



RESEARCH ARTICLE

USE OF PLATELET RICH FIBRIN IN POST SURGICAL JAW DEFECT

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ABSTRACT

Introduction: Reconstruction of bony defects represents a challenge for the oro-facial reconstruction team. Defects in the facial skeleton present several prosthetic, functional challenges unique to the stomatognathic system. The major aim of the reconstruction is to achieve complete regeneration and restoration of function. However, this becomes a daunting task as the body's immune and inflammatory mechanisms come into play simultaneously allowing repair to occur; instead of complete regeneration. Recently, the use of platelet concentrates has been proposed as an aid for enhancing regeneration of osseous and epithelial tissues in oral surgery.

Aim: To evaluate platelet rich fibrin (PRF) as an autologous grafting material in 3rd molar extraction sockets as post-surgical jaw defect.

Materials and methods: A total of 15 patients of either sex, aged between 19-30 years were selected to be a part of this study. They were divided into two groups: group I: Third molar extraction socket with Platelet rich fibrin (PRF) placement after extraction (Test) .Group II: Third molar extraction socket without Platelet rich fibrin (PRF) placement after extraction (Control). Post extraction instructions were given and the patients were recalled for follow-up on the 3rd, 7th day post-operatively and also after 1 month, 2 months and 6th month for recording of radiographic parameters.

Results: Statistically significant difference with reference to the periodontal pocket depth, distance between CEJ to highest point of alveolar bone and bone density of regenerate was noticed. However, no statistically significant difference between the 2 groups was recorded in pain, extra-oral obvious swelling.

Conclusion: platelet rich fibrin (PRF), can be of paramount importance in minimizing periodontal complications that may follow the extraction of impacted lower third molar.

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INTRODUCTION

Following any injury blood clot forms and with that the healing process begins. The process proceeds in three successive phases; vascular, cellular and cicatrization phase. It is a highly coordinated sequence of biochemical, physiologic, cellular and molecular responses involving numerous cell types, growth factors, hormones, cytokines and other proteins, which is directed towards tissue integrity and functional capacity after injury (Ronaldo, 2011 and Olufemi, 2011). The

early events of socket healing include the formation of granulation tissue which is progressively replaced by newly formed bone. The healing process is considered almost complete after 6 months, once bone remodeling begins. Most often missing teeth are replaced with implant supported prosthesis (Fabbro, 2011). In this case, the most conventional and predictable protocol dictates that implants are placed in the extraction sites after completion of the healing process, but parallel to ingrowth of bone into the socket a consistent resorption of the alveolar ridge occurs physiologically during the healing and remodeling phase of the extraction socket, reducing the available bone support for implants (4,5). This represents a concern even if implant treatment is not planned,

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such as in case of wisdom tooth extraction, because the rapid post-extraction bone loss may extend to surrounding teeth, compromising their stability and causing tissue recession. The greatest amount of bone loss occurs in the horizontal dimension, mainly on the facial cortical aspect, causing narrowing of the ridge (6). The preservation of hard and soft tissues following the extraction of one or more teeth is one of the most challenging objectives of dental procedures. Recently, the use of platelet concentrates has been proposed as an aid for enhancing regeneration of osseous and epithelial tissues in oral surgery. Various in-vitro studies, animal experiments and clinical trials have suggested that platelet concentrates may effectively trigger stimulation of osseous and soft tissue regeneration and reduce inflammation, pain and unwanted side effects. From the clinical standpoint, this biomaterial accelerates physiologic healing and thus, the present study aims at evaluating the efficacy of platelet rich fibrin (PRF) in socket preservation and wound healing in extraction wounds.

MATERIALS AND METHODS

In vivo controlled clinical split mouth study was performed for evaluation of the effect of platelet rich fibrin on bone healing in post surgical jaw defect. A total of 15 patients of either sex, aged between 19-30 years were selected on the basis of following criteria from those who were referred to the Department of Oral and Maxillofacial Surgery, Saraswati Dental College and Hospital, Lucknow Uttar Pradesh:

Inclusion Criteria

- Patients with bilaterally impacted 3rd molars requiring similar surgical methods for their removal.
- Patients with good general health (ASA classification-I and II) without any contraindication for minor oral and maxillofacial surgical procedures.
- Patients who were cooperative and committed to maintain oral hygiene.
- Patients between 19-30 years of age.
- Surgical site free of infection

Exclusion Criteria

- Current smokers, tobacco and betel nut chewers and substance abusers.
- Patients suffering from chronic systemic illness like diabetes; or compromised immunity, nutritional deficiencies, bleeding or bone disorders.
- Patients suffering from any ailment or taking agents or medication that may alter platelet count or function.
- Known allergy or hypersensitivity to any product used in the study.
- Absence of buccal cortical bone of extraction socket.

Study Design

This was a split mouth study with the following study design:

Group I: Third molar extraction socket with Platelet rich fibrin (PRF) placement after extraction (Test)

Group II: Third molar extraction socket without Platelet rich fibrin (PRF) placement after extraction (Control)

MATERIALS AND METHODS

Patients willing to undergo surgical extraction of bilaterally impacted 3rd molars were included in the study. A detailed history of the patient was recorded and routine blood investigations were done. Before starting the procedure a pre informed written consent of the patient was taken. Patients were kept on antibiotic (ciprofloxacin 500mg) anti-inflammatory (comblam : ibuprofen 400mg, paracetamol 325mg) coverage 12 hrs preoperatively. PRF was placed in all extraction sockets on the one side whereas no PRF was placed on the other side.

Surgical Technique

Local anaesthesia 2% Lignocaine Hydrochloride with adrenaline was administered in the concentration of 1:100000. Standard mucoperiosteal flap was raised with adequate bone window created, under constant stream of saline tooth sectioning was done and the tooth was carefully removed with minimal mechanical trauma. Once the tooth was removed, bone margins were smoothed, irrigation with normal saline and diluted betadine was done and haemostasis was achieved by applying an antiseptic pressure pack and post operative instructions were explained. Post operatively patients were kept on antibiotic ciprofloxacin (500 mg) 12 hourly, analgesic ketorolac (10 mg) 12 hourly and multi vitamin supplement Capsule Zevit (B Complex + Vitamin C+ Zinc Sulphate) 24 hourly for five days. Patients were instructed to start brushing from next day. Chlorhexidine mouth wash was prescribed to be done twice daily post meal.

Method of preparation of PRF

The anticubital area was prepared by a cotton swab soaked in spirit. 10ml blood was drawn into test tubes without anticoagulant and centrifuged immediately at 3000 rpm for 12 minutes. The resultant product consisted of the following:

- Topmost layer consisting of acellular plasma
- PRF clot in the middle
- Red blood cells at the bottom

The prepared PRF was placed in the extraction socket. Sutures were placed with 3-0 silk and primary closure was achieved. Sutures were removed on 7th postoperative day. Post extraction instructions were given and the patients were recalled for follow-up on the 3rd, 7th day post-operatively and also after 1 month, 2 months and 6th month for recording of radiographic parameters.

Clinical Parameters

1. Pain-Post-operative pain assessment was performed at 3rd, 7th, 1 month and 2 months post-operatively using Visual analogue scale (VAS)
 - 0- No Pain
 - 1 to 3- Mild Pain
 - 4 to 7- Moderate Pain
 - 8 to 10- Severe pain
2. Swelling- The presence or absence of extraoral swelling was assessed preoperatively, 7th day, 1 month and 2 months.
3. Periodontal probing pocket depth- was assessed using William's periodontal probe with normal value being 2mm – 3mm.

4. Infection- wounds were examined for any sign infection preoperatively, 1 week, 1 month and 2 months postoperatively.
5. Wound margins- were noted postoperatively, 1 week, 1 month and 2 months for inflammation and dehiscence.

Radiological Assessment

The bone healing was assessed using standard OPG and IOPA radiographs. Films were developed, fixed, and rinsed under standard conditions. Distance between CEJ to highest point of alveolar bone height on the distal aspect of 2nd molar was measured preoperatively, 1 month, 2 month and 6 months postoperatively using Orthophos XG5 with Sidexis Next Gen 2.4 software. Alveolar bone density after regeneration was radiologically measured immediate postoperatively, 1 month, 2 month and 6 months using Image J Software on digital orthopantomogram.

Statistical Analysis

Continuous data were summarized as Mean \pm SD while discrete (categorical) in %. Continuous groups were compared by two factor (Groups X Periods) repeated measures analysis of variance (ANOVA) using general linear models (GLM) and the significance of mean difference within and between the groups was done. One way ANOVA test was done between all time intervals between each group. Categorical groups were compared by chi-square (χ^2) test. A two-sided ($\alpha=2$) $p<0.05$ was considered statistically significant. All analyses were performed on SPSS (Windows version 15.0).

RESULTS

Fifteen serially selected patients of bilaterally impacted mandibular third molars from the outpatient Department of Oral and Maxillofacial Surgery in Saraswati Dental College & Hospital considered and thirty impacted teeth in those patients were divided randomly in 2 groups of 15 each. In group I surgical site was grafted with platelet rich fibrin (PRF) and in group II surgical site was used as control. In all, 7 patients were males, with a mean age of 22.90 years, ranging from 20-29 years. 8 patients were females, with a mean age of 24.60 years, ranging from 19-30 years. The pain scores in subjects of both groups marginally reduced in one week post operatively ($P>0.05$) but was nearly zero by the 1st & 2nd months post-operatively ($P<0.05$) as compared to that pre-operatively (Table 1).

Mean immediate post-operative alveolar bone density of 15 sites which were included in group I was 107.55. Mean one month post-operative alveolar bone density of 15 sites which were included in group II was 114.01. Mean one month post-operative alveolar bone density of 15 sites which were included in group II was 108.21. Mean two month post-operative Alveolar bone density of 15 sites which were included in group I was 14.13. Mean two month post-operative alveolar bone density of 15 sites which were included in group II was 115.59. After six months mean Alveolar bone density of 15 sites which were included in group I was 135.15. Mean sixth month post-operative alveolar bone density of 15 sites which were included in group II was 124.26. Difference between both groups was not statistically significant immediate postoperatively ($P>0.05$), but was statistically significant 1st month post-operatively & was statistically very highly significant 2nd & 6th month post-operatively ($P<0.001$), (Table 1)

DISCUSSION

Third molar surgery has been associated with a variety of complications such as pain, inflammation, pocket formation and alveolar bone loss occurring after impaction surgery. One of the most important complications is formation of socket distal to 2nd molar after surgical removal of impacted third molar. This study was aimed at evaluating the efficacy of autologous platelet rich fibrin (PRF) in accelerating bone regeneration and repair in fresh third molar extraction sockets.

Kiran *et al* conducted a study using osteoblast cell cultures to investigate the influence of PRP and PRF on proliferation and differentiation of osteoblasts. The affinity of osteoblasts to the PRF membrane appeared to be superior (Kiran, 2011). In a similar study conducted by Alissa *et al*, complications encountered: two dry sockets and one acutely inflamed alveolus in patients of the control group, which determined a borderline statistically significant difference in favour of the PRP group (Alissa, 2010). Marco Mozzati 2010 in his study measured swelling postoperatively using the method of Neupert *et al*., measurements showed that PRGF reduces post-operative swelling in study sites compared with control sites (Mozzati, 2010). In a study conducted, A. A. Krausz studied the long-term changes in periodontal health and alveolar bone height distal to the adjacent second molar following extraction of an impacted third molar and found no statistical significance ($P>0.05$) in clinical attachment level (Krausz, 2005).

Table 1. Pain scores of both the groups

Pain score	Group I				p value	Group II				p value
	Immediate post op	I week	I month	II month		Immediate post op	I week	I month	II month	
Swelling	3.20	2.97	0.40	0.06	$p>0.05$	3.47	3.27	0.47	0.00	$p>0.05$
Alveolar bone density	107.40	114.01	124.13	135.15	$P<$	107.55	108.45	115.59	124.26	$p>0.05$
		(at 1 month)	(at 2 month)	(at 6 month)	0.001	(at 1 month)	(at 1 month)	(at 2 month)	(at 6 month)	

Extra-oral obvious swelling was not present pre-operatively in any of the 15 sites in group I patients. After 1 week post-operatively only 3 sites (20%) had extra-oral obvious swelling. After 1 & 2 months, the obvious swelling was absent in all the patients. Intra-oral obvious swelling was present in 1 patient pre-operatively in group II. After 1 week post-operatively 4 cases (26.6%) had obvious swelling. After 1 & 2 months, the obvious swelling was absent in all patients. Difference was not statistically significant ($P >0.05$) at time intervals (Table 1).

Study conducted by Sammartino G calculated clinical attachment level examined by probing at the level of the distal surface of the second molar for both groups at all time intervals. They observed a notable reduction in the periodontal pocket depth and an improvement in the periodontal attachment loss in those cases treated with platelet concentrates. They also observed considerable bone regeneration in 17 cases treated with platelet concentrates (Sammartino, 2011).

Alissa *et al.* (2010) carried out radiographic evaluation by the two Minded examiners revealed a statistically significant difference ($P=0.01$) for pockets with dense homogeneous trabecular pattern, a borderline statistically significant difference in the trabecular pattern for bone volume ($P=0.06$) favouring platelet rich concentrate use, and no significant differences for trabecular separation ($P=0.66$), trabecular length ($P=0.16$), trabecular width $P=0.16$) and trabecular number ($P=0.38$). Rutkowski *et al.*, 2010 measured radiographic bone density change with CT scan and found a positive result for bone density in the early 2 weeks (Rutkowski, 2010).

Summary

The present study gives the following inferences:

- The periodontal pocket depth (Distal to 2nd Molar) improved significantly after 1 month in subjects of group I as compared to subjects of group II.
- There was statistically significant difference between the 2 groups in distance between CEJ to highest point of alveolar bone just distal to 2nd molar measured radiographically on 1 month, 2month & 6th month post-operatively.
- There was statistically significant difference between the groups in improvement in alveolar bone density of regenerate measured radiographically after 1 month, 2months & 4months post-operatively.
- No statistically significant difference between the 2 groups was recorded in pain, extra-oral obvious swelling.

Conclusion

In essence, the PRF proved to be an autologous biomaterial with useful features that allowed efficient post extraction bone defect filling and faster bone regeneration. In conclusion, the present study shows that platelet rich fibrin (PRF), can be of paramount importance in minimizing periodontal complications that may follow the extraction of impacted lower third molar.

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