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ORIGINAL ARTICLE

Influence of platelet rich fibrin on post-extraction socket healing: A clinical and radiographic study

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KEYWORDS

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Abstract *Aim:* The aim of this study was to evaluate clinically and radiographically, extraction socket healing using autologous platelet rich fibrin (PRF).

Materials and methods: Twenty-four subjects needing single tooth simple extractions were selected. Twenty-four extraction sockets were divided into test group (PRF, n = 12) and control group (blood clot, n = 12). PRF was prepared with blood drawn from individuals after extraction using standard technique. PRF was placed in test group sockets followed by pressure application and figure 8 sutures. Sockets in control group were allowed to heal in the presence of blood clot and received a figure 8 suture. Ridge width was assessed using cast analysis with the help of acrylic stent and a pair of calipers. Radiographic analysis of socket surface area was performed using computer graphic software program. The clinical follow up assessments were performed at 1, 4 and 8 weeks. Collected data was assessed using ANOVA and multiple comparisons test.

Results: Subjects were aged between 25 and 50 (mean 37.8) years, including 15 females. The mean horizontal ridge width for sockets in the test group were 11.70 ± 2.37 mm, 11.33 ± 2.30 mm and 10.97 ± 2.33 mm at 1, 4 and 8 weeks respectively. Ridge width proportions were significantly higher among test group as compared to control group between baseline to 4 and 8 weeks respectively. The mean radiographic bone fill (RBF) percentage in the test group, was 74.05 ± 1.66%, 81.54 ± 3.33% and 88.81 ± 1.53% at 1, 4 and 8 weeks respectively. The mean RBF was significantly higher in the test group than control group at all time intervals.

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Conclusion: The study outcomes demonstrate that the use of PRF accelerate socket wound healing after tooth extraction as noticed by increased bone fill and reduced alveolar bone width resorption using clinical and radiographic methods.

1. Introduction

Tooth extraction is a common dental procedure in the management of tooth decay, complicated fractures, periodontal disease, infections and orthodontic space creation (Buchwald and Kocher, 2013; Gonda and MacEntee, 2013). Physiologic healing of the post-extraction socket involves a complex process of bone cells migration and maturation leading to selective bone resorption and apposition (Cardaropoli and Araujo, 2003; Araujo and Lindhe, 2005). These post extraction events result in dimensional loss in both horizontal and vertical planes of the residual alveolar ridge. Replacement of lost teeth is further complicated, specially in case of implant therapy, due to loss of bone volume required for successful implant treatment. In addition, post extraction bone loss necessitates bone-grafting procedures for implant placement to predictably restore function and esthetic (Penarrocha-Diago and Aloy-Prosper, 2013).

Multiple procedures are employed for prevention of post-extraction bone loss and predictable implant placements after extraction, including socket preservation with grafts (biomaterials), and immediate or early implant placements. While the clinician has a number of graft materials to choose from, some bone graft materials need longer healing time to achieve even a small amount of new bone incorporation into the graft site (Norton and Wilson, 2002). In addition, immediate implant placements to avoid subsequent bone resorption often result in buccal bone defects requiring simultaneous grafts, showing lower success rates compared to non graft implant placements (Le and Borzabadi-Farahani, 2014). Early implant placement is another possible alternative for avoiding post extraction bone loss, however, at 4 weeks bone formation is slow and bone density is suboptimal (Hammerle and Chen, 2004).

Socket preservation using biomaterials has been proposed and autologous platelet concentrates including platelet rich plasma (PRP) with growth factors and platelet rich fibrin (PRF) are employed (Rutherford and Niekrash, 1992; Zhang and Wang, 2007). PRF is a second-generation of autologous growth factors, which encourages healing and is proposed to be associated with effective and early organization of bone substance and bone volume percentage (Dohan and Choukroun, 2006; Kutkut and Andreana, 2012). In addition, PRF is a platelet concentrate with leukocytes in dense fibrin matrix, which can be conveniently prepared from autogenous non anti-coagulated blood when centrifuged (Choukroun and Diss, 2006). Reports with regards to the clinical efficacy of using platelet concentrates (like PRF) in the healing of extraction sockets have been controversial. With studies showing significant and comparable outcomes among control and test groups for assessing the effect of platelet concentrates on post extraction socket preservation (Simonpieri and Del Corso, 2009; Simonpieri and Del Corso, 2012). It is hypothesized that PRF will accelerate socket wound healing after tooth extraction, noticed by increased bone fill and reduced bone resorption. Therefore the aim of this study was to evaluate clinically and radiographically extraction socket healing using autologous platelet rich fibrin (PRF) membrane.

2. Materials and methods

2.1. Patient selection

A total of twenty-four subjects who required tooth extraction and future implant therapy were included in the study. Patients were selected from Periodontics Clinic, of a dental school in Riyadh, Saudi Arabia, Riyadh College of Pharmacy and Dentistry. The protocol for the investigation was approved and registered by the institutional review board of the research center (FPGRP- 43431004/138). The present study was performed in accordance with the declaration of Helsinki. All participants have been informed about the procedure and informed consents in english and Arabic (based on patient background) were obtained.

Inclusion criteria consisted of patients with an unremarkable medical history, subjects with at least one site bordered by minimum of one tooth, nonsmokers, teeth with root fracture, patients having teeth with hopeless periodontal prognosis, teeth with failed endodontic therapy or advanced carious lesion. Patients with systemic diseases, with presence or history of osteonecrosis of the jaws, with use of bisphosphonates, exposure to head and neck radiation, chemotherapy, and patients with distinct peri-apical pathology were excluded. A sample size of minimum of 12 subjects in each group was identified using power calculation, incorporating means and standard deviations from previous studies (Hauser and Gaydarov, 2013).

The patients fulfilling the criteria were randomly allocated into two groups:

Group I (test group-n = 12): Extraction sockets which received platelet rich fibrin.
Group II (control group-n = 12): Eight extraction sockets left for normal healing (blood clot).

2.2. PRF preparation

Immediately after surgical procedure, 20 ml of blood was drawn from each patient in test group without adding anticoagulant. Following blood collection each sample was centrifuged at 3000 rpm (approximately 400 g) for 10 min using compact centrifuge (Hermle labortechnik, Germany). This results in a fibrin clot formation, containing platelets located in the middle of the tube, just between the red blood cell layer at the bottom and acellular plasma at the top. This clot is removed from the tube using sterilized tweezers and the

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