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APPLICATIONS OF PLATELET RICH PLASMA IN CHRONIC ULCERS OF HEAD AND NECK- A PROSPECTIVE STUDY

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ABSTRACT

Introduction- Platelet rich plasma is an autologous substance that has found its applications in different aspects of surgery. PRP's healing power is attributed to the abundance of growth factors present in it. Thus, we have used platelet rich plasma in management of non-healing ulcers of head and neck

Objectives-

- To apply Platelet Rich Plasma in chronic ulcers of head and neck.
- To establish the benefits of Platelet rich plasma as an easily available, cost effective, harmless substance which can be used to improve the quality of life.

Materials and Methods- It was a prospective study on 20 patients in a tertiary centre from August 2021 till September 2022. Of the 20 patients, 10 patients received antibiotics and conventional dressing. The other group received platelet rich plasma infiltration around the wound. **Results and analysis-** Comparing the platelet count in PRP vs baseline platelet levels, we found the count in PRP was 8.23x105 /ml vs 2.03x105 /ml in baseline. The wound healing period in PRP group was also shorter i.e., 15 days compared to 17 days in control group. Mean ulcer diameter in PRP group on day 4, 8 and 10 were 6 cm, 3 cm, and 2 cm respectively; in the non-PRP group it was 7 cm, 4 cm and 2 cm respectively. Biopsy from the ulcers treated with PRP was taken on Day 10 after application and showed epithelialisation, inflammatory cell infiltrate, collagen deposition and neo angiogenesis. In contrast, non-PRP group only showed inflammatory cell infiltration on day 10. **Conclusion-** Platelet rich plasma is a useful, cost effective, autologous material. Our prospective study has shown that PRP application helps in improving wound healing and reducing hospital stay and morbidity of patients.

KEYWORDS

PRP, chronic ulcer

INTRODUCTION-

Platelet rich plasma is an autologous substance that has found its applications in different aspects of surgery. PRP's healing power is attributed to the abundance of growth factors present in it. It is safe, promotes healing and is prepared easily within short period of time. Due to its value in biostimulation and healing acceleration, this material has various applications in cardiothoracic surgery, orthopaedic surgery, neurosurgery, plastic surgery, dentistry, and oral and maxillofacial surgery (1). Simon E Smith reviewed articles on PRP application in bone healing and concluded it to be safe and reproducible in mimicking bone remodelling.

Besides its high platelet concentration, platelet-rich plasma contains several growth factors that are useful for wound healing. After clot formation, the platelets degranulate and release the following growth factors such as platelet-derived growth factor (PDGF), transforming growth factor alpha (TGF-α), transforming growth factor beta (TGF-β), epidermal growth factor (EGF), fibroblast growth factor (FGF), insulin-like growth factor and platelet-derived angiogenesis factors, along with white blood cells, phagocytic cells, a high native fibrinogen concentration, and vasoactive and chemotactic agents (1).

Also, this agent has been used in Dermatology for hair restoration, skin rejuvenation, dermal augmentation and acne scar removal as confirmed by Jason Emer (2). Pencheng Xu et al from Guangzou, China applied PRP on wound reproduced in C57/ BL6 mice and witnessed promising results as to healing of wound (3). However, the use of PRP is not a novel idea. Rather, previous works on application of PRP in atrophic Rhinitis as shown by Hany Samir Mustafa et al (4) showed improved SNOT 25 scores and accentuated sense of smell. We endeavoured to use platelet rich plasma in treating chronic ulcers of head and neck region.

AIMS AND OBJECTIVES-

- To apply Platelet Rich Plasma in chronic ulcers of head and neck.
- To establish the benefits of Platelet rich plasma as an easily available, cost effective, harmless substance which can be used to improve the quality of life.

MATERIALS AND METHODS-

We performed a prospective cross-sectional study over a period of 1 year, from August 2021 till September 2022, over a sample of 20 patients. We followed the following inclusion and exclusion criteria-

Inclusion Criteria-

- Patients who developed ulcers in the head and neck region following radiation therapy for head and neck malignancies.
- Patients who developed abscesses involving head and neck area.

Exclusion Criteria-

- Patients who did not consent for application of platelet rich plasma.
- Patients with ulcers that were diagnosed to be malignant.
- Patients who had coagulopathy or were on anti-platelet drugs.

Preparation of platelet rich plasma-

1. Venous blood was drawn from the antecubital vein.
2. The blood was put in acid citrate dextrose tube.
3. The tube was subjected to soft spin in the centrifuge.
4. The supernatant which stood out was extracted and transferred to another tube without any anticoagulant.
5. This tube was now subjected to hard spin.
6. The upper 2/3rd of the resultant was Platelet poor plasma. The lower 1/3rd was platelet rich plasma.
7. The platelet pellet settled down at the bottom.

It was shaken with 2.5 ml plasma and extracted.

The platelet rich plasma thus extracted was infiltrated around the ulcer

margins and draped over the ulcer bed. In all the above procedures, the wound healing times were calculated in days. In patients with chronic ulcers, we measured the wound diameter on Day 4, 8 and 10 after application of platelet rich plasma.

On day 10 of application of PRP, biopsy was taken from wound margins and were subjected to histopathological examination. All the patients were followed up for a period of 2 months after application.

RESULTS AND ANALYSIS-

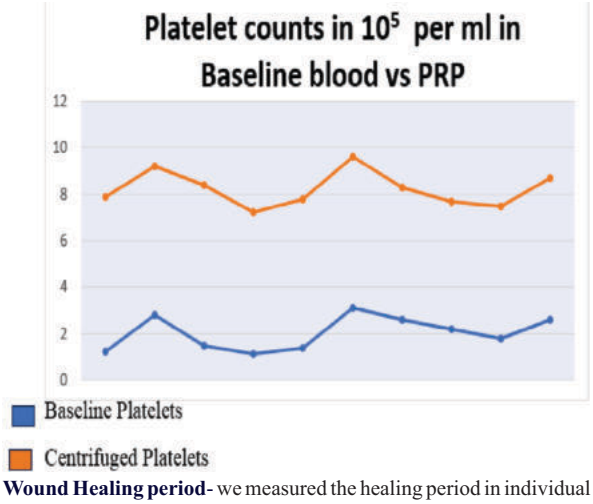
The following parameters were analysed-

- The quantitative estimation if platelets in PRP.
- Wound healing period.
- Wound contracture over time.
- Histopathological evidence of wound healing.

The presence of RBC in PRP might impede upon the release and action of the growth factors. Also, the number of platelets obtained after centrifugation is critical to ensure quality and proper amounts of growth factor release.

Hence, we compared the baseline platelet counts and the counts after centrifugation to assure proper amounts of platelets are present in the samples that we apply.

Baseline platelet count in 105 per ml of blood	Centrifuged platelet count in 105 per ml of blood
1.2	7.9
2.8	9.2
1.5	8.4
1.1	7.2
1.4	7.8
3.1	9.6
2.6	8.3
2.2	7.7
1.8	7.5
2.6	8.7



Wound Healing period- we measured the healing period in individual patients and compared them with the controls

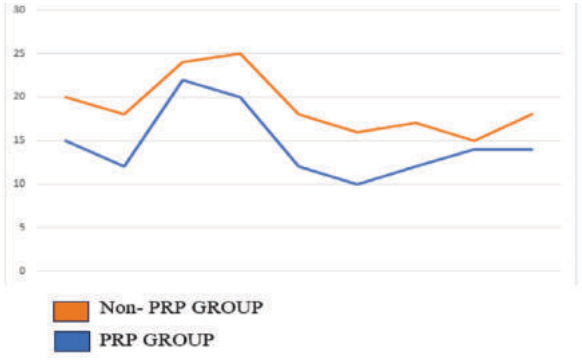
The following were the results-

PRP GROUP	NON – PRP GROUP
15	20
12	18
22	24
20	25
12	18
10	16
12	17
14	15
14	18
15	19

Wound Diameter- We measured the individual wound diameter on Day 4, 8 and 10 and the results in centimetres were as follows-

Wound Diameter on Day 4-

PRP GROUP	NON PRP GROUP
5	10
4	8
6	5
7	7
6	7
5	6
6	8
8	7
7	6
6	8



Thus, in a more simplified form, the healing periods can be compared in the following chart-

Wound Diameter on Day 8-

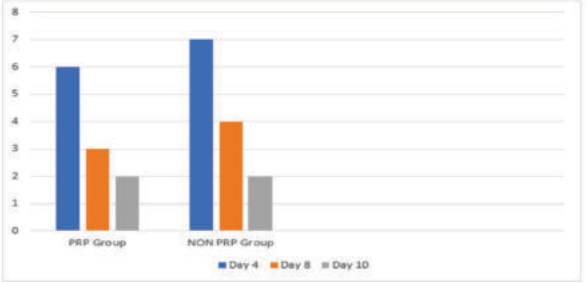
PRP GROUP	NON-PRP GROUP
2	3
3	4
3	3
3	6
4	3
2	3
2	4
3	4
3	5
2	4

Wound Diameter on Day 10-

PRP GROUP	NON-PRP GROUP
1	2
2	2
2	1
1	4
3	2
1	1
1	2
2	2
2	3
1	2

Simplifying the above results, we calculated the mean diameter and tabulated the data-

	Day 4	Day 8	Day 10
PRP GROUP	6	3	2
NON-PRP GROUP	7	4	2



The underlying chart shows the above data-

Progression of ulcer after application of PRP

Histopathological evidence of healing-

On Day 10 after application of platelet rich plasma, we obtained biopsy from the ulcer margins and subjected it to histopathological examination-

	Ulcers in PRP group	Ulcers in NON-PRP group
Epithelialisation	√	×
Inflammatory cell infiltration	√	×
Collagen Deposition	√	×
Neoangiogenesis	√	×

DISCUSSION-

Platelet rich plasma is a safe, easily available autologous material that can be used extensively in tissue repair.

The preparation is easy, the application being simple too.M Stavrakas et al (5) reviewed the works on application of prp in ENT and suggested a strong and bright future prospect for this to be used further M. J. Carter et al (6) reviewed 21 RCTs and comparative non RCT designs and were able to show the potential benefits of PRP in different ulcer viz. venous ulcers, diabetic foot.

Among the proteins are those that contain growth factors (PRGFs) (5,7).

The PDGF growth factor stimulates cell proliferation, fibroblast chemotaxis, and collagen synthesis.

The growth-transformation factor, TGF, controls cell proliferation, has intrinsic inflammatory ability, and induces extracelular matrix production and tissue repair.

The epidermic growth factor or EGF promotes keratinocyte production, stimulates angiogenesis, fibroblast chemotaxis, and a provisional matrix formation (7).

Platelets also transport proteins that originate in their cell precursors (megakaryocyte) and others that are captured from the surrounding plasma by endocytosis (8).

Treatment with PRP seems to limit the noxious effect of deep tissue injury, preventing the spread of tissue necrosis (9).

Jean M de Leon et al. investigated clinical outcomes in chronic nonhealing wounds following the short-term use of an enhanced, near-physiological concentration of platelet-rich plasma (PRP) gel and found that utilization of PRP gel can restart the healing process.

Rapid treatment response was observed in 275 of 285 wounds, and the magnitude of response was consistently high, with statistically significant outcomes reported for various subgroup (10)

CONCLUSION-

From our study, we found that platelet rich plasma can be used as a safe autologous material for tissue healing. It thus holds immense prospect in future endeavours as far as ENT and Head-Neck surgery is concerned.

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