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Autologous platelet concentrates: 'Ambit' in integrated health sciences

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Abstract

Autologous Platelet Concentrates (APCs) prove to be a promising therapy in integrated health sciences, which utilizes the body's natural healing mechanism. Derived from the patient's own blood, APCs are rich in growth factors,cytokines, and other proteins that facilitate tissue regeneration by reducing the inflammation and promoting healing. The utilization of APCs, particularly in regenerative medicine, orthopedics, and dermatology, has garnered increasing attention due to their potential to improve healing outcomes and reduce the risk of immune rejection. By integrating APC therapies into clinical practice, health professionals can harness the biological properties of platelets to enhance tissue repair, accelerate recovery, and optimize patient outcomes. This review explores the valuable principles behind APCs, their applications across various medical disciplines, and the potential future developments in their integration within health systems.

Keywords: Autologous; Platelet concentrates; Therapeutic benefits; Integrated Health Sciences

1. Introduction

Wound healing engages a systematic event of physiological processes involving blood components, soluble mediators, cells, and extracellular matrix.[1] The diseased periodontium heals unusually and requires the orchestrated reconstruction of both soft and hard tissue.[2]Superabundant growth factors and cytokines gets released from the extracellular matrices, resident cells and infiltrating cells which serve to promote the growth and differentiation of the periodontal tissues.[3]Certain growth factors have been successfully used at the site of injury that promotes the wound healing

Autologous platelet concentrates (APCs) typify the bioactive additives procured from a patient's own blood, aiming to accelerate the natural healing and regeneration of tissues. They promote the healing favorably as it concentrates the cells and therapeutic elements of blood at the site of the wound or surgery.[4]

APCs are subsets of blood-derived products, which are categorized into four types, subdivisions of the two broader categories: Platelet-Rich Plasma (PRP) and Platelet-Rich Fibrin (PRF). As elaborated, in literature, APCs are further divided into four different families, based on their leukocyte content and fibrin structure as Pure Platelet-Rich Plasma (P-PRP), Leukocyte- and Platelet-Rich Plasma (L-PRP), Pure Platelet-Rich Fibrin (P-PRF), and Leukocyte and Platelet-Rich Fibrin(L-PRF)[5-9]

This narrative review hunts through the plethora of possibilities with which the use of APC's rules different arenas of medical science.

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2. Salient Features of APCs

2.1. Generations of APCs

The First-generation APCs, Platelet-rich Plasma, have a limited quantity of plasma with enriched platelets obtained from patient's own blood. It is supposed to use along with bone grafts in treating periodontal defects [10]Though PRP has enriched platelet concentrates, the protocol for its preparation is a bit complicated and expensive as it requires an anticoagulant during its preparation**.** [11-12]

The shortcomings of first-generation APCs were overpowered by the second generation of platelet concentrates, Platelet-rich Fibrin. (PRF) The ease of preparation without an anticoagulant, cost effectiveness, and its high expertise in tissue regeneration make it an absolute APC. The crisis in storage, requirement of quick handling, prevention of the structural component of PRF from dehydration, and risk of bacterial contamination of the membranes if stored in refrigerators are the few shortcomings of PRF.[13]

2.2. Forms of PRF

- L-PRF (Leukocyte-Platelet Rich Fibrin)
- I-PRF (Injectable Platelet Rich Fibrin)
- A-PRF (Advanced Platelet Rich Fibrin)
- T-PRF (Titanium Platelet-rich fibrin)
- P-PRF (Pure-Platelet Rich Fibrin)

2.3. Preparation Protocols for APCs

The process of preparing APCs starts with the collection of the patient's own blood through venous puncture. The blood collected has to be processed with the help of a centrifuge to separate the different types of platelet concentrates depending on the preparation protocols as given below:[14-18] (Table 1)

Table 1 Preparation Protocols for APCs

Type of Platelet concentrate	Centrifuge Protocol	Time
Platelet Rich Plasma	1200 rpm 3300 rpm	12 min 7min
Platelet rich Fibrin/L-PRF	2700-3000 rpm	12 min
I-Platelet Rich fibrin	700-800 rpm	3-4 min
Advanced Platelet Rich Fibrin	1500rpm	14 min
Titanium Platelet rich fibrin	2700rpm	12min
Concentrated Growth factor	2700-2400-2700-3000 rpm	2-4-4-3 min respectively

Valuables of APC's

- Production of a homogenous and reproducible platelet product.[19]
- The regenerative properties of APCs are attributable to their formation of a 3D fibrin scaffold during platelet activation, cellular proliferation, including fibroblasts, osteoblasts[20]
- The growth factors derived from APCs are found to have a strong bacteriostatic effect against a polymicrobial environment in a wound, which might play a prophylactic role in wound site infection[21]
- APCs are rich in Platelet-derived growth factors which include transforming growth factor (TGF), Vascular endothelial growth factor (VEGF), Fibroblast growth factor (FGF), Epidermal growth factor (EGF), Insulin-like growth factor (IGF-1)[22]

3. Clinical Relevance of APCs (Intra Oral Applications)

3.1. APCs in Oral Medicine

The anti-inflammatory properties of platelet-derived growth factor are found to be useful in treating atrophic-erosive Oral Lichen Planus, which is obstinate to corticosteroid treatment[23]In addition, the platelet concentrates were found to be effective in treating recurrent aphthous stomatitis [24]

3.2. APCs in Endodontics

The immature teeth requiring endodontic therapy demonstrated the complete apex closure along with an increase in dentinal wall thickness. which could be due to platelet degranulation and release of Growth factors by platelets contributing to regenerative endodontics.[25]

3.3. APCs in Oral Surgery

The use of Platelet concentrates is effective in

- Healing of extraction sockets- Use of platelet concentrates as an adjunctive in extracted sockets has effectively reduced the incidence of dry socket and enhances the healing potential of the extracted socket. The sites treated with APCs have been found to have reduced postoperative pain and other postoperative complications [26]
- Sinus lift surgeries -Use of Platelet concentrates enhances new bone formation, reduces inflammation, stimulates vascularization, thereby reducing postoperative pain and facial swelling.[27]
- Dental Implant surgeries- Use of Platelet concentrates either alone or in combination with exogenous bone grafting material fastens the process of osseointegration as well as soft tissue healing, minimizing the post-operative complications.[19]

3.4. APCs in Periodontology

- Treatment of bony defects – application of APCs to the bony defects during open flap debridement provides beneficial effects when the defects are either filled, covered, or combined. Clinically patient-related outcome measures (PROM), probing pocket depth, and an improved clinical attachment level.[28]
- Role in Alveolar bone regeneration – depending on the classification of defects proposed by Benic & Hammerle, APCs can be used for the alveolar bone regeneration as follows:[29]

Table 2 Classification of bone defects (Benic &Hammerle)

Type of defect	Description of the defect	Type of APCs used
Class 2	Well-contained defect Non-contained defect	Autologous fibrin membrane (L-PRF) Barrier membrane is added with flowable APCs
Class 3	Dehiscence type of defect	Barrier membrane is added
Class 4 & 5	Horizontal and vertical type of defect	APCs soaked with bone grafts are used

- In Periodontal Plastic surgeries- As the APCs support soft tissue healing, use of L-PRF, PRGF gels between the coronally advanced flap and root surface facilitates proper root coverage and improves the clinical periodontal parameters[30]
- In treating Endo Perio Lesion- Use of L-PRF and its derivatives treats apical marginal defects. These do improve the clinical attachment level, reduce probing pocket depth. Use of Platelet concentrates improve patient related outcome measure [31]

3.5. Extra oral Application of APCs

Healing of chronic wounds:

- Application of platelet concentrates on to the chronic wounds like diabetic foot ulcers, leprosy ulcers, venous leg ulcers, burns have been reviewed and it proves to be successful as both a standard and adjunctive treatment

of the same.[32] The release of growth factors, regulation of cytokine mediators, and the antibacterial properties of the APCs contribute to a successful role in aiding the healing of chronic wounds[33]

In Ophthalmology

- Use of APCs for dry eyes has been found effective when used as eye drops, one drop 6 times a day for 6 weeks [34]

In Orthopedics

- Tendon & ligament repairs have been effective when Platelet concentrates have been found to improve tendon strength and regeneration of tendons. Ultrasound-guided injections are effective in treating elbow tendonitis.[35]

In facial aesthetics

- Varied usage of APCs elucidates its role in aesthetic facial treatments as well. It's used as a volumizing substance in procedures like micro needling, intradermal injection, fillers around the eye, and peri-oral areas[36]

4. Conclusion

APCs have been an endogenous biomaterial that has been used for many years in the medical field due to their valuable potential in healing, due to its regenerative capacity that accelerates the regeneration of lost tissues, both soft and hard tissue. Slowly but surely, there will be lots of headway in the field of regenerative medicine with APCs as a pioneer.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] Rodrigues M, Kosaric N, Bonham CA, Gurtner GC. Wound healing:a cellular perspective review. Physiol Rev. 2019;99:665-706

[2] AmericanAcademyofPeriodontology. Glossary of PeriodontalTerms. 3rd ed. American Academy of Periodontology; 1992.

[3] Fraser D, Caton J, Benoit DSW. Periodontal wound healing and re-generation: insights for engineering new therapeutic approaches.Front Dental Med. 2022;3:1-24

[4] Avila-Ortiz G, Ambruster J, Barootchi S, et al. American Academy of periodontology best evidence consensus statement on the use of biologics in clinical practice. J Periodontol. 2022;93:1763-1770

[5] Dohan Ehrenfest DM, Rasmusson L, Albrektsson T. Classification of platelet concentrates: from pure platelet-rich plasma (P-PRP) to leucocyte- and platelet- rich fibrin (L-PRF). Trends Biotechnol. 2009;27:158-167.

[6] Dohan Ehrenfest DM, Andia I, Zumstein MA, Zhang CQ, Pinto NR, Bielecki T. Classification of platelet concentrates (Platelet-Rich plasma-PRP, Platelet-Rich Fibrin-PRF) for topical and infiltrative use in orthopedic and sports medicine: current consensus, clinical implications and perspectives. Muscles Ligaments Tendons J. 2014;4:3-9.

[7] Varshney S, Dwivedi A, Pandey V. Antimicrobial effects of various platelet rich concentrates-vibes from in-vitro studies-a systematic review. J Oral Biol Craniofac Res. 2019;9:299-305

[8] Pietruszka P, Chruścicka I, Duś-Ilnicka I, Paradowska-Stolarz A. PRP and PRF-subgroups and divisions when used in dentistry. J Pers Med. 2021;11:944.

[9] Calciolari E, Dourou M, Akcali A, Donos N. Differences between first- and second-generation autologous platelet concentrates. Periodontol 2000. 2025;97:52-73

[10] Gawaz M, Vogel S. Platelets in tissue repair: Control of apoptosis and interactions with regenerative cells. Blood. 2013;122(15):2550-2554.

[11] Ehrenfest DMD, Sammartino G, Shibli JA, Wang H, Zou D, Bernard J. Guidelines for the publication of articles related to platelet concentrates (Platelet-Rich Plasma - PRP , or Platelet-Rich Fibrin - PRF): the international classification of the POSEIDO. POSEIDO Journal. 2013;1(1):17-27.

[12] Kiran NK, Mukunda K S, Tilak T RN. Platelet Concentrates: A Promising Innovation In Dentistry. J. Dent. Sci. Res. 2011;2(1):50-61.

[13] Dohan Ehrenfest DM, de Peppo GM, Doglioli P, Sammartino G. Slow release of growth factors and thrombospondin-1 in Choukroun's platelet-rich fibrin (PRF): A gold standard to achieve for all surgical platelet concentrates technologies. Growth Factors. 2009;27(1):63-69.

[14] Dohan Ehrenfest DM, Del Corso M, Diss A, Mouhyi J, Charrier J-B. Three-Dimensional Architecture and Cell Composition of a Choukroun's Platelet-Rich Fibrin Clot and Membrane. J Periodontol. 2010;81(4):546-555.

[15] Miron RJ, Chai J, Zhang P, et al. A novel method for harvesting concentrated platelet-rich fibrin (CPRF) with a 10-fold increase in platelet and leukocyte yields. Clin Oral Investig. 2020;24(8):2819-2828.

[16] Fujioka-Kobayashi M, Miron RJ, Hernandez M, Kandalam U, Zhang Y, Choukroun J. Optimized Platelet-Rich Fibrin With the Low-Speed Concept: Growth Factor Release, Biocompatibility, and Cellular Response. J Periodontol. 2017;88(1):112- 121.

[17] Growth Factor Release, Biocompatibility, and Cellular Response. J Periodontol. 2017;88(1):112- 121.

[18] Growth Factor Release, Biocompatibility, and Cellular Response. J Periodontol. 2017;88(1):112- 121.1

[19] E Anitua, M Sánchez, AT Nurden, P Nurden, G Orive, I. AndíaNew insights into and novel applications for platelet-rich fibrin therapiesTrends Biotechnol, 24 (2006), pp. 227-234

[20] F Graziani, S Ivanovski, S Cei, F Ducci, M Tonetti, M. Gabriele The in vitro effect of different PRP concentrations on osteoblasts and fibroblasts Clin Oral Implants Res, 17 (2006), pp. 212-219

[21] TM Bielecki, TS Gazdzik, J Arendt, T Szczepanski, W Król, T. Wielkoszynski

[22] Antibacterial effect of autologous platelet gel enriched with growth factors other active substances: an in vitro study J Bone Joint Surg Br, 89 (2007), pp. 417-420

[23] Matulić N, Tafra Đ, Barić J, et al. Regeneracija koštanog i mekog tkiva primjenom PRGF-Endoret tehnologije - prikaz slučaja. Medix. 2016;22(119/120):310-313

[24] Piñas, L., Alkhraisat, M.H., Fernández, R.S. *et al.* Biological Therapy of Refractory Ulcerative Oral Lichen Planus with Plasma Rich in Growth Factors. *Am J Clin Dermatol* **18**,(2017) 429–433

[25] Aminabadi NA. Plasma rich in growth factors as a potential therapeutic candidate for treatment of recurrent aphthous stomatitis. Med Hypotheses. 2008;70(3):529-531.

[26] Bakhtiar H, Vatanpour M, Rayani A, et al. The plasmarich in growth factor as a suitable matrix in regenerative endodontics: a case series. N Y State Dent J. 2014;80(4):49-53.

[27] M Del Fabbro, S Panda, S. Taschieri Adjunctive use of plasma rich in growth factors for improving alveolar socket healing: a systematic review J Evid Based Dent Pract, 19 (2019), pp. 166-176

[28] Anitua E, Prado R, Orive G. A lateral approach for sinus elevation using PRGF technology. Clin Implant Dent Relat Res. 2009;11(Suppl 1):23-31.

[29] Miron RJ, Moraschini V, Estrin N, et al. Periodontal regeneration using platelet-rich fibrin. Intrabony defects: a systematic review with meta-analysis. Periodontol 2000. 2024.

[30] Benic GI, Hämmerle CH. Horizontal bone augmentation by means of guided bone regeneration. Periodontol 2000. 2014; 66: 13-40.

[31] Barootchi S, Tavelli L, Galarraga Vinueza ME, Pinto N, Sanz A, Wang H-L. Effect of autogenous platelet concentrates and their centrifugation protocols on the outcomes of root coverage: A systematic review & network meta-analysis. Periodontol 2000. 2024.

[32] Sabeti M, Gabbay J, Al A. Endodontic surgery and Platelet concentrates: A comprehensive review. Periodontol 2000. 2025; 97: 308-319.

[33] Perussolo J, Calciolari E, Dereka X, Donos N. Platelet-Rich plasma (PRP) and plasma-Rich in growth factors (PRGF) in extra-oral wound care. Periodontol 2000. 2025; 97: 320-341.

[34] Calciolari E, Dourou M, Akcali A, Donos N. Differences between first- and second-generation autologous platelet concentrates. Periodontol 2000. 2025; 97: 52-73.

[35] JL Alio, AE Rodriguez, R Ferreira-Oliveira, D Wróbel-Dudzińska, AA. Abdelghany Treatment of dry eye disease with autologous platelet-rich plasma: a prospective, interventional, non-randomized study Ophthalmol Ther, 6 (2017), pp. 285-293

[36] E Anitua, M Sánchez, G Orive, I. Andía The potential impact of the preparation rich in growth factors (PRGF) in different medical fields Biomaterials, 28 (2007), pp. 4551-4560

[37] Miron R, Davies C. Autologous platelet concentrates in aesthetic medicine. Periodontol 2000. 2025; 97: 363-419.