

Case Report

Evaluation of Effectiveness Of Platelet Rich Fibrin (PRF) For Ridge Preservation After Atraumatic Extraction – A Case Series

Shilpa B.S.¹, Priyanka Jaiswal², Pooja Suryavanshi³, Vikas V. Pakhare⁴

^{1,3}P.G student, Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha

² Reader, Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha

⁴Senior Lecturer, Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha,

ARTICLE INFO



Keywords:

Ridge preservation, Atraumatic extraction, Platelet rich fibrin.

ABSTRACT

Aim and objective: The present study was undertaken to evaluate the effectiveness of Platelet rich fibrin (PRF) for ridge preservation after atraumatic extraction.

Method: 7 patients with a non- restorable tooth requiring extraction were included in this study. After atraumatic extraction, the sockets were filled with PRF as the sole grafting material. At the time of extraction and 3 months later bucco-lingual and vertical socket dimensions were measured clinically and radiographically respectively.

Results: The mean bucco-lingual measurement of socket at baseline was 10.0 ± 1.6 mm and 3 months after ridge preservation was 9.4 ± 1.6 mm showing minimal changes. The radiographic vertical bone level at baseline was 14.1 ± 1.0 mm and 3 months post-operatively was 12.7 ± 0.8 mm showing minimal changes in apico-coronal dimension.

Conclusion: The ridge preservation using PRF as the sole grafting material after atraumatic extraction was found to be an effective procedure.

Introduction

One of the most important prerequisite for achieving and maintaining osseointegration around dental implant is the presence of sufficient volume and optimal quality of healthy bone at the recipient site. This includes not only bone of sufficient height to allow the insertion of implant of appropriate length but also a ridge of sufficient width. An average of 40 to 60% of original height and width is expected to be lost after tooth extraction, with greatest loss occurring within first year (1). Clinical studies have shown that implants placed in a site with a missing buccal cortical plate have a greater rate of soft tissue complications and/or compromised long-term prognosis (2, 3, 4, 5

and 6). The rate and pattern of bone resorption may be further altered, if pathologic and traumatic processes have damaged one or more of the bony walls of the socket. In these circumstances, fibrous tissue is likely to occupy part of the socket, preventing normal healing and osseous regeneration (7). Therefore, preservation of alveolar dimensions after tooth extraction is crucial to maintain adequate bone volume for placement and stabilization of the implants and to achieve optimal esthetic and functional prosthetic results.

With the aim of minimizing the need for alveolar ridge augmentation, several authors have

* Corresponding author: *Dr. Shilpa B.S. P.G student, Department of Periodontics, Address: Department of Periodontics, Sharad Pawar Dental College, Sawangi (M), Wardha – 442004, Phone numbers – 7744874907, E-mail address – dr.shilpasridhar@gmail.com*



Fig 1: Preoperative Clinical View

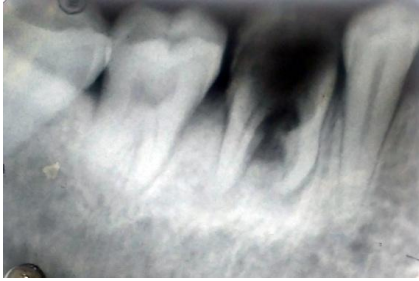


Fig 2: Intra oral periapical radiograph showing fractured root



Fig 3: Incisions placed and periodontal ligament fibres were severed with surgical blade

proposed techniques to preserve the anatomy of the alveolar ridge after tooth extraction. These procedures have collectively been termed alveolar ridge preservation (ARP) or socket preservation (8). The rationale for alveolar ridge preservation (ARP) procedure include: a) an attempt to reduce crestal bone dehiscence, b) encourage socket fill, c) improve bone quality prior to implant placement, ensuring better primary stability (7). Several different ARP techniques exist, most of which include the use of a foreign graft materials. Because ARP is a relatively new procedure, no long-term studies regarding the technique have been published, and even though several case reports



Fig 4: Atraumatic extraction was completed



Fig 5: Placement of plasma rich fibrin in extraction socket after pre-suturing



Fig 6: Intra oral peri-apical radiograph 3 months after ridge preservation

have been presented, there is no evidence to support the superiority of one technique over the other.

Currently, bone graft materials and guided bone regeneration (GBR) are used following tooth extraction for the preservation of the extraction socket. However, treatment with membrane and graft material often result in compromised outcomes because of the avascular and inert nature of bone graft material as well as movement and exposure of membrane (9,10). Recently, Choukroun et al (11), suggested use of autologous platelet rich fibrin (PRF) as a grafting material for ridge preservation. PRF is obtained by gentle centrifugation of blood and is characterized as

No of patients	07
Mean age	28.57±7.93
Female:Male ratio	5:2
No of extraction sites	07
No of sites in mandible:maxilla	1:6
No of single rooted teeth	03
No of multi rooted teeth	04
Teeth extracted due to crown/ root fracture	01
Teeth extracted due to caries	06

Table I: Patient Characteristics

being platelet rich and fibrin dense, besides not requiring the addition of any anti clotting agent. It can be used directly as a filler agent or compressed into a membrane. PRF is believed to release polypeptide growth factors such as transforming growth factor β 1, platelet- derived growth factor, vascular endothelial growth factor, fibroblast growth factor into the surgical wound in a sustained fashion for at least 7 days (12). PRF looks like a fibrin network and leads to more-efficient cell migration, proliferation, and thus angiogenesis. However, little information is available on clinical evaluations of extraction sockets with PRF. Therefore the aim of this study is to evaluate the effectiveness of PRF as sole grafting material for ridge preservation after atraumatic extraction.

MATERIALS AND METHOD:

A total of 7 systemically healthy patients within age range of 25 to 35 years (Mean age 28.57±7.93 years)

were recruited from the outpatient department of Periodontics, Sharad Pawar Dental College, Sawangi (Meghe), Wardha. The patients were enrolled in the study using the following inclusion criteria: 1.Tooth which needs extraction due to root fractures, endodontic failures, internal and external resorption, non-restorable carious lesions, and residual roots 2. Presence of at least 4 mm of bone beyond the root apex (**Table I**). Exclusion criteria included 1. Patients with compromised general health conditions that would jeopardize the bone healing (like uncontrolled diabetes, osteoporosis etc) 2. History of alcoholism, excessive smoking or drug abuse, 3.Pregnant and lactating mothers.

Prior to initiating this study, the purpose and design of this clinical trial was explained to the patients and written informed consent was obtained. The study protocol was approved by the ethical committee of Datta Meghe Institute of Medical Sciences, Sawangi (Meghe), Wardha.

After proper examination and diagnosis, initial therapy consisting of oral hygiene instructions, supragingival and sub-gingival scaling were performed. Plaque control instructions were repeated until the patient achieved a plaque score of ≤ 1 . Prior to the surgical phase, diagnostic casts of each patient were prepared to establish maxilla-mandibular relationship. The clinical photographs (Fig 1), as well as intra oral periapical (IOPA) radiograph were obtained for all the patients (Fig 2).

Clinical measurements recorded were plaque index (PI) (13), papillary bleeding index (PBI) (14) and periodontal status of patient that included probing pocket depth (PPD) and clinical attachment loss (CAL). Clinical measurements at the extraction site

Sr.no	Site	Pre-Surgical (in mm)	3months post surgery (in mm)	Difference (in mm)
1.	15	9	8.5	0.5
2.	16	10	9.5	0.5
3.	26	11	10.5	0.5
4.	11	7	6.5	0.5
5.	16	11	10.	1
6.	16	12	11.5	0.5
7.	46	10	9.5	0.5
Mean±SD		10.0±1.6	9.4±1.6	0.6±0.2

Table- II: Measurement of bucco-lingual dimension of socket

recorded were assessment of gingival biotype (15), and bucco-lingual dimension.

Radiographic measurements recorded using IOPA radiograph included apico-coronal length of root with William's graduated periodontal probe. 3 months post ridge preservation, IOPA radiograph were taken to determine bone formation in preserved socket.

SURGICAL PROCEDURE:

Preoperative Protocol:

Prior to surgery, the patients were instructed to use 0.2% chlorhexidine as a mouth rinse. A local anesthetic with adrenaline (1:80,000) was administered as local infiltration.

Extraction of Teeth:

The surgical procedure was done under complete asepsis and infection control. Briefly after induction of local anesthesia, sulcular incisions were performed on the buccal and lingual aspects of the teeth to be removed with minimal flap reflection to minimize crestal bone loss (Fig 3). Every attempt was made to minimize trauma to the alveolus during extraction. Surgical blade (no: 15) was used to sever the

Sr.no	Site	Pre-surgical (in mm)	3 months post surgery (in mm)	Difference (in mm)
1.	15	14.5	13	1.5
2.	16	14	13	1
3.	26	13.5	12.5	1
4.	11	13	12.5	0.5
5.	16	14	12.5	1.5
6.	16	13.5	11.5	2.0
7.	46	16	14	2
Mean±SD		14.1±1.0	12.7±0.8	1.4±0.6

Table-III: Radiographic Vertical Bone Level at Baseline and 3 Months Post- Surgery

periodontal ligament fibres at the mesial and distal aspect of the root (Fig 3). The periodontal ligament fibers were further separated with the use of periotomes. The tooth was carefully extracted (Fig 4). Small elevators were used if required, but luxation was performed in the mesio-distal direction with extreme care to avoid fracture of the buccal and/or lingual walls. The roots of multi-rooted teeth were extracted carefully by separating (dividing) the roots using surgical bur, to facilitate its removal.

Socket Preparation:

Once the tooth was extracted, the sockets were examined for the buccolingual and vertical dimensions (Table II, III). The fresh socket was debrided of granulation tissue. The extraction socket was irrigated with antiseptic solution and fresh bleeding was induced, prior to placement of PRF.

Preparation of PRF and its use for alveolar ridge preservation as grafting material:

To obtain PRF, 10 ml venous blood was drawn and was collected in a test tube without any anti coagulants. The test tube was placed in a centrifuge at 3000 rpm for 13 minutes. The platelet poor plasma formed the superficial layer with middle platelet rich buffy coat (PRF) and red blood cells at the bottom of the tube. The extraction socket was filled with PRF (Fig 5) and sutures were given. In all cases, pre-suturing was done prior to placement of PRF, where suture threads were passed through the flaps, followed by placement of PRF and then knots were tied to prevent dislodgement of PRF from extraction socket while passing the suture needle through the flaps.

Postoperative Management

Antibiotics (Amoxicillin 500 mg + Clavulanic acid 125 mg, twice daily) and anti-inflammatory analgesics (Ibuprofen, 400 mg thrice daily) were advised for 5 days and a chlorhexidine mouthwash (0.12%) was prescribed for 3-week duration post-surgically. No tooth brushing or mechanical cleansing was allowed at the surgical area till sutures were removed i.e.7 days post-surgery.

STATISTICAL ANALYSIS:

The mean and standard deviations (Mean±SD) values were calculated for all clinical parameters including PI, PBI, PPD, CAL and radiographic marginal bone level. The mean data was analyzed for the statistical significance by standard statistical method to compare data from baseline to those at 3 months for all the patients.

RESULTS:

Seven systemically healthy patients (5 females, 2 males) in the age group of 25 to 35 years (Mean age 28.57±7.93 years) were treated by atraumatic

extraction followed by ridge preservation using PRF in 7 extraction sockets (**Table I**). There was no clinical evidence of infection of the extraction site. None of the selected patients dropped out before the termination of study. The mean full mouth plaque index (FMPI) and full mouth papilla bleeding index (FMPBI) scores at baseline and at 3 months follow up period remained low (<1), in all patients. This could be due to the reinforcement of oral hygiene instructions. After atraumatic extraction the labial/buccal as well as lingual/palatal cortical plates were intact at all the 7 extraction sites.

The measurements of buccolingual dimension of the socket immediately after extraction and at 3 months post surgery were recorded (**Table II**). The radiographic vertical bone level at baseline and 3 months post extraction (Fig 6) showed minimal changes in apico-coronal dimension (**Table III**).

DISCUSSION:

Traditional method of tooth extraction often result in loss of the labial/buccal plate of the alveolar bone. Loss of alveolar bone due to post-extraction bone resorption can result in functional and esthetic problems that necessitate the use of augmenting procedures to reestablish the missing original dimensions (16). In the present study atraumatic extraction protocol was followed, where, the buccolingual dimension of the socket showed minimal changes 3 months after ridge preservation (**Table II**). All teeth were extracted with minimal trauma, by luxating them in mesio-distal direction only. Atraumatic tooth extraction is of key importance for preservation of buccal cortical bone prior to implant placement (17). This was a useful technique, resulting in preservation of intact labial/buccal as well as lingual/palatal walls of all extraction sockets, which

was required for uneventful healing and soft tissue framing (18).

An important debate topic is the choice of grafting material for the ridge preservation procedures. The various graft materials that can be used include autografts, allografts, xenografts, alloplasts, bioactive agents, or a combination. In the present study PRF was used as a sole grafting material in the fresh extraction socket. PRF is a viable and biocompatible autologous biologic material that can be used alone to maintain ridge dimension during preservation procedures, while at the same time stimulating rapid osseous fill of the socket. PRF also possesses the ability to accelerate tissue regeneration by stimulating the normal physiology (19).

In the present study, apico-coronal dimension showed minimal changes (**Table-III**) indicating that PRF was useful for bone formation. These results are in accordance with other studies where various graft material were used for ridge preservation procedure. Brownfield et al (20) reported a vertical bone loss of 0.2 to 1.7 mm when the extraction socket was treated with osteoinductive graft. Barone et al (21) used xenograft as a grafting material and reported a mean 0.7mm vertical resorption at the buccal sites of preserved sockets. Gupta et al (22) reported mean dimension loss of 1.68 mm in the control group (atraumatic extraction only) and 1.07 mm in the test groups where the extraction socket were treated with bovine bone graft, collagen plug and collagen membrane following atraumatic extraction.

CONCLUSION:

Within the limitations of the present study, it can be concluded that the use of PRF can prove to be a useful grafting material in preserving the alveolar ridge by limiting the amount of bone resorption after tooth

extraction. However, long term studies with histological analysis are required to establish efficacy of PRF as a sole grafting material for ridge preservation.

References:

1. Sevor JJ, Meffert. Placement of implants into fresh extraction sites using a resorbable collagen membrane: Case reports. *Pract Periodontics Aesthet Dent* 1992;4:35-41.
2. Amler MH, Johnson PL, Salman I. Histological and histochemical investigation of human alveolar socket healing in undisturbed extraction wounds. *J Am Dent Assoc* 1960;61(7):32-44.
3. Araújo MG, Sukekava F, Wennström JL, et al. Tissue modelling following implant placement in fresh extraction sockets. *Clin Oral Implants Res* 2006;17(6):615-24.
4. Covani U, Bortolaia C, Barone A, et al. Buccolingual crestal bone changes after immediate and delayed implant placement. *J Periodontol* 2004;75(12):1605-12.
5. Tan WL, Wong TL, Wong MC, Lang NP. A systematic review of post-extraction alveolar hard and soft tissue dimensional changes in humans. *Clin Oral Implants Res* 2012;23(Suppl 5): 1-21.
6. Trombelli L, Farina R, Marzola A, Bozzi L, Liljenberg B, Lindhe J. Modeling and remodeling of human extraction sockets. *J Clin Periodontol* 2008;35:630-39.
7. El Askary, AES. Socket Augmentation: Rationale and Technique, in *Fundamentals of Esthetic Implant Dentistry*. Blackwell Munksgaard, Oxford, UK.
8. I. Darby, S. T. Chen, and D. Buser, "Ridge preservation techniques for implant therapy," *The International Journal of Oral & Maxillofacial Implants*, vol. 24, pp. 260- 271, 2009.
9. Jovanovic SA, Schenk RK, Orsini M, Kenney EB. Supracrestal bone formation around dental implants: An experimental dog study. *Int J Oral Maxillofac Implants* 1995;10:23-31
10. Lasella JM, Greenwell H, Miller RL, et al. Ridge preservation with freeze-dried bone allograft and a collagen membrane compared to extraction alone for implant site development: A clinical and histologic study in humans. *J Periodontol* 2003; 74:990-999.
11. Choukroun J, Adda F, Schoeffler C, Vervelle A. PRF: an opportunity in perio-implantology (in French). *Implantodontie* 2000; 42:55-62
12. Dohan Ehrenfest DM, Del Corso M, Diss A, Mouhyi J, Charrier JB. Three dimensional architecture and cell composition of a Choukroun's platelet-rich fibrin clot and membrane. *J Periodontol* 2010 Apr;81(4):546-555
13. Turesky, Gilmore, Glickman. Reduced plaque formation by the chloromethyl analogue of vitamin C. *J Periodontol* 1970; 41-49.
14. Muhlemann H.R. Psychological and chemical mediators of gingival health. *J Prev Dent* 1977; 4: 6.
15. Müller HP, Schaller N, Eger T, Heinecke A. Thickness of masticatory mucosa. *J Clin Periodontol* 2000;27:431-6.
16. Tassos Irinakis. Rationale for socket preservation after extraction of a single-rooted tooth when planning for future implant placement. *J Can Dent Assoc* 2006;72(10):917-22.
17. Evans CD, Chen ST. Esthetic outcomes of immediate implant placements. *Clin Oral Implants Res* 2008;19:73-80.
18. Wilson TG Jr, Schenk R, Buser D, Cochran D. Implants placed in immediate extraction sites: A report of histologic and histometric analyses of human biopsies. *Int J Oral Maxillofac Implants* 1998;13:333-341.
19. Singer A, Clark RA. Cutaneous wound healing. *N Engl J Med* 1999;341:738-746.

-
20. Brownfield LA, Weltman RL. Ridge preservation with or without an osteoinductive allograft: A clinical, radiographic, micro-computed tomography, and histologic study evaluating dimensional changes and new bone formation of the alveolar ridge. *J Periodontol* 2012;83:581-589
 21. Barone A, Aldini NN, Fini M, et al. Xenograft versus extraction alone for ridge preservation after tooth removal: A clinical and histomorphometric study. *J Periodontol* 2008;79:1370-1377.
 22. Gupta HS, Chowdhary KY, Pathak TS, Kini VV, Pereira R, Mistry A. Socket preservation at molar site using platelet rich fibrin and bioceramics for implant site development, *J Contemp Dent* 2013;3(2):102-107