Letter to the editor

Platelet-Rich Plasma Applications in Plastic Surgery

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DEAR EDITOR-IN-CHIEF

Platelet-rich plasma (PRP) is part of the blood with a high concentration of platelets. The history of PRP application began in the field of hematology. However, it spread to other areas of medicine as well. In this essay, we briefly highlight the current applications of PRP in plastic surgery [1].

PRP is a preparation of autologous platelet-enriched plasma. Hematologists were pioneers in utilizing the PRP concept more than 40 years ago. It was primarily used as a means to correct thrombocytopenia, then it could attain, over time, substantial attention in other fields of medicine. Sports medicine, musculoskeletal injuries, cardiac surgeries, pediatric surgery, gynecology, urology, plastic surgery, and ophthalmology are the other medical fields which then consequently have started taking the benefits of PRP. As a more recent application, dermatology and aesthetics utilize PRP for managing conditions such as wound healing, scar revision, skin rejuvenation, and alopecia [2].

Platelets play a key role in the regeneration and healing process of the skin, by releasing cytokines, growth factors, and fibrinogen, and starting a coagulation cascade. Furthermore, PRP increases dermal collagen levels not only by growth factors, but also by skin needling (the mesotherapy technique "point by point"). Per definition, all the products of this family can be used as liquid solutions or in an activated gel form. They can, therefore, be injected (for example, in sports medicine) or placed during gelling on a skin wound or suture (like the use of fibrin glues). It is important to realize that several factors during the preparation process can affect the final PRP product, such as temperature, force and time of centrifugation, sequence, the number of centrifugations, use of anticoagulation, and mechanism of activation. Generally, four types of platelet-rich mediums can be produced based on the extent of buffy coat inclusion and the use of anticoagulation as follows;

1- Pure PRP (P-PRP): these products are preparations without leukocytes and with a low-density fibrin network after activation.

2- Leukocyte-rich PRP (L-PRP): preparations with leukocytes and with

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a low-density fibrin network after activation.
3- Pure Platelet-rich Fibrin (P-PRF): preparations without leukocytes and with a high-density fibrin network. Per definition, these products exist only in a strongly activated gel form and cannot be injected or used like traditional fibrin glues. Because of their strong fibrin matrix, however, they can be handled like a real solid material for other applications.
4- Leukocyte-rich PRF (L-PRF): preparations with leukocytes and with a high-density fibrin network. Per definition, these products also exist only in a strongly activated gel form and cannot be injected.
In general, there is a variety of preparation methods and types of applied activators, which makes it difficult to have a highly accurate or quantitative judgment about the efficacy of each product. However, in almost all the studies the concentrated platelets have had beneficial effects [1].
About 30 years ago, maxillofacial surgeons started using PRF in their operations to use its potential for adherence and homeostasis. Later on, it gradually became part of the other sorts of surgery as well. In plastic surgery numerous reports showed the valuable results of using PRP/PRF for wound healing, fat grafting, bone grafting, facelift, and hair restoration [3, 4].
In terms of wound healing, almost all of the articles evaluating the effect of PRP/PRF report significantly favorable outcomes. Successful wound healing can be separated into three phases: inflammation, proliferation, and remodeling. Platelets play a critical role in all three phases of wound healing. PRP injections seem to be a strong potential for better pain management and mobility with patients suffering from chronic plantar fasciitis. It has been used for skin rejuvenation, treatment of scars, burn healing, and scar removing wounds due to its ability to activate fibroblasts and synthesize collagen. PRP/PRF is used both during the amputation surgery, and after-care. The reported effects include shortening the healing time and lessening edema, ecchymosis, and pain. None of the studies reported any PRP-related side effects. As of now, the authors deem PRP therapy a potential candidate for the healing of diabetic foot ulcers, but more research is needed [5].
Fat grafting, which has gained remarkable attention in recent years, could take advantage of the benefits of PRP/PRF as well. For such a case, PRP is combined with autologous fat and then injected into the recipient tissue. Wound healing, nutrient support, angiogenesis, and adipose-derived stem cell proliferation all have been enhanced after PRP/PRF-enriched fat grafting. One exception to this rule is breast fat grafting, which it is shown to have no beneficial effect over the conventional PRP-free approach [6].
Bone grafting is another surgery that can benefit from PRP. Overall, studies have shown that PRP-enriched bone grafts have stronger bone augmentation, shorter bone regeneration time, less postoperative pain, and lower rates of hematoma and edema [7].
Using PRP for hair loss perhaps is its most renowned application. Both *in vivo* and *in vitro* studies show the positive impacts of A-PRP and AA-PRP on hair loss in androgenic alopecia patients; Providing a safer and more effective alternative to the common hair loss medications such as Minoxidil®, Finasteride®, and Dutasteride®. No major side effects, such as scarring, progressive worsening, or infections, were reported in the analyzed articles. Only mild headache, tolerable and temporary pain during the procedure, mild itching and desquamation, and transient edema were reported by some subjects after PRP injection [8].
That said, PRP is shown to be a potent tool in cosmetic, plastic and reconstructive surgery. The use of this method generally results in a reduction in operating time and postoperative pain, enhances flap and graft survival, hastens re-epithelialization, decreases the necessity of drains and pressure dressings and the incidences of complications. However, PRP is yet to make an exhibition of its full potential in the expanse of plastic surgery.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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