

“Clinical Study on Platelet Rich Plasma in Wound Healing”

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Abstract: Introduction: wound management is a challenging task to the surgeon and a debilitating issue to the patients. The general treatment including the expert care in dressings, meticulous use of antibiotics, Negative pressure vacuum therapy dressings, surgical interventions and reconstructions using a lot of resources, expenses and expert hands. But the results are still unpredictable and unassured. Platelet-rich plasma (PRP) has a numerous number of growth factors, chemokines, cytokines and many other proteins which have a numerous number of properties out of which one is its role in wound healing. **Materials and Methods:** The PRP therapy consists of self-activated autologous platelet-rich plasma derived from centrifugation of whole blood by Double centrifugation method. It is given as a local subcutaneous infiltrate along the wound margins on every fourth day till the wound is completely healed with regeneration of skin or red healthy granulation tissue. The study consisted of 30 patients, ages ranging from 20 to 60, both males and females who were studied from January 2017 to december 2018. Hb per cent below 9 was a contraindication. The wounds consisted of both acute and chronic, including compound fractures, infected wounds, non-healing ulcers. **Results:** 28 wounds were healed by this technique which did not require any further procedures and two of them required split skin grafting. The average number of sittings required were seven. Antibiotic cultures showed no bacterial growth during the course of treatment. **Conclusion:** platelet-rich therapy is a novel mode of treating wounds by their growth factor properties and antibacterial properties giving satisfying results without wasting resources nor need of any other complex and expert techniques in wound

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I. Introduction

Wound management in orthopaedics as in compound fractures , degloving injuries, lacerations and non-healing postoperative wounds ,bedsores is a challenging task to surgeon and a debilitating issue to the patients. The treatment of which includes the expert care in dressings ,meticulous use of antibiotics ,Negative pressure vacuum therapy dressings ,surgical debridement's and reconstructions using a lot of resources, expenses and expertise hands^[1]. The above mentioned treatment needs facilities that are only present at a higher centres ,But the results are still unpredictable and unassured .Platelet rich plasma has a numerous number of growth factors (FGF-B , PDGF, TGF-B , IGF , KGF , EGF , VEGF) , chemokines , cytokines and many other proteins which have a numerous number of properties out of which one is its role in wound healing^[2-4]. Platelet rich plasma has come into use for many orthopaedic problems of tendons and bones^[5,6]. Apart from autologous platelet rich plasma , gel forms of PRP are also available which is used as a topical applicant apart from the regular wound management techniques^[6-11]. The results as cited in the literature are encouraging.

II. Aims and objectives

This is a prospective study which is taken up to evaluate the effectiveness of platelet rich plasma (PRP) in the wound healing in both acute and chronic nonhealing wounds.

III. Materials and Methods

The platelet rich plasma therapy consists of self-activated autologous platelet rich plasma derived from centrifugation of whole blood by Double centrifugation method^[12].

3.1Preparation of PRP:

20 ml of autologous venous blood is taken and is transferred to 4 EDTA tubes equally .First spin called as hard spin is at a 2000 rpm, at room temperature, for 15 minutes. Then the upper buffy layer is transferred to a plain tubes and is then recentrifuged at 1200rpm for 10 minutes which separates the Platelet rich Plasma and Platelet poor plasma, as PRP settles down . 2-4 ml of PRP is extracted and istransferred it into a 5 ml syringe with a 21G needle. It is given as a local subcutaneous infiltrate along the wound margins on every fourth day till the wound is completely healed with regeneration of skin or red healthy granulation tissue is formed for larger

wounds which could be treated by split skin grafts. The wounds are cleaned daily with normal saline and chlorhexidine if the wounds were dirty only .No antibiotics were given during the course of study. Serial assessment of haemoglobin, wound measurements were taken after every sitting , culture swabs were sent during the study .

IV. Inclusion criteria

The study consisted of 30 patients, ages ranging from 20 to 60 , both males and females , diabetics and non-diabetics , the wounds consisted of both acute and chronic , including compound fractures , infected wounds, non-healing ulcers , who were studied from January 2017 to December 2018 .

V. Exclusion criteria

Haemoglobin percent below 9% was a contra-indication.

VI. Observations and Results

The study consisted of 22 males and 8 females .Most of the wounds being acute posttraumatic and commonest site being the lower limb.28 wounds were completely healed by this technique which did not require any further procedures and two of them required split skin grafting .None of the cases had wound dehiscence. The average number of sittings required were seven .12 wounds were infected at the beginning of the treatment with culture showing Staph Aureus being the most isolated organism.Antibiotic cultures showed no bacterial growth during the course of treatment .Infection and pain control was observed in all the cases.Mean haemoglobin was 11.6 at the initiation of the treatment and 11.2 by the end of the treatment.5 cases which had Haemoglobin% less than 10% had underwent packed cell transfusion to attain Haemoglobin above 10%.The average wound size was 32.6cmsq and 28 of them had near normal skin closures.None of the complications were noted.



Figure 1a

Figure 1b

Figure 1c

Figure 1d

Figure 1e

Figure 1f

Figure 1a-1f :post-surgical nonhealing wound over Rt ankle measuring 6x6 cm treated with 6 sittings of PRP injection

Case 2



Figure 2a

Figure 2b

Figure 2c

Figure 2d

Figure 2e

Figure 2a-2e: non-healing wound after flap put for a compound fracture Lt both bone distal leg measuring 11x8 cms treated with 9 sittings of PRP injection

Case 3



Figure 3a

Figure 3b

Figure 3c

Figure 3d

Figure 3e

Figure 3a-3e : acute lacerated wound following an RTA measuring about 5x3 cms on the medial aspect of the proximal leg treated with 5 sittings of PRP injection

Case 4



Figure 4a

Figure 4b

Figure 4c

Figure 4d



Figure 4a to 4g :38 y old male with compound grade 3b femur shaft with soft tissue defect of 24x12 cm wound over anterior aspect of proximal thigh treated with 4 sittings of PRP and taken up for split skin grafting.

VII. Discussion

PRP infiltration therapy is a very effective, efficient, biologically safe and easily producible modality in treatment of simple and complex wounds. PRP is a product of regenerative medicine utilizing the growth factors present in the platelets that leads to a series of cascade of steps involving the phagocytic activity followed by neo angiogenesis and epithelization on multiple infiltrations^[13]. The healing by PRP is as follows 1) control of infection 2) suppress the formation of unhealthy tissue 3) Formation of granulation tissue 4) Epithelization & Remodeling^[12] This pattern of healing by PRP infiltration is observed as wound undergoes the above four but overlapping stages, during healing process and mimic the normal healing process. Phase of granulation is faster than that of epithelization and remodeling phase, and after granulation the progression of wound closure was

about 0.5 to 0.7 cm per day. With this technique many acute and non-healing wounds which were tried treating with advanced techniques but failed have been successfully healed. During the course of treatment, the wound cultures progressed from positive culture to negative cultures showing the antibiotic property of PRP thus having the advantage of preventing misuse of antibiotics and resistance^[16]. Improvement in the VAS of pain has subsequently improved from the initial phases of treatment hence proving the analgesic property of PRP and thus limiting the usage of NSAIDS in the patients. Since being autologous, has no risk of disease transmission. This technique needs no expert training and can be administered with ease. It has absolutely no side-effects and can be administered to patient with any co-morbid condition except any hematological disorder.

VIII. conclusion

The regenerative medicine, which is being developed in the present era is key to many diseases, stem cells, mesenchymal cells and platelets being the key biologic products of the regenerative medicine. Platelet rich therapy is a novel mode of treating wounds by their growth factor properties and antibacterial properties giving satisfying results without wasting resources nor need of any other complex and expert techniques in wound the wound management. This technique is exclusive of drugs, meticulous dressings and major surgical interventions. Platelet as blood product is being used as platelet rich plasma (PRP) and also have very promising results for the treatment of various impairments including of tendons and bones.

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