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Role of Autologous Platelet Rich Plasma in application of Full Thickness Skin Graft

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ABSTRACT

Autologous platelet rich plasma is the component of plasma containing concentrated platelets after graded centrifugation. It has various applications. Since time immemorial, skin grafting has been used for wound coverage. However, the healing process is longer and may be difficult, depending on the site, defect size, and patients' general condition, and is difficult to be carried out in patients who have limited donor sites & is associated with poor outcomes. Platelet rich plasma can be used in the management, to assist in the graft uptake, thus decreasing patient morbidity and improving the surgical outcome.

Keywords: Autologous platelet rich plasma; Full thickness skin graft; Management; Wound healing.

INTRODUCTION

A Full thickness skin graft (FTSG) is defined as a graft that contains the epidermis and dermis. Full thickness skin graft is the gold standard when it comes to management of a healthy raw area in face and regions where required small grafts. Unlike flaps, skin grafts do not have their own blood supply & must hence depend on a well vascularized wound bed for graft uptake. Full thickness skin graft survival depends on the blood supply of the edges of the wound. APRP is said to contain several growth factors such as platelet derived growth factor (PDGF), vascular endothelial growth factor (EGF) that have the ability to stimulate angiogenesis and stimulate fibroblast cell differentiation, enhance soft tissue healing.[1,2] In this case report, we highlight the role of Autologous platelet rich plasma (APRP) in the application of Full thickness skin graft.

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MATERIALS AND METHODS

The study was conducted in the department of plastic surgery in a tertiary care center in South India after obtaining the departmental ethical committee approval. Informed written consent was taken from the patient. 21-year-old male presented to the hospital with post burn contracture to the

left little finger with Metacarpo phalangeal joint subluxation. Patient had fire flame injury wherein, he inserted his hand in the hot firewood at 2 years of age, now presented with chief complaints of left-hand little finger functional deficit & painless deformity (Fig. 1).

Fig. 1: Post burn contracture left little finger

Patient was admitted with the above symptoms & evaluated. He underwent Contracture release followed by full thickness graft from left groin. Pre-op X-ray shows Metacarpo-phalangeal joint subluxation. K-wire fixation of left little finger under fluoroscopic guidance. Once joint is fixed and raw area is created, it was grafted with full thickness graft taken from the right groin. Autologous platelet rich plasma was sprayed over the dermal side of the graft and also over the wound bed before fixing the full thickness skin graft over the raw area. (Fig. 2 and 3)

Fig. 2: APRP sprayed over the dermal side of skin graft

Fig. 3: APRP sprayed over the raw area before placing the skin graft

Full thickness skin graft was fixed with absorbable sutures at the edges of the raw area. (Fig. 4) Autologous platelet rich plasma was prepared by the following methods as described.

Fig. 4: Skin graft applied over the raw area

Steps of Autologous platelet rich plasma preparation were as follows: 10 ml of heparinized venous blood of the patient is taken and centrifuged at 3000 rpm for 10 minutes. The three layers are formed. The upper layer of the three layers, was taken and recentrifuged at 4000 rpm for 10 minutes. The content is separated into 2 layers. The bottom layer of the plasma is rich in platelets and is aspirated using 18 G needle.[3,4] Autologous platelet rich plasma was taken and used in our case.

RESULTS

Patient post-operative period was uneventful and showed unremarkable recovery. Graft uptake was good and wound site healed well. Patient discharged successfully.

DISCUSSION

Action of platelet is release of bioactive proteins responsible for attracting macrophages, mesenchymal stem cells, and osteoblasts. These cells are known to promote removal of necrotic tissue and enhances tissue regeneration and healing. It is also helpful in acceleration of wound healing.[5] Platelet Rich Plasma (PRP) is defined as a portion of the plasma having a higher concentration of platelet. It consists of platelets with clotting and growth factors. The APRP 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. 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.[6] 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.[7] Among these, PDGF and EGF are found to be the key growth factors that are involved in fibroblast migration, proliferation, and synthesis of collagen. Increased concentrations of PDGF & EGFis the probable reason for the accelerated wound healing, which is estimated to be at least 2–3 times faster than that of normal.[8,9] Similar mechanism of action is hypothesized to be seen in the case is APRP use in Full thickness skin graft. As grafts are tissues that are transferred without their own blood supply, they have to revascularize in the new site. This is clearly promoted by APRP. A major advantage of using of APRP is that it is extracted from the same patient, thus having almost nil chances of hypersensitivity, immunological reactions and transmission of blood borne diseases. Also, it is observed to be cost effective, and by improving the take of Full thickness skin graft, it reduces hospital stay for the patient, and thus decreases the patient morbidity & health care costs.

CONCLUSION

A PRP application for Full thickness skin graft has shown promising results and we propose that it can be used to improve outcomes on graft uptake. A larger, multicentric randomized control trial may be required to validate the same.

Conflicts of interest: None

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