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

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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±1.6mm and 3 months after ridge preservation was 9.4±1.6mm 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
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 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
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 β1, 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 subgingival 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

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Value</th>
</tr>
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<tbody>
<tr>
<td>No of patients</td>
<td>07</td>
</tr>
<tr>
<td>Mean age</td>
<td>28.57±7.93</td>
</tr>
<tr>
<td>Female:Male ratio</td>
<td>5:2</td>
</tr>
<tr>
<td>No of extraction sites</td>
<td>07</td>
</tr>
<tr>
<td>No of sites in mandible:maxilla</td>
<td>1:6</td>
</tr>
<tr>
<td>No of single rooted teeth</td>
<td>03</td>
</tr>
<tr>
<td>No of multi rooted teeth</td>
<td>04</td>
</tr>
<tr>
<td>Teeth extracted due to crown/ root fracture</td>
<td>01</td>
</tr>
<tr>
<td>Teeth extracted due to caries</td>
<td>06</td>
</tr>
</tbody>
</table>

Table I: Patient Characteristics
### Table II: Measurement of bucco-lingual dimension of socket

<table>
<thead>
<tr>
<th>Sr.no</th>
<th>Site</th>
<th>Pre-Surgical (in mm)</th>
<th>3months post surgery (in mm)</th>
<th>Difference (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>15</td>
<td>9</td>
<td>8.5</td>
<td>0.5</td>
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<tr>
<td>2.</td>
<td>16</td>
<td>10</td>
<td>9.5</td>
<td>0.5</td>
</tr>
<tr>
<td>3.</td>
<td>26</td>
<td>11</td>
<td>10.5</td>
<td>0.5</td>
</tr>
<tr>
<td>4.</td>
<td>11</td>
<td>7</td>
<td>6.5</td>
<td>0.5</td>
</tr>
<tr>
<td>5.</td>
<td>16</td>
<td>11</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>16</td>
<td>12</td>
<td>11.5</td>
<td>0.5</td>
</tr>
<tr>
<td>7.</td>
<td>46</td>
<td>10</td>
<td>9.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Mean±SD: 10.0±1.6, 9.4±1.6, 0.6±0.2

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

<table>
<thead>
<tr>
<th>Sr.no</th>
<th>Site</th>
<th>Pre-surgical (in mm)</th>
<th>3 months post surgery (in mm)</th>
<th>Difference (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>15</td>
<td>14.5</td>
<td>13</td>
<td>1.5</td>
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<tr>
<td>2.</td>
<td>16</td>
<td>14</td>
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<td>6.</td>
<td>16</td>
<td>13.5</td>
<td>11.5</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>46</td>
<td>16</td>
<td>14</td>
<td>2</td>
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</table>

Mean±SD: 14.1±1, 12.7±0.8, 1.4±0.6

### 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 severe the 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 traumatic 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 buccolinguinal 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 buccolinguinal 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
(traumatic 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:


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