Original Article

Evaluation of efficacy of platelet-rich fibrin membrane and bone graft in coverage of immediate dental implant in esthetic zone: An *in vivo* study

ABSTRACT

Objective: This study compared and evaluated the clinical and radiographic results of guided bone regeneration using platelet-rich fibrin (PRF) and collagen membrane as barrier membrane in immediately placed implants with severe buccal bone defect (with respect to marginal bone level, implant stability quotient [ISQ]), and histological analysis of new bone formation.

Materials and Methods: Sixteen implants were placed in patients requiring immediate implant placement and having a buccal wall defect and randomly divided into two groups one receiving PRF membranes and other collagen membrane. The sites were grafted with bone-substitute material in both the groups. After 4 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 digital intraoral periapical, buccal defect clinically by probe and histological analysis of biopsied bone.

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 4 months were compared. No significant difference between both the groups was found after 4 months. Bone quality seemed to be equal in both groups after histological analysis. Within the limits of the study, both the groups had shown similar results in all criteria.

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.

Keywords: Bone augmentation, bone regeneration, 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.

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%[1] 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.

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Schropp *et al*.[2] 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 *et al*.,[3] 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[4] 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.

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 literature, buccal wall thickness in anterior maxilla was <1 mm[7,8] 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.[1]

Platelet-rich fibrin (PRF) is the second generation of platelet derivative which is prepared in a single step and does not require any additives.[9] 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 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 in guided tissue regeneration.[11]

The current literature is very limited when it comes to of comparative evaluation of PRF membrane and collagen membrane in immediate implant with the buccal bone defect. However, the current study compares and evaluates the clinical and radiographic results of GBR using PRF and collagen membrane as barrier membrane in immediately placed implants with severe buccal bone defect (with respect to marginal bone level, implant stability quotient [ISQ]) as well as histological analysis of new bone formation.

MATERIALS AND METHODS

All patients willing to participate in the study signed an informed consent form. The study was approved by the university ethical clearance- EC Registration No. ECR/526/Inst/UP/2014 Dt.31.1.14- No. Dean/2015-16/EC/579. A total of 16 patients were randomly selected for immediate placement of implants for the study following the inclusion and exclusion criteria [Table 1]. Randomization of the participants (eight in each group) was done through the lottery system. Patients who received immediate implant placement and GBR with resorbable collagen membrane were placed in Group 1 and immediate implant placement and GBR with PRF membrane were in Group 2. In both the groups, eight patients were included and each patient received single implant and all in the anterior maxilla. The average age of Group 1 was years (range: 18–45 years old) and Group 2 was years (range: 21–45 years old).

Surgical procedure

Complete blood investigations were performed and after the diagnostic workout, informed consent has been obtained before the surgical procedure and initial periodontal therapy was done. Two gram of amoxicillin+ potassium clavulanate (augmentin) was given 1 h before surgery as a preoperative prophylactic antibiotic. Patients were asked to rinse with chlorhexidine mouth wash (0.2%) for 1 min before intervention.

Surgical area was scrubbed by betadine scrub and patients were draped. The surgical site was anesthetized by nerve block with local infiltration of 2% lignocaine with 1:80,000 adrenaline. Implant surgery was performed through a flapped approach. After adequate anesthesia was achieved, crestal incision along with releasing incision was given and full-thickness mucoperiosteal flap was raised. After

flap reflection, the root stump or the fractured tooth or hopeless tooth were traumatically extracted and the site was thoroughly debrided and irrigated with saline. Consequently, implants and cover screws (double piece, ADIN; Touareg™-S) were placed at respective sites. Implants threads were exposed in the defect area [Figure 1] (buccal wall defect) which was managed by application of particulate bone graft (cera bone granules; natural bovine bone graft, particle size 0.5–1.0 mm) and collagen membrane (Jason membrane, botiss dental, Berlin. Germany) in Group 1 and PRF membranes in Group 2 [Figures 2 and 3]. In between the surgical procedure, chairside procedure for fabrication of A-PRF was being carried out. Silica coated red cap tube of 10 ml without anticoagulant was used for A-PRF membrane formation. The patient's blood was withdrawn directly into tubes by vacutainers and tubes were transferred to the centrifugation machine (DUO Quattro PRF Centrifuge, Nice, France) for obtaining A-PRF. For obtaining A-PRF centrifugation was done at 1300 rpm for 8 min.[9] Three layers appeared into the tube: a red blood cell base at the bottom, acellular plasma as a supernatant (platelet-poor plasma), and the PRF clot in between these two. The clot was retrieved from the tubes, placed in the PRF box and transformed into a membrane. Bone was placed into the defects and covered with collagen membrane in Group 1 and PRF membranes in Group 2 sequentially with primary closure (interrupted sutures were performed by 3-0 silk suture). Postoperative instructions were given and the patient was prescribed antibiotics, analgesics, anti-inflammatory and chlorhexidine mouth rinses for 7 days. Patients were recalled after 1 day for follow-up and after 7 days for suture removal and further evaluation. Four months after implant placement, second-stage surgery was done by flapped approach, bone biopsy was performed and onlay bone grafting was done at the biopsied site. Cover screw was removed, and healing cap was placed for 2 weeks to allow soft-tissue healing.

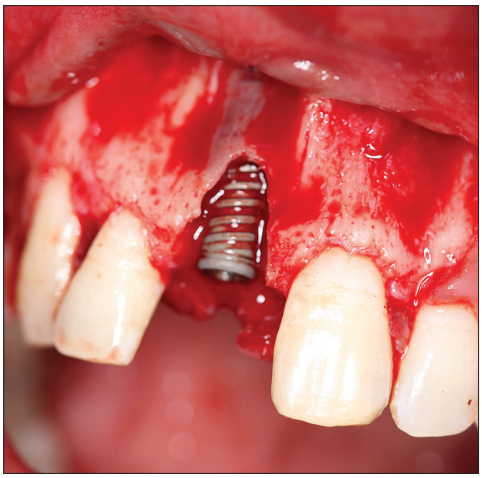


Figure 1: Exposed threads after implant insertion

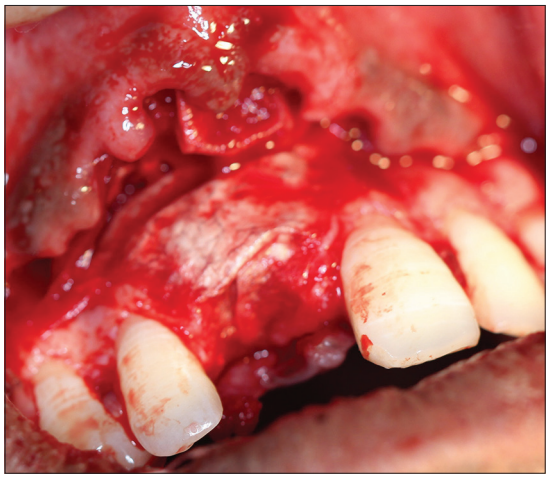


Figure 2: Bone graft is covered by collagen membrane in Group A

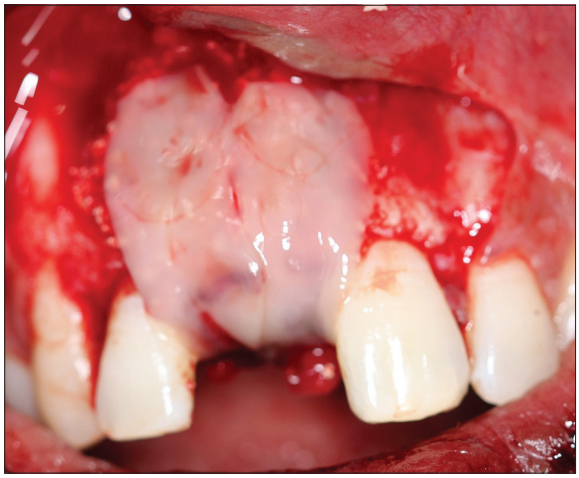


Figure 3: Bone graft is covered by multi-layered platelet-rich fibrin membranes in Group B

Implant stability quotient

Resonance frequency analysis, using Osstell Mentor (Osstell AB, Gothenburg, Sweden), was performed to evaluate the primary stability of implants before bone grafting in the first-stage surgery and at the time of second-stage surgery [Figure 4]. At both the time, baseline and at 4th-month ISQ buccolingually (BL), mesiodistally was taken, and their average was calculated. Percentage increase in average ISQ in Group 1 (using collagen as membrane) and Group 2 (using PRF as membrane) was also calculated.

Bone defect evaluation method

Bone defect height was evaluated using a plastic periodontal probe on the buccal surface of implant [Figure 5]. The vertical height measured in the first-stage surgery is noted as Baseline and at second stage is noted as after 4th month for both the groups. Percentage buccal defect height reduction is calculated according to the following formula:-

Percentage (%) defect height reduction[12] = ([preoperative bone level {baseline}-bone defect at surgical exposure in the second surgery {after 4 months}]/preoperative bone level {baseline}) × 100.

Peri-implant bone level analysis

To measure the peri-implant bone changes, peri-apical radiographs were taken both at the time of implant placement [Figure 6] and 4 months after placement [Figure 7]. All periapical radiographs were obtained using a digital intraoral sensor (Sirona Dental system, Bensheim, Germany) and an X-ray positioner. An individually customized positioning jig [Figure 8] was fabricated for each patient using acrylic resin to stabilize intraorally the paralleling device, making it possible to achieve standardized serial radiographs. The marginal bone level was measured using the Sirona software (SIDEXISXG, SironaDental, Inc. 2016, LongIsland City, Newyork, USA). This was the same software that was used to obtain the digital radiographs and images were calibrated with the known size of implant thus no image size distortion was generated. Vertical measurements were taken from the mesial and the distal shoulder of the implant to the first bone-implant contact in an axis parallel to the implant. A positive numerical value was recorded when the first bone-implant contact was higher than the implant shoulder, and a negative numerical value was recorded if the contact was lower than the implant shoulder. The data collected at the time of implant placement were used as the baseline value. Analysis of the peri-implant bone change was computed using image analysis software.

Histological examination

Bone biopsies were collected using trephines [Figure 9] (Salvin Dental Specialities, Charlotte, North Carolina) of 4-mm diameter under copious irrigation. Bone biopsies obtained were carefully rinsed for 30–40 s with normal saline to remove blood. The specimens were then placed in Eppendorf tubes with an adequate volume of 10% formalin solution for 24 h.

The specimens were dehydrated with a graded series of alcohol (Isopropyl alcohol), 70% alcohol for 1 h, 95%

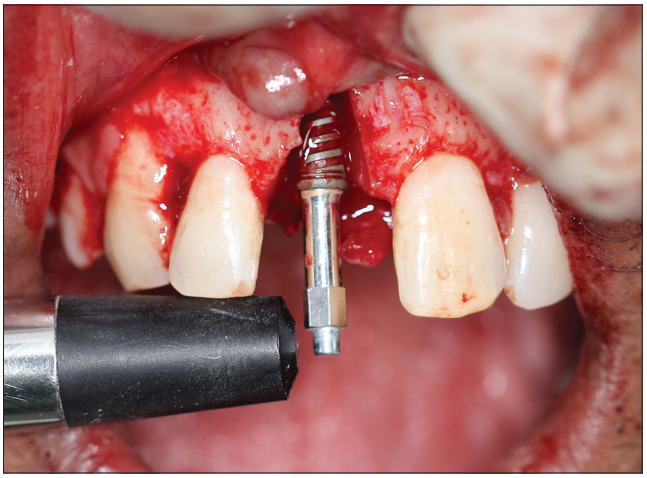


Figure 4: Measurement of implant stability by ostell Mentor

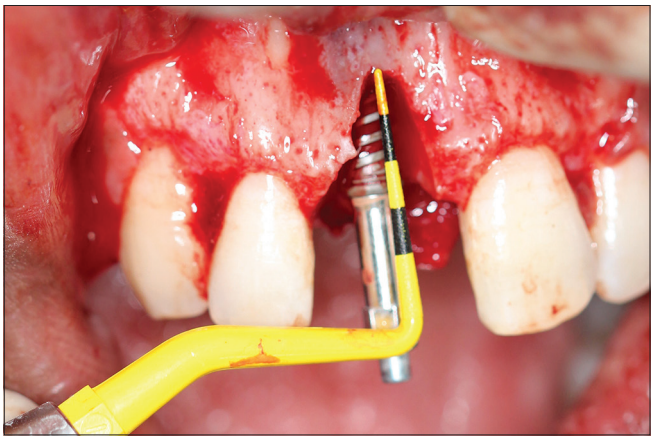


Figure 5: Measurement of buccal defect after implant placement

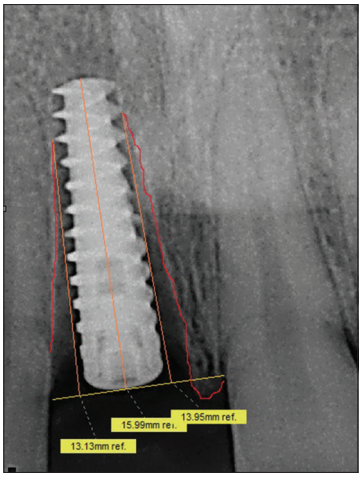


Figure 6: Measurement in intraoral periapical at baseline

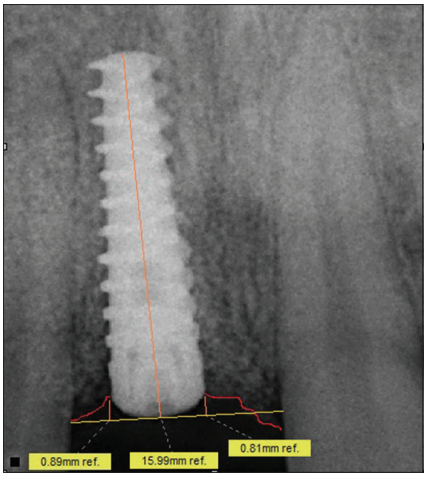


Figure 7: Measurement in intraoral periapical after 4 months

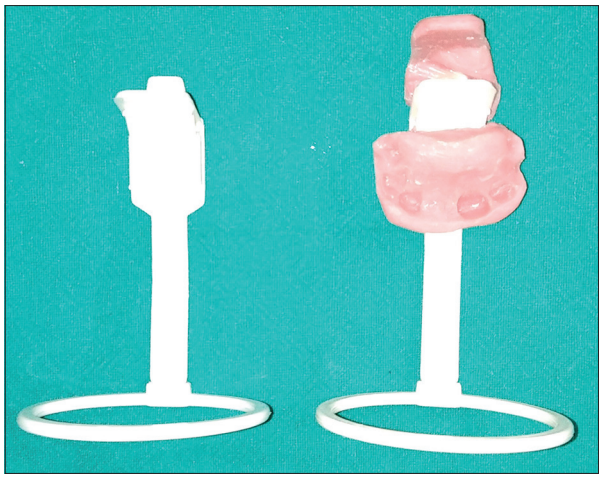


Figure 8: Customized occlusal Jig

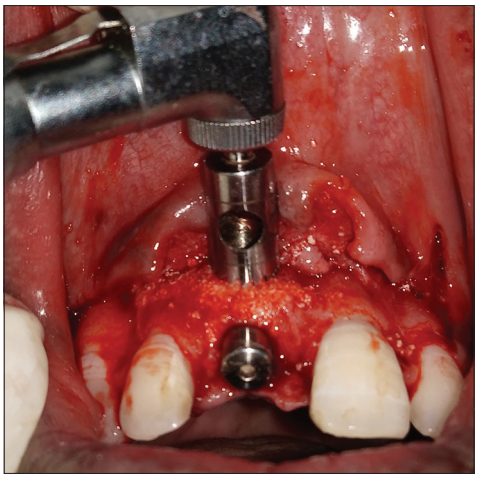


Figure 9: Biopsy of bone tissue after 4 months by trephine

alcohol for 1 h, and 100% alcohol for 2 h (2 changes). Then, the specimens were kept in xylene for 3 h (2 changes). Finally, specimens were impregnated with paraffin wax for 8 h (wax bath) and block preparation was done. After the block preparation, 4.5 µm sections were prepared using a semiautomatic microtome. The sections were stained with hematoxylin and eosin, and mounting was done. The investigation was conducted in a transmitted bright field microscope (Nikon eclipse Ci,) connected to high-resolution digital cameras (Nikon DS Fi2).

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 one patient, in which cover screw was exposed. All the patients were evaluated clinically, radiographically according to predescribed parameters, and histological examination was also done using bone tissue biopsy at the second-stage surgery (after 4 months).

Group 1 (collagen membrane group)

The buccal defect height at the time of implant placement (baseline) ranged from 4 to 12 mm (mean = 7.35 mm, standard deviation [SD] = 3.01); at second-stage surgery, it was 0–1 mm (mean = 0.32 mm, SD 0.46) [Table 2 and Graph 1]. Percentage buccal defect height reduction varies from 85.7% to 100% [Table 3 and Graph 2].

ISQ mesiodistally ranged from 32 to 69 (mean = 47.62, SD = 13.42) at baseline and ranged 66–72 (mean = 70.12, SD = 1.88) at second-stage surgery. ISQ buccolingually ranged from 28 to 45 (mean = 35.75, SD = 5.17) at baseline and ranged 65–69 (mean = 67, SD = 1.51) at second-stage surgery. Average ISQ ranged from 34.5 to 40.5 (mean = 41.68, SD = 7.2) at baseline and ranged 65.5–71.5 (mean = 68.56, SD = 1.52) at second-stage surgery [Table 4 and Graph 3].

Crestal bone level mesially ranged from −3 to −10 mm from the reference line (mean ± SD = −5.81 ± 2.57) at baseline

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 head-and-neck area
Presence of a single failing tooth in anterior maxilla	Smokers
Patient who gave positive informed consent	Pregnant women
Patient were available for follow-up	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

Table 2: Inter group comparison of buccal defect (in mm) at baseline and 4th month

Parameter	Time interval	Group	Mean±SD	*t*	*P*
Buccal defect	Baseline	Collagen	7.35±3.01	−0.06	0.95
		PRF	7.43±2.47		
	4 months	Collagen	0.32±0.46	0.00	1
		PRF	0.32±0.49		

Unpaired or independent *t*-test, nonsignificant difference ($P>0.05$), significant difference ($P\leq0.05$), highly significant difference ($P\leq0.01$). SD: Standard deviation, PRF: Platelet-rich fibrin

and ranged −0.5–1.5 mm (mean ± SD = 0.09 ± 0.76) at second-stage surgery. Crestal bone level distally ranged from −1.4 to −9.76 mm (mean ± SD = −5.34 ± 2.96) at baseline and ranged −0.4–1 mm (mean ± SD = 0.17±0.42) at second-stage surgery [Table 5 and Graph 4].

Group 2 (platelet-rich fibrin membrane group)

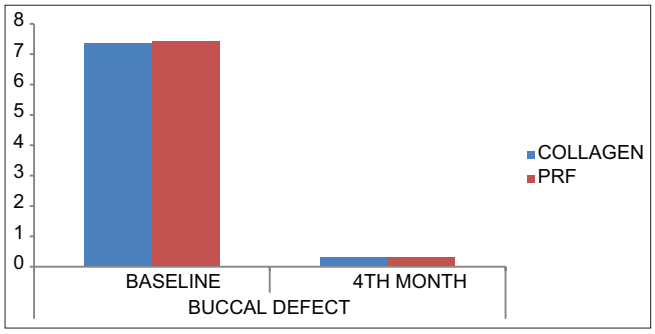
The buccal defect height at the time of implant placement (baseline) ranged from 3 to 11 mm (mean = 7.43 mm, SD = 2.47); at second-stage surgery, it was 0–1.3 mm (mean = 0.32 mm, SD = 0.49) [Table 2 and Graph 1]. Percentage buccal defect height reduction varies from 83.7%–100% [Table 3 and Graph 2].

ISQ mesiodistally ranged from 42 to 71 (mean = 51.87, SD = 10.32) at baseline and ranged 69–72 (mean = 71.12, SD = 1.55) at second-stage surgery. ISQ Buccolingually ranged from 22 to 51 (mean = 34.25, SD = 8.27) at baseline and ranged 64–71 (mean = 67.12, SD = 2.64) at second-stage surgery. Average ISQ ranged from 38.5 to 61 (mean = 43.06, SD = 7.41) at baseline and ranged 66.5–71.5 (mean = 69.12, SD = 1.78) at second-stage surgery [Table 4 and Graph 3].

Crestal bone level mesially ranged from −2.9 to −12.67 mm from the reference line (mean ± SD= −5.7 ± 3.27) at baseline and ranged −0.7–0.3 mm (mean ± SD = 0.03 ± 0.56) at second-stage surgery. Crestal bone level distally ranged from −2.9 to −13.08 mm (mean ± SD = −5.64 ± 3.56) at baseline and ranged 0–0.8 mm (mean ± SD = 0.18 ± 0.30) at second-stage surgery [Table 5 and Graph 4].

Histological analysis

When analyzing their histological characteristics, all samples of both the 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.[13,14]



Graph 1: Comparison of buccal wall defect at baseline (implant placement) and at 4th month (at second-stage surgery) between the group using collagen membrane and the group using platelet-rich fibrin membrane

After 4 months of bone biopsy of both the groups revealed vital bone formation with osteocytes within the lacunae lined by osteoblasts[13,14] [Figures 10 and 11]. 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 (collagen membrane group).

DISCUSSION

The present study was undertaken to evaluate the effect of PRF membrane on bone agumentation in immediate

Table 3: Percentage buccal defect height reduction in Group 1 (using collagen as membrane) and Group 2 (using platelet-rich fibrin as membrane)

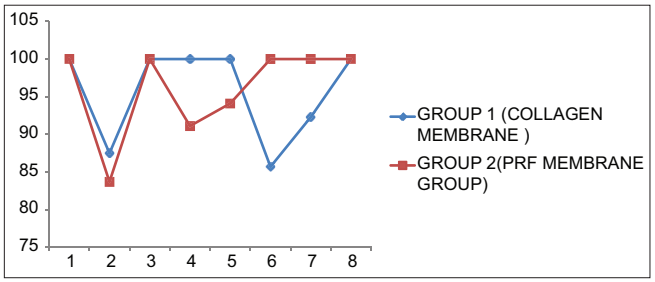
Group 1 (collagen)	Group 2 (PRF)
100	100
87.5	83.7
100	100
100	91.1
100	94.1
85.7	100
92.3	100
100	100

χ^2=6, P=0.423. PRF: Platelet-rich fibrin

Table 4: Inter group comparison of implant stability quotient at baseline and 4th month

Parameter	Time interval	Group	Mean±SD	*t*	*P*
ISQ mesiodistal	Baseline	Collagen	47.62±13.42	0.71	0.49
		PRF	51.87±10.32		
	4 months	Collagen	70.12±1.88	−1.15	0.26
		PRF	71.12±1.55		
ISQ buccolingual	Baseline	Collagen	35.75±5.17	0.435	0.67
		PRF	34.25±8.27		
	4 months	Collagen	67.00±1.51	−0.11	0.90
		PRF	67.12±2.64		
ISQ average	Baseline	Collagen	41.68±7.20	−0.37	0.71
		PRF	43.06±7.41		
	4 months	Collagen	68.56±1.52	−0.67	0.50
		PRF	69.12±1.78		

Unpaired or independent *t*-test, nonsignificant difference ($P>0.05$), significant difference ($P\leq0.05$), highly significant difference ($P\leq0.01$). SD: Standard deviation, PRF: Platelet-rich fibrin, ISQ: Implant stability quotient



Graph 2: Distribution of % buccal defect height reduction in Group 1 (collagen membrane group) and Group 2 (platelet-rich fibrin membrane group)

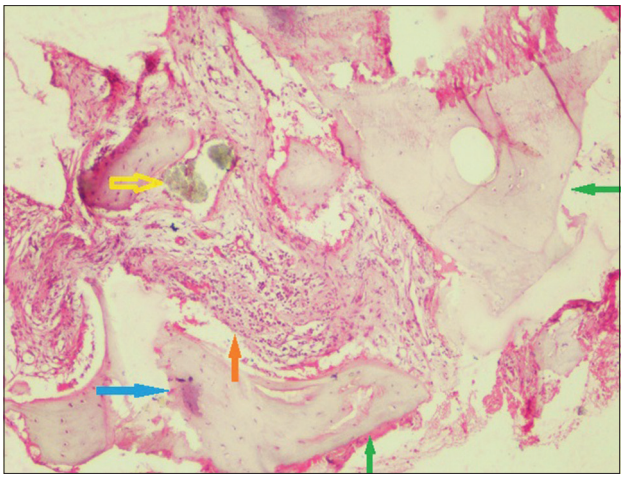


Figure 10: New bone (green arrows) enclosing the xenograft's particles (yellow arrow), that appeared partially degraded by the histological process. Mineralization foci (blue arrow) dark purple stain and supporting connective tissue stroma (orange arrow). H and E stain; ×10 (collagen group)

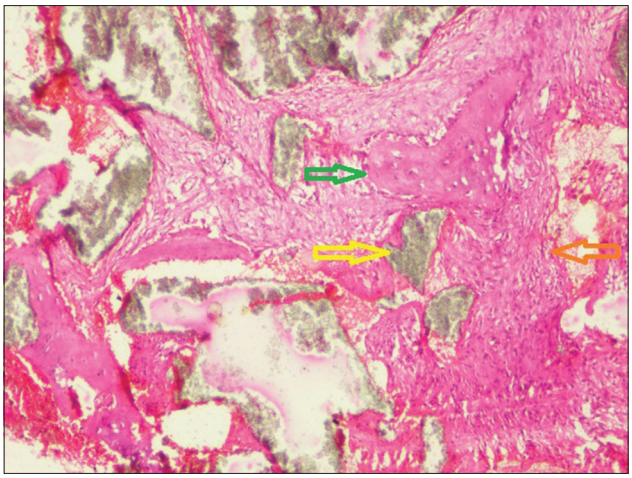
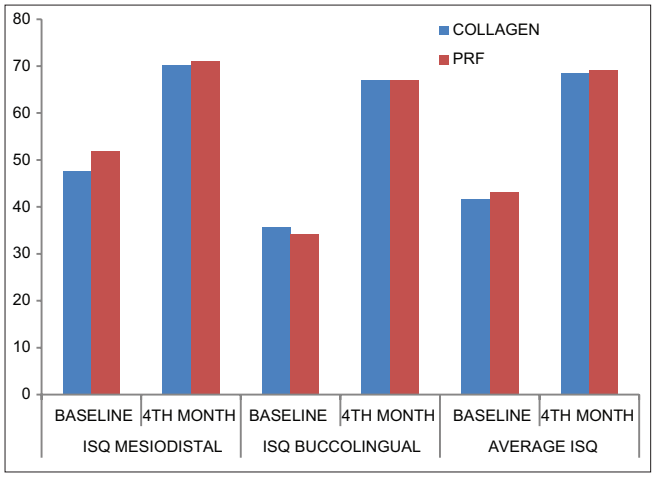
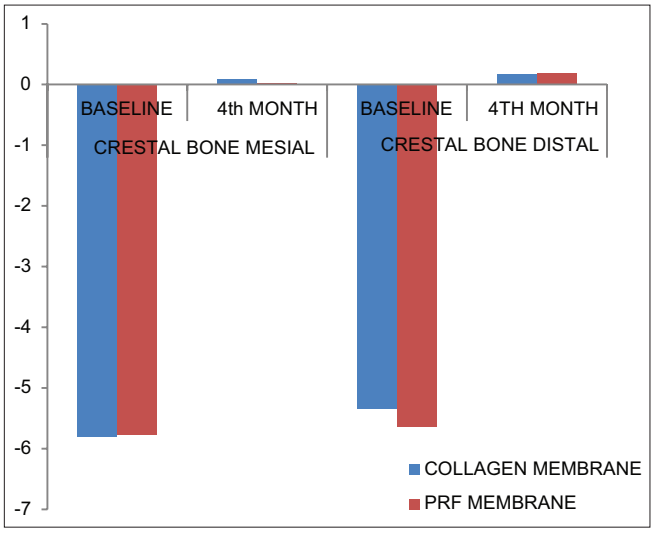


Figure 11: New bone (green arrows) enclosing the xenograft's particles (yellow arrow), that appeared partially degraded by the histological process. Supporting connective tissue stroma (orange arrow). H and E stain; ×10 (platelet-rich fibrin group)



Graph 3: Comparison of implant stability quotient (buccolingual, mesiolingual, and average of both) at baseline (implant placement) and at 4th month (at second-stage surgery) between the group using collagen membrane and the group using platelet-rich fibrin membrane



Graph 4: Comparison of crestal bone height (mesially and distally) at baseline (implant placement) and at 4th month (at second-stage surgery) between the group using collagen membrane and the group using platelet-rich fibrin membrane

Table 5: Inter group comparison of crestal bone level (mm) at baseline and 4 months

Parameter	Time interval	Group	Mean±SD	*t*	*P*
Crestal bone mesial	Baseline	Collagen	−5.81±2.57	−0.02	0.91
		PRF	−5.77±3.27		
	4 months	Collagen	0.09±0.76	0.18	0.85
		PRF	0.03±0.56		
Crestal bone distal	Baseline	Collagen	−5.34±2.96	0.18	0.85
		PRF	−5.64±3.56		
	4 months	Collagen	0.17±0.42	−0.06	0.94
		PRF	0.18±0.30		

Unpaired or independent *t*-test, nonsignificant difference ($P>0.05$), significant difference ($P\leq0.05$), highly significant difference ($P\leq0.01$). SD: Standard deviation, PRF: Platelet-rich fibrin

implant placement over the collagen membrane which is considered as the gold standard in the GBR procedure.

PRF is second-generation platelet concentrate which is autologous in source and contains a large amount of platelets and leukocytes cytokines. 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[6] and angiogenesis. According to Slater *et al*. cytokines have mitogenic properties for osteoblastic cells[15] and mediate the chemotaxis of undifferentiated mesenchymal stem cells to the cells of osteoblastic phenotype.[16] *In vitro* study conducted by He L *et al*., on rat osteoblasts have also shown that gradual release of autologous GFs by PRF have effect on proliferation and differentiation of rat osteoblasts.[17] Gassling *et al*. have concluded in his study that 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*.[18] In the pool of available bone graft present currently, mainly the bone grafting materials are osteoconductive in nature, therefore, the use of PRF will be boon for a bone graft due to its osteoinductive properties. Several studies[9,11,17,19] reported that 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 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.[19]

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.[20] The standardized periapical radiographs are particularly well-suited and preferred for longitudinal assessment of implant crestal bone loss[21] and have minimal distortion.[22]

Thus, the present study was undertaken to evaluate the "marginal bone level" changes around implants using the standardized periapical radiographs which were obtained through long cone paralleling technique assisted by coustomized radiographic film holders.[21,23-25] The radiographs were made at Baseline (0 month), i.e., immediately after implant placement and then after 4 months, but before prosthetic loading.[26]

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 4th month significant increase is there in buccal defect height reduction, ISQ, and crestal bone level. The mean buccal defect in collagen group is 7.35 ± 3.01 mm and in PRF group is 7.43 ± 2.47 mm at baseline and after 4 months it reduces to 0.32 ± 0.46 mm in collagen group and 0.32 ± 0.49 mm in 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.

When comparison is made in mean values of average ISQ in both the groups at baseline and after 4 months (41.68 ± 7.20 in collagen group and 43.06 ± 7.41 in PRF group at baseline, 68.56 ± 1.52 in collagen group and 69.12 ± 1.78 in PRF group at 4th month), no significant difference between both the groups is found after 4 months.

When comparison is made in mean values of crestal bone level on mesial and distal side at baseline and at 4th month between both the groups (crestal bone level mesially was −5.81 ± 2.57 mm in collagen group and −5.77 ± 3.27 mm in PRF group at baseline and after 4 months 0.09 ± 0.76 mm and 0.03 ± 0.56 mm, respectively. Distally, it was −5.34 ± 2.96 mm in collagen group and −5.64 ± 3.56 mm in PRF group at baseline, and after 4 months 0.17 ± 0.42 mm and 0.18 ± 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 4 months in both groups.

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. After 4 months, bone biopsy of both the groups revealed vital bone formation with osteocytes within the lacunae lined by osteoblasts.[13,14] 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 (collagen membrane group).

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. 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 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. Using 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.[27]

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.

Disclaimers

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Conflicts of interest

There are no conflicts of interest.

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