ORIGINAL RESEARCH

Assessing The Efficacy Of L-Prf In Immediate Implant Placement Procedure: A Clinical Study

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ABSTRACT

Background: L-PRF or leucocyte-platelet-rich fibrin membrane is a newer platelet concentrate that is recently being accepted widely as an autologous healing biomaterial having properties of promoting healing and angiogenesis in sites with immediate implant placement.

Aim: The present clinical study aimed to assess the soft-tissue and hard-tissue outcomes after immediate implant placement in sites with or without the use of L-PRF.

Methods: The present clinical study assessed 36 sites of immediate implant placement that were randomly divided into two groups having 18 implants each where Group I had additional L-PRF and Group II did not use L-PRF with immediate implant placement. A definitive restoration was given at all the sites after 3 months of implant placement and subjects were assessed at 6 months follow-up.

Results: Statistically non-significant better results were seen after using L-PRF at extraction socket sites of immediate implant placement compared to sites without the use of L-PRF concerning the radiographic and clinical parameters.

Conclusion: The present study concludes that using L-PRF in immediate implant placement sites depicted marginally better results compared to the extraction sites where no L-PRF was used with immediate implant placement.

Keywords: Immediate implant placement, implant success, PRF, L-PRF, tissue biotype.

INTRODUCTION

The most advanced and widely accepted method of replacing missing teeth is a dental implant. A continuous advancement has been seen in techniques and technologies for implant placement where immediate implant placement has been widely accepted and adopted technique owing to it significantly reducing the treatment time. Schulte and Heimke in 1976 first described the immediate implant placement in the fresh extraction sockets. Presently, immediate implant placement is used widely and is well-accepted as it has various advantages including short treatment duration and better soft-tissue esthetics along with the lesser number of surgical interventions needed.[1] In a fresh extraction socket, immediate implant placement can lead to a gap in the socket wall and implant surface which can be attributed to differences in the morphology of the extraction socket, the shape of the extraction socket, and the difference in the implant size. Remodeling of the alveolus in later stages can lead to resorption of the alveolar bone that can leave some gaps and can lead to implant exposure leading to poor esthetic outcomes. The gaps of less than 2 mm heal on their own, however, the gaps >2mm might need barrier membranes, bone grafts, or a combination of both to get acceptable healing following implant placement.[2] To attain better success in cases of immediate implant placement, various modified techniques of the surgeries have been used along with different augmentation procedures as used of PRP (platelet-rich plasma), bone substitutes, and autografts which have shown different degrees of drawbacks and advantages.[3] Among platelet concentrates, another regenerative material enhancing and promoting the healing process of the alveolus post-extraction is L-PRF (Leukocyte-platelet-rich fibrin). L-PRF is being widely accepted globally for various oral surgical procedures with high acceptance in alveolar ridge preservation cases.[4] As L-PRF is a second-generation platelet concentrate that has most of the platelet aggregates along with growth factors and

leucocytes. L-PRF results in better healing owing to its property of slow-releasing growth factors from the fibrin matrix. L-PRF can also act as a bio-barrier as it had a unique membrane-forming ability that helps in adequate socket preservation. L-PRF has added advantages of being quickly prepared, autologous, and inexpensive.[5] However, the existing literature data is scarce for the use of L-PRF as a biomaterial in cases of immediate implant placement. Hence, the present clinical study aimed to assess the soft-tissue and hard-tissue outcomes after immediate implant placement in sites with or without the use of L-PRF.

MATERIALS AND METHODS

The present randomized controlled clinical study was aimed to assess the soft-tissue and hard-tissue outcomes after immediate implant placement in sites with or without the use of L-PRF. The study population was recruited from the Department of Periodontology & Implantology, Yogita Dental College and Hospital, Khed, Ratnagiri, Maharashtra taking oral and written informed consent from all the participating subjects. The study included 36 subjects from both genders that had to get immediate implant placement. The inclusion criteria for the study were subjects with no scute infection at the immediate implant placement site, had dense, cortical, and porous alveolar bone at the site of immediate implant placement, aged between 18-70 years, and gave consent for study participation. The sites taken for immediate implant placement were sites that required extraction for root resorptions, grossly carious roots, and/or having root fractures. The exclusion criteria were subjects with periapical pathologies, traumatic occlusion, systemic diseases affecting implant placement or osseointegration, tobacco chewers, current smokers, and subjects with poor oral hygiene. The subjects were randomized using the software.In all 36 subjects, the implants were placed by a single operator expert in the field. The diameter of the placed implant was between 3.75mm to 5mm. Study casts were made for all the subjects and preoperative radiographs were taken including orthopantomography and periapical radiograph to assess the sufficient distance available in the floor of the nose and bone coronal to the maxillary sinus, bone height and width, bone quantity, bone quality, bone shape, and availability of native bone. After final inclusion, the subjects underwent phase I periodontal therapy including scaling, root planing, and polishing before implant placement followed by oral hygiene instructions. Plaque control was practiced by all the subjects and plaque index scores were <1.The 36 sites were then randomly divided into two groups where in Group I subjects, in 18 sites immediate implants were placed along with the use of L-PRF, and in Group II, immediate implants were placed in 18 sites without the use of L-PRF membrane. L-PRF was prepared using 10 ml autologous venous blood collected under strict aseptic and sterile protocol. The collected blood was subjected to centrifugation for 12 minutes at 2700 rpm. To get L-PRF of uniform thickness, the clot was placed on a box and compressed with the lid for 1 minute. The surgical procedure was identical for all the subjects and was done under 2% lignocaine with 1:80,000 adrenaline for nerve blocks based on the site being treated. After administration of local anesthesia, the teeth were extracted using the minimal traumatic technique to hard and soft tissues and preserve the lingual and buccal cortical plates. with either Piezotome or forceps. Curettage was done and the socket was irrigated with normal saline to remove any remaining bone chips or debris. Drilling needed beyond the root was assessed by measuring the socket depth. Drilling was done with a surgical drill guide at 600-800 rpm with copious irrigation. After sequential drilling and preparation of the osteotomy site, implants were placed 2-3 mm apical to the apex to attain good primary stability.[6] Implant width and length for each site were assessed with clinical parameters and radiographs. The implants were seated completely to place the coronal implant collar at or below the crestal bone level and the cover screw was placed. The gap between the socket wall and the implant was filled with L-PRF in Group I subjects additionally followed by suturing. Antibiotics and NSAIDs were given for 5 days to all the subjects of both groups. The sutures were removed on day 10th. Various radiographic and clinical features were assessed at 1, 3, and 6 months following Oncu and Erbeyoglu in 2019.[7] The second-stage surgery was done after 3 months, and gingival former was placed followed by prosthesis delivery. The outcomes assessed primarily were radiolucency, peri-implant bone loss, and tissue biotype. At the site of implant placement, local anesthesia was administered and an endodontic reamer was used to assess tissue thickness measured from the external mucosal surface to bony resistance. The thick and thin tissue biotypes were considered for soft-tissue thickness of <2 and >2mm following Bhat PR in 2015.[8] Implant health was indicated by marginal bone around implants. Postoperative radiographs were taken to assess marginal bone loss between the coronal level of bone on radiographs and the fixture-abutment junction. Bone loss was assessed in mm. Peri-implant radiolucency was marked as 0 and 1 where o denoted no radiolucency at implant contact or bone site and 1 depicted radiolucency at bone and implant contact site.[9] The secondary outcomes assessed were implant stability and peri-implant pocket depth. The pocket depth was measured at 4 sites including lingual, buccal, distal, and mesial in mm using Williams periodontal probe from Hu-Friedy®. The depth was assessed from the gingival margin to the base of the gingival sulcus. Mobility was assessed with a clinical implant mobility scale of 2008.[10] The data gathered were analyzed statistically using SPSS software version 21.0 (IBM Corp., NY,

USA) with Chi-square and t-test. The level of significance was kept at $p<0.05$.

RESULTS

The present randomized controlled clinical study was aimed to assess the soft-tissue and hard-tissue outcomes after immediate implant placement in sites with or without the use of L-PRF. The study assessed 36 subjects and all the subjects completed the follow-up for 6 months. For tissue biotype, it was seen that at baseline, tissue biotype was comparable in two groups with p=0.774. At 1 month follow-up, the tissue biotype in Group I with L-PRF was 1.69±0.89 which was unchanged since baseline and in Group II was 1.35±0.52 which was lesser than at baseline. The difference between the two groups at 1-month follow-up was non-significant with p=0334. At 3 months follow-up, the difference was non-significant in the two groups with p=0.277. At 6 months follow-up, the difference was non-significant with increased tissue thickness in both Groups I and II (Table 1). The probing depth at 3 months was 1.73±0.52 mm in Group I, where L-PRF was used, whereas, in Group II, at 3 months, the probing depth was 1.65±0.47 which was non-significantly lesser than Group I with p=0.724. At 6 months, the probing depth in the L-PRF group increased non-significantly from baseline to 1.94±0.67, whereas, in Group II, where probing depth increased to 2.03±0.63. the difference between the two groups was statistically non-significant with p=0.796 as shown in Table 2.On assessing the marginal bone loss, at baseline, marginal bone loss was comparable in the two groups with p=0.657. At 1 month, marginal bone loss was higher in Group I where L-PRF was used with 0.55±0.54mm compared to 0.49±0.44mm in Group II where L-PRF was not used. The difference was statistically non-significant with p=0.814. At 3 months, a non-significantly higher bone loss was seen without L-PRF compared to Group I with L-PRF use with p=0.483. At 6 months, the marginal bone loss was higher in Group II compared to Group I with p=0.325 as depicted in Table 3. Concerning the comparison of implant stability in two groups of study subjects at different time intervals, it was seen that at baseline, implant stability was similar in the two groups which were 0.13±0.35 with p=1.000. At 3 months, stability was higher in Group I with 0.46±0.75 and was lesser in Group II with 0.24±0.46. The difference was statistically non-significant with p=0.424. At 6 months follow-up, implant stability was similar in the two groups with 0.35±0.52 and p=1.000 (Table 4).On the radiographic assessment, at baseline, radiolucency scores were 0 and 1 in 88.8% (n=16) and 11.1% (n=2) study subjects respectively in both groups I and II with and without L-PRF use. At 1 month follow-up, periapical radiolucency scores were 0 in 88.8% (n=16) and 1 in 11.1% (n=2) subjects, and 0 and 1 in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group II which was comparable with p=0.54. At 3 months follow-up, periapical radiolucency scores were zero in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group I and 0 and 1 in 66.6% (n=12) and 33.3% (n=6) subjects from Group II respectively which was non-significant with p=0.57. At 6 months follow-up, periapical radiolucency scores were zero in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group I and were 1 in 66.6% (n=12) and 33.3% (n=6) subjects from Group II respectively. The difference was non-significant statistically with p=0.57 as shown in Table 5.

Tissue biotype	Group I (Mean ± S. D)	Group II (Mean ± S. D)	p-value
Baseline	1.69±0.89	1.58±0.75	0.774
1 month	1.69±0.89	1.35±0.52	0.334
3 months	1.87±0.95	1.46±0.75	0.277
6 months	2.02±0.89	1.58±0.75	0.257

Table 1: Comparison of tissue biotypes in two groups of study subjects at different time intervals

Probing depth	Group I	Group II	p-value
3 months	1.73±0.52	1.65±0.47	0.724
6 months	1.94±0.67	2.03±0.63	0.796

Table 2: Comparison of peri-implant probing depth in two groups of study subjects at 3 and 6 months

Marginal bone loss	Group I	Group II	p-value
Baseline	0.28±0.26	0.22±0.27	0.657
1 month	0.55±0.54	0.49±0.44	0.814
3 months	0.66±0.47	0.83±0.44	0.483
6 months	0.68±0.55	0.95±0.53	0.325

Table 3: Comparison of marginal bone loss in two groups of study subjects at baseline, 3 and 6 months

Implant stability	Group I	Group II	p-value
Baseline	0.13±0.35	0.13±0.35	1.000

3 months	0.46±0.75	0.24±0.46	0.424
6 months	0.35±0.52	0.35±0.52	1.000

Table 4: Comparison of implant stability in two groups of study subjects at 3 and 6 months

Radiolucency	Score	Group I n=18 (%)	Group II n=18 (%)	p-value
Baseline	0	16 (88.8)	16 (88.8)	1.00
	1	2 (11.1)	2 (11.1)	
1 month	0	16 (88.8)	14 (77.7)	0.54
	1	2 (11.1)	4 (22.2)	
3 months	0	14 (77.7)	12 (66.6)	0.57
	1	4 (22.2)	6 (33.3)	
6 months	0	14 (77.7)	12 (66.6)	0.57
	1	4 (22.2)	6 (33.3)	

Table 5: Comparison of peri-Implant radiolucency in two groups of study subjects at baseline, 3 and 6 months

DISCUSSION

The present clinical study assessed 36 subjects and all the subjects completed the follow-up for 6 months. For tissue biotype, it was seen that at baseline, tissue biotype was comparable in two groups with p=0.774. At 1 month follow-up, the tissue biotype in Group I with L-PRF was 1.69±0.89 which was unchanged since baseline and in Group II was 1.35±0.52 which was lesser than at baseline. The difference between the two groups at 1-month follow-up was non-significant with p=0334. At 3 months follow-up, the difference was non-significant in the two groups with p=0.277. At 6 months follow-up, the difference was non-significant with increased tissue thickness in both Groups I and II. These results were similar to the studies of Edward J et al[11] in 2017 and Thumati P et al[12] in 2013 where authors reported similar changes in tissue biotype in immediate loading implants It was seen that the probing depth at 3 months was 1.73±0.52 mm in Group I, where L-PRF was used, whereas, in Group II, at 3 months, the probing depth was 1.65±0.47 which was non-significantly lesser than Group I with p=0.724. At 6 months, the probing depth in the L-PRF group increased non-significantly from baseline to 1.94±0.67, whereas, in Group II, where probing depth increased to 2.03±0.63. the difference between the two groups was statistically non-significant with p=0.796. These results were consistent with the previous findings of Naveau A et al[13] in 2019 and Nashar AA et al[14] in 2016 where probing depth alterations comparable to the present study were reported by the authors in their respective studies. The study results showed that the marginal bone loss, at baseline, marginal bone loss was comparable in the two groups with p=0.657. At 1 month, marginal bone loss was higher in Group I where L-PRF was used with 0.55±0.54mm compared to 0.49±0.44mm in Group II where L-PRF was not used. The difference was statistically non-significant with p=0.814. At 3 months, a non-significantly higher bone loss was seen without L-PRF compared to Group I with L-PRF use with p=0.483. At 6 months, the marginal bone loss was higher in Group II compared to Group I with p=0.325. These results were in agreement with the studies of Wang X et al[15] in 2017 and Del Corso M et al[16] in 2012 where authors reported that marginal bone loss in immediate loading implants with PRF was comparable to the results of the present study. On the comparison of implant stability in two groups of study subjects at different time intervals, it was seen that at baseline, implant stability was similar in the two groups which were 0.13±0.35 with p=1.000. At 3 months, stability was higher in Group I with 0.46±0.75 and was lesser in Group II with 0.24±0.46. The difference was statistically non-significant with p=0.424. At 6 months follow-up, implant stability was similar in the two groups with 0.35±0.52 and p=1.000. These results aligned with the findings of Ragab A et al[17] in 2013 and Oncu E et al[18] in 2019 where implant stability with PRF was similar to the present study at different time intervals was similar to the present study findings. Concerning the radiographic assessment, at baseline, radiolucency scores were 0 and 1 in 88.8% (n=16) and 11.1% (n=2) study subjects respectively in both groups I and II with and without L-PRF use. At 1 month follow-up, periapical radiolucency scores were 0 in 88.8% (n=16) and 1 in 11.1% (n=2) subjects, and 0 and 1 in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group II which was comparable with p=0.54. At 3 months follow-up, periapical radiolucency scores were zero in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group I and 0 and 1 in 66.6% (n=12) and 33.3% (n=6) subjects from Group II respectively which was non-significant with p=0.57. At 6 months follow-up, periapical radiolucency scores were zero in 77.7% (n=14) and 22.2% (n=4) subjects respectively from Group I and were 1 in 66.6% (n=12) and 33.3% (n=6) subjects from Group II respectively. The difference was non-significant statistically with p=0.57. These results were comparable with the findings reported by Malo P et al[19] in 2003 and Canellas JV et al[20] in 2020 where the reported radiographic success in the present study was similar to the one reported by the authors.

CONCLUSION

Considering its limitations, the present study concludes that using L-PRF in immediate implant placement sites depicted marginally better results compared to the extraction sites where no L-PRF was used with immediate implant placement. However, the study assessed a small number of subjects for a shorter follow-up time warranting further longitudinal prospective studies to further validate the results.

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