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Evaluation of Clinical and Radiographic Parameters in PRF Coated Vs Un-Coated Dental Implants

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Abstract

Aim: The aim of the present study was to compare and evaluate the clinical and radiographic parameters of PRF coated and non-coated implants.

Materials and Method: The dental implants were inserted using the two-stage surgical protocol with or without PRF (platelet rich fibrin) liquid and PRF gel application. The clinical assessment was based on data accumulated after recording periodontal indices and radiographic bone loss over a period of 6 months.

Results: All 20 implants showed no clinical signs of inflammation or infection and the clinical parameters for both the study groups recorded statistically insignificant values. The radiographic evaluation revealed that the bone loss observed in both the groups was well under normal limits.

Conclusion: In our study it can be concluded that coating the implant fixtures with PRF liquid does not enhance the bone regeneration when compared with conventionally placed implants without the use of platelet concentrates (PRF).

Keywords: PRF, Implants, Dentistry, Crestal Bone Loss

Introduction

The aim of modern dentistry is to restore lost function, aesthetic and health of a patient by treating the condition inflicting his or her oral cavity to the most. Loss of teeth has been a debilitating and unpleasing condition that inflicts every individual in their lifetime. A number of techniques are available for the rehabilitation of edentulous space. These common techniques involve conventional fixed prosthetics, removable partial dentures and in some patients orthodontic treatment. These conventional methods offer satisfactory results but are associated with numerous drawbacks such as loss of bone, tooth substance and a potential loss of tooth vitality, especially in young individuals. In an attempt to overcome these disadvantages, implant dentistry has evolved over the years. The use of platelet concentrates in dentistry as a means to enhance the periodontal tissue health is a time old concept. With advancements in Implantology, platelet concentrate generations have evolved to provide biological mediators aiding the healing response.

PRF in the form of a platelet gel can be used in conjunction with bone grafts offering numerous advantages, such as promoting wound healing, haemostasis, bone growth and various procedures such as facial plastic surgery (Charrier et al 2008) [1], sinus-lift procedures for a sole conductive filling material (Mazor et al 2019)[2], Furcation defects (Siddiqui et al 2016)[3], infra bony defects (Mathur et al 2015)[4], socket augmentation (Das et al 2016)[5] and multiple gingival recession cases treated with coronally displaced flap (Agarwal et al 2016)[6]. These growth factors are sustainably released for at least 1 week up to 28 days [7], allowing PRF to stimulate the environment for a significant time during wound healing. It is an inexpensive and easily handled material and has been used in treatment of periodontal osseous defects achieves probing depth reduction, clinical attachment gain and an increased intensity of radiography over a 6-month period.[8]

Materials And Methods

A Prospective Randomized Controlled Trial (RCT) was conducted to clinically analyse the effects of PRF liquid in conventionally placed implant and document its findings. A total of 20 subjects were selected from the Out Patient Department of Periodontology, Himachal Institute of Dental Sciences, Paonta Sahib, Himachal Pradesh, India. The inclusion criteria were subjects with i) maintainable oral hygiene, ii) partially edentulous state in either maxilla or mandible, iii) adequate bone quantity at the implant site. Exclusion Criteria were subjects i) having infection around implant site, ii) history of bleeding disorder or on anticoagulant therapy, iii) immunocompromised state and debilitating disease. These were divided into two groups of 10 using the chit system, where the implant was coated with acellular PRF fluid before placement in the test group and non-coated implant placed in the control group. The inspiration behind exploring the use of PRF for the bioactivation of implants was drawn from the studies conducted by Oncu E and Alaaddinoglu EE in 2015 [9]. Preoperative clinical examination and radiographic assessments were done. Dental, medical and psychological conditions were evaluated. The intended implant sites and opposing dentition were examined.

During the surgical phase, to prepare the osteotomy, drilling was done in a sequential manner. The osteotomy was widened sequentially, depending upon the size of implant to be placed. The two stage implant placement protocol was used in this study where the sutures were removed after 1 week and the second stage procedure was initiated after 1 month from implants placement followed by prosthetic phase for the implant.

PRF preparation and placement: The standard protocol for PRF preparation was used. A 10ml blood sample was collected in glass tube (without any anticoagulants) from the median cubital vein and immediately centrifuged at 3000rpm for 10 minutes [10].The Remi Centrifurge (Model no. C852, Remi Elektrotechnik Limited) (Fig 1.a) was used to extract the PRF from the sample. The resulting PRF (Fig 1.b) was picked with forceps, and the red thrombus was eliminated with scissors. The PRF liquid was transferred into a sterile glass dish. In the test group (Group A), the implant was then coated with the PRF liquid and placed into the prepared osteotomy site (Fig 1.c and Fig 2.a). A two stage implant placement protocol was used and sutures were removed after 1 week. The second stage procedure was initiated after 1

month from implants placement followed by prosthetic phase for the implant (Fig. 2 c).

Fig.1 a: Remi Centrifuge

Fig. 1 b: PRF

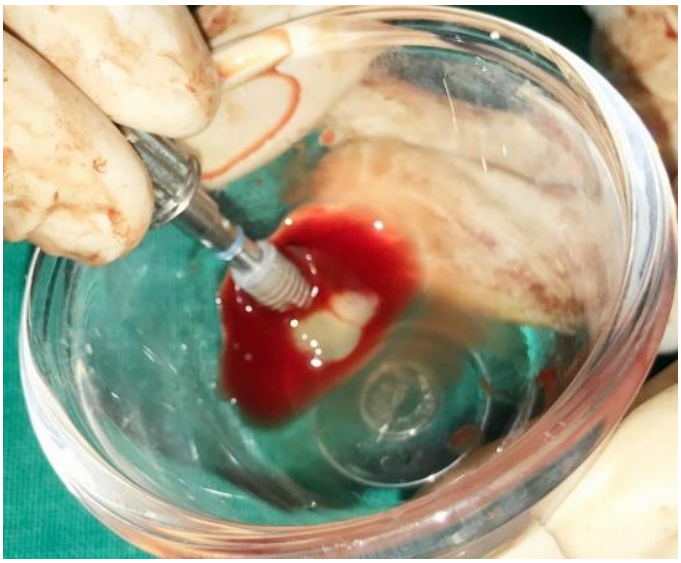

Fig. 1 c: Implant coated with PRF fluid

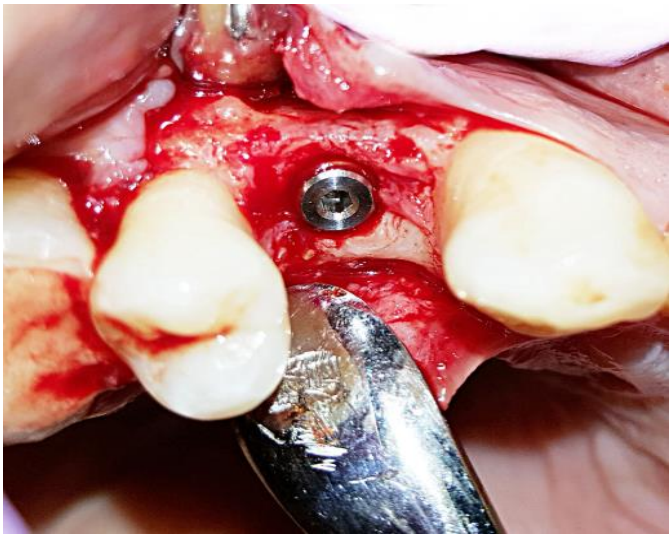

Fig. 2 a: Implant placed in the osteotomy site

Fig. 2 b: IOPAR for measurement of crestal bone at 6 months.

Over the follow up period of 6 months, in both the experimental and control groups, the following clinical parameters (Mombelli Plaque Index [11], Gingival Index [12], Sulcular Bleeding Index [13] and Probing Depth) and radiographic assessment was done. The depth of the peri-implant sulcus was measured on all sides of each implant to the nearest millimeter by using a Hu-Friedy Colorvue UNC 12 periodontal probe. The distance between the marginal border of the gingival and the tip of pocket probe was scored as the probing pocket depth (PPD). The deepest pocket per implant was used for data analysis.

Radiographic evaluation was initiated at time of placement (baseline) T0. Standardized intra-oral periapical radiographs (IOPARs) (Fig 2.b) and Radiovisiography (RVGs CS Imaging Patient Browser 7.0.18) were made using the long cone technique with an aiming device. The most coronal point of healing abutment was taken as a static reference line. The point of bone to implant contact was chosen as the bone level The point of bone to implant contact was chosen as the bone level as was done by AJ Flichy-Fernandez in 2011[14]. Measurements were made at the mesial and distal aspect of implants by placing perpendicular line from the static reference line to the bone level of bone using digital radiographic technique [14]. The clinical parameters including the radiographic assessment were assessed in the 1 month (T1), 3 months (T3) and 6 months (T6) after implant placement.

Statistical Analysis

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS for Windows Version 16, SPSS Inc. IBM, USA). Normality testing showed that scores for both the groups were not distributed normally, as assessed by Shapiro-Wilk test ($p<0.05$). The comparison of parameters between the two groups was done using Mann-Whitney U test. Level of statistical significance for this study was fixed at $p<0.05$.

Results

At the 6 months interval Group A had a mean mesial crestal bone loss of 2.1±0.41 and for Group B the score was 2.3±0.45 on the mesial aspect, while on the distal aspect Group A had a mean distal crestal bone loss of 2.1±0.31 and for Group B the score was 2.5±0.77. The intergroup difference was observed as non-significant at $p = 0.226$ on mesial aspect and at $p= 0.240$ for the distal aspect. Similarly non-significant values were recorded for the clinical parameters over the span of six months. (Table 1)

Time of measurement	Group	Bone loss aspect	Mean	± Standard deviation	P value
Baseline 1 month	A	Mesial	1.60	±0.350	0.819
	B		1.62	0.359	
	A	Distal	1.63	0.372	0.790
	B		1.65	0.394	
Baseline 3 months	A	Mesial	1.81	0.379	0.185
	B		2.02	0.515	
	A	Distal	1.82	0.432	0.570
	B		1.94	0.532	
Baseline 6 months	A	Mesial	2.18	0.458	0.226
	B		2.11	0.772	
	A	Distal	2.11	0.317	0.240
	B		2.50	0.772	

Table 1. Comparison of crestal bone level changes between Group A and Group B on mesial and distal side at different time interval

Discussion

Dental implants have been deemed as one of the most promising disciplines in dentistry and are amongst the most researched topics of our field. They have helped

provide an almost ideal prosthesis for the stomatognathic system which restores both aesthetics and function and also improves the overall health of each patient. The long term success depends upon the maintenance of these structures which are seen to undergo a variety of changes after implant placement and loading. Several adjuncts and techniques have been put forward to enhance and protect the harmony of the marginal bone and the peri-implant soft tissue for the longevity of the delivered prosthesis. With the advent of newer technologies, Platelet concentrates have shown promise in recent years. The Platelet concentrates that are actively being used in modern dentistry aid in improving the biological properties of tissues in its contact. Over the decade the use of various platelet concentrates, namely Platelet Rich Fibrin (PRF) and Platelet rich Plasma (PRP) in implant dentistry has increased exponentially; due to its ability to provide a sustained release of growth factors and provide a scaffold for tissue and even graft stabilization. Each layer of PRF has its own benefits and can be used in a variety of techniques. The liquid component of PRF contains concentrated growth factors that show promising results when used as an adjunct in implant dentistry.

In this study conventional implant placement was done in fully healed bony edentulous spans as is done in the study by Gupta R et al 2019 [15]. The protocol followed for the collection and production of PRF in this study was taken from the standard protocol suggested by Kobayashi M et al in 2012 [10]. Dohan et al in 2006 [16] and Hartshorne J et al 2016 [17] described the conceptual and technical evolution from fibrin glues to platelet concentrates and their biological properties and nature. Amongst its many actions PRF has been associated with an enhanced gingival and periodontal cellular activity and improved overall mechanical properties of these tissues. [18-20] Compared to application of single, supra-physiological concentrations of recombinant growth factors, Platelet Concentrates such as PRF has the advantage of offering multiple, synergistically working growth factors at the wound site and in concentrations that are physiologically and biologically more relevant [21] and has thus been widely used for accelerating soft tissue and hard tissue healing [22,19]. One of the main concerns during rehabilitation of edentulous span using implants is the conservation of bony architecture and a harmonious soft tissue. The structure of soft tissue is highly dependent on the bone structure, which will establish the shape and anatomy of the region. The loss of bone structure is the most common cause of aesthetic failure, due to the gingival structure accompanying the bone condition [14]. Studies conducted to investigate the effects of topical application of PRF on the implant fixture in different forms have shown accelerated bone regeneration and early soft tissue healing, Arora S et al (2016) [23]. In our study, the acellular PRF was coated around the length of the implant before placement in the osteotomy site while the PRF gel was placed over the fixture before suturing in an attempt to accelerate the overall healing and to assess the effects of PRF on the peri-implant soft tissue and marginal bone loss levels [20, 24,25].

The non-significant difference amongst the results of both the groups could be the result of the stringent measures that were taken to ensure proper oral hygiene was maintained throughout the treatment phase for each patient. During Phase-one, complete oral prophylaxis was achieved in each patient before implant placement.

Each of the 20 patients was educated about proper implant maintenance during and after the implant prosthesis delivery. As a result of these steps, patients in both the groups exhibited excellent oral hygiene and a high level of motivation towards proper maintenance of their prosthesis. All these factors cumulatively could have had a positive effect on the peri-implant soft tissues resulting in a statistically non-significant result amongst both the groups.

Furthermore, similar results in crestal bone loss amongst the control and test group could be explained by the protocol followed for implant placement and the formation of a healthy biological seal around the healing collar, together helped in keeping the bone loss under acceptable limits. Adin Touareg-S implants which were used in our study have a spiral tap that condenses the bone during placement for immediate stability with a modified SLA surface (aluminium oxidise base, acid etched). Surface modification of implants maybe additive e.g. hydroxyapatite and titanium plasma spraying (TPS) or subjective e.g. (sandblasting and acid etching) to produce roughened surfaces with increase in surface area improving osseointegration as compared with smooth, machined surfaces [26-28]. The implant topography and design of this system has a favourable effect on marginal bone architecture, thus the overall factors could have overshadowed the effects of PRF on the test group.

Conclusion

In our study it can be concluded that PRF coating to an implant fixture does not show any additional benefits when compared with conventional implants placed without platelet rich concentrates (PRF)

Reference

1. Charrier JB, Monteil JP, Albert S, Collon S, Bobin S, Dohan Ehrenfest DM. Relevance of Choukroun's Platelet-Rich Fibrin (PRF) and SMAS flap in primary reconstruction after superficial or subtotal parotidectomy in patients with focal pleiomorphic adenoma: a new technique. Rev Laryngol Otol Rhinol (Bord) 2008;129:313–318
2. Mazor Z, Horowitz RA, Del Corso M, Prasad HS, Rohrer MD, Dohan Ehrenfest DM Sinus floor augmentation with simultaneous implant placement using Choukroun's platelet-rich fibrin as the sole grafting material: a radiologic and histologic study at 6 months. J Periodontol. 2009;80(12):2056-64
3. Siddiqui ZR, Jhingran R, Bains VK, Srivastava R, Madan R, Rizvi I Comparative evaluation of platelet-rich fibrin versus beta-tri-calcium phosphate in the treatment of Grade II mandibular furcation defects using cone-beam computed tomography Eur J Dent. 2016;10(4): 496–506.
4. Mathur A, Bains VK, Gupta V, Jhingran R, Singh GP. Evaluation of intrabony defects treated with platelet-rich fibrin or autogenous bone graft: A comparative analysis. Eur J Dent. 2015; 9(1): 100–108.
5. Das S, Jhingran R, Bains VK,1 Madan R, Srivastava R, Rizvi I. Socket preservation by beta-tri-calcium phosphate with collagen compared to platelet-rich fibrin: A clinico-radiographic study Eur J Dent. 2016;10(2): 264–276.
6. Agarwal A, Gupta ND, Jain A. Platelet rich fibrin combined with decalcified freeze-dried bone allograft for the treatment of human intrabony

periodontal defects: a randomized split mouth clinical trail. Acta Odontol Scand. 2016;74(1):36-43

7. He L, Lin Y, Hu X, Zhang Y, Wu H. A comparative study of platelet-rich fibrin (PRF) and platelet-rich plasma (PRP) on the effect of proliferation and differentiation of rat osteoblasts in vitro Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108:707-713
8. Chang YC, Wu KC, Zha JH. Clinical application of platelet-rich fibrin as the sole grafting material in periodontal intra-bony defects J Dent Sci. 2011;6:181-188
9. Öncü E, Alaaddinog˘lu E. The Effect of Platelet-Rich Fibrin on Implant Stability. The Int J Oral Max Imp.2015;30(3):2-5
10. Kobayashi M, Kawase T, Horimizu M, Okuda K, Wolff LF, Yoshie H. A proposed protocol for the standardized preparation of PRF membranes for clinical use. Biologicals. 2012;40(5):323-9
11. Giovanni E. Salvi, Niklaus P. Lang, Diagnostic Parameters for Monitoring Peri-implant Conditions. Int J Oral Maxillofac Implants 2004;19:116–127
12. Bessa Rebelo MA, Corrêa de Queiroz A. Gingival Diseases - Their Aetiology, Prevention and Treatment; Chap-3: Gingival Indices: State of Art 2014:42-54
13. Newbrun E. Indices to measure gingival bleeding. J Peridontol 1996;67(6):555-561
14. Flichy-Fernández AJ, Ata-Ali J, Carrió P, Oltra P, Conejero J, Peńarrocha M. Radiological assessment of peri-implant bone loss: a 12-month retrospective study.J Clin Exp Dent 2011;3(5):430-434
15. Gupta R, Luthra RP, Kaur D, Sheth HH, Sharma A, Dudeja P, et al A novel way to place short implants using platelet-rich fibrin (PRF): An original research. Int J App Dent Sci. 2019; 5(1): 99-106
16. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part I: technological concepts and evolution. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2006;101(3):37-44
17. Hartshorne J, Gluckman H. A comprehensive clinical review of Platelet Rich Fibrin (PRF) and its role in promoting tissue healing and regeneration in dentistry. Part 1: Definition, development, biological characteristics and function. Int Dent African Edition 2016; 6(5):14-24
18. Chang YC, Zhao JH. Effects of platelet-rich fibrin on human periodontal ligament fibroblasts and application for periodontal infrabony defects. Aust Dent J. 2011;56(4):365-371
19. Cáceres M, Martínez C, Martínez J, Smith PC. Effects of platelet-rich and -poor plasma on the reparative response of gingival fibroblasts. Clin Oral Implants Res. 2012;23(9):1104-1111
20. Ehrenfest DM, Andia I, Zumstein MA, Zhang CQ, Pinto RN, Bielecki T. Classification of platelet concentrates (Platelet-Rich Plasma-PRP, Platelet-Rich Fibrin-PRF) for topical and infiltrative use in orthopedic and sports medicine: current consensus, clinical implications and perspectives. Muscles Ligaments Tendons J. 2014 Jan-Mar; 4(1): 3–9
21. Gulati M, Govila V, Anand V, Anand B. Implant maintenance: A clinical update. Int Schol Res Not.2014;1-8
22. Saluja H, Dehane V, Mahindra U. Platelet-Rich fibrin: A second generation platelet concentrate and

a new friend of oral and maxillofacial surgeons. Ann Maxillofac Surg. 2011;1(1):53-57

23. Arora S, Bali S, Thukral P, Bhushan A, Taneja M, Aggarwal P. A comparative evaluation of immediate implant placement in fresh extraction socket with and without the use of Platelet Rich Fibrin- A Clinical and Radiographic study. Int J Oral Implantol Clin Res. 2016;7(3):48-58
24. El Kenawy MH, El Shinnawi UM, Ahmed M. Salem AM, Ahmed FH. Efficacy of Platelet Rich Fibrin (PRF) Membrane in Immediate Dental Implant Mansoura Journal of Dentistry 2014;1(3):78-84
25. Sehgal M, Puri L, Yadav S, Malhotra P, Phukela SS. Immediate Dental Implants Enriched with L-PRF in the Esthetic Zone. Case Rep Den. 2018:1-6
26. Lollobrigida M, Maritato M, Bozzuto G, Formisano G, Molinari A, De Biase A et al. Biomimetic Implant Surface Functionalization with Liquid L-PRF Products: In Vitro Study. Biomed Res Int.2018;8:9031435
27. Nagarajan B, Murthy V, Livingstone D, Surendra MP, Jayaraman S. Evaluation of Crestal Bone Loss Around Implants Placed at Equicrestal and Subcrestal Levels Before Loading: A prospective Clinical Study. J Clin Diag Res 2015;9(12):ZC47-ZC50
28. Cervino G , Fiorillo L, Iannello G, Santonocito D, Risitano G, Cicciù M. Sandblasted and Acid Etched Titanium Dental Implant Surfaces Systematic Review and Confocal Microscopy Evaluation. Materials 2019;12:1-20