

Postsurgical cutaneous defect treated with PRP: A case report

*Ioanna Verzoviti, Maria Nathanailidou, Christina Maria Prodromou,
Maria Eleni Koulouri, Dimitrios Keramidaris*

Department of General Surgery, 417 Army Shared Fund Hospital, Athens, Greece

Abstract. There are visible cosmetic flaws that are difficult to treat after large open abdominal surgeries. The centrifugation of whole blood yields autologous platelet-rich plasma (PRP), which contains numerous growth factors that encourage vascular development and wound healing. The favorable outcomes in skin rejuvenation and clinical application of PRP suggest that it is effective for wound healing. We may have a hard time posing a big challenge because of the patient's clinical state, the absence of usable tissue and any comorbidities the patient may have. Herein we report the case of a 73-year-old patient, who was presented with a postsurgical abdominal tissue defect that could not be healed differently. There are few reports on the use of PRP for cutaneous defects, thus our scope is to highlight the usefulness and effectiveness of this non-invasive method for the wound healing of any large skin defects. (www.actabiomedica.it)

Key words: platelet-rich plasma, PRP, postsurgical cutaneous defect, tissue rejuvenation, wound healing

Introduction

Platelet-rich plasma has been aided in enhancing tissue repair and regeneration. By introducing increased levels of platelets and their associated bioactive molecules, it increases the secretion of proteins and the concentration of growth factors, maximizing the healing process at the cellular level. In degenerative tissues and compromised individuals with diabetes mellitus, immunosuppression, or sarcoidosis, it is a preferred therapeutic option (1). Being an autologous biologic substance makes PRP less susceptible to bacterial infections, contagious ailments, and immune responses in clinical settings. A blood sample is collected from the patient, centrifuged to separate the red blood cells from the plasma, and then mixed with a blood thinner. It is important to emphasize that not all PRP preparations are the same, for example they may vary in the final volume of plasma in which the platelets are suspended, the volume of the whole blood taken,

the platelet recovery efficacy, and the addition of exogenous thrombin. All these variables will impact the potential efficacy and the final PRP product (2). PRP injections are used to treat various conditions, from musculoskeletal issues to cosmetic procedures. We suggest its use in a patient with an abdominal tissue defect, after an open abdominal surgery, where other therapeutic approaches failed to heal his wound, after an open abdominal surgery. Even though different conventional therapeutic methods are used for wound healing enhancement, novel treatments remain a clinical challenge. Despite this, experimental studies using stem cells and PRP on cutaneous wound regenerative therapies provide encouraging results (3).

Case Report

A 73-year-old male patient presented to the amputation prevention clinic with a case of a postsurgical

abdominal tissue defect. His medical history revealed type two diabetes mellitus, hypertension, left orchiectomy due to seminoma, 48 years ago, hemorrhoidectomy, 33 years ago, open cholecystectomy, 23 years ago and low anterior resection and segmentectomy of the right upper pulmonary lobe, due to a moderately-differentiated adenocarcinoma of the colon with pulmonary metastasis, 3 years ago. Since then, the patient has been presented with multiple episodes of subileus, which were treated conservatively. However, ten months ago, he underwent an exploratory laparotomy due to intestinal obstruction, which was the result of sigmoid volvulus. The patient underwent Hartmann's procedure where there was also an excision of the ischemic part of the colon. Due to the massive edema of the bowel, and a huge white line hernia that preexisted due to his first colectomy, the abdominal wall had lost its compliance and was unable to close properly. For this reason, we decided to use a reinforced biological mesh to repair the gap (Figure 1).

Afterwards, we decided to try the vacuum-assisted closure in order to reduce the defect. Therefore, we placed the vacuum device and changed the dressing frequently. The patient was making regular follow-ups in the clinic for about 8 weeks without significant decrease in size, despite of the epithelialization that had been promoted by the vacuum device. Thus, we decided to include him in a treatment program by using PRP injection to enhance the healing. Before this therapy, his defect measured 7.5 cm (length) × 6.5 cm (width) × 0.5cm (depth) (Figure 2).

The patient underwent blood sampling in a 60 mL (about 2.03 oz) syringe containing 8 mL of anticoagulant (ACDA-A). The Preparation of the PRP sample was performed in the operating room. No kind of anaesthesia was given to the patient. The sample of PRP was processed by an FDA-approved autologous platelet separator (Magellan Autologous Separator: Arteriocyte Medical Systems) to yield 6 mL of PRP. This quantity was divided to be used accordingly: 3 mL of PRP was used to inject subcutaneously and peripherally to the trauma area and 3 mL was mixed with thrombin and Calcium Chloride (CaCl₂) to form a PRP-based gel, which was placed on top of the ulcer area. 5 minutes after the injection procedure, a vaseline-induced gauze was placed on top of the ulcer,



Figure 1. Before the vacuum use.

and then on top of that, a sterile gauze completely closed the trauma area. This was the preparation of the first injection. After 3 weeks, approximately half of the ulcer was healed, (reduced to the size of 4x3x0.2 cm) and there was also noted an appreciable ulcer epithelialization. Then the patient had a second PRP injection, which was prepared exactly in the same way, as previously described. One month after the second injection, there was even further ulcer healing and large epithelialization with a reduction in the ulcer size (3x2x0.1 cm) (Figure 3).

Lastly, the patient had its 3rd and last injection applied where in that case, only 3 mL were injected subcutaneously. One month later, the ulcer had healed and epithelialized completely, leaving an insignificant mark, compared to his initial situation (Figure 4).



Figure 2. After the vacuum use.

The Magellan Separator is a fully automated closed loop processing system that requires limited intervention during processing. PRP is automatically separated from anticoagulated whole blood in approximately 15 minutes and dispensed into a separate sterile syringe (4). A comparative study among available commercial PRP separation systems has shown that the Magellan system offers high quality PRP (5).

Discussion

In the past few years, a robust volume of research has focused on using platelet-rich plasma (PRP).



Figure 3. After 2nd infusion.

Numerous papers have been published, concerning the use of PRP in orthopedics, such as musculoskeletal pain and injuries, osteoarthritis, in post-surgical and ulcerations healing and in cosmetic procedures, such as hair loss (6). PRP is the autologous human plasma with a high platelet concentration (7). It is widely known that platelets are of great importance for the procedures of hemostasis and thrombosis. Their vital role is to modulate the phases of wound healing. For instance, they promote and stabilize the clot (8). Moreover, they release locally active growth factors that facilitate wound healing, and they have several anti-inflammatory and antimicrobial properties by suppressing cytokine release (7,9). Some microorganisms against whom PRP seems to have antimicrobial properties are *E. coli*, *MRSA*, *C. albicans*, and *C. neoformans* (9). Its ability to promote the natural healing process has made it the subject of numerous studies in the past few decades, allowing it to be used as a therapeutic option for wound healing and, generally, tissue regeneration (8). Eventually, PRP appears



Figure 4. After 3rd infusion.

to be efficacious in the management of tissue rejuvenation. Besides, it seems a preferable choice for patients who have a long healing time, poor healing effect after surgery, or even pseudo-healing (9). According to a study that included patients with clean chronic diabetic foot ulcers, over 86% of the patients who received PRP treatment achieved complete healing compared to the rest of the patients who did not receive this therapeutic option. PRP undoubtedly increased the healing rate significantly (10). Although PRP has gained significant attention in orthopedics and dermatology, its application in cutaneous defects is limited. In our patient, PRP was applied to deal with a postsurgical abdominal tissue defect that could not be healed after the use of the vacuum device. A case series involving 14 cases of chronic unhealed ulcers conducted in Saudi Arabia by Tabanjeh et al. revealed the efficacy of PRP in complete wound closure (9). In the field of regenerative medicine stem cells co-transplanted with

PRP have also been reported. Raposio et al. suggested that adipose-derived stem cells (ASCs) added to PRP enhance the healing process of chronic wounds. ASCs seem to be the most preferable stem cells, as they are abundant, easy to be isolated and have an easy clinical application as well. Thanks to them wound healing is promoted by the in situ differentiation and secretion of paracrine factor (11). These findings were also in accordance with the study of Ghufran et al., who proposed the combination of PRP with ASCs and curcumin for the treatment of diabetic wounds (12). PRP combined with ASCs or dermal microvascular endothelial cells seems also a promising therapeutic option for wounds caused by external radiation, probably due to the induction of basic fibroblast growth factor (bFGF) (13). Several studies have pointed out the safety of PRP, as it is a product of autologous blood and it is not supposed to have immunogenic adverse reactions. However, Latalski et al presented a case of allergic reaction to PRP in a patient with no medical history of allergic diseases. Therefore, skin tests could be performed before the infusion in order to reduce this risk (6). In our case, tests were negative for allergic reaction. It should also be mentioned that there are some absolute and relative contraindications for the use PRP. Hematologic disorders, either they are hereditary, or acquired, as well as severe metabolic disorders are absolute contraindications. As far as the relative contraindications are concerned, they are among others malignancies, some auto-immune diseases, such as lupus and rheumatoid arthritis, anemia ($Hb < 10d/dL$), recent fever or illness and patients who have received anticoagulant medications the last three days (10). In our case, the patient did have a medical history of malignancy, he was however, free of disease in the last few years. Hence, we decided to include him in the PRP treatment program, and the results were absolutely gratifying.

Our paper presents PRP infusion as an easy, quick and effective therapeutic option for abdominal tissue defects that are probably difficult to be healed with different methods. These findings support consideration for early use of PRP in similar cases to improve recovery timelines and aid in improvement of quality of life.

Conclusions

Increasing re-epithelialization and angiogenesis and modulating the inflammation are some of the ways in which PRP works. PRP can be used to promote cutaneous wound healing in large skin defects, in cases where traditional surgery cannot be performed. Treatment with autologous platelet rich plasma can be used to enhance angiogenesis and tissue healing, according to this case report.

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Correspondence:

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Ioanna Verzoviti, MD

Department of General Surgery, 417 Army Shared Fund Hospital

Monis Petraki 10, 11521, Athens, Greece

E-mail: jverzoviti@gmail.com

ORCID: 0000-0002-6866-284X