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ASSESSMENT OF THE EFFECT OF A-PRF WITH BONE GRAFT AND WITHOUT BONE GRAFT IN IMMEDIATE IMPLANT PLACEMENT: AN ORIGINAL RESEARCH

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ABSTRACT

INTRODUCTION

The aim of this study was to compare and evaluate the clinical and radiographic results of bone graft using advanced platelet-rich fibrin (A-PRF) and bone graft without A-PRF in immediately placed implants with severe buccal bone defect**.**

MATERIALS AND METHODS

Thirty implants were placed in patients requiring immediate implant placement and having a buccal wall defect and randomly divided into two groups one receiving bone graft with A- PRF membranes and other receiving bone graft without A-PRF. The sites were grafted with bone-substitute material in both the groups. After 3 months, at the time of second-stage surgery, implant stability is measured by Osstell Mentor, crestal bone level on mesial and distal sides of implant by Grid intraoral periapical radiograph.

RESULTS

The results were insignificant and comparable in both the groups when comparison was made between the groups. The mean buccal defect, mean values of average ISQ, crestal bone level in both the groups at baseline and after 3 months were compared. No significant difference between both the groups was found after 3 months. Bone quality seemed to be equal in both groups but better results were found in cases with A-PRF. Within the limits of the study, both the groups had shown almost similar results in all criteria with better results in cases with A-PRF.

CONCLUSION

Within the limitation of the study, it can be concluded that both the treatment modalities are successful in terms of buccal defect reduction, stability, and increase in crestal bone level, but more better results were found in cases with A-PRF.

KEYWORDS: Bone Stability, bone graft, advanced-platelet-rich-fibrin.

INTRODUCTION

Dental implants have consolidated its place as being innovative and superior treatment feasibility as prosthodontic alternative to conventional fixed partial denture, resin-bonded restorations, cast partial dentures, or removal partial dentures[1]. The original protocol suggested a waiting period of 3–6 months for healing after tooth extraction before implant placement. The recent protocol namely "Immediate implant placement" precludes the waiting period. The success rate of immediate implant placement is 97.3%–99% which is comparable to the original technique and have added advantages such as preservation of alveolar bone and soft tissue; overall less treatment time, less number of appointments and patient's satisfaction.Schropp[2] et al.conducted a study, in which he reported reduction in width of the horizontal ridge up to 50% after 3 months of extraction. However, according to study carried out by Tan[3] et al., there was 32% reduction at 3 months and

29%–63% reduction horizontally at 6 months and vertically resorption was found between 11% and 22% in 6 months after extraction. Bone resorption occurs both buccolingually and apicocoronally and the first 3 months after extraction are very critical and bone resorption occurs at highest rate in this time. Placement of immediate implant has several advantages that improves patient acceptance and satisfaction and these includes elimination of the waiting period for socket ossification, fewer surgical sessions, shortened edentulous time period and total time period of treatment, reduced overall cost, and preservation of alveolar bone allowing for optimal placement of implant[4]. After the introduction of immediate implant placement as an acceptable procedure, many studies have been conducted to explore merit and demerit of this technique and how to increase its longevity of implant. The significance of thickness of the buccal bone wall is reported widely in literature and is considered as one of the most important factors in healthy and esthetically pleasing implant restoration. Although there are still discussions going on and controversies exists regarding the exact amount of the buccal wall thickness, but it has been advocated that at least 1–2 mm should exist to avoid vertical bone loss and subsequent loss of gingival soft tissue[5,6] . According to Huynh-Ba[7] et al, buccal wall thickness in anterior maxilla was <1 mm in 70%–80% population with at least 50% cases having fenestration and dehiscence defects of buccal wall[8] so in most of the clinical situations encountered, augmentation procedures are needed to achieve adequate bony contours around the implant. In many cases, tooth extraction is accompanied by severe loss of buccal wall of the tooth socket. In such cases, guided bone regeneration (GBR) procedure is suggested once the initial stability and optimal position of implant have been achieved. Advanced Platelet-rich fibrin (A-PRF) is the second generation of platelet derivative which is prepared in a single step and does not require any additives[9]. A-PRF provides a fibrin matrix enriched with platelets, leukocytes, and growth factors (GFs)[10]. The fibrin network provides efficient cell proliferation, migration, and acts as scaffold for tissue regeneration and restoration of bony defects[11]. The slow and sustainable release of GFs allows the A-PRF membrane to help in the faster wound healing process, early bone formation around implant thus helps in attaining osseointegration at faster rate and due to its strong fibrin matrix, it has the possibility to be used as natural barrier. The current literature is very limited when it comes to of comparative evaluation of A-PRF membrane in immediate implant with the buccal bone defect. However, the current study compares and evaluates the clinical and radiographic results of Bone graft using A-PRF in immediately placed implants with severe buccal bone defect (with respect to marginal bone level, implant stability quotient[12].

MATERIAL AND METHODS

In this study, total of 30 patients were randomly selected for immediate placement of implants for the study following the inclusion and exclusion criteria (Table 1). Randomization of the participants (fifteen in each group) was done. Patients who received immediate implant placement with Bone graft and A-PRF membrane were placed in Group 1 and immediate implant placement with bone graft and without A-PRF membrane were placed in Group 2. In both the groups, Fifteen patients were included and each patient received single implant. The average age of Group 1 was years (range: 21–45 years old) and Group 2 was years (range: 21–45 years old).

Table 1: Inclusion and Exclusion Criteria

Inclusion criteria	**Exclusion criteria**
Patients were at least 18 years of age	Any history of metabolic or systemic disease affecting the integration of implant or connective tissue health surrounding implant
Good oral hygiene and satisfactory periodontal status of the remaining dentition	History of irradiation in the headandneck area
Presence of a single failing tooth in anterior maxilla	Smokers
Patient who gave positive informed consent	Pregnant women
Patient were available for followup	Parafunctional habits such as bruxism, tongue thrust, and teeth clenching
	Untreated generalized periodontitis
	Psychiatric disorders or unrealistic expectations
	Acute infection (abscess) at the intended site for implant placement

RESULTS

In all the patients, postsurgical inconveniences were minimal after tooth extraction and implant placement procedure. All implants osseointegrated successfully and none of the implants failed during the study. There was slight postoperative pain and swelling in a few patients. Healing was uneventful except for two patient, in which cover screw was exposed. All the patients were evaluated clinically, radiographically according topredescribed parameters, at baseline and after 3 months. Results were good for both the groups but for cases with A-PRF showed more better results.

Table 2: Percentage buccal defect height reduction in Group 1 and Group 2

Group 1 (Bone graft with A-PRF)	Group 2 (Bone graft without A-PRF)
100	100
80.5	82.7
100	100
100	92.1
100	93.1
86.7	100
91.3	100
100	100

χ^2=6, *P*=0.423. A-PRF: Advanced-Plateletrich fibrin

DISCUSSION

The present study was undertaken to evaluate the effect of A-PRF membrane on bone formation in immediate implant placement over. A-PRF is second-generation platelet concentrate which is autologous in source and contains a large amount of platelets and leukocytes cytokines. A-PRF polymerize and form three-dimensional structure with platelet cytokines entrapped in fibrin mesh has shown to be advantageous for the bone graft healing process and angiogenesis[13]. According to Slater[14] et al. cytokines have mitogenic properties for osteoblastic cells and mediate the chemotaxis of undifferentiated mesenchymalstem cells to the cells of osteoblastic phenotype. In vitro study conducted by He L[15] et al., on rat osteoblasts have also shown that gradual release of autologous GFs by A-PRF have effect on proliferation and differentiation of rat osteoblasts. Gassling[16] et al. have concluded in his study that A-PRF is more suitable than the collagen membrane for periosteal cell cultivation in vitro and thus has the possibility to support bone graft healing in vivo. In the pool of available bone graft present currently, mainly the bone grafting materials are osteoconductive in nature, therefore, the use of A-PRF will be boon for a bone graft due to its osteoinductive properties. Several studies reported that A-PRF membrane releases vascular endothelial growth factor and transforming growth factor (TGF) which is crucial in provisional matrix formation and osteoblastic activity and releases maximum levels of TGF-β1 at day 14. The gradual release of cytokines and GFs present in A-PRF has shown to have great effects on the development of cells and extracellular matrix and thus may support new bone formation in bone grafts[17]. Radiographs are an important tool for the assessment of bone architecture and bone level changes. In implants as stress concentration occurs mainly in crestal bone, it is important to choose the imaging option that delineates small changes in crestal bone levels and can accurately reproduce repeatedly. The standardized periapical radiographs are particularly well-suited and preferred for longitudinal assessment of implant crestal bone loss and have minimal distortion[18]. Thus, the present study was undertaken to evaluate the "marginal bone level" changes around implants using the standardized grid intraoral periapical radiographs which were obtained through long cone paralleling technique assisted by customized radiographic film holders[19].The radiographs were made at Baseline (0 month), i.e., immediately after implant placement and then after 3 months, but before prosthetic loading[20]. In this study, the results were insignificant and comparable in both the groups when the comparison is done between the groups but when comparing the parameters in the same group over time, i.e., from baseline to 3rd month significant increase is there in buccal defect height reduction, ISQ, and crestal bone level. The mean buccal defect in Bone graft with A-PRF group is 8.36 ± 2.01 mm and in group with Bone graft and without A-PRF is 8.42 ± 2.07 mm at baseline and after 3 months it reduces to 0.22 ± 0.36 mm in A-PRF group and 0.12 ± 0.39 mm in without A-PRF group. It indicates that there is no difference in buccal defect reduction in both the groups with a highly significant percentage buccal defect reduction in all the participants but was found in A-PRF group[21]. When comparison is made in mean values of average ISQ in both the groups at baseline and after 3 months (31.68 ± 6.20 in A-PRF group and 33.06 ± 6.41 in without A-PRF group at baseline, 28.56 ± 2.52 in A-PRF group and 19.12 ± 2.78 in without A-PRF group after 3rd month), no significant difference between both the groups is found after 3 months. When comparison is made in mean

values of crestal bone level on mesial and distal side at baseline and at 3rd month between both the groups (crestal bone level mesially was −4.81 ± 1.57 mm in A-PRF group and −6.77 ± 1.27 mm in without A-PRF group at baseline and after 3 months 1.09 ± 0.76 mm and 0.01 ± 0.56 mm, respectively. Distally, it was −4.34 ± 2.96 mm in A-PRF group and −3.64 ± 2.56 mm in without A-PRF group at baseline, and after 3 months 1.17 ± 0.42 mm and 1.18 ± 0.30 mm, respectively, no significant change in crestal bone level is found indicating the equal effect of both treatment modalities. It clearly indicates that there was considerable increase in bone level over 3 months in both groups comparatively more with one in A-PRF group. After analyzing histological characteristics, all samples of both groups showed the presence of newly formed bone, residual graft particles, and connective tissue in greater or lesser amounts. The presence of newly formed bone, in direct contact with residual particles of each bone substitute material, indicated adequate osteoconductive capacity[22]. After 3 months, bone biopsy of both the groups revealed vital bone formation with osteocytes within the lacunae lined by osteoblasts. Vessels are seen in marrow spaces in both groups. In both groups, xenograft particles can be seen. Mineralization foci is more evident in Group 1.Within the limitation of the study, it can be concluded that both the treatment modalities are successful in terms of buccal defect reduction, stability, and increase in crestal bone level. Histological analysis showed vital bone formation in both groups. According to this study, there was no significant difference following implant placement with both treatment modalities which means that using A-PRF membranes alone with bone graft can be possible. There is considerable increase in bone level in both the treatment modalities so instead of going for delayed healing protocol, which leads to considerable bone loss after the remodeling of extraction socket immediate placement with grafting can be done effectively and prosthesis driven implantology can be practiced[23]. Using A-PRF as membrane has several advantages: autologous origin, gradual GF release, incorporating osseoinductive features to the grafted site, no anticoagulants and thrombin required in preparation, chair-side procedure, less time consuming, better workability, easier manipulation, no need of extra surgical appointment[24]. Although, both the treatment modalities are successful further research is required and clinical results need to be further validated and refined with long-term follow-up and larger number of participants.

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