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Role of Platelet Rich Fibrin (PRF) in Treatment of Post Acne Scars: Review Article

Nagwa Ali Fahmy Diab, Aya Mohamed Abdallah, AlShimaa Mohamed Ibrahim
Department of Dermatology, Venereology and Andrology, Zagazig University Hospital, Egypt.
***Corresponding author:** Aya Mohamed Abdallah, **E-Mail:** ayaabdallah781991@gmail.com

ABSTRACT

Background: There are many forms of scars that can result from inflammatory acne. It has a negative impact on the patient's personal and professional relationships. Acne scars are caused by the aberrant creation or breakdown of collagen that happens during healing processes. Atrophic scarring is the consequence in the majority of instances (80–90%) of collagen degradation at the dermal level. Hypertrophic or keloid scars are rarer manifestations of an enhanced collagen synthesis. Platelet rich fibrin (PRF) was introduced into the acne scar care picture after platelet-derived growth factor (PDGF) was proven to stimulate wound healing, angiogenesis, and tissue remodelling. Minimally invasive platelet-rich plasma methods provide the advantage of a fast recovery time and low cost.

Objective: To examine the potential role of platelet rich fibrin in the treatment of post-acne scars.

Methods: The databases were searched for articles published in English in 3 data bases [PubMed – Google scholar-Science direct] and Boolean operators (and, or, not) had been used such as [Platelet Rich Fibrin and Post Acne Sars OR PRF] and in peer-reviewed articles between 2009 and 2021. Documents in a language apart from English were excluded as sources for interpretation was not found. Papers apart from main scientific studies were excluded: documents unavailable as total written text, conversation, conference abstract papers and dissertations.

Conclusion: Cell migration and proliferation are more efficient when fibrin is rich in platelets. When compared to platelet rich plasma, the fibrin matrix favours a slow and steady release of growth factors over time.

Keywords: Platelet Rich Fibrin, Post Acne Sars.

INTRODUCTION

A delayed or poor medical treatment can cause acne scarring, although this can also happen despite receiving appropriate medical treatment. Acne-related inflammation damages collagen and other tissues, causing persistent changes in skin texture and fibrosis. Inflammation, granulation, and remodelling are all common wound healing stages for scars [(1)].

There are several therapies for acne scars, however they may only be partially effective, leaving patients frustrated and disappointed [(1)]. Acne scarring has far-reaching consequences that go beyond a person's ability to enjoy life because of their appearance. It has been linked to depression and other mental health conditions, suicidal thoughts, emotional debilitation, shame, low self-esteem and overall social impairment [(2)].

Most acne scars are connected with a loss of collagen (atrophic scars), whereas the rest are associated with a growth of collagen (fibrotic scars) (keloidal or hypertrophic scars). Following fibre contraction, atrophic scars appear in the form of depressions. Some acne scars can be characterised as boxcar, icepick or rolling atrophic acne scars [(3)]. Even though medical treatment for acne can help prevent scarring, it can also exacerbate existing scarring if treatment is delayed or inadequate. Acne-related inflammation damages collagen and other tissues, causing persistent changes in skin texture and fibrosis. Inflammation, granulation, and remodelling are all common wound healing stages for scars [(4)].

Extracellular matrix components and parenchymal cells (keratinocytes and fibroblasts) are all involved in wound healing. Endothelial and nerve cells are also involved. lymphocytes, monocytes, and neutrophils, as well as other immune-inflammatory blood cells, penetrate the wound and contribute to its healing process [(5)]. Scars like hypertrophic scars and keloids can be categorised as variants of wound healing. 6 to 8 weeks after the initial injury, anabolic and catabolic processes reach balance in a normal wound. Wounds at this point are around 30-40 percent as strong as healthy skin. In time, the scar becomes stronger due to the cross-linking of collagen fibres, which occurs as the scar matures. A hyperemic and perhaps thicker scar forms at this stage, but it gradually thins out over months to form a flat, white, malleable and possibly stretched mature scar. When the healing process is out of balance, more collagen is created than destroyed, resulting in an out-of-control scar. A raised, hyperemic scar is still visible on the skin. A hypertrophic or keloid scar is one with an overabundance of fibrous tissue [(6)].

Platelet Rich Fibirin (PRF):

To get rid of anticoagulants known as leukocyte and platelet-rich fibrin (L-PRF), a new type of platelet concentrate was created. Due to the absence of anti-coagulants, the blood must be centrifuged quickly to separate the different layers of blood before it clots. In the "platelet-rich" layer after centrifugation, a fibrin clot is discovered. Platelets and leukocytes are typically found within this fibrin matrix, which is enriched with blood-derived growth factors and cytokines. When compared to platelet rich plasma (PRP), the fibrin matrix favours the progressive release of growth factors over time [(6)].

External anticoagulants are required with PRP, and this has been highlighted as a disadvantage. Finally, anticoagulants inhibit the release of growth factors, which are associated to the clotting mechanism [(7)].

It is also a drawback that upon activation, growth factors from the liquid PRP are suddenly released. Calcium chloride or bovine thrombin activated nearly all

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of the growth factors, releasing nearly all of them. Platelet concentrations without anticoagulant were developed as a result of these restrictions. Growth factors and cells are trapped in the fibrin matrix, which slowly releases them over time [8].

For the purpose of clot scaffolding and the localisation of mesenchymal stem cells, PRF is comparable to PRP except that PRF naturally contains fibrin. There is no anticoagulant in PRF creation and centrifugation, and spin times and speeds are different. As a natural filler, PRF has been suggested. The use of PRF as a supplement to surgical and nonsurgical cosmetic therapies has been highly successful. When it comes to the release of platelet-related therapeutic granules, PRF is superior to PRP [9].

Fluid-PRF has a 350% increase in migration of skin fibroblasts compared to PRP (200 percent increase) . Cell growth was similarly boosted by fluid-PRF after 5 days. While PDGF mRNA levels were considerably elevated by both PRP and fluid-PRF, the fluid-PRF group had much higher levels of TGF-beta, collagen 1, and fibronectin mRNA. When compared to PRP, fluid-PRF was found to have a much better ability to stimulate collagen synthesis [10].

Table (1): Comparison between PRP and PRF injections [11]

	PRP	Injectable PRF
1	There must be an external anticoagulant applied.	No requirement for an external anticoagulant.
2	It takes a lot of time.	Preparation time is limited.
3	A burst of growth factors that lasts for a brief length of time.	Release of growth factors continuously and continuously throughout a period of time
4	Growth factors stimulate more cellular proliferation.	Lower Cellular proliferation.
5	Reduced cell migration and growth factor mRNA expression	Growth factor mRNA expression and cellular migration are both increased.
6	Growth factor release is low overall.	The release of more growth factors
7	Dissolves within a week or less.	For at least ten days, morphology is preserved.

Preparation of PRF:

A. PRF enriched with leukocytes non-anticoagulant-treated blood is taken. It is centrifuged at 750 g for 12 minutes at a high speed. As the fibrin clot sank, the RBC settled down, but the platelets and WBC are caught in it. Platelet-rich fibrin (PRF) is the name given to this mixture. This is referred to as L-PRF or leukocyte-rich PRF since WBC is a critical aspect of wound healing [12].

B. Using a lower centrifugal speed of 200 g (1300 RPM) and a longer spin time, the A-PRF (Advanced PRF) is created. It is then decided to use a shorter spin time of 8 minutes while maintaining the same centrifugal speeds (200 g). Known as "A-PRF Plus," it is connected with an even greater growth factor yield [13].

C. Injectable PRF, or I-PRF, as it is more commonly known; for three minutes, the centrifugal force is maintained at 60 g. Because of this short centrifugation, the clot is not formed and the liquid preparation is still liquid at this moment. In a 10 mL tube, the amount of I-PRF generated is typically between 1 and 1.5 mL. In comparison to L-PRF and A-PRF, it contains more platelets and WBC. 15–20 minutes before it starts to form a clot, it's still liquid. It can be injected into the scalp or skin of the face, or mixed with bone grafting materials and sculpted into the desired shape before it clots into shape and hardens [14].

Application of PRF:

1. Skin rejuvination: The use of PRF as a skin rejuvenation treatment is becoming more popular. It is possible to utilise these PRF solutions as an anti-aging treatment and to improve skin tone and texture, blemishes, and acne scars. Tear troughs, nasolabial folds, marrionnete lines, peri-oral lines, and the skin on the neck, chest, and hands can all benefit from these [15]. For extracellular matrix remodelling, leukocytes deposit proteins into a cluster of mesenchymal stem cells. This promotes the growth of fibroblasts and increases anti-inflammatory effects. The addition of PRF to hyaluronic acid (HA) has been found to be an effective option for treating clinical signs of ageing associated with ageing human dermal fibroblasts by improving HA's response to Growth Factor β 1 (TGF-β 1). Research into combing HA fillers in the treatment of ageing skin is needed to improve their efficacy [8].
2. **Wound healing:** Fibrin, fibronectin, and vitronectin work together to form a bioscaffold that protects growth factors and cytokines from proteolysis, allowing them to remain active for a longer time period. PDGF (platelet-derived growth factor), VEGF (vascular endothelial growth factor), FGF (fibroblast growth factor), and HGF (hepatocyte growth factor) are just a few of the autologous growth factors that can be used [16]. Stem cells, cytokines, leukocytes, and platelets are all housed in a tetramolecular framework made of fibrin, which itself is polymerized into a tetramolecular scaffold. As a result of PRF's slow polymerization, improved cell proliferation and migration and hemostatic impact, and the absence of anticoagulant agents and activators while generating PRF, the preparation of PRF is easier than

that of PRP. Over the course of 7-10 days, fibrin serves as the vehicle via which growth factors are transported and released in greater quantities. Additionally, second-generation platelet concentrates have more antibacterial properties [(17)].

3. **Androgenetic alopecia:** PRF contains a wide range of cell types and growth factors that are supposed to aid in the healing process. Because injectable PRF is fully autologous, there are no concerns about utilising exogenous anticoagulants [(18)].
4. **Bone Regeneration:** As a bone-regeneration treatment, it is most commonly utilised for oral and maxillofacial reconstruction [(19)].

Minimally invasive platelet-rich plasma methods provide the advantage of a fast recovery time and low cost. As a result of the activation of additional factors in the platelet-rich plasma, such as insulin-like growth factor, and vascular endothelial growth factor, the remodelling of atrophic acne scars may be facilitated [(20)].

Anticoagulants known as leukocyte and platelet-rich fibrin were removed using a second-generation platelet concentrate (L- PRF). Due to the absence of anti-coagulants, the blood must be centrifuged quickly to separate the different layers of blood before it clots. A fibrin clot is discovered in the "platelet-rich" layer after centrifugation. Platelets and leukocytes are typically found within this fibrin matrix, which is enriched with blood-derived growth factors and cytokines. When compared to PRP, the fibrin matrix favours the progressive release of growth factors over time [(21)].

CONCLUSION

Cell migration and proliferation are more efficient when fibrin is rich in platelets. When compared to platelet rich plasma, the fibrin matrix favours a slow and steady release of growth factors over time.

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REFERENCES

1. **Halvorsen J, Stern R, Dalgard F *et al.* (2011):** Suicidal ideation, mental health problems, and social impairment are increased in adolescents with acne: a population-based study. The Journal of Investigative Dermatology, 131(2): 363–370.
2. **Patel V, Koo J (2015):** Delusions of parasitosis; suggested dialogue between dermatologist and patient. The Journal of Dermatological Treatment, 26(5): 456–460.
3. **Werschler W, Herdener R, Ross V *et al.* (2015):** Critical considerations on optimizing topical corticosteroid therapy. The Journal of Clinical and Aesthetic Dermatology, 8(8): 2–8.
4. **Rivera A, Spencer J (2007):** Clinical aspects of full-thickness wound healing. Clin Dermatol., 25:39–48 72.
5. **Fabbrocini G, Annunziata M, D'arco V *et al.* (2010):** Acne scars: pathogenesis, classification and treatment. Dermatol Res Pract., 7: 80-84.
6. **Hsu K, Luan C, Tsai Y (2017):** Review of silicone gel sheeting and silicone gel for the prevention of hypertrophic scars and keloids. Wounds, 29 (5):154-158.
7. **Tsujino T, Isobe K, Kawabata H *et al.* (2019):** Spectrophotometric determination of the aggregation activity of platelets in platelet-rich plasma for better quality control. Dentistry Journal, 7(2): 61-66.
8. **Masuki H, Isobe K, Kawabata H *et al.* (2020):** Acute cytotoxic effects of silica microparticles used for coating of plastic blood-collection tubes on human periosteal cells. Odontology, 108:545–52.
9. **Liu R, Yan M, Chen S *et al.* (2019):** Effectiveness of platelet-rich fibrin as an adjunctive material to bone graft in maxillary sinus augmentation: a meta-analysis of randomized controlled trails. Biomed Res Int., 9: 62-66.
10. **Giannini S, Buda R, Cavallo M *et al.* (2010):** Cartilage repair evolution in post-traumatic osteochondral lesions of the talus: from open field autolo-gous chondrocyte to bone-marrow-derived cells transplantation. Injury, 41(11):1196-1203.
11. **Malan T, Woolley A (2020):** Comparative Study of Platelet Count: Injectable Platelet Rich Fibrin (i-PRF) Compared to Platelet Rich Plasma (PRP)- Controlled in Vitro Laboratory Study. ResearchGate, Pp. 1-19. https://www.researchgate.net/publication/339712179_Comparative_Study_of_Platelet_Count_Injectable_Platelet_Rich_Fibrin_i-PRF_Compared_to_Platelet_Rich_Plasma_PRP_-Controlled_in_vitro_laboratory_study
12. **Kobayashi E, Flückiger L, Fujioka-Kobayashi M *et al.* (2016).** Comparative release of growth factors from PRP, PRF, and advanced-PRF. Clinical Oral Investigations, 20(9): 2353–2360.
13. **Fujioka-Kobayashi M, Katagiri H, Kono M *et al.* (2020):** Improved growth factor delivery and cellular activity using concentrated platelet-rich fibrin (C-PRF) when compared with traditional injectable (i-PRF) protocols. Clin Oral Investig., 24:4373–83.
14. **Miron R, Chai J, Zhang P *et al.* (2020):** A novel method for harvesting concentrated platelet-rich fibrin (C-PRF) with a 10-fold increase in platelet and leukocyte yields. Clin Oral Investig., 24:2819–28.
15. **Hassan H, Quinlan D, Ghanem A (2020):** Injectable platelet-rich fibrin for facial rejuvenation: A prospective, single-center study. J Cosmet Dermatol., 19:3213–21.
16. **Shashank B, Bhushan M (2021):** Injectable platelet-rich fibrin (PRF): The newest biomaterial and its use in various dermatological conditions in our practice: A case series. J Cosmet Dermatol., 20:1421-6.
17. **Kour P, Pudakalkatti P, Vas A *et al.* (2018):** Comparative evaluation of antimicrobial efficacy of platelet-rich plasma, platelet-rich fibrin, and injectable platelet-rich fibrin on the standard strains of porphyromonas gingivalis and aggregatibacter actinomycetemcomitans. Contemp Clin Dent., 9(2): 325–30.
18. **Mercuri S, Paolino G, Nicola M *et al.* (2021):** Investigating the safety and efficacy of platelet-rich plasma (PRP) treatment for female androgenetic alopecia: Review of the literature. Medicina (Kaunas), 57:311-316.
19. **Muñoz F, Jiménez C, Espinoza D *et al.* (2016):** Use of leukocyte and platelet-rich fibrin (L-PRF) in periodontally accelerated osteogenic orthodontics (PAOO): clinical effects on edema and pain. J Clin Exp Dent., 8: 119-24.
20. **Arwert E, Hoste E, Watt F (2012):** Epithelial stem cells, wound healing and cancer. Nat Rev Cancer, 12:170-180.
21. **Ehrenfest D, DM, Rasmusson L, Albrektsson T (2009):** Classification of platelet concentrates: from pure platelet rich plasma (P-PRP) to leucocyte- and platelet-rich fibrin (L-PRF). Trends Biotechnol., 27: 158-167.