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Original Research Article

Role of platelet rich fibrin matrix in wound bed preparation in degloving injury

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ABSTRACT

Degloving Injury are major debilitating conditions and its treatment is also challenging. The treatment of post traumatic degloving injury requires a multimodal approach. Adjuvant platelet rich fibrin matrix can be tried for post traumatic wounds as a modality for wound bed preparation. In this study we share our experience regarding the use of platelet rich fibrin matrix as an adjunct in the management of post traumatic degloving wounds of the lower extremity.

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1. Introduction

Skin avulsions and soft tissue injuries to the bone are both examples of post-traumatic degloving injuries. These wounds can occur everywhere on the body, although the extremities, trunk, scalp, face, and genitalia are the most often affected areas. The majority of these patients also have secondary injuries as a result of polytrauma, which includes significant blood loss, and the degloved skin and soft tissue are frequently practically dead. If degloving injuries are not identified quickly, there will be more morbidity and mortality. Various management techniques are described based on the wounded place. According to recent research, treating non-healing ulcers using autologous platelet-rich fibrin matrix that is rich in growth factors is successful.¹ In our study we used platelet rich fibrin matrix (PRFM) as an adjunct for preparing wound bed in the management of post traumatic degloved injury.

2. Materials and Methods

This study was conducted in the department of Plastic Surgery at tertiary care center after getting the departmental ethical committee approval. Informed written consent was taken from the patient. This is the prospective observational study about a 73-year-old male came with non-healing post traumatic degloved wound with no known co morbidities. He met with RTA (road traffic accident) 5 months back with degloving injury of the left lower limb for which serial debridement was done by primary centre before referring to our centre. At admission patient presented to plastic surgery department with extensive raw area over the left lower limb extending from just below knee to dorsum of foot (Figure 1). PRFM was used for the wound bed preparation. Under all aseptic precautions, 10 ml of venous blood was drawn, added to a sterile centrifugation tube devoid of anticoagulant. Centrifugation was done at 3000 rpm (approximately 400 g) for 10 minutes. After keeping the centrifuged tubes standing for 3 to 5 minutes, fibrin clot was observed sandwiched between the upper plasma layer and the bottom red blood cell layer PRFM was separated

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from red corpuscles at the base using a sterile forceps and scissor, preserving a small RBC layer measuring around one mm in length, which was transferred onto a sterile cup (Figure 2). The PRFM was transferred to the raw area and applied over the wound and covered with a sterile dressing (Figure 3). The PRFM was transferred to the raw area and applied over the wound and covered with a sterile dressing.



Fig. 1: At admission

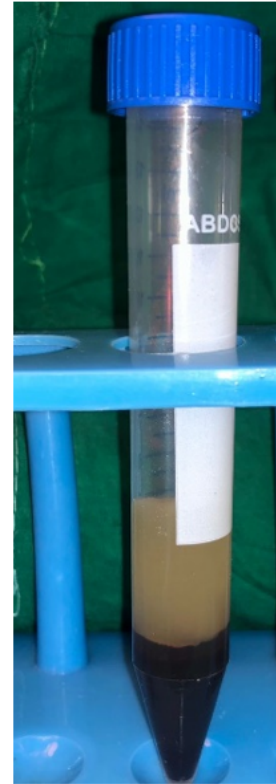


Fig. 2: PRFM in upper part of test tube

3. Results

After 2 weeks, the wound bed got ready with appearance of healthy granulation tissue (Figure 4). The future plan is to cover the raw area with skin grafting.

4. Discussion

Degloving soft tissue injuries are severe and may be fatal. Early identification and treatment are necessary. A strong index of suspicion is still essential, particularly in the care of closed injuries. Usually, a multidisciplinary approach is required. To properly care for such individuals, early repair and efficient rehabilitation are also imperative. Studies that span multiple disciplines and institutions are necessary. Lower-limb degloving injuries can have a complicated and time-consuming course of treatment. In order to prepare the wound bed for grafting, a vacuum aided closure (VAC) device is now routinely used. It may be necessary to use artificial dermal replacement, cryopreserved split-thickness skin grafts obtained from degloved flaps, or VAC therapy for lower limb degloving injuries. Both haemostasis and the process of healing a wound depend heavily on platelets.² Keratinocyte, fibroblast, and endothelial cell migration, proliferation, and activities are all aided by the release of cytokines and growth factors by platelets.³



Fig. 3: PRFM applied over the raw area



Fig. 4: Wound bed with appearance of healthy granulation tissue

Chronic wounds experience a delay in the inflammatory stage of recovery. They do not heal because they lack the development factors. Growth factors are generated from platelets and can be found in platelet rich plasma (PRP), platelet rich fibrin (PRF), and platelet rich plasma (PRF). Application of therapies produced from platelet-rich plasma is helpful in this regard. A functional variant of fibrinogen is fibrin.⁴ With a function in platelet aggregation, thrombin converts fibrinogen into insoluble fibrin. Because platelet concentrates frequently do not contain coagulation factors, platelet-rich fibrin (PRF) was created in order to have the predicted effects on tissue regeneration and wound healing. Thrombin and fibrinogen mix to create a fibrin clot when fibrinogen is concentrated in the upper part of the tube during centrifugation. These factors start to release 5–10 min after clotting and keep doing so for at least 60–300 min, resulting in a slow sustained release. Platelets, leucocytes, cytokines, and circulating stem cells are combined with a fibrin matrix gel that has been polymerized into a tetramolecular structure.⁵ Compared to PRP, PRF offers clear advantages. The PRFM preparation method is simpler, requires little handling, and is not dependent on an anticoagulant or thrombin activator. The necessary items are conveniently available in a hospital. Compared to APRP's liquid formulation, PRFM's gel form is simpler to apply to a raw region.⁶ A special architecture that aids in the healing process is provided by the activity of autologous growth factors and the biomechanical stiffness of plasmatic proteins after fibrin formation. In addition to fibrin, fibronectin, and vitronectin, growth factors from

activated platelet alpha-granules also play a significant role in tissue repair. These growth factors are hepatocyte growth factor (HGF), fibroblast growth factor-b (FGFb), PDGF, vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), and angiopoietin-I. (Ang-I).⁷ The endothelial mitogenic response was predominantly brought on by the vascular endothelial growth factor produced by PRFM via the extracellular signal-regulated protein kinase activation pathway. Finally, this PRFM formulation efficiently increased wound angiogenesis and endothelial cell proliferation in chronic wounds, demonstrating the potential mechanisms of action of PRFM in the healing of chronic ulcers. The usage of PRFM was linked to an elevated level of capillaries and CD31-positive cells as well as a markedly accelerated pace of cutaneous wound healing. Tumor growth factor (TGF), platelet-derived growth factor (PDGF), insulin-like growth factor-1 (IGF-1), fibroblast growth factor (FGF), VEGF, and connective tissue growth factor are all present in high concentrations in platelet-rich fibrin (CTGF). By encouraging cell proliferation, raising collagen production, stimulating vascularization, and triggering cell differentiation, these substances hasten tissue regeneration and speed up the healing of wounds.⁸ This results in the removal of necrotic tissues. PRF enhances wound healing in many disease conditions, according to numerous research. When compared to standard bandages, PRF considerably sped up the rate at which wounds healed, suggesting that it may be used to treat chronic wounds and diabetic foot ulcers. The effects of PRFM on wound healing may be related to the increase of local amounts of growth factors such PDGF, TGF-, and VEGF, which leads to blood vessel regeneration. In fibrin gel, the main proangiogenic factors FGFb, VEGF, angiopoietin, and PDGF are present, increasing the local growth factor levels. Additionally, PRFM contains fibrinogen breakdown products, encourages leukocyte and platelet migration and recruitment, and provides fibrin scaffolds, all of which help to keep growth factors in the wound for a longer period of time. The entire process of wound healing will benefit from the usage of PRFM in the initial stages. Even if the matrix eventually degrades, the wound healing is better thanks to the continued signalling pathway that PRFM started.⁹ It is yet unknown how other biological components may be influencing the healing power of PRF, and further research is required. Additionally, more research is needed to determine the value of PRFM in the treatment of diabetic wounds. Given that it has a positive effect, is simple to create, and is inexpensive, platelet-rich fibrin could be used in a variety of situations, such as acute and chronic wound healing. In our investigation, PRFM aided in the creation of the wound bed.

5. Conclusion

This is a preliminary study to assess the use of platelet rich fibrin matrix in wound bed preparation in degloving injuries. A large multicentric, double blinded control study with statistical analysis is required to further substantiate the results.

6. Authors' Contributions

All authors made contributions to the research, is putatively expected to be useful article.

7. Source of Funding

None.

8. Conflicts of Interest

None.

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