Review Article

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Role of Platelet Rich Fibrin Matrix in Management of Electric Burns

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Abstract

Electric burns injury is a problem which is still found nowadays. The wound ranges from mild blistering to full thickness charring of tissues, when the wound goes into the healing phase there is difficulty due to the nature of the burns and the large area it involves. Any problem with the edge of the wound can be detrimental to healing and may cause delay in wound healing. In this article, we share our experience of using Platelet Rich Fibrin (PRF) for wound bed preparation in electric burns wound healing.

Keywords: Platelet Rich Fibrin Matrix, Electric Burns.

INTRODUCTION

Electric burns is a common problem in our country,ranging from low voltage household to high voltage burns. Fatalities due to electric burns has come down as well as low voltage burns due to progress in the field of household safety. Electric burns causes burns over the surface with loss of tissue and the plastic surgeon faces difficulty in the wound management. Wound bed preparation is a novel concept which is used for the management of wounds that fail to heal well and can be summarized with the T.I.M.E with T for tissue: non-viable or deficient. I for infection/inflammation, M for moisture balance. E for epidermis which was later changed to E for edge which allows the granulation tissue to come. Conventionally Autologous Platelet Rich Plasma is in practice and is used as one of the agents, but recently in literature, we have come across platelet rich fibrin matrix for the use in wound bed preparation

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MATERIALS AND METHODS

This study was conducted in the department of Plastic Surgery at tertiary care center after the departmental ethical committee approval was taken. Informed written consent was taken from the patient in study. The details of the patient in study are as follows: 40 year old female with no known co morbidities with h/o Accidental electric burns from household supply who presented to our casualty and sustainedcircumferential 3rd to 4th degree burns over the left little finger with loss of vascularity of the distal part and 2nd degree burns over the medial aspect of the ring finger in the proximal phalanx. Patient was taken for little

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finger disarticulation after1 week when the line of demarcation developed. Following the procedure patient was dressed regularly. She developed a raw area over the medial aspect of the ring finger which did not show any evidence of healing. Wound bed preparation was planned for the patient with Platelet Rich Fibrin Matrix (PRFM). Under strict aseptic precautions, ten 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. Three layers were obtained: upper straw coloured platelet poor plasma (PPP), red coloured lower fraction containing red blood cells (RBCs) and the middle fraction containing the PRFM (figure 2a).The upper straw coloured layer (PPP) was discarded. PRFM was separated from red corpuscles at the base using a sterile forceps and scissor, preserving a small RBC layer measuring around one mm in length (figure 2b), which was transferred onto a sterile gauze.The PRF was transferred to the raw area (figure 3) and covered with a sterile dressing. Two sittings were done one week apart and the wound bed was reassessed 2 weeks. The wound showed healing as evidenced by healthy granulation tissue.(figure4)

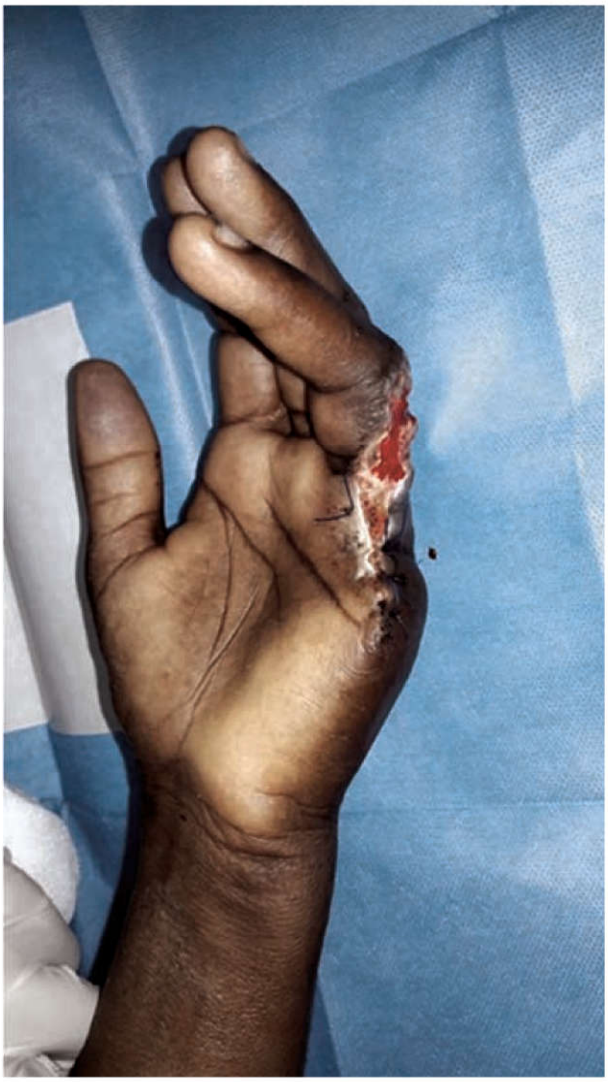

Figure 1: electric burns raw area

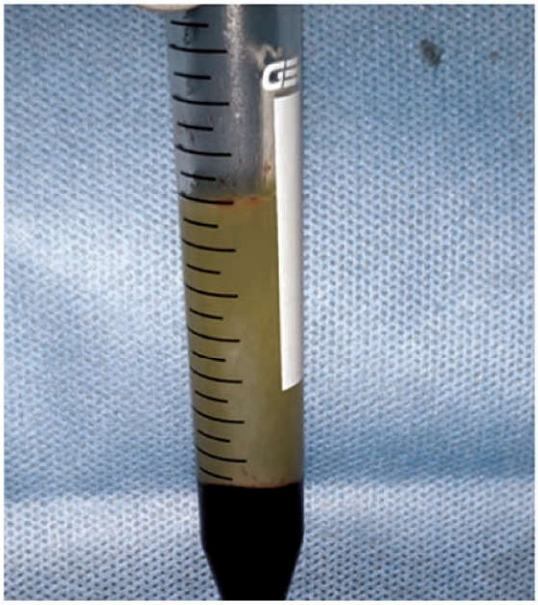

Figure2a: platelet rich fibrin matrix

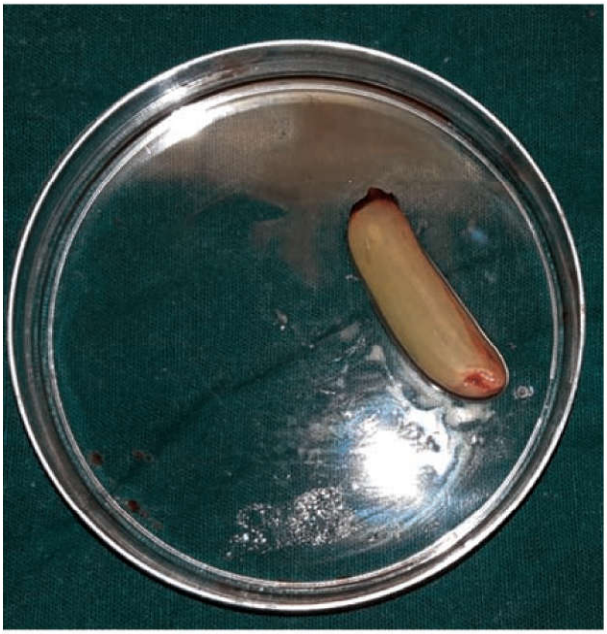

Figure2b: platelet rich fibrin matrix

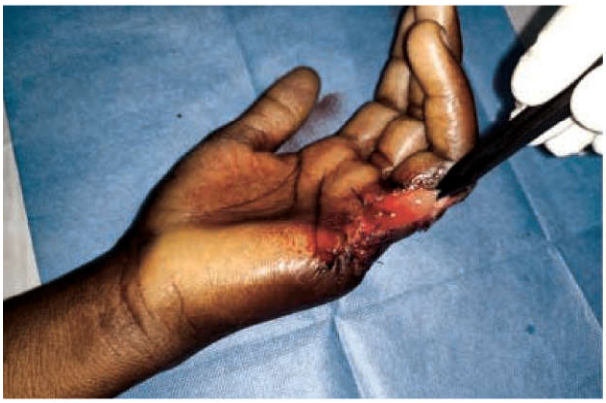

Figure 3: application of PRF to raw area

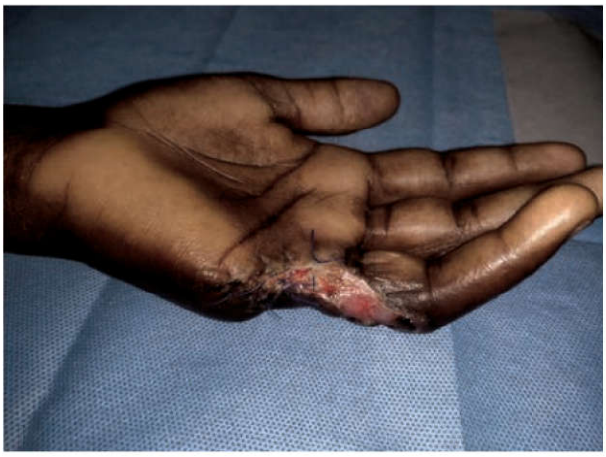

Figure 4: healing wound bed

DISCUSSION

Burn injury is a major cause of trauma to the human body, causing death as well as disability, with a long healing period and high cost in hospital treatment. The mortality rate of burn injury has decreased with new treatment modalities, but secondary infections and prolonged healing periods still affect the mortality rates. Early debridement and skin grafting have been successful, but insuf¬ficient graft donor area and poor patient circumstances for surgery hinder skin grafting. In these circumstances, using products thatwould increase the wound-healing process can be used. For this purpose, different kinds of dressings and pharmacotherapies have been developed, but most are costly, and the mechanisms underlying these therapies have not been fully documented.

Wound bed preparationhas emerged as a means of preparing the wound to accept advanced wound healing measures. It became clear that may not be possible to treat a poorly prepared wound bed with advanced therapies. Wound bed preparation was redefined as 'the global management of the wound to accelerate endogenous healing or to facilitate the effectiveness of other therapeutic measures.[1] Wound bed preparation started to be summarized by the acronym T.I.M.E by June 2002 with T for tissue: non-viable or deficient. I for infection/ inflammation, M for moisture balance. E for edge. Debridement, control of inflammation and moisture are essential parts of wound bed preparation that may stimulate the edge of the wound to migrate, but if they fail, advanced therapies is required.

Platelets play a crucial role in haemostasis[2] and also in the wound healing process. Platelets release a variety of cytokines as well as growth factors[3], which control and enhance the migration, proliferation, and functions of keratinocytes, fibroblasts, and endothelial cells. Chronic wounds stall in the inflammatory phaseof healing. They lack the growth factors and do not heal. Platelet derived autologous products, platelets rich fibrin(PRF) and platelet rich plasma (PRP) are a rich source of growth factors. The application of platelet- rich-derived therapies is useful in this regard.

Fibrin is the active form of Fibrinogen4. Fibrinogen is transformed to insoluble fibrin by thrombin with role in platelet aggregation. Platelet concentrates lack coagulation factors, termed platelet-rich fibrin (PRF) was developed for its anticipated properties in tissue regeneration and wound healing. Duringcentrifugation, fibrinogen gets concentrated in the upper part of the tube and combine with thrombin to form a fibrin clot. There is release of growth factors from PRF. The release of these factors commences 5- 10 min after clotting and continues for at least 60-300 min, provides slow sustained release[5]

PRF ismade of a fibrin matrix gelpolymerized in a tetra molecular structure, with platelets, leucocytes, cytokines, and circulating stem cells.[6] PRF has few distinct advantages over PRP. Thetechnique of PRF preparation is simpler, involves minimal handling, and not dependent on anticoagulantor thrombin activator. The consumables required are easily available in a hospital. Further, the gelform of PRF is easy to apply on rawarea compared to the liquid formulation of PRP.[7] The effects of PRFare due to factors of healing that act in complex synergy, such asleukocytes, fibrin matrix, and circulating progenitor cells. The activity of theautologous growth factors along with biomechanical stiffness of plasmatic proteins afterfibrin mesh formation offer a unique architecture that is favorable to healing process. The growth factors released from

the alpha-granules of activated platelets, and factors such as fibrin, fibronectin and vitronectin play pivotal role in tissue repair and regeneration. These growth factors includevascular endothelial growth factor (VEGF), fibroblast growth factor-b (FGFb), PDGF,hepatocyte growth factor (HGF), EGF, and angiopoietin-I (Ang-I) among others.8

CONCLUSION

This is a preliminary study to assess the usefulness of PRF injection in management of electric burns. It helps in the wound bed preparation. More long-term clinical study are needed to determine whether PRF can be used for wound bed preparation in electric burns.

Limitations: This was done on a single patient and needs large population based study to apply in practice

Conflict of interest none

Disclosure none

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