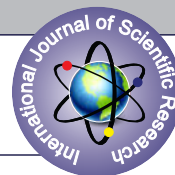


COMPARISON OF POST EXTRACTION SOCKET HEALING WITH AND WITHOUT USING PLATELET RICH FIBRIN (PRF) – A CLINICAL AND RADIOGRAPHIC STUDY



Dental Science

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ABSTRACT

AIM: The aim of this study is to comparatively evaluate the post extraction socket healing clinically and radiographically with and without using Platelet Rich Fibrin (PRF). **MATERIALS AND METHODS:** Fifty, otherwise healthy individuals undergoing dental treatment in the department of Oral and Maxillofacial surgery, Vivekananda Dental College for women, Thiruchengode, were randomly selected and the participants were divided into two groups – test group (PRF, n=25) and control group (Blood clot, n=25). Blood was freshly obtained from the participants of the test group and PRF was prepared. PRF was placed in the sockets of the test group and followed by the pressure application and suturing. Control group were allowed to heal naturally. Clinically, soft tissue healing and socket closure were assessed. Radiographic analysis of socket healing done by comparison of pre- and post-operative radiographs. The clinical follow-up assessments were done at an interval of 3 days, 1 week and 4 weeks and the data obtained were assessed. **RESULT:** The patients were aged above 18 years, including 33 females and 17 males. The soft tissue and socket healing were higher in the test group when compared with the control group clinically and the mean proportion of radiographic bone fill was significantly higher in the test group in all the time intervals of 3 days, 1 week and 4 weeks, respectively. **CONCLUSION:** Outcome of the study demonstrate that the PRF placement in the extraction socket accelerates soft tissue healing and socket healing and increases the bone fill and reduces the bone resorption using clinical and radiographic methods.

KEYWORDS

Extraction Socket, Post Extraction Healing, Platelet Rich Fibrin, Bone Formation, Soft Tissue Healing.

1. INTRODUCTION:

Tooth extraction is the most common dental treatment provided for the management of decayed tooth, complicated fractures of tooth, periodontal diseases, infections and orthodontic space creations¹. The number of carious lesions and attachment loss², male gender² and tobacco usage³ acts as a predictor of tooth loss. The post extraction socket healing occurs by a cycle of events listed out as coagulum formation which gets replaced by provisional connective tissue matrix formation, followed by woven bone, and then by the lamellar bone formation and then mineralisation and during this process the socket closure occurs by the formation of hard tissue bridge of cortical bone⁴. After extraction, the replacement of the teeth at the extraction site becomes complicated due to the reduction in bone mass, post extraction. Adequate bone density is required for both implant therapy as well as removable prosthesis. In case of loss of bone volume, bone grafting procedures prior to the prosthetic procedure helps in meeting the requirements for placing the prosthesis⁵. Post extraction bone resorption were attempted to prevent by numerous procedures such as placement as graft materials, bioactive glass⁶ which requires more time for adaptation into the grafted site. Autologous platelet concentrates such as PRP (Platelet Rich Plasma) and PRF (Platelet Rich Fibrin) were proposed as a biological means of socket preservation⁷.

Platelet Rich Fibrin was proposed to be a minimally invasive technique that presents with lower risk factors and satisfactory results⁸. When compared with platelet rich plasma, the polymerisation of which is induced by the addition of anticoagulants to the obtained blood sample, the polymerisation process which enables PRF as a more potential storage media of cytokines and growth and stimulate cell migration⁹. Platelet Rich Fibrin when placed in extraction socket, showed a significant outcome among control and test groups, clinically and radiographically¹⁰. It is hypothesized as placement of platelet rich fibrin in the post extraction socket accelerates bone deposition and soft tissue healing reduces bone resorption. Therefore the aim of this study is to comparatively evaluate post extraction socket healing with and without placement of Platelet Rich Fibrin.

2. MATERIALS AND METHODS:

2.1 Patient selection:

A total of fifty subjects undergoing dental treatment at Vivekananda Dental College for women, in the department of Oral and Maxillofacial Surgery were randomly selected. The participants were divided into two groups of twenty five participants in each group. All the participants were informed regarding the procedure and written consent were obtained from each participant of the test group in Tamil and English based on the patient background. Inclusion criteria consisted of patients of age group above 18 years of both the sexes, non smokers, tooth with hopeless prognosis, failed endodontic therapy and grossly decayed tooth/ fractured/ carious root. Patients with the habit of smoking or tobacco usage in any form, under medications known to affect wound healing and blood coagulation, pregnancy and lactations, patients undergoing head and neck radiotherapy, chemotherapy and under bisphosphonate usage, patients with past or present history of osteoradionecrosis of the jaws were excluded.

The patients fulfilling the above inclusion criterias were randomly allocated into the two groups:

GROUP I- Test group n = 25 Participants whose extraction socket received platelet rich fibrin post extraction.

GROUP II- Control group n = 25 Participants whose extraction sockets were allowed to heal naturally.

2.2 PRF preparation:

Immediately after extraction, 5 ml of blood was drawn from the median cubital vein of each patients of the test group and the blood sample were centrifuged at 2800 rpm for 10 minutes without the addition of anticoagulants using a compact centrifuge at Vivekananda Medical Laboratory, Vivekananda Medical Care Hospital. The fibrin clot formation occurs, which consists of platelets in the middle, red blood cell layer at the bottom and acellular plasma at the top. Fibrin clot was formed as a white puffy coat in the middle. The fibrin clot was removed from the vacutainers using sterilized tweezers and transferred to a sterile saline bowl and covered, which produces an autologous fibrin membrane.

2.3 Clinical procedure:

All the patients were given local anaesthesia, under strict aseptic conditions. Local anaesthesia consisted of 2% lidocaine hydrochloride, and 1:1,00,000 epinephrine. (Fig 1.1) Mucoperiosteal flap were elevated if required and the teeth were extracted using extraction forceps and periosteal elevator (Fig 1.2). The extraction socket of test group were treated with PRF (Fig 1.3) immediately post extraction followed by pressure application and suturing (1.4). Suturing was done using 3.0 black silk thread and flap closure were done. Extraction sockets of control group were treated with pressure application and placement of sterile gauze immediately post extraction. Post extraction instructions were given to the control and case groups for not disturbing the extraction site, to avoid chewing hard and spicy foods, excessive rinsing and spitting for 48 hours, tongue and finger should not be used to apply pressure at wound site, avoid smoking after the procedure. Patient recalled for recalled for follow up at an interval of 3 days, 1 week and 4 weeks.

2.4 Clinical Analysis:

Patient were recalled for follow up at an interval of 3 days (Fig 1.5), 1 week (Fig 1.6) and 4 weeks (Fig 1.7) for post operative review and clinical evaluation along with radiographic analysis were made.

Clinically, the wound healing was assessed by the level of closure of the socket, wound approximation, presence or absence of pain and inflammation, pus formation, allergic reaction, occurrence of dry socket, difficulty level in continuing with the normal day to day activities. Clinical assessments were made at an interval of 3 days, 1 week and 4 weeks for each patient of the test group and control group and findings were recorded along with clinical photographs. Suture removal was done at the time period of 3 days for the test group.



Fig 1.1



Fig 1.2



Fig 1.3



Fig 1.4



Fig 1.5



Fig 1.6



Fig 1.7

2.5 Radiographic analysis:

Pre operative radiograph was taken on the day of PRF placement and post operative follow up radiographs were taken at a time interval of 1 week (Fig 1.7) and 4 weeks (Fig 1.8). Orthopantomograph/ IOPA were taken pre-operatively and post-operatively for the participants of test groups and control groups based on the convenience at 1 week and 4 week and were compared and statistically analysed. The clinical and radiographic findings at 3 days, 1 week and 4 weeks follow-up were compared for changes in soft tissue healing and alveolar bone fill in the extraction sockets and statistically analyzed.

3. RESULTS:

Fifty patients aged above 18 years, including 33 female patients and 17 male patients were selected and completed the study. Each patient underwent either single or multiple tooth extractions based on their requirements.

3.1 Clinical analysis result:

The condition of the soft tissue and the socket were analyzed after extraction (at baseline) and at a time interval of 3 days, 1 week and 4 weeks after extraction in both the test group and control group patients. After extraction, the test group presented with a painless, healed soft tissue as well as socket closure was in progress after 3 days of extraction. The complete healing of soft tissue and socket was observed after 1 week. On probing, the depth of the socket was 2mm at an interval of 1 week. After 4 weeks, the patients presented with a completely healed soft tissue and complete closure of the socket with the soft tissue was observed and probing was inhibited. The control group patients when reviewed after 3 days, presented with no initiation of socket closure and probing depth was significant. After one week, socket healing occurred with no soft tissue healing and closure of the socket was in progress and probing. On 4 weeks review, the socket closure was nearly completed.

The mean difference in the proportion of the soft tissue healing and socket healing in control and test groups at a time interval of 3 days, 1 week and 4 weeks are tabulated in Table 1. Significant differences were observed in the soft tissue healing and socket healing clinically among the test group and the control group for the parameters observed.

3.2 Radiographic analysis:

Radiographic analysis was done at a time interval of 1 week and 4 week respectively for the test group and the control group. Pre-operative and post-operative OPG or IOPA were taken based on the convenience. Radiographic evaluation of the test group showed a radio-opacity in the region of the PRF placement which was similar to the bone fill. Fig 1.11 shows the radiographic bone fill in the PRF placed site of 26 whereas the control site 27 do not show any signs of bone fill. In the control group, the radiographic evaluation showed no bone fill at an interval of 1 week and initiation of bone fill at an interval of 4 weeks. The mean radiographic bone fill was significantly higher in the test group when compared to the control group at all the time intervals of 1 week and 3 weeks.

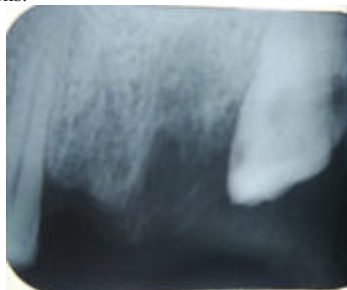


Fig 1.11

4. DISCUSSION:

The aim of this study is to comparatively evaluate the healing of extraction socket without and with using Platelet Rich Fibrin (PRF) both clinically and radiographically. The hypothesis that placement of PRF in the extraction socket will induce rapid wound healing after tooth extraction, supported by the accelerated soft tissue healing, socket closure, increased bone fill and reduction in bone resorption was accepted. The mean bone fill was significantly higher in the test group when compared to the control group. Soft tissue healing and socket closure was more rapid in the test group when compared to the control group. The placement of PRF didn't show occurrence of any allergic reactions, post operative pain and complications like dry socket, trismus, haemorrhage and infection. In addition to these findings, the comparison between the parameters among the test group and the control group showed that there are statistically significant differences from the baseline (tooth extraction), 3 days, 1 week and 4 weeks, respectively. It is suggested that the placement of PRF in the extraction site enhances cell proliferation and increases the healing efficacy. In addition to this, platelets release cytokines and other growth factors such as platelet-derived growth factor (PDGF), epidermal growth factor (EGF), Vascular Endothelial growth factor (VEGF), Thrombospondin-1 (TSP-1), Transforming Growth Factor (TGF- β) that enhances the cell proliferation, neo angiogenesis, and epithelialisation¹¹. These factors are secreted from the platelet plug that formed to provide haemostasis and accelerates wound healing¹². PRF progressively release cytokines during the remodelling of fibrin matrix which explains the healing property of PRF¹³. PRF when used for healing provided a wide range of growth factors locally to the

placement site and proteins on a fibrin mesh, which supports the wound healing process that results in an aesthetic wound healing¹⁴.

Initially, numerous graft materials have been used for alveolar ridge preservation¹⁵ which were of increased cost and technique sensitive and chance of disease transmission and infection. When compared to the non grafted sites, the grafted sites showed less vital bone formation¹⁶. Whereas the placement of PRF for ridge preservation and wound healing is an economical, less technique sensitive and there are less possibility of cross infection as it is taken from the patient itself and allergic reaction as it is processed without the addition of any anticoagulants and it is a flapless technique for ridge preservation. Studies showed, flap advancement results in alterations in the positions of mucogingival junction, displacement of keratinized mucosa and ridge resorption¹⁷. Moreover, the mean values of bone density was significantly higher in the PRF groups when compared to PRP groups at a time interval of 4 months follow up¹⁸. The present study showed that the autologous PRF has higher efficacy in the post extraction socket healing. These results are in harmony with the report of Hauser and Gaydarov (2013), who evaluated the alveolar bone loss in the PRF placed extraction sockets and compared the results with the control group at a 8 week follow up and the result was 0.48% of alveolar bone loss was reported in the PRF groups which was significantly lower compared to the control groups (3.68%). Microcomputed tomography results of the same study showed an improved micro-architecture and higher bone quality in the PRF group when compared to the control group¹⁹. Similarly, radiographic analysis of the present study showed statistically significant difference between the PRF group and the non-PRF group at a time period of 1 week and 4 week, respectively with a higher radiographic bone fill in the PRF group. The clinical soft tissue healing and socket healing were also significantly higher in the test group when compared to the control group. Similar studies showed that the use of PRF in the extraction socket accelerates wound healing which is indicated by the increase in the bone fill and reduction in the alveolar bone width resorption clinically and radiographically²⁰. These findings are in accordance with the present study and the results are supportive. However, it is recommended to perform the comparative analysis of PRF in socket healing with other efficient bio-absorbable membrane to assess the efficacy of PRF in wound healing and socket preservation. In addition to this, the limitation of this study was the short term follow-up of 4 weeks with limited examination to assess the socket healing. Therefore, further long term follow-up studies with improved methodology are warranted. From the clinical point, the use of bio-absorbable PRF membrane in extraction socket and surgical sites is recommended to improve the healing and ridge preservation.

5. CONCLUSION:

The study outcomes determine that the placement of PRF in the extraction socket for wound healing, accelerated the soft tissue healing and socket healing as noticed clinically and preservation of the extraction socket as noticed by the increased bone fill radiographically.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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