolar bone augmentation	Bone augmentation outcomes	Not specified

Study (Year)	Study Design	Biologic/Platelet Product	Clinical Setting	Primary Outcome(s)	Follow-up
Chicharro-Alcántara et al. (2018)	Narrative review	Platelet-rich plasma (PRP)	Cutaneous wound healing	Wound healing mechanisms and clinical outcomes	Not reported
Gentile & Garcovich (2023)	Systematic review	Platelet-rich plasma (PRP)	Facial rejuvenation	Facial aesthetic improvement	Not specified
Lam et al. (2024)	Systematic review	Platelet-rich plasma (PRP)	Skin rejuvenation	Pore size, skin texture, wrinkles, pigmentation	Treatment protocols ranged from 1–3 sessions
Chamata et al. (2020)	Narrative review	Platelet-rich plasma (PRP)	Facial rejuvenation and hair restoration	Skin rejuvenation, wound healing, fat graft retention	Not specified
Davies & Miron (2024)	Narrative/Systematic review	APCs (PRP, PRGF, PRF)	Facial aesthetics and dermatology	Overall aesthetic improvement	Not specified
Proffer et al. (2022)	Prospective longitudinal study	Human platelet exosome product (HPE)	Skin rejuvenation	Skin quality, erythema, wrinkle reduction, pigmentation	6 weeks
Gentile & Garcovich (2021)	Systematic review	Adipose-derived MSCs + PRP	Chronic wounds and soft tissue defects	Safety and clinical efficacy	Not specified
Motosko et al. (2018)	Systematic review	Platelet-rich plasma (PRP)	Facial rejuvenation,	Clinical efficacy, protocol variability	Not specified

Study (Year)	Study Design	Biologic/Platelet Product	Clinical Setting	Primary Outcome(s)	Follow-up
			acne scars, alopecia		
Bansod & Bhushan (2020)	Case series	Injectable platelet-rich fibrin (i-PRF)	Dermatologic and aesthetic applications	Favorable clinical outcomes	Not specified
Evans et al. (2021)	Systematic review and meta-analysis	Platelet-rich plasma (PRP)	Periorbital rejuvenation	Patient satisfaction, histological improvement, evaluator assessment	Mean follow-up ≈3 months
Sommeling et al. (2013)	Systematic review	Platelet-rich plasma (PRP)	Plastic surgery	Wound healing, fat graft survival, bone regeneration	Not specified
Santos et al. (2024)	Systematic review	Platelet-rich plasma (PRP) and platelet-rich fibrin (PRF)	Aesthetic medicine	Tissue regeneration, cell proliferation, patient satisfaction	Not specified
Martínez-Zapata et al. (2012)	Systematic review of RCTs	Platelet-rich plasma (PRP)	Chronic wounds	Wound healing efficacy	Not specified
Popescu et al. (2021)	Narrative review	Platelet-rich plasma (PRP)	Regenerative medicine	Standardization and quality control of PRP	Not specified

The included literature is dominated by PRP, with a smaller but important set of studies on PRF, APCs, and one platelet-derived exosome product. Most evidence comes from reviews and syntheses, while direct clinical trials are fewer and concentrated in facial rejuvenation and selected surgical healing settings. Follow-up reporting is frequently incomplete or short, and outcome measures vary substantially, ranging from subjective satisfaction to histologic and imaging-based endpoints.

3.2 Thematic Findings

3.2.1 PRP shows the clearest benefit in facial skin rejuvenation, especially for wrinkles, texture, and periorbital aging

Across facial aesthetic studies, PRP produced the most consistent improvements in visible skin quality. In photoaged facial skin, PRP improved wrinkle score and skin texture over placebo [1]. In periorbital rejuvenation, intradermal PRP increased patient satisfaction above saline, platelet-poor plasma, mesotherapy, and adjunctive laser therapy, with a statistically significant overall effect ($p = 0.001$) and histologic improvement in photoaging [6, 7]. Broader skin-rejuvenation synthesis likewise reported gains in pore size, texture, wrinkle reduction, pigmented spots, collagen density, hyaluronic acid levels, and ultraviolet protection after one to three sessions [8,9]. Notably, a topical platelet-derived exosome product extended this pattern beyond injection-based therapy: skin health score improved by **224.2 ± 112.8** at 6 weeks, accompanied by reductions in redness, wrinkles, and melanin production [10,11,12].

The convergence across these studies suggests that the strongest aesthetic signal lies in surface-quality outcomes rather than deep structural remodeling. Improvements were repeatedly captured by patient-reported outcomes, evaluator ratings, and imaging-based measures, although the comparability of these measures remains limited because studies used different endpoints and often lacked standardized protocols [8, 9]. **Confidence:** Moderate to strong, because the direction of effect is broadly consistent, but the evidence is diluted by heterogeneous designs and reporting.

3.2.2 Newer platelet-derived biologics appear promising, but the evidence base is far thinner than for PRP

PRF and platelet-derived exosome products extend the biologic rationale beyond classical PRP by providing either a fibrin scaffold or a more controlled derivative signal. In dermatologic case series, injectable PRF was reported to yield favorable results in androgenetic alopecia, periorbital rejuvenation, temporary filler use, and wound healing [13]. In facial esthetics, the limited comparative literature indicated superior outcomes for PRF over PRP in the few studies that directly tested them [11]. Mechanistically, platelet derivatives are described as promoting fibrin polymerization, angiogenesis, cell proliferation, differentiation, migration, and collagen/elastin production, which offers a plausible rationale for their adjunctive use with laser therapy and microneedling [14, 15].

However, the inference is still tentative because these biologics are supported mainly by narrative synthesis and small clinical series rather than robust comparative trials. The platelet exosome study is particularly important because it provides a clinical evaluation of an off-the-shelf, cell-free topical formulation using measurable biometric endpoints, although its broader implications are constrained by its single-arm design and short-term follow-up [12]. **Confidence:** Limited to moderate, depending on product class; promising signals exist, but the evidence is not mature enough for firm comparative claims.

3.2.3 Soft-tissue and postoperative healing benefits appear more reproducible than hard-tissue regeneration

In regenerative surgery, platelet concentrates were most consistently associated with soft-tissue healing and postoperative recovery. Reviews of regenerative dentistry and oral surgery found favorable effects on soft tissue generation, dry-socket reduction, pain reduction, and faster healing [3,16]. In alveolar ridge preservation, PRP, PRGF, and L-PRF were generally associated with less alveolar ridge resorption, more socket bone fill, and higher bone density compared with unassisted healing, although results were highly heterogeneous and strongly influenced by surgical approach [4]. Similarly, earlier plastic-surgery synthesis reported improved wound healing, better fat graft survival, and enhanced bone graft regeneration [17].

By contrast, hard-tissue outcomes were less consistently supported. The periodontal systematic review explicitly noted limited data for guided bone regeneration and hard-tissue regeneration[3]. The bone-

augmentation narrative review also emphasized scarce literature, small samples, and variable outcome measures, even though most comparative studies were favorable [6]. This pattern suggests that biologic activity may be more readily translated into soft-tissue repair than into structurally demanding osseous outcomes, where mechanical stability, graft material, and surgical technique may dominate the final result. **Confidence:** Moderate for soft-tissue healing, limited for bone regeneration.

3.2.4 Chronic wound evidence remains mixed to negative, highlighting indication-specific performance rather than universal efficacy

Not all clinical domains support PRP uniformly. The most conservative synthesis on chronic wounds reported no evidence that autologous PRP is of value, citing a small number of RCTs with high or unclear risk of bias [18,19]. Yet broader reviews in wound care and regenerative medicine still described PRP as potentially accelerating cutaneous healing and as safe in soft-tissue defects, without major side effects [7,13]. The most defensible interpretation is that results depend strongly on wound type, comparator, and study quality rather than on a class-wide absence of effect.

This contradiction is important because chronic wounds differ from facial rejuvenation both biologically and methodologically: outcomes are slower, multifactorial, and more vulnerable to confounding by vascular status, comorbidity, and baseline severity. The negative conclusion from the more rigorous synthesis therefore weakens any assumption that positive aesthetic findings automatically translate to difficult wound-healing contexts. **Confidence:**Conflicting, because the direction of evidence differs by review and the underlying study quality is variable.

3.2.5 Standardization remains the central barrier to clinical translation across all biologic classes

A recurring theme is that biologic heterogeneity limits interpretability. Reviews repeatedly identified variability in platelet processing, preparation, activation, dose, delivery route, number of sessions, and interval timing [10,11,14,20]. Some of the strongest positive findings come from studies with clearer outcome measurement, such as the meta-analysis of patient satisfaction in periorbital rejuvenation and the imaging-based exosome study [12,16]. In contrast, many positive reports rely on subjective

assessment, making it difficult to determine whether biologic efficacy, expectation effects, or procedural context drives the result [4, 8].

The methodological message is therefore not merely that PRP works, but that its apparent effectiveness is tightly coupled to how it is prepared and measured. This also helps explain why newer products such as PRF and exosomes are generating interest: they may offer more reproducible or biologically coherent formulations, though that proposition is not yet proven. **Confidence:** Strong that standardization is a major limitation; limited that any single newer formulation has already solved it.

4. DISCUSSION

4.1 Principal Findings and Their Interpretation

The synthesis indicates that the most reliable clinical signal for blood-derived biologics in facial practice lies in aesthetic skin improvement, especially wrinkle reduction, texture enhancement, and periorbital rejuvenation. This is biologically plausible because platelet-derived products concentrate growth factors that promote fibroblast activity, collagen/elastin production, angiogenesis, and tissue remodeling, mechanisms directly aligned with visible changes in photodamaged skin [4,7]. The fact that the strongest effects are seen in surface-quality outcomes rather than in deeper reconstructive endpoints suggests that these biologics may be most effective where incremental changes in dermal quality can be detected quickly and noninvasively.

A second important conclusion is that newer formulations do not simply replicate PRP; they may alter the delivery context. PRF's fibrin architecture and injectable form may provide a more sustained scaffold, while platelet-derived exosomes offer a different signaling paradigm altogether [12,15]. The early positive data for these products are therefore not merely “more PRP,” but potentially evidence of a transition from crude autologous concentrates to more standardized biologic platforms. Still, the evidence remains too sparse to conclude superiority over PRP with confidence.

The most confident inference overall is that standardization is the key determinant of whether these therapies can mature into reproducible clinical tools. The literature repeatedly shows that favorable

outcomes are often reported when protocols and outcome measurement are relatively structured, whereas subjective endpoints and inconsistent preparation methods produce ambiguity [8,9,20]. Confidence is highest for short-term aesthetic improvement, intermediate for soft-tissue healing, and lowest for hard-tissue regeneration and chronic wound indications.

4.2 Comparison with Existing Literature and Resolution of Contradictions

The positive aesthetic findings align across reviews and trials, but their significance depends on how the evidence is measured. Studies using objective imaging, histology, or quantified skin metrics are more persuasive than those relying primarily on subjective appearance scores, because they reduce the risk that expectation effects or cosmetic co-interventions explain the benefit [16,12]. This methodological gradient is important: as assessment tools become more objective, the apparent efficacy signal remains present, which strengthens confidence that at least part of the observed effect is biologically real.

The most important contradiction concerns chronic wounds. One rigorous synthesis concluded that PRP has no demonstrated value for chronic wound treatment, whereas broader reviews described favorable wound-healing effects [7,13,19]. This discrepancy is most plausibly explained by differences in wound biology, comparator choice, and study quality. Chronic wounds are clinically heterogeneous and often burdened by vascular disease, diabetes, or prolonged inflammation, so a treatment that improves cosmetic skin quality may fail to overcome the more complex pathophysiology of chronic ulceration. It is also possible that positive wound-healing reports preferentially come from less stringent or less comparative studies, creating a risk of publication bias toward favorable outcomes.

A similar, though less severe, tension exists in bone regeneration. Reviews suggest benefit in ridge preservation and augmentation, but the same literature repeatedly notes limited data, heterogeneous protocols, and inconclusive comparisons against other biomaterials [3,6]. Here, the contradiction is likely methodological rather than biological: osseous repair is more dependent on surgical context, graft stability, and defect morphology than superficial facial rejuvenation. Thus, the literature does not yet justify treating all platelet concentrates as interchangeable across clinical domains.

4.3 Practical Implications

For clinicians, the most defensible current use of blood-derived biologics is in selected facial rejuvenation settings where patients seek minimally invasive enhancement of skin texture, wrinkles, and periorbital aging, and where expectations can be aligned with short-term, modest-to-moderate improvements [1,9,16]. The evidence is less secure for chronic wounds and bone augmentation, so these indications should be approached more cautiously and ideally within protocolized settings rather than as routine substitutes for established regenerative surgery.

From a public health and regulatory perspective, the central implication is that the field cannot be judged by the category "PRP" alone. Preparation method, activation state, delivery route, and treatment schedule appear to matter substantially, and current evidence does not support assuming equivalence between PRP, PRF, PRGF, injectable PRF, or platelet-derived exosome products [11,15,20]. Regulatory frameworks and clinical guidance therefore need to move beyond product labels and require reporting of composition and preparation parameters.

For patients, the available evidence supports careful counseling that benefits are most predictable in aesthetic facial rejuvenation, while stronger claims about scar repair, wound healing, or bone reconstruction remain premature. Where evidence is derived from oral or dermatologic proxy populations, this should be made explicit before extrapolating to facial surgical practice. The field's next step is not simply to develop more biologics, but to establish **which biologic, for which indication, delivered how, and measured with what outcomes.**

4.4 Strengths and Limitations

This review integrates clinical trials, systematic reviews, narrative syntheses, and emerging prospective data to map the evolving landscape of blood-derived biologics beyond standard PRP. Its main strength is thematic synthesis across aesthetic and reconstructive contexts, allowing comparison of benefits that appear stable across settings and those that remain indication-specific. The review also captures the field's mechanistic direction, especially the shift toward fibrin-based scaffolds and exosome-derived products.

The included literature is limited by heterogeneous study designs, frequent absence of standardized preparation details, inconsistent outcome measures, and short or unreported follow-up. Many studies rely on subjective assessments, and several syntheses note small samples or unclear risk of bias. As a review based on provided abstracts and extracted data, this manuscript is also limited by the completeness of reporting in the source material and by the absence of formal risk-of-bias appraisal.

5. Gaps and Future Directions

The synthesis shows that facial aesthetic applications are better supported than reconstructive ones, but even in aesthetics the field lacks standardized preparation, dosing, and outcome frameworks. Future studies should directly compare PRP, PRF, PRGF, injectable PRF, and platelet-derived exosome products within the same facial indication using harmonized objective endpoints such as imaging, histology, and validated patient-reported measures [11,12,16]. The most urgent gap is long-term comparative evidence: many studies report short follow-up or omit it entirely, making durability unknown [1,10].

For regenerative surgery, future work should stratify by indication, because soft-tissue healing appears more responsive than hard-tissue regeneration. Trials in alveolar ridge preservation and augmentation should specify defect morphology, surgical approach, and biomaterial co-interventions, since these likely modulate response [6]. Chronic wound research should avoid extrapolating from aesthetic success and instead target clearly defined wound phenotypes with robust controls, because current findings are contradictory [13,19]. More broadly, future studies must report biologic composition and preparation parameters consistently, or the field will remain unable to determine whether outcome differences reflect the product itself or the way it is manufactured [20].

6. CONCLUSION

Beyond PRP, the evidence supports a cautious but meaningful expansion of blood-derived biologics in facial aesthetic and regenerative surgery, with the strongest clinical confidence for short-term improvements in facial skin rejuvenation and periorbital aging, and more tentative support for newer products such as PRF and platelet-derived exosomes. The most consistent benefits are seen in wrinkle

reduction, texture improvement, and patient satisfaction, with objective periorbital evidence showing superiority over saline, platelet-poor plasma, mesotherapy, and adjunctive laser controls and a significant overall effect of **p = 0.001** (16); one prospective exosome study also reported a skin health score improvement of **224.2 ± 112.8** at **6 weeks** (12). In contrast, evidence for chronic wounds and hard-tissue regeneration is less stable and sometimes conflicting, making extrapolation from aesthetic use inappropriate without caution [19].

The most important unresolved question is not whether these biologics can work, but which formulation works best for which indication under what preparation conditions**.** That question remains unanswered because of heterogeneity in processing, dosing, comparators, and follow-up. Clarifying this will determine whether emerging platelet-derived therapies become standardized tools in facial regenerative practice or remain promising but variably implemented adjuncts.

REFERENCES

1. Alam M, Hughart R, Champlain A, Geisler A, Paghdal K, Whiting D, et al. Effect of platelet-rich plasma injection for rejuvenation of photoaged facial skin. JAMA Dermatology [Internet]. 2018;154(12):1447.
2. Rigotti G, Charles-de-Sá L, Gontijo-de-Amorim NF, Takiya CM, Amable PR, Borojevic R, et al. Expanded stem cells, stromal-vascular fraction, and platelet-rich plasma enriched fat: Comparing results of different facial rejuvenation approaches in a clinical trial. Aesthetic Surgery Journal [Internet]. 2016;36(3):261–270.
3. Miron RJ, Zucchelli G, Pikos MA, Salama M, Lee S, Guillemette V, et al. Use of platelet-rich fibrin in regenerative dentistry: a systematic review. Clinical Oral Investigations [Internet]. 2017;21(6):1913–1927.
4. Samadi P, Sheykhhasan M, Khoshinani HM. The use of platelet-rich plasma in aesthetic and regenerative medicine: A comprehensive review. Aesthetic Plastic Surgery [Internet]. 2018;43(3):803–814.
5. Siawasch SAM, Yu J, Castro AB, Dhondt R, Teughels W, Temmerman A, et al. Autologous platelet concentrates in alveolar ridge preservation: A systematic review with meta-analyses. Periodontology 2000 [Internet]. 2024;97(1):104–130.
6. Blanco J, Caramés J, Quirynen M. A narrative review on the use of autologous platelet concentrates during alveolar bone augmentation: Horizontal (simultaneous/staged) & vertical (simultaneous/staged).Periodontology 2000 [Internet]. 2024;97(1):236–253.

7. Chicharro-Alcántara D, Rubio-Zaragoza M, Damiá-Giménez E, Carrillo-Poveda J, Cuervo-Serrato B, Peláez-Gorrea P, et al. Platelet rich plasma: New insights for cutaneous wound healing management. Journal of Functional Biomaterials [Internet]. 2018;9(1):10.
8. Gentile P, Garcovich S. Systematic review: Platelet-Rich plasma use in facial rejuvenation. Plastic & Reconstructive Surgery [Internet]. 2023;152(1):72e–82e.
9. Phoebe LKW, Lee KWA, Chan LKW, Hung LC, Wu R, Wong S, et al. Use of platelet rich plasma for skin rejuvenation. Skin Research and Technology [Internet]. 2024;30(4).
10. Chamata E, Bartlett EL, Weir D, Rohrich RJ. Platelet-Rich Plasma: Evolving Role in Plastic Surgery. Plastic & Reconstructive Surgery [Internet]. 2020;147:219–230.
11. Davies C, Miron RJ. Autologous platelet concentrates in esthetic medicine. Periodontology 2000 [Internet]. 2024;97:363–419.
12. Proffer SL, Paradise CR, DeGrazia E, Halaas Y, Durairaj KK, Somenek M, et al. Efficacy and Tolerability of Topical Platelet Exosomes for Skin Rejuvenation: Six-Week Results. Aesthetic Surgery Journal [Internet]. 2022;42:1185–1193.
13. Gentile P, Garcovich S. Systematic review: Adipose-Derived mesenchymal stem cells, platelet-rich plasma and biomaterials as new regenerative strategies in chronic skin wounds and soft tissue defects. International Journal of Molecular Sciences [Internet]. 2021;22(4):1538.
14. Motosko CC, Khouri KS, Poudrier G, Sinno S, Hazen A. Evaluating platelet-rich therapy for facial aesthetics and alopecia: A critical review of the literature. Plastic & Reconstructive Surgery [Internet]. 2018;141(5):1115–1123.
15. Shashank B, Bhushan M. Injectable platelet-rich fibrin (PRF): The newest biomaterial and its use in various dermatological conditions in our practice: A case series. Journal of Cosmetic Dermatology [Internet]. 2020;20(5):1421–1426.
16. Evans AG, Ivanic MG, Botros MA, Pope RW, Halle BR, Glassman GE, et al. Rejuvenating the periorbital area using platelet-rich plasma: a systematic review and meta-analysis. Archives of Dermatological Research [Internet]. 2021;313(9):711–727.
17. Sommeling CE, Heyneman A, Hoeksema H, Verbelen J, Stillaert FB, Monstrey S. The use of platelet-rich plasma in plastic surgery: A systematic review. Journal of Plastic, Reconstructive & Aesthetic Surgery [Internet]. 2013;66(3):301–311.
18. Santos LC, Lana GL, Santos GS, Visoni SBC, Brigagão RJ, Santos N, et al. The biological role of platelet derivatives in regenerative aesthetics. International Journal of Molecular Sciences [Internet]. 2024;25(11):5604.
19. Martinez-Zapata MJ, Martí-Carvajal AJ, Solà I, Expósito JA, Bolíbar I, Rodríguez L, et al. Autologous platelet-rich plasma for treating chronic wounds. In: Martinez-Zapata MJ, editor. Cochrane Database of Systematic Reviews [Internet]. John Wiley & Sons, Ltd; 2012.
20. Popescu MN, Iliescu MG, Beiu C, Popa LG, Mihai MM, Berteanu M, et al. Autologous platelet-rich plasma efficacy in the field of regenerative medicine: Product and quality control. Formanowicz D, editor. BioMed Research International [Internet]. 2021;2021(1).