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Original Research

Evaluation of treatment outcome after immediate implant placement with and without autologous leukocyte platelet rich fibrin

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ABSTRACT:

There has been some challenges related to immediate implant placement in oral and maxillofacial surgery. The new generation Concentrate L-PRF (Leukocyte- platelet rich Fibrin), is a biomaterial which are known to contain platelet-derived growth factors that are used to promote active wound healing and bone growth. This study will include 20 patients enrolling themselves in the study will be divided equally into 2 groups .10 patients will be considered as control group. Rest 10 patients includes in L-PRF group. L- PRF will be prepared from patients' autologous blood and placed in immediate extraction sockets after the placement of implant in test group and control group is left without any similar adjunct. The result showed that the soft tissue healing was earlier in test groups as compared to control groups. Also the bone loss was less in test groups.

Key words- Atraumatic extraction, Immediate implant placement, Leukocyte Platelet Rich Fibrin

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INTRODUCTION

Dental implants is use to provide support for prosthesis and offers a number of advantages as compared with the use of removable prosthesis for example maintain bone, vertical dimension, balance occlusal force, improves masticatory performance, increases stability and retention.[1]

Placement of implants immediately following extraction has now become an increasingly common strategy to preserve bone and reduce treatment time. The purpose of preserving the extraction socket is to maintain the architecture of the alveolar bone, prevent soft tissue collapse, and minimize or eliminate the need for future bone augmentation procedures.[2]

The implant stability can be enhanced by modifying the implant surfaces and also by inducing the regenerative capacity of surrounding tissues at bone implant interface zone with appropriate stimuli.

Application of autologus growth factors is one of the factor to improve and accelerate osseous healing by increasing bone implant contact. Various studies have shown that the use of PRF (Platelet Rich Fibrin) as an autologus material for increasing the osseointegration rate improved the implant stability. Application of L-PRF in an inflamed soft tissue injury has proved that the volume and concentration of platelets and leukocytes is adequate for induction of healing process despite concurrent infection.[3]

The purpose of the present study is to evaluate the effect of platelet rich fibrin treatment on bone levels and clinical stability of dental implants.

MATERIALS AND METHODS

METHOD OF COLLECTION OF DATA

The study was conducted on adults with non restorable teeth due to trauma, caries, root resorption, etc who required replacement of dentition with immediate implant placement.

This study included 20 patients having age between 25-50 years were divided equally into 2 groups .10 patients were considered as control group. Rest 10 patients were included in L-PRF group. Patient with

poor oral hygiene, traumatic occlusion, smokers, systemic conditions and bony atrophy were excluded from the study.

L- PRF was prepared from patient's autologous blood and placed in immediate extraction sockets after the placement of implant in test group and control group is left without any similar adjunct.

Clinical parameters will be assessed during implant placement for clinical mobility and perforation of buccal or lingual wall of socket. After first stage of surgery, we will check for infection, pain, soft tissue dehiscence and loss of sensation on 7th post operative day and 3rd month after stage one surgery. Radiographic parameters will be assessed immediately after implant placement and after 6 months using CBCT.

COLLECTION OF PRF

The L-PRF was prepared through a single centrifugation of blood according to the protocol of Dohan Ehrenfest et al. for a period of 12 minutes at 2700 rpm. Blood was taken in 9 mL tubes, 30 minutes before the surgery, immediately centrifuged, and used for the filing of the experimental sites. After the centrifugation and activation of the preparation the centrifuge rotates at 480 G (2700 RPM) for 12 minutes, the blood components will separate out into: RBCs (red color—bottom half), WBCs (a thin white colored band) and Plasma (straw colored—top half).After centrifugation, each L-PRF clot was separated from the portion of red blood cells (red thrombus), obtaining a fibrin clot with a red small portion in order to include the "buffy" coat richer in large leucocytes. The L-PRF clot was condensed and modeled on a sterile surgical plate before the application in the sockets.

SURGICAL PROCEDURE

All the patients were evaluated clinically and radiographically. Extra oral and intra oral painting was done with 5% solution of povidine iodine. Draping of the patient done with sterile drapes exposing the surgical field. Patients were given a mouth wash with chlorhexidine. The surgical procedure was performed under local anesthesia (2% lignocaine Hcl with 1:80,000 adrenaline). Atraumatic extraction was performed with the help of luxators and elevators. The socket was cleaned with betadine solution after the extraction. The length of extracted tooth was measured with scale and willaims probe and correlated with CBCT.

First pilot drill is used to go through the planned osteotomy site. Then desired length of the implant is marked over the drill and osteotomy is deepened until the marking reaches the most apical part of the alveolar process. The drills are used sequentially in an ascending fashion based on the manufacturers guide. Once the osteotomy has been completed, thorough irrigation of the implant bed is done with saline and betadiene. The implant is then placed into the osteotomy site using wrench ratchet. The residual gap between implant and socket was filled with prepared L-PRF and a part of LPRF clot was flattened and used as a membrane before flap closure. Mucosal closure was done with 4- 0 vicryl.

FOLLOW UP

Patients were recalled on seventh postoperative day, 1 month, and 6 months. During every third month, sixth month follow up CBCT were taken and implant stability, any bony perforation, pain, infection were noted.

RESULT

The present study was done to evaluate the efficacy of autologous platelet L-PRF (Leukocyte- platelet rich Fibrin) with control group in soft tissue regeneration, in reducing the peri implant pain and inflammation in immediate implant placement and reducing alveolar bone resorption.

The clinical parameters were compared between the two groups. In both the groups the incidence of infection and mobility was not seen in any patient in any of the group on first post-operative day, at 7th day, 3 month and 6 month interval. Both the groups were identical with respect to infection, mobility.

The pain during treatment was compared between the groups. The pain was measured with the help of Visual analog scale between 0 and 10. The pain was absent among all patients in with PRF group while it is present in some patients in without PRF group.

The Loss of Sensation was compared between the groups. Both the groups were identical with respect to Loss of Sensation.

The incidence of Perforation in bone was not seen in any patient of with PRF group (Group A) at 3 month and 6 month while it was present in 4 patients of without PRF group (Group B).

The incidence of exposure of cover screw was not seen in any patient of with PRF group (Group A) at 3 month and 6 month while it was present in 3 patients of without PRF group (Group B).

The Mean Crestal Bone change was .32 mm, 0.19 mm, 0.17 mm and 0.20 mm in buccal, lingual. mesial and distal resp. in test group and in control group was 0.49 mm ,. 0.38 mm , 0.33 mm and 0.34 mm in buccal lingual, mesial and distal respectively. The mean Horizontal Defect Distance was lesser in test group as compared to control group. (Table 2)

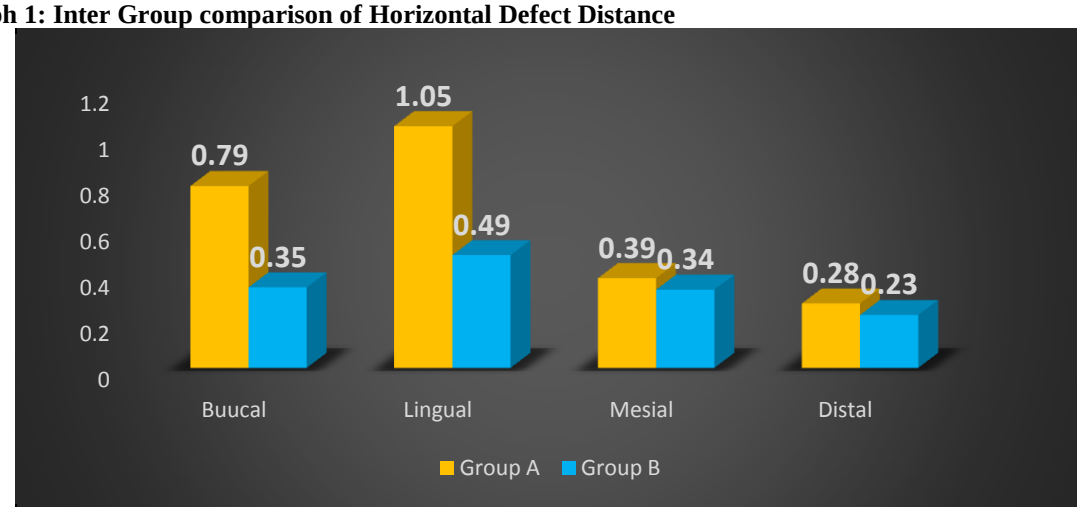
Table 1: Crestal bone length from starting of treatment till 6 months

Parameter **TEST GROUP**	Time	Mean	Std. Deviation	T value	P Value
Buccal	Baseline 6 Month	1.15 0.83	0.86 0.67	5.08	0.001*
Lingual/Palatal	Baseline 6 Month	0.59 0.40	0.26 0.16	3.14	0.012*
Mesial	Baseline 6 Month	0.56 0.39	0.08 0.07	6.53	0.01*
Distal	Baseline 6 Month	0.49 0.29	0.11 0.12	6.00	0.002*
Control Group					
Buccal	Baseline 6 Month	0.93 0.44	0.33 0.16	7.86	0.001
Lingual/Palatal	Baseline 6 Month	0.76 0.38	0.39 0.19	5.46	0.001
Mesial	Baseline 6 Month	0.56 0.23	0.12 0.13	11.0	0.001
Distal	Baseline 6 Month	0.55 0.21	0.17 0.09	9.16	0.001

Table 2: Comparison of Horizontal Defect Distance

Parameter **TEST GROUP**	Time	Mean	Std. Deviation	T value	P Value
Buccal	Baseline 6 Month	0.99 0.20	0.42 0.20	7.61	0.01*
Lingual/Palatal	Baseline 6 Month	1.21 0.16	1.19 0.12	3.03	0.014*
Mesial	Baseline 6 Month	0.66 0.27	0.30 0.17	5.93	0.01*
Distal	Baseline 6 Month	0.51 0.23	0.15 0.11	5.46	0.01*
Control Group					
Buccal	Baseline 6 Month	0.83 0.48	0.25 0.13	8.17	0.01*
Lingual/Palatal	Baseline 6 Month	1.29 0.80	0.68 0.44	3.97	0.014*
Mesial	Baseline 6 Month	0.67 0.34	0.35 0.21	4.61	0.01*
Distal	Baseline 6 Month	0.60 0.37	0.37 0.22	4.51	0.01*

Graph 1: Inter Group comparison of Horizontal Defect Distance



PRE OP IMAGES

Figure 1

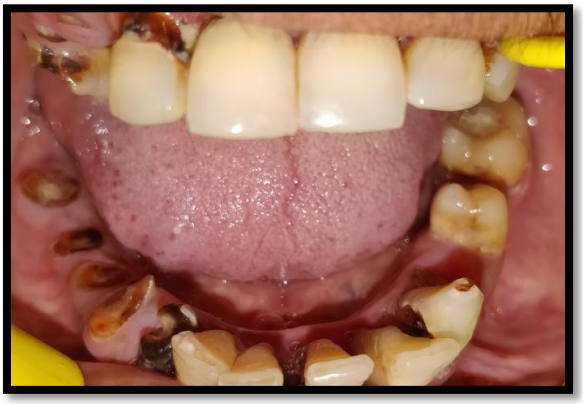
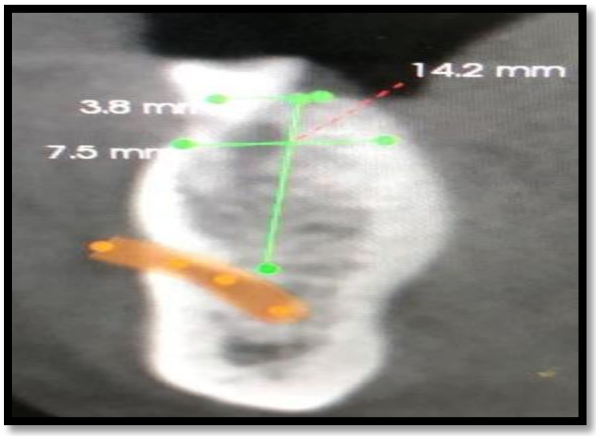


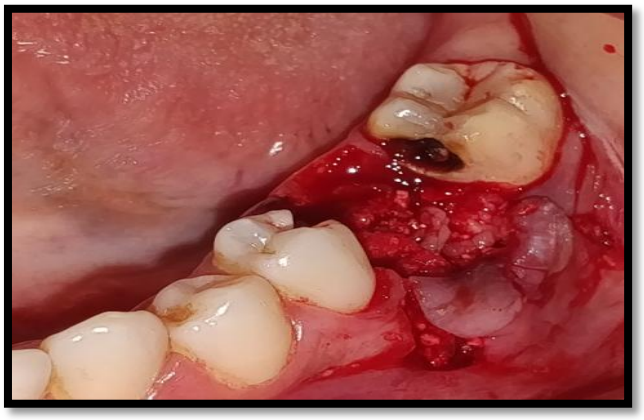
Figure 2



INTRA OP

Figure 3 PREPARATION OF L-PRF

FIGURE 4. L-PRF PLACEMENT ON IMPLANT SITE



POST OP

Figure 5

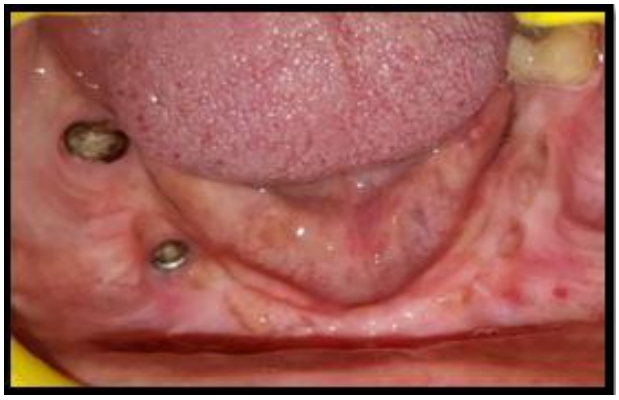
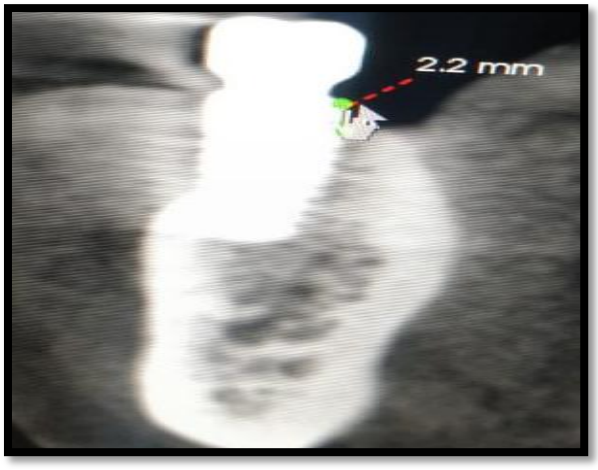


FIGURE 6 CBCT AFTER IMPLANT PLACEMENT



DISCUSSION

The placement of dental implants into freshly extracted sockets were introduced first by Schwartz in 1970's for the restoring the missing teeth, masticatory function, speech and esthetics. [4]

Immediate implant placement has provided implant dentistry the opportunity to achieve better and faster functional and esthetic results. In the past era, the extraction sockets were left to heal for at least 1 year before placing the implants.. However, the majority of the patients are more interested in shortening the treatment time between tooth extraction and implant placement, or even better in having the implants inserted during the same session as the teeth are extracted (immediate implants)[5]. Another great advantage with immediate implants is the amount of bone loss which would occur in healing time of extraction socket will be reduced.

There are also some disadvantages with immediate implants such as:

1. Risk of infections after the socket gets infected (Rosenquist 1996; Takeshita 1997)[6];
2. The presence of gaps between implant and socket wall. It is also possible that one or more bony socket walls are partly resorbed either due to the disease processes or damaged as a result of the tooth extraction procedure;
3. Covering of implant with flap, if a two-stage implantation procedure is preferred (Rosenquist 1997).

One of the latest achievements in dentistry is the use of platelet rich Plasma (PRP), platelet rich fibrin (PRF) for the improvement of reparation and regeneration of the soft and hard tissue after different surgical procedures. Platelet rich fibrin is concentrated platelets in a small volume of plasma. During platelet degranulation many biologic active substances are released which participate in the primary hemostasis and help the following reparation and regeneration of the soft and hard tissues.[7]

Depending on the centrifuges used, spin, duration of the procedure, content of the concentrate PRF can be of two types- Leucocyte-poor or pure platelet-rich fibrin (P-PRF) concentrates and, leucocyte-rich PRF (L-PRF).[8]

The L-PRF clot contains maximum amount of platelets and leukocytes from the harvested blood , and creates a strong fibrin architecture which has a three dimensional distribution of the platelets and leukocytes.[9]

Leucocyte Platelet rich fibrin (L-PRF) is an autologus source of various growth factors. PRF accelerate early bone regeneration by increased angiogenesis, chemotaxis, mitosis, and stem cell proliferation. The proteins derived from platelets PDGF, TGFβ, VEGF, and EGF. Plasma contains certain natural growth factors in the name of IGF and HGF.[10]

"Lack of mobility" is the term used to describe implant movement, and is a clinical condition most often used to describe whether the implant is integrated. A clinically mobile implant indicates the presence of connective tissue between the implant and bone, and suggests clinical failure for an endosteal root-form implant. A root-form implant supported prosthesis is almost predictable with this type of support system. True absence of mobility is not meant by lack of clinical mobility. A healthy implant may move upto 75 micrometers; yet, it indicates a zero clinical mobility, Clinical lack of implant mobility does not always coincide with a direct bone–implant interface. Lack of mobility usually means that at least a portion of the implant is in direct contact with bone when observed clinically, although the percentage of bone contact cannot be specified.[11]

A significant indicator of implant health is usually the marginal bone around the implant crestal region. The level of the crestal bone may be measured from the crestal position of the implant at the initial implant surgery. HDD is the distance calculated from the implant to the socket wall. The most common method in the literature to asses bone loss after healing is by radiographic evaluation.

In the present study a total of twenty patients were included in the present study in which 10 patients belonged to study group and 10 patients belonged to control group. The type of PRF used in this study was L-PRF Both L-PRF treated and untreated implants were of same implant design. Equinox dental implants were selected making use of CBCT respectively. All the 30 patients were asymptomatic before the surgery.

Bone loss was similar in both the groups with slight higher bone loss rates in control group these were in accordance with the study of Shobhit Arora, Shweta Bali et al. in which mean crestal bone change and horizontal defect distance was found higher in control groups then in test groups .[12]

These finding were very highly significant. This was assumed to be because of the use of PRF, it is a concentration of seven fundamental GFs which are actively secreted by platelets to initiate wound healing and bone regeneration. PRF works via the degranulation of the β granules in platelets, which contain the synthesized and prepackaged GFs. The vigorous secretion of these GFs is initiated by the clotting process of blood and begins within 10 minutes after clotting. More than 95% of these presynthesized GFs are secreted within 1 hour. Therefore a threefold or greater concentration of platelets, as was measured in PRF, can be expected to have a profound effect on wound healing and bone regeneration.[10]

CONCLUSION

L-PRF can be used as an adjunct to promote wound healing and bone regeneration in implant placement after immediate extraction.

The present study done on 20 patients clearly indicates a definite improvement in the soft tissue healing and faster bone regeneration after the placement of implants in immediate extraction sockets. It showed excellent bone regeneration with soft tissue healing and lesser postoperative complication in L- PRF group compared to control group.

Preparation of autologous L- PRF in dental office is not a time consuming, procedure, it is easier to use and beneficial to patient and as well as clinician. It is cost effective also. L-PRF is a new application of tissue engineering and a developing area for clinicians and researchers. Most importantly, this autologous product eliminates concerns about immunogenic reactions and disease transmission.

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