Role of Autologous Platelet Rich Plasma in Preventing Flap Necrosis

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ABSTRACT

Platelet-rich plasma (PRP) is currently used in different medical fields.It is being used in several different applications as in tissue regeneration, wound healing, scar revision, skin rejuvenating effects, and alopecia. PRP is a biological product defined as a portion of the plasma fraction of autologous blood with a platelet concentration above the baseline.In this manuscript, we discuss the role of autologous platelet rich plasma in preventing the flap necrosis in an electrical burn patient.

Keywords: Autologous Platelet Rich Plasma, Electrical Burns, Flap, Flap Necrosis.

INTRODUCTION

Platelet-rich plasma (PRP) is currently used in different medical fields. The interest in the application of PRP in dermatology has recently increased. It is being used in several different applications as in tissue regeneration, wound healing, scar revision, skin rejuvenating effects, and alopecia.Platelet-rich plasma (PRP) is also known as platelet rich growth factors (GFs), platelet-rich fibrin (PRF) matrix, PRF, and platelet concentrate. The concept and description of PRP started in the field of hematology1. In this manuscript, we discuss the role of autologous platelet rich plasma in preventing the flap necrosis in an electrical burn patient.

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Materials and Methods

This study was conducted in the Department of Plastic Surgery in a tertiary care institute. Department scientific committee approval was obtained. In this case report a 45 year old male sustained electrical burn injuries while working at construction building. He sustained electrocution by contact with electric wire and initiated sparks and electrical wire fell on patient head. He was admittedto emergency department of Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER) with an electrical burn in the frontoparietal area (entry zone) and the left leg (exit zone). The scalp defect size was 20*15cm. (figure 1)The scalp defect wound bed preparation was done and a rotation flap was performed. Adjuvant autologous platelet rich plasma was given to prevent flap necrosis. (figure 2,3)

Figure 1: Post electrical burn scalp defect

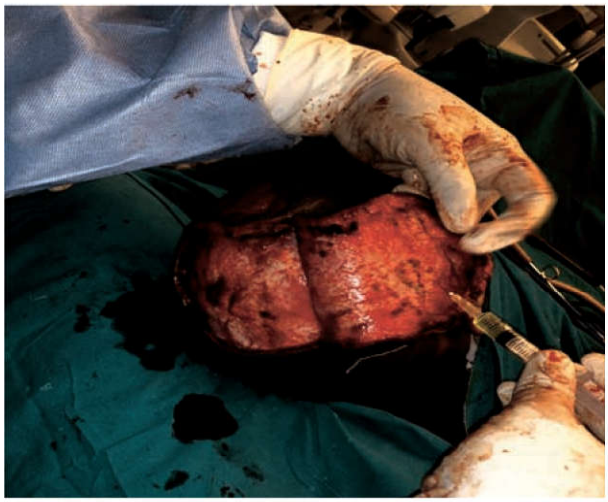

Figure 1: Post electrical burn scalp defect

Figure 3: Autologous platelet rich plasma on the flap after inset

Figure 4: Healthy scalp flap

Results

In our patient, autologous platelet rich plasma helped as an adjuvant in preventing the flap necrosis.(figure 4)

Discussion

Platelet-rich plasma (PRP) is also known as platelet rich growth factors (GFs), platelet-rich fibrin (PRF) matrix, PRF, and platelet concentrate. The concept and description of PRP started in the field of hematology. Hematologists created the term PRP in the 1970s in order to describe the plasma with a platelet count above that of peripheral blood, which was initially used as a transfusion product to treat patients with thrombocytopenia.[2] Ten years later, PRP started to be used in maxillofacial surgery as PRF. Fibrin had the potential for adherence and homeostatic properties, and PRP with its anti-inflammatory characteristics stimulated cell proliferation.[3] Subsequently, PRP has been used predominantly in the musculoskeletal field in sports injuries. With its use in professional sportspersons, it has attracted widespread attention in the media and has been extensively used in this field.[4] Other medical fields that also use PRP are cardiac surgery, pediatric surgery, gynecology, urology, plastic surgery, and ophthalmology.[5]

PRP is a biological product defined as a portion of the plasma fraction of autologous blood with a platelet concentration above the baseline (before centrifugation).[6] As such, PRP contains not only a high level of platelets but also the full complement of clotting factors, the latter typically

remaining at their normal, physiologic levels.[7] It is enriched by a range of GFs, chemokines, cytokines, and other plasma proteins. The PRP is obtained from the blood of patients before centrifugation. After centrifugation and according to their different density gradients, the separation of blood components (red blood cells, PRP, and platelet-poor plasma [PPP]) follows. In PRP, besides the higher concentration of platelets, other parameters need to be taken into account, such as the presence or absence of leucocytes and activation. This will define the type of PRP used in different pathologies.

Devices to Obtain PRP Currently, there is a great discussion and no consensus regarding PRP preparation. PRP is prepared through a process known as differential centrifugation, in which acceleration force is adjusted to sediment certain cellular constituents based on different specific gravity.[8]

Regarding the preparation of PRP, there are 2 techniques:

1. Open technique: the product is exposed to the environment of the working area and comes in contact with different materials that should be used for their production, such as pipettes or product-collection tubes. In the blood processing to obtain PRP with the open technique, it should be guaranteed that the product is not contaminated during microbiological handling.
2. Closed technique: it involves the use of commercial devices with CE marking (including centrifuge equipment and application) in which the product is not exposed to the environment (recommended). Several CE medical devices are available for the production of autologous PRP. Most of them are included in one of the following 3 types of devices:
    a. The blood is obtained with a tube that contains an anticoagulant, and this tube can be used for any type of centrifuge.
    b. Medical devices with which the blood is collected into a tube that already contains an anticoagulant; the centrifugation can then be made in any type of centrifuge.
    c. Medical devices with which the blood is collected into a syringe previously filled with an anticoagulant; usually, the blood is transferred into a secondary device whose shape imposes the use of the centrifuge supplied by the same manufacturer.[9]

After centrifugation, the tube shows 3 basic layers: at the bottom of the tube, there are red blood cells with leukocytes deposited immediately above; the middle layer corresponds to the PRP, and at the top, there is the PPP. The PPP is removed, and PRP is obtained. Platelets can be activated before application of the PRP, although there is no consensus on whether or not platelets must be previously activated before their application and with which agonist.10In our patient, autologous platelet rich plasma had a significant role in preventing flap necrosis.

Conclusion

Autologous platelet rich plasma had a significant role in preventing the flap necrosis in an electrical burn patient.

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