Original Article

Comparative Evaluation of A-Prf and L-Prf on Osseointegration of Dental Implants: A Bio-Clinical and Radiological Study

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Abstract

Background: This study was aimed at assessing the comparative evaluation of A-PRF and L-PRF on osseointegration of dental implants: A bio-clinical and radiological study. **Methods and Materials:** Patients in the mean age of 20–55 years are randomly selected for a double-blind clinical trial. A-PRF placed in 10 implant sites, and L-PRF placed in 10 implant sites. All the patients were evaluated for osseointegration at implant sites using CBCT, evaluation of bone specific alkaline phosphatase at baseline and 6 months. **Results:** The results of the current trial showed a statistical significance with better osseointegration for Group A when compared with Group B. The bone specific alkaline phosphatase levels show statistical significance after 6 months. **Conclusions:** Proper osseointegration was accomplished for all the implants. Within the limited sample size, both A-PRF and L-PRF favors osseointegration but when compared better osseointegration was evidenced with L-PRF. The bone specific alkaline phosphatase levels also found to be statistically significant.

Keywords: A-Prf, CBCT, Dental implants, L-Prf, Osseointegration

Introduction

One among the various strategies that have been used to accelerate the time required for osseointegration around dental implants is platelet-rich fibrin. It increases osteoblastic differentiation and enhance healing of peri-implant bone. PRF is autogenous, does not require second spin and advantageous than autograft as it does not require second surgical site preparation.[1]

Choukron's PRF protocol is simple and free technique and is produced without anticoagulants. Second generation leukocyte platelet-rich fibrin (2700 rpm, 12 min) and third generation advanced platelet-rich fibrin (1500 rpm, 14 min) are the platelet concentrates used to enhance osseointegration around dental implants.

One of the bio-chemical markers of bone formation is bone specific alkaline phosphatase and is a phenotype marker of bone turnover. Hence, the present study aims to compare A-Prf and L- Prf on osseointegration of dental implants, both clinically and radiologically.

Materials and Methods

This was a randomized controlled clinical trial. The study population included patients aged between 20 and 55 years requiring dental implants were selected from the outpatient department of periodontology, St. Joseph Dental College and Hospital, between April 2019 and March 2020.

Approval of the study was obtained from the Institutional Ethical Committee, and informed consent was taken from all the patients before commencing the study. Patients with two or more edentulous sites in either maxilla or mandible and good systemic health were included in the study. Patients with any systemic disease that affects periodontium were excluded from the study.

Crestal bone loss, Hounsfield units (Figures 1c-d and 2c-d), and bone specific alkaline phosphatase levels were evaluated at baseline and 6 months.

After thorough general examination, periodontal examination, and radiographic examination, the patient recalled for surgery. Before the surgery, in both the groups, local anesthesia

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(Lignocaine and adrenaline; 1:80000) was administered and midcrestal incision given, followed by full-thickness mucoperiosteal flap elevation to expose the osteotomy site (Figures 1a and 2a). A-Prf was placed in osteotomy Site A (Figure 1b) and L-Prf was placed at osteotomy Site B (Figure 2b). The implant placement and cover screw positioning was done.

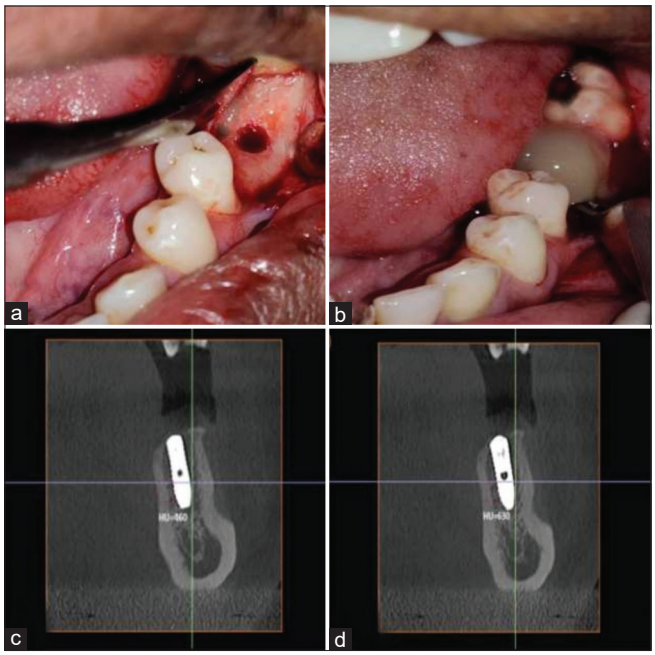

Figure 1: (Group A): (a) Mucoperiosteal flap elevation and osteotomy site preparation, (b) Advanced platelet-rich fibrin placed, (c) Immediate post-operative CBCT image, and (d) 6 months post-operative CBCT image

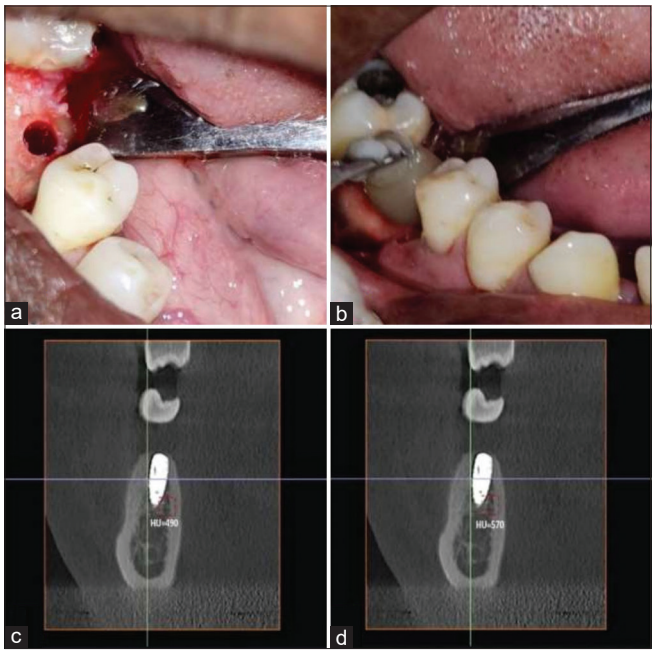

Figure 2: (Group B): (a) Mucoperiosteal flap elevation and osteotomy site preparation, (b) Leukocyte platelet-rich fibrin placed, (c) Immediate post-operative CBCT image, and (d) 6 months post-operative CBCT image

In both the groups, delayed loading was done, after 3 months healing abutments were placed, impressions taken after 15 days of abutment placement followed by crown fabrication, and then, each implant was functionally loaded with metal ceramic crowns.

Results

A total 10 patients with bilateral edentulous sites (20 edentulous sites) were enrolled in the study. A total of 20 implants, ten in each group, were placed (Group A-A Prf, Group B-L Prf). All the participants completed 6 months study period with no loss of follow-up at recall visits.

On intergroup comparison, the mean HU at baseline for Group A and Group B are 423.43 and 440.29, respectively, with *P*-value of 0.5021, whereas the mean HU at 6 months for Group A and Group B are 637.14 and 512.86, respectively, with *P*-value of 0.0001 which shows statistical significance (Table 1).

On intragroup comparison, the mean HU values revealed statistical significance in both Group A and Group B with *P*-values of 0.0001 and 0.0012, respectively (Table 1).

There was a statistically significant increase in bone specific alkaline phosphatase levels when compared at baseline and 6 months with *P*-value of 0.01 (Table 2). The mean crestal bone loss at 6 months showed no statistical significance between Group A and Group B (Table 3).

Table 1: Mean and standard deviation of Hounsfield units (HU) at baseline of Group A and Group B

Group	Mean	SD	t-value	*P*-value
Hounsfield units at baseline			0.6921	0.5021
Group A	423.43	50.14		
Group B	440.29	40.18		
Hounsfield units at 6 months			6.6018	0.0001
Group A	637.14	30.39		
Group B	512.86	39.46		

Table 2: Mean and standard deviation of Alkaline phosphatase levels at baseline and 6 months

Alkaline phosphatase	Time	Mean	SD	Mean Diff	*t*-value	*P*-value
	Baseline	76.43	9.00	−1.86	−3.657	0.01
	6 months	78.29	7.85			

Table 3: Crestal bone loss after 6 months for Group A and Group B

Statistics	Crestal bone loss after 6 months		*P*-value
	Group A	Group B	
Mean±SD	0.857±0.86	0.784±0.88	0.85
Range	0–2.29	0–3	
n	10	10	

Discussion

The parameters included are crestal bone loss, Hounsfield units, and bone specific alkaline phosphatase levels at baseline and 6 months.

The results of crestal bone loss between Group A and Group B were not statistically significant. This was in accordance to the studies done by Misch *et al*.[2], Norton (1988),[3] Pillar *et al*. (1991),[4] and Hanggi (2005).[5]

Hounsfield units which measure the bone density increased significantly in both the groups which show successful osseointegration. These results are in correlation with the studies by Kyou Hiasa *et al*. in 2016, Stoppie *et al*. 2011, Farre-Pages *et al*. 2010,[6] and Fuh 2010.[7]

A-Prf might influence bone regeneration, especially through the presence of monocyte/macrophage and their growth factors enhancing osteoblast differentiation and osseointegration. This is in accordance with Chang *et al*. 2008,[8] Sinder *et al*. 2015,[9] Fujioka-Kobayashi *et al*. 2017,[10] and Pitzurra *et al*. 2019.[11]

A-Prf due to slower spinning protocols released more growth factors which shows significantly higher bone density in accordance with the study conducted by Ghanaati *et al*. 2014[12] and Kobayashi *et al*. 2016.[13]

There was statistically significant increase in bone specific alkaline phosphatase levels due to enhancement and improvement in bone activity as it serves as an indicator of bone formation. This was in accordance with the studies conducted by Sharma *et al*. 2014,[14] Zhou *et al*. 2015,[15] and Tirachaimongkol *et al*. 2016.[16]

Conclusions

In this, randomized controlled clinical trial when A-Prf and L-Prf were compared better osseointegration was achieved with A-Prf. However, longer duration trails with larger sample size are necessary to study the efficiency of the material in attaining predictable treatment outcomes.

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