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Evaluation of the Healing Outcomes of Dry Socket Using Platelet Rich Fibrin - A Prospective Study

Manishaa. V[1], Senthil Murugan Pandurangan[2*]

[1]Post graduate, Department of Oral & Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, India, 152104004.sdc@saveetha.com
[2]Professor, Department of Oral & Maxillofacial Surgery, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Science, Saveetha University, India, senthilmuruganp.sdc@saveetha.com

Background and aim: Dry socket is a common complication secondary to extraction of any tooth. The important concern with dry socket is pain. Platelet rich fibrin is a second generation concentrate produced from autologous blood without any biomechanical manipulation. The aim of the study is to evaluate the tissue regenerative properties of Platelet rich fibrin in management of dry socket.
Methods: A total of thirty participants were included in this study, divided into two groups (n=15). Patients in Group I were treated with irrigation of the dry socket and dressing with platelet rich fibrin, while Group II were taken as control with no intervention. The post operative pain levels using the Visual Analogue Scale (VAS) scores, degree of inflammation and granulation tissue formation was evaluated at baseline, and at the end of one week. The statistics were analysed using the t tests and Mann-Whitney U test for inter group analysis, and paired t test and Wilcoxon test for analysis of effect of the intervention within the group.
Results: Patients who received platelet rich fibrin had lesser VAS scores when compared to control patients and were statistically significant (p value < 0.05). The degree of inflammation and granulation tissue formation were comparatively better in Group I, with statistical significance.
Conclusion: Platelet rich fibrin plays an important role in accelerating healing and providing relief from symptoms of dry socket.

Keywords: extraction, dry socket, healing, platelet rich fibrin.

1. Introduction

Dry socket, or alveolar osteitis, is a common and painful complication following tooth extraction. It occurs when the blood clot that normally forms at the site of the extraction either fails to develop or dislodges prematurely, leading to exposed bone and nerves [1]. Traditional management includes irrigation, medicated dressings, and pain control. Recently, platelet-rich fibrin (PRF) has emerged as a promising alternative for managing dry socket due to its

regenerative properties [2].

PRF is a second-generation platelet concentrate that is derived from the patient's own blood. It contains a high concentration of platelets, leukocytes, and growth factors, which are essential for wound healing and tissue regeneration [3]. Unlike its predecessor, platelet-rich plasma (PRP), PRF is obtained through a simpler and less invasive process that involves centrifuging a blood sample without the addition of anticoagulants. This results in a fibrin matrix that gradually releases growth factors over time, promoting sustained healing [4].

The application of PRF in the management of dry socket leverages its ability to accelerate tissue repair and reduce inflammation. PRF stimulates the formation of new blood vessels, enhancing blood supply to the affected area and facilitating nutrient and oxygen delivery essential for healing [5]. The leukocytes and cytokines in PRF modulate the inflammatory response, reducing pain and swelling associated with dry socket [6]. Growth factors such as platelet-derived growth factor (PDGF) and transforming growth factor-beta (TGF-β) in PRF promote the proliferation and differentiation of fibroblasts and osteoblasts, aiding in the regeneration of soft and hard tissues. The presence of leukocytes in PRF provides an antimicrobial effect, lowering the risk of infection at the extraction site [7].

The use of PRF in the management of dry socket offers several advantages over traditional treatments. Being autologous, PRF is derived from the patient's own blood, minimizing the risk of allergic reactions or immune responses [8]. The preparation of PRF is relatively simple and cost-effective, requiring no additional biochemical agents. The sustained release of growth factors from the PRF matrix promotes faster and more effective healing compared to conventional treatments. The anti-inflammatory properties of PRF help in reducing pain and discomfort, improving patient comfort and compliance [9].

The aim of the present study is to evaluate the efficacy of platelet rich fibrin in treatment of dry socket. The objective of the study is to analyse the effect of PRF in reduction of pain, degree of inflammation and over the rate of granulation tissue formation.

2. Materials and methodology

Study setting

The study participants were those who reported to the Oral and Maxillofacial Surgery Department with complaints of pain after extraction of tooth, seeking treatment for the same. The study has been approved by the Ethics committee of the institute (IHEC/SDC/OMFS-2104/23/086). Each of the study participants were explained about the study and an informed consent was obtained from them.

Inclusion criteria

Participants included those from 20 to 40 years of age who had presented with pain in the extracted socket region. Patients who had undergone conservative management and yet had no response to treatment were included.

Exclusion criteria

Patients with systemic diseases and patients with irregular follow-up were excluded. Patients

with any kind of bleeding or clotting disorders were excluded.

Intervention

A total of thirty patients with dry socket symptoms were enrolled into the study. These participants were equally distributed into two groups - Group I (n=15) and group II (n=15). The patients were assigned into two groups randomly based on sealed opaque envelopes that were prepared by the primary investigator. The study was single blinded, i.e., the participants were unaware of the study grouping. All the study group participants (Group I) received a platelet rich fibrin dressing after irrigation of the socket, while the Group II participants were taken as control.

The PRF was made following the Choukroun et al [10] protocol. Blood specimens were collected from the individual without a blood thinner in 10 ml glass-coated plastic tubes and spun at 3000 rpm for 12 minutes. A clot of fibrin developed in the central section, with cell-free plasma located in the top of the tube, and the red blood cells settling in the lower section. The fibrin clot was easily removed from the bottom of the tube. The separated PRF was inserted into the dry socket and secured using a figure of eight suture. All the participants were prescribed painkillers for the first two days.

Assessment

Each of the parameters were measured at the baseline and at the end of one week post operatively. The pain scores were measured using the Visual Analogue Scale from 0 to 10 in increasing order, wherein 0 means least or no pain and 10 refers to terrible unbearable pain. The degree of inflammation was analysed using a severity index for inflammation from 0 to 3 which consisted of 0 - no inflammation, 1 - mild inflammation, 2 - moderate inflammation, and 3 - severe inflammation. Inflammation was assessed clinically by gentle probing of the extraction socket to ensure the presence or absence of bleeding. Granulation tissue formation was evaluated clinically by the coverage of the exposed bony walls of the extraction site by soft granulation tissue which can be graded as: 0 - no bony walls exposed, 1 - only one bony wall exposed, 2 - two bony walls exposed, 3 - three bony walls exposed, and 4 - four bony walls exposed. The granulation tissue was divided into healthy (pink and does not bleed on probing) and unhealthy granulation tissue (dark red and often bleeds on probing).

Statistical Analysis

Data were analyzed using SPSS for Windows version 23.0. Categorical variables were compared using Chi-square test. Inter group analysis was done using Wilcoxon test and paired t tests before and after the treatment. Analysis between the groups was done using Mann-Whitney U test and Student's t-test. A p value of <0.05 was considered significant.

3. Results

The study consists of two groups, with each of the groups having 15 participants. The baseline values of pain measured using the Visual Analog scale were comparable in both groups and were not statistically significant (p value > 0.05). The patients in Group II (Control) showed a slight improvement in the pain levels at the end of 1 week, while those in Group I (PRF) showed comparatively better reduction in the pain levels, with statistically significant values

(p value = 0.001) (Table 1) (Graph 1).

On the other hand, degree of inflammation reduced steadily by the end of one week in both groups. At the end of one month, the degree of inflammation in Group I was lesser than that of Group II, and was statistically significant (p value = 0.005) (Table 2) (Graph 2). Similarly, participants of Group I showed a greater granulation tissue formation when compared to patients in Group II, with statistical significance (p value = 0.0005) (Table 3) (Graph 3). In this study, no complications or any adverse effects were reported due to these drugs.

Table 1: Tabulation of pain levels using VAS scores between the two groups

Time point	GROUP I - PRF	GROUP II - Control	p Value
Baseline	. 8.5 ± 1.2	8.3 ± 1.0	0.63
After one week	3.2 ± 1.5	5.6 ± 1.8	0.001**

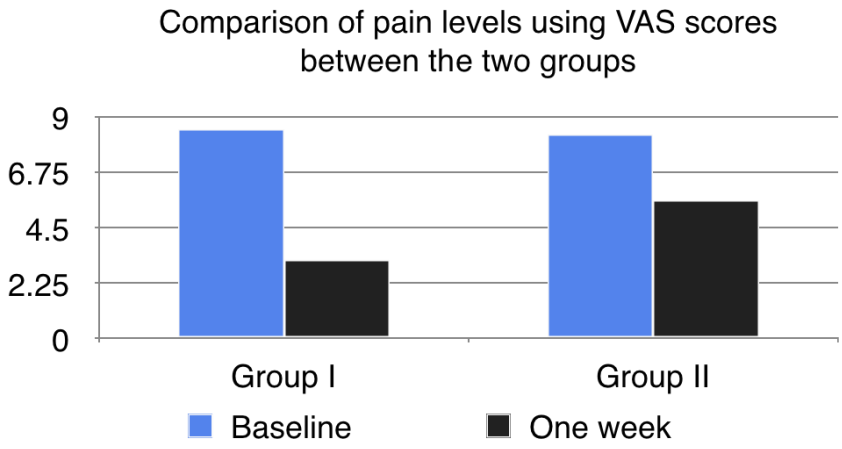
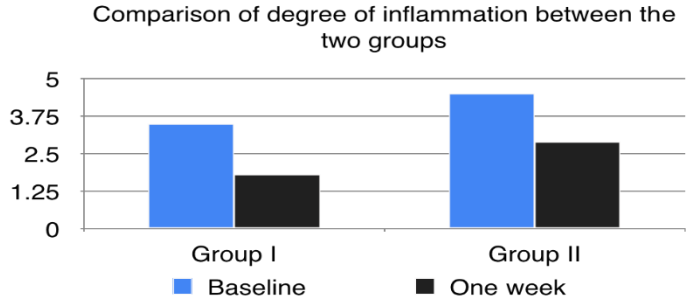


Figure 1: Comparison of pain levels using VAS scores between the two groups

Table 2: Tabulation of degree of inflammation between the two groups

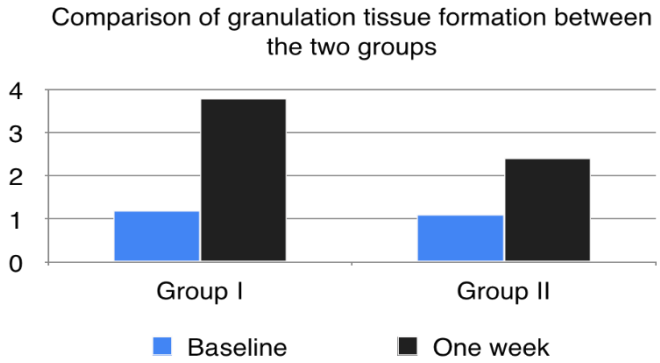
Time point	GROUP I - PRF	GROUP II - Control	p Value
Baseline	3.5 ± 0.5	3.4 ± 0.6	0.75
After one week	1.8 ± 0.6	2.9 ± 0.7	0.005*



Graph 2: Comparison of degree of inflammation between the two groups

Table 3: Tabulation of granulation tissue formation between the two groups

Time point	GROUP I - PRF	GROUP II - Control	p Value
Baseline	1.2 ± 0.4	1.1 ± 0.3	0.68
After one week	3.8 ± 0.7	2.4 ± 0.8	0.0005**



Graph 3: Comparison of granulation tissue formation between the two groups

4. Discussion

The most common and uncomfortable sign of dry socket that needs to be treated effectively is pain. Numerous approaches have been put out over time to address the pain brought on by alveolar osteitis [11]. Nonetheless, there is currently no clear standard procedure for managing the related pain, and physicians continue to struggle in determining the most effective course of action. Platelets, leukocytes, and their cytokines are entangled in PRF, an autologous biomaterial based on fibrin. Applying platelet-rich fibrin has been suggested as a way to manage dry socket pain more recently [12].

Clinical standardization of alveolar osteitis might provide a challenge due to its complexity. According to Chakravarthi's [13] definition, major symptoms including bad breath, foul taste, and continuous, throbbing pain extending to the neck, temple, and ears that start one to three days after tooth extraction and don't go away despite taking medication are considered criteria of dry socket. The absence of a blood clot, retained or infected roots, localized edema, and lymphadenopathy are all considered signs. To diagnose alveolar osteitis, at least two symptoms and one sign are required. A number of variables, including age, gender, smoking status, systemic illness, extraction site, and surgical technique, can affect the risk of pain following surgery.

Studies have been conducted to compare the onset and duration of pain relief between PRF and zinc oxide eugenol. Different results have been obtained and the variation has been attributed to the difference in sample size and the individual patient characteristics and features such as age and medical status [14]. Zinc oxide eugenol is known to have both obtudent and antimicrobial properties.

Numerous studies have demonstrated the benefits of PRF in promoting healing and reducing pain compared to traditional treatments. A study by Al-Hamed et al highlighted the significant reduction in pain and accelerated healing in patients treated with PRF compared to those receiving conventional therapy [15]. The anti-inflammatory and regenerative properties of PRF contributed to these outcomes.

Del Corso et al conducted a clinical trial that showed a marked improvement in the healing of extraction sites treated with PRF. Patients exhibited faster soft tissue healing and less

postoperative discomfort [16]. A comparative study by Kundu and Hazari found that PRF-treated sockets had better clinical outcomes than those treated with zinc oxide-eugenol dressings, a commonly used medication for dry socket. The PRF group reported lower pain scores and fewer incidences of complications [17].

Choukroun et al discussed the antimicrobial properties of PRF, attributing its effectiveness in reducing infection rates to the leukocytes and cytokines present in the fibrin matrix [10]. This was particularly beneficial in preventing secondary infections in dry socket cases. A review by Miron et al emphasized the cost-effectiveness and accessibility of PRF as a treatment modality [18]. Since PRF is autologous and requires minimal processing, it is a cost-effective alternative to more complex and expensive treatments.

5. Conclusion

Platelet-rich fibrin represents a significant advancement in the management of dry socket post-extraction. Its ability to promote angiogenesis, reduce inflammation, enhance tissue regeneration, and provide microbial defense makes it a valuable tool in modern dental practice. As more clinical studies support its efficacy and safety, PRF is poised to become a standard treatment modality for dry socket and other oral surgical complications.

Conflict of interest:

There are no conflicts of interest.

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Ethical statement:

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References

1. Crawford JY. Dry socket. Dent Cosmos. 1896;38:929–993.
2. Bloomer CR. Alveolar osteitis prevention by immediate placement of medicated packing. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2000;90:282–4.
3. Blum IR. Contemporary views on dry socket (alveolar osteitis): A clinical appraisal of standardization, aetiopathogenesis and management: A critical review. Int J Oral Maxillofac Surg. 2002;31:309–17.
4. Oginni FO. Dry socket: A prospective study of prevalent risk factors in a Nigerian population. J Oral Maxillofac Surg. 2008;66:2290–5.
5. Rakhshan V. Common risk factors for postoperative pain following the extraction of wisdom teeth. J Korean Assoc Oral Maxillofac Surg. 2015;41:59–65.
6. Ross R, Glomset J, Kariya B, Harker L. A platelet-dependent serum factor that stimulates the proliferation of arterial smooth muscle cells in vitro. Proc Natl Acad Sci U S A. 1974;71:1207–

10.
7. Haraji A, Lassemi E, Motamedi MH, Alavi M, Adibnejad S. Effect of plasma rich in growth factors on alveolar osteitis. Natl J Maxillofac Surg. 2012;3:38–41.
8. Pal US, Singh BP, Verma V. Comparative evaluation of zinc oxide eugenol versus gelatin sponge soaked in plasma rich in growth factor in the treatment of dry socket: An initial study. Contemp Clin Dent. 2013;4:37–41.
9. Kolokythas A, Olech E, Miloro M. Alveolar osteitis: a com- prehensive review of concepts and controversies. Int J Dent 2010;2010:249073.
10. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, et al. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part V: Histologic evaluations of PRF effects on bone allograft maturation in sinus lift. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;101:299–303.
11. Corso MD, Toffler M, David M, Ehrenfest D. Use of autologous leukocyte and platelet rich fibrin (L-PRF) membrane in post avulsion sites: An overview of Choukroun's PRF. J Implant Adv Clin Dent. 2010;1:27–35.
12. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, et al. Platelet-rich fibrin (PRF): A second- generation platelet concentrate. Part III: Leucocyte activation: A new feature for platelet concentrates? Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;101:e51–5.
13. Chakravarthi S (2017) Platelet rich fibrin in the management of established dry socket. J Korean Assoc Oral Maxillofac Surg 2017(43):160–165.
14. Reeshma S, Dain CP (2021) Comparison of platelet-rich fibrin with zinc oxide eugenol in the relief of pain in alveolar osteitis. Health Sci Rep 4:e354.
15. Al-Hamed, F. S., Tawfik, M. A., Abdelfadil, E., & Al-Said, S. (2017). Efficacy of Platelet-Rich Fibrin After Mandibular Third Molar Extraction: A Systematic Review and Meta-Analysis. Journal of Oral and Maxillofacial Surgery, 75(6), 1124-1135.
16. Del Corso, M., Sammartino, G., Dohan Ehrenfest, D. M. (2016). Re: Clinical evaluation of a modified coronally advanced flap alone or in combination with a platelet-rich fibrin membrane for the treatment of adjacent multiple gingival recessions. Journal of Periodontology, 77(4), 672-680.
17. Kundu, R., & Hazari, P. (2014). Platelet-rich fibrin as an adjunct to palatal wound healing after harvesting a free gingival graft: A case series. Journal of Indian Society of Periodontology, 18(3), 399-402.
18. Miron, R. J., Chai, J., Zhang, P., Li, Y., Wang, Y., Mourão, C. F. A. B., ... & Zhang, Y. (2017). A novel method for harvesting platelet-rich fibrin gels without centrifugation. Clinical Oral Investigations, 21(8), 2335-2342.