



## RESEARCH ARTICLE

### ANALYSIS OF WOUND HEALING EFFICACY OF PLATELET RICH PLASMA IN MANDIBULAR THIRD MOLAR EXTRACTION WOUNDS: A COMPARATIVE DOUBLE BLIND STUDY

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#### ABSTRACT

**Aim:** To compare the healing of mandibular third molar extraction wounds with and without Platelet Rich Plasma.

**Materials and Methods:** This was parallel comparative double blind study involving two groups viz group A and B. In study group (group A), Platelet rich plasma was placed in the extraction socket before closure of the socket in 30 patient. Group B consists of 30 patients who will be the control group where the extraction sockets will be closed without any intra socket medicaments. The patients would be allocated to the groups randomly.

**Results:** The result of the study shows rapid bone regeneration in the extraction socket treated with Platelet Rich Plasma when compared with the socket without Platelet Rich Plasma.

**Conclusion:** Incorporation of Platelet Rich Plasma in the extraction sockets has significant improved soft tissue healing and bone regeneration.

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## INTRODUCTION

Satisfactory and timely healing after tooth extraction are essential to obtain ideal functional reconstruction. Traumatic removal of a tooth, or a poor healing response, may lead to excessive bone loss delaying tooth replacement. Immediately following tooth removal, a healing process begins that affects the eventual alveolar bone volume. Platelet rich plasma (PRP) has been promoted as an effective method for improving wound healing and thereby bone formation (Schropp, 2013). Platelet-rich plasma (PRP), an autologous concentrate of platelets in a relatively small volume of plasma, enables delivery of growth factors in increased amounts to surgical sites to promote wound healing. Platelets contain growth factors such as platelet derived growth factor (PDGF) (including aa, ab and bb isomers), transforming growth factor-b (TGF-b) (including b1 and b2 isomers), fibroblast growth factor, insulin-like growth factor-I (IGF-I), epithelial growth factor, vascular endothelial growth factor, and numerous other secretory proteins. PDGF and TGF-b improve soft tissue and bone healing, stimulate collagen production, improve wound strength, and initiate callus formation (Gurbuzer *et al.*, 2008 and Vivek *et al.*, 2009).

PRP was first introduced to the oral surgery community by Whitman *et al.* in their 1997 article entitled "Platelet Gel: An Autologous Alternative to Fibrin Glue with Applications in Oral and Maxillofacial Surgery." PRP enjoyed a great increase in popularity in the oral and maxillofacial surgery community after the publication of a landmark article by Marx *et al.* in 1998. As suggested by Marx, PRP is not osteoinductive and the bone regeneration process starts with release of PDGF and TGF-b through degranulation of platelet (Gurbuzer, 2008). This study was carried out to evaluate the efficacy of PRP on bone regeneration after surgical removal of mandibular third molars.

## MATERIALS AND METHODS

This study was conducted in the Department of Oral and Maxillofacial Surgery, NDMC Medical college, Hindurao hospital, Delhi. All healthy people between 18 and 70 years, including male and female with bilaterally mandibular third molar impactions were included in the study. A sample size of 25 patients signed an informed consent before the study.

### Collection of autologous PRP

A venous puncture using a 21 gauge needle was made in the ante-cubital fossa and whole blood was drawn. 0.45 mL of the anticoagulant trisodium citrate was added and tubes were

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centrifuged for 10 minutes at 1150 3 g. After centrifugation, the tubes were removed and placed in a test tube rack where the red blood cell/plasma interface was allowed to set for 3 minutes. The upper plasma layer or platelet poor plasma was aspirated to the 3 mm mark. The PRP was collected from between the upper 3 mm mark and the lower 2 mm mark using a separate beveled 20-gauge 1.5 inch needled syringe.

### Study design

The subjects were randomly divided into two groups:

**Group I:** socket in which Platelet rich plasma was placed after surgical removal of impacted tooth.

**Group II:** socket without Platelet rich plasma.

In both the groups the patients were recalled on first, second and seventh day postoperatively to assess the healing of the wound. IOPA radiographs were taken preoperatively, 3rd and 6th month post operatively to assess the alveolar bone height distal to second molar and the bone density. The results were tabulated and subjected to descriptive statistics. Student t test was done to compare intergroup difference and Z test for the results of wound status.

### RESULTS

On evaluation of wound dehiscence, in extraction socket areas, it was found that group I (PRP grafted sockets) showed dehiscence in 6% cases while group II (No PRP) showed dehiscence in 94% cases. The decrease in alveolar bone level was significant in group I as compared to group II in 3rd and 6th month post operatively. The results of this study demonstrate that PRP contributed to better healing of soft tissue and bone as compared to the extracted socket without its use, (Table1).

**Table 1. Shows the intergroup comparison after application of PRP in bone density**

| Time    | Group1 | Group 2 | Student t test | Level of significance(p) |
|---------|--------|---------|----------------|--------------------------|
| 3months | 105.78 | 145.72  | 11.65          | 0.001                    |
| 6months | 46.11  | 90.25   | 13.61          | 0.001                    |

### DISCUSSION

Following tooth extraction, a cascade of inflammatory reactions immediately begins, and the extraction socket is temporarily closed by clotting blood. Epithelial tissue proliferation and migration start within the first week and tissue integrity is quickly restored. Histological evidence of active bone formation in the extraction socket is seen as early as 2 weeks following extraction. The socket is filled with newly formed bone in about 6 months (Gurbuzer, 2008 and Mancuso *et al.*, 2003). If the removed tooth is not replaced by an implant within 6–12 months, the residual ridge alveolar bone undergoes permanent catabolic remodeling (Fugazzotto *et al.*, 2005; Atwood *et al.*, 2001 and Levin, 2008). If a clinically acceptable method existed to consistently decrease healing time, both patients and clinicians would benefit. The objective of this study was to evaluate the effect of locally administered concentrated PRP in the extraction sockets. Juan *et al.* elaborated characteristics of PRP as: It provides adhesiveness and tensile strength for clot stabilization, is

biologically acceptable to the root surface, contains important growth factors such as PDGF and TGF- $\beta$  released by platelets, promotes angiogenesis, contains a dense fibrin network that is highly osteoconductive, has haemostatic properties, improves wound healing and is affordable treatment modality (Tozum, 2003; Demiralp, 2004 and Sanchez, 2003). Mancuso [2003] in his study also reported decrease in alveolar osteitis; objectively faster soft tissue flap healing and less oedema 7 days post surgically in PRP treated sockets. Marx also supported the presence of GF's in high concentration in PRP which is responsible for its effect in accelerating both soft and hard tissue healing (Marx *et al.*, 1998), Anitua (Anitua *et al.*, 1999), also reported improved epithelisation and bone density when platelet rich plasma was placed in extraction socket. The results of our study are in accordance with the studies conducted previously.

### Summary

In this study, authors attempted to use autologous PRP to promote wound healing and osseous regeneration in human third molar extraction sites. It clearly indicates definite improvement in soft tissue healing and faster regeneration of bone after 3rd molar surgery in cases treated with PRP as compared to control group post operatively. However, further clinical trials with longer duration follow up should be done to get more informative and conclusive results.

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