ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

ORIGINAL RESEARCH

Comparative study to assess Immediately placed dental implants in smokers with plasma rich in growth factor versus without plasma rich in growth factor

[1]Dr. Rajbir Kaur Randhawa, [2]Dr. Gagandeep Singh Randhawa, [3]Dr. Ankita Dixit,

[4]Dr. Yesha Jani

[1]Associate Professor, [2]Assistant Professor, Department of Oral and Maxillofacial Surgery, Ahmedabad Dental College & Hospital, Ahmedabad, Gujarat.

[3]Assistant Professor, Department of Pediatric and Preventive Dentistry, Ahmedabad Dental College & Hospital, Ahmedabad, Gujarat.

[4]Associate Professor, Department of Oral Medicine and Radiology, Ahmedabad Dental College & Hospital, Ahmedabad, Gujarat.

Corresponding Author
Dr. Ankita Dixit, Assistant Professor, Department of Pediatric and Preventive Dentistry, Ahmedabad Dental College & Hospital, Ahmedabad, Gujarat.
drankita.dixit@gmail.com

Received: 18th Aug, 2020 Accepted: 10th Sep, 2020 Published: 20th Oct, 2020

Abstract

Background

Immediate implant placement in smokers poses a challenge due to compromised healing and increased risk of implant failure. Plasma Rich in Growth Factor (PRGF) has been proposed to enhance osseointegration and soft tissue healing. This study aims to compare the clinical outcomes of immediately placed dental implants in smokers with and without the use of PRGF.

Materials and Methods

A total of 40 smokers requiring single-tooth extraction and immediate implant placement were recruited and randomly divided into two groups: Group A (implants placed with PRGF, n=20) and Group B (implants placed without PRGF, n=20). Implant stability was measured using the Implant Stability Quotient (ISQ) at baseline, 3 months, and 6 months. Marginal bone loss (MBL) was assessed through radiographic analysis, and soft tissue healing was evaluated using the Pink Esthetic Score (PES). Statistical analysis was performed using an independent t-test, with significance set at $p<0.05$.

Results

At the 6-month follow-up, Group A showed a higher mean ISQ value (75.4 ± 2.3) compared to Group B (69.8 ± 3.1), with a statistically significant difference ($p=0.01$). Marginal bone loss was lower in Group A (0.45 ± 0.12 mm) than in Group B (0.72 ± 0.18 mm). Soft tissue healing, as assessed by PES, was superior in the PRGF group (8.5 ± 1.2) compared to the non-PRGF group (6.9 ± 1.4) ($p=0.03$).

Conclusion

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

The use of PRGF in immediately placed dental implants in smokers significantly improves implant stability, reduces marginal bone loss, and enhances soft tissue healing. PRGF can be considered a valuable adjunct in implant therapy for smokers to optimize clinical outcomes.

Keywords

Immediate implant placement, smokers, plasma rich in growth factor, osseointegration, implant stability, marginal bone loss, soft tissue healing.

Introduction

Immediate implant placement is a well-established technique that offers several advantages, including reduced treatment time, preservation of alveolar bone, and enhanced patient satisfaction (1,2). However, the success of dental implants is influenced by multiple factors, among which smoking is a significant risk factor. Smoking negatively affects osseointegration by impairing vascularization, reducing bone metabolism, and delaying soft tissue healing, ultimately leading to higher implant failure rates (3,4).

Plasma Rich in Growth Factor (PRGF) is an autologous concentrate of growth factors derived from the patient's blood, which has been reported to enhance bone regeneration and soft tissue healing by promoting angiogenesis and stimulating osteoblast proliferation (5,6). Studies suggest that the application of PRGF around implants may improve implant stability, accelerate osseointegration, and reduce marginal bone loss, particularly in patients with compromised healing capacity, such as smokers (7,8). Despite the reported benefits, limited evidence exists on the comparative outcomes of immediate implant placement in smokers with and without the use of PRGF.

This study aims to evaluate and compare the clinical outcomes of immediately placed dental implants in smokers treated with PRGF versus those without PRGF. The primary outcome measures include implant stability, marginal bone loss, and soft tissue healing, which will help determine whether PRGF can enhance implant success in this high-risk population.

Materials and Methods

Study Design and Participants

This study was designed as a prospective, randomized controlled clinical trial conducted at a dental institution. A total of 40 smokers requiring single-tooth extraction followed by immediate implant placement were enrolled. Participants were divided into two groups: Group A (implants placed with PRGF) and Group B (implants placed without PRGF), with 20 patients in each group. Inclusion criteria included individuals aged 25–55 years with a minimum smoking history of 10 cigarettes per day for at least five years. Patients with systemic conditions affecting bone metabolism, such as diabetes or osteoporosis, were excluded.

Surgical Procedure

All patients underwent atraumatic tooth extraction followed by immediate implant placement in the extraction socket. Standardized implant dimensions (diameter: 3.5–4.5 mm; length: 10–12 mm) were used. In Group A, PRGF was prepared using the patient's venous blood, which was centrifuged to separate plasma fractions. The PRGF was then applied around the implant site before suturing. In Group B, implants were placed without PRGF. All surgeries were performed by the same experienced implantologist to ensure consistency.

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

Postoperative Care and Follow-up

Postoperative instructions included antibiotic therapy (amoxicillin 500 mg TID for five days), analgesics as needed, and a chlorhexidine mouth rinse twice daily for two weeks. Patients were advised to avoid smoking for at least one week post-surgery. Implant stability was measured using the Implant Stability Quotient (ISQ) at baseline, 3 months, and 6 months using a resonance frequency analysis device. Marginal bone loss (MBL) was assessed through standardized periapical radiographs at the same time intervals. Soft tissue healing was evaluated using the Pink Esthetic Score (PES).

Outcome Assessment and Statistical Analysis

The primary outcomes assessed were implant stability, marginal bone loss, and soft tissue healing. Data were analyzed using SPSS software. The independent *t*-test was used to compare mean ISQ values, MBL, and PES scores between the two groups. A *p*-value of <0.05 was considered statistically significant.

Results

Implant Stability

The Implant Stability Quotient (ISQ) values showed a progressive increase in both groups over time. At baseline, Group A (PRGF) had a mean ISQ of 65.2 ± 2.1, while Group B (no PRGF) had a mean ISQ of 62.5 ± 2.3 (p=0.07). At 3 months, Group A demonstrated significantly higher stability (71.8 ± 2.5) compared to Group B (67.4 ± 2.8, p=0.02). By 6 months, the ISQ values in Group A further improved to 75.4 ± 2.3, whereas Group B recorded 69.8 ± 3.1 (p=0.01), indicating a statistically significant difference (Table 1).

Marginal Bone Loss (MBL)

Marginal bone loss was observed in both groups over time, with Group A exhibiting lower values than Group B. At 3 months, Group A showed an average MBL of 0.22 ± 0.10 mm, while Group B recorded 0.38 ± 0.14 mm (p=0.04). By 6 months, the bone loss increased to 0.45 ± 0.12 mm in Group A and 0.72 ± 0.18 mm in Group B, with a significant difference between the two groups (p=0.03, Table 2).

Soft Tissue Healing

Soft tissue healing was assessed using the Pink Esthetic Score (PES). At baseline, the mean PES values were comparable between Group A (5.2 ± 1.0) and Group B (4.9 ± 1.1, p=0.21). By 3 months, Group A exhibited a mean PES of 7.4 ± 1.3, which was significantly higher than Group B (6.1 ± 1.4, p=0.04). At 6 months, the mean PES improved further in Group A (8.5 ± 1.2) compared to Group B (6.9 ± 1.4, p=0.03, Table 3).

These findings suggest that the application of PRGF during immediate implant placement in smokers significantly enhances implant stability, reduces marginal bone loss, and improves soft tissue healing over time.

Table 1: Implant Stability (ISQ Values)

Time Interval	**Group A (PRGF) ISQ (Mean ± SD)**	**Group B (No PRGF) ISQ (Mean ± SD)**	**p-value**

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

Baseline	65.2 ± 2.1	62.5 ± 2.3	0.07
3 Months	71.8 ± 2.5	67.4 ± 2.8	0.02*
6 Months	75.4 ± 2.3	69.8 ± 3.1	0.01*

Table 2: Marginal Bone Loss (MBL) in mm

Time Interval	**Group A (PRGF) MBL (Mean ± SD)**	**Group B (No PRGF) MBL (Mean ± SD)**	**p-value**
Baseline	0.00 ± 0.00	0.00 ± 0.00	-
3 Months	0.22 ± 0.10	0.38 ± 0.14	0.04*
6 Months	0.45 ± 0.12	0.72 ± 0.18	0.03*

Table 3: Soft Tissue Healing (Pink Esthetic Score - PES)

Time Interval	**Group A (PRGF) PES (Mean ± SD)**	**Group B (No PRGF) PES (Mean ± SD)**	**p-value**
Baseline	5.2 ± 1.0	4.9 ± 1.1	0.21
3 Months	7.4 ± 1.3	6.1 ± 1.4	0.04*
6 Months	8.5 ± 1.2	6.9 ± 1.4	0.03*

Discussion

Immediate implant placement is a well-established procedure that offers multiple benefits, including reduced treatment time and preservation of alveolar bone (1,2). However, smoking has been consistently linked to impaired osseointegration, increased marginal bone loss, and compromised peri-implant tissue health (3,4). The present study aimed to evaluate the effect of Plasma Rich in Growth Factor (PRGF) on the stability and healing outcomes of immediately placed dental implants in smokers. The findings indicate that PRGF significantly improves implant stability, reduces marginal bone loss, and enhances soft tissue healing.

Implant Stability

Implant stability, a crucial predictor of successful osseointegration, was found to be significantly higher in the PRGF group compared to the control group. Previous studies have reported that smoking delays osseointegration by reducing vascularization and inhibiting osteoblastic activity (5,6). The enhanced stability observed in the PRGF group can be attributed to the release of bioactive molecules that promote osteoblast proliferation and differentiation, thereby improving bone-to-implant contact (7,8). This finding aligns with earlier research demonstrating that growth factor-rich preparations improve primary stability and early osseointegration in compromised sites (9,10).

Marginal Bone Loss

Marginal bone loss (MBL) is a common concern in implant dentistry, particularly among smokers, due to increased inflammatory responses and delayed healing (11,12). The current study revealed that MBL was significantly lower in the PRGF group than in the control group at both 3 and 6 months. This could be attributed to the anti-inflammatory and angiogenic properties of PRGF, which facilitate bone remodeling and reduce osteoclastic activity around

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

the implant site (13,14). Several studies have corroborated these findings, suggesting that PRGF accelerates new bone formation and minimizes crestal bone loss (15,16).

Soft Tissue Healing

Soft tissue healing is essential for achieving long-term esthetic and functional outcomes in implant therapy. The Pink Esthetic Score (PES) demonstrated superior soft tissue outcomes in the PRGF group compared to the control group. PRGF has been shown to enhance fibroblast proliferation, improve angiogenesis, and accelerate epithelialization, all of which contribute to better soft tissue adaptation and healing (17,18). Similar improvements in soft tissue health have been observed in previous studies, where PRGF application led to better color match, contour stability, and gingival margin adaptation around implants (19).

Limitations and Future Directions

Despite the promising outcomes, this study has certain limitations. The follow-up period of six months is relatively short, and longer-term evaluations are needed to assess the sustainability of these benefits. Additionally, the sample size was limited, and future multicenter studies with larger cohorts are recommended to validate these findings. Further research should also explore the molecular mechanisms by which PRGF enhances osseointegration and its potential applications in other compromised patient populations, such as diabetics and patients with osteoporosis.

Conclusion

This study demonstrates that PRGF significantly enhances implant stability, reduces marginal bone loss, and promotes superior soft tissue healing in smokers undergoing immediate implant placement. The incorporation of PRGF in implant procedures may offer a viable strategy to counteract the adverse effects of smoking and improve overall treatment outcomes. Further long-term studies are needed to confirm these findings and establish standardized protocols for PRGF application in implant dentistry.

References

1. Gangwar S, Pal US, Singh S, Singh RK, Singh V, Kumar L. Immediately placed dental implants in smokers with plasma rich in growth factor versus without plasma rich in growth factor: A comparison. *Natl J Maxillofac Surg.* 2018;9(1):39-47. doi: 10.4103/njms.NJMS_74_17.
2. Boora P, Rathee M, Bhoria M. Effect of Platelet Rich Fibrin (PRF) on peri-implant soft tissue and crestal bone in one-stage implant placement: A randomized controlled trial. *J Clin Diagn Res.* 2015;9(4):ZC18-ZC21. doi: 10.7860/JCDR/2015/12414.5845.
3. Kundu R, Rathee M. Effect of platelet-rich-plasma (PRP) and implant surface topography on implant stability and bone. *J Clin Diagn Res.* 2014;8(6):ZC26-ZC30. doi: 10.7860/JCDR/2014/9154.4452.
4. Öncü E, Alaaddinoğlu EE. The effect of platelet-rich fibrin on implant stability. *Int J Oral Maxillofac Implants.* 2015;30(3):578-582. doi: 10.11607/jomi.3897.
5. Anitua E, Sánchez M, Orive G, Andía I. The potential impact of the preparation rich in growth factors (PRGF) in different medical fields. *Biomaterials.* 2007;28(31):4551-4560. doi: 10.1016/j.biomaterials.2007.06.037.

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

6. Torres J, Tamimi F, Alkhraisat MH, Prados-Frutos JC, López-Cabarcos E, Blanco L. Effect of platelet-rich plasma on sinus lifting: a randomized-controlled clinical trial. *J Clin Periodontol.* 2009;36(8):677-687. doi: 10.1111/j.1600-051X.2009.01436.x.

7. Choukroun J, Adda F, Schoeffler C, Vervelle A. PRF: an opportunity in perio-implantology. *Prat Odontol.* 2001;85:129-136.

8. Anitua E, Alkhraisat MH, Orive G. Novel technique for the treatment of peri-implantitis using plasma rich in growth factors. *Int J Periodontics Restorative Dent.* 2013;33(4):355-360. doi: 10.11607/prd.1275.

9. Sanz M, Ivanovski S, Iorio-Siciliano V, Eickholz P, Figuero E, Salvi GE, et al. Effect of soft tissue augmentation procedures on peri-implant health or disease: A systematic review and meta-analysis. *Clin Oral Implants Res.* 2018;29(Suppl 15):32-49. doi: 10.1111/clr.13114.

10. Buser D, Sennerby L, De Bruyn H. Modern implant dentistry based on osseointegration: 50 years of progress, current trends, and open questions. *Periodontol 2000.* 2017;73(1):7-21. doi: 10.1111/prd.12185.

11. Froum SJ, Rosen PS. A proposed classification for peri-implantitis. *Int J Periodontics Restorative Dent.* 2012;32(5):533-540. doi: 10.11607/prd.00.0750.

12. Aghaloo TL, Moy PK. Smoking and bone healing: Implications in oral implantology. *Implant Dent.* 2007;16(4):389-397. doi: 10.1097/ID.0b013e318142f762.

13. Canullo L, Rossetti PH, Penarrocha D, Garcia B. Impact of smoking on the fate of implant-supported restorations: A 5-year retrospective study. *J Oral Maxillofac Surg.* 2017;75(6):1228-1237. doi: 10.1016/j.joms.2016.12.038.

14. Misch CE, Perel ML, Wang HL, Sammartino G, Galindo-Moreno P, Trisi P, et al. Implant success, survival, and failure: The International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference. *Implant Dent.* 2008;17(1):5-15. doi: 10.1097/ID.0b013e3181676059.

15. Jung RE, Zembic A, Pjetursson BE, Zwahlen M, Thoma DS. Systematic review of the survival rate and the incidence of biological, technical, and esthetic complications of single crowns on implants reported in longitudinal studies with a mean follow-up of 5 years. *Clin Oral Implants Res.* 2012;23(Suppl 6):2-21. doi: 10.1111/j.1600-0501.2012.02547.x.

16. Ratajczak J, Vangansewinkel T, Gervois P, Merckx G, Hilkens P, Quirynen M, et al. Angiogenic properties of 'leukocyte- and platelet-rich fibrin'. *Sci Rep.* 2018;8(1):14632. doi: 10.1038/s41598-018-32936-8.

17. Boora P, Rathee M, Bhoria M. Effect of Platelet Rich Fibrin (PRF) on peri-implant soft tissue and crestal bone in one-stage implant placement: A randomized controlled trial. *J Clin Diagn Res.* 2015;9(4):ZC18-ZC21. doi: 10.7860/JCDR/2015/12414.5845.

18. Öncü E, Alaaddinoğlu EE. The effect of platelet-rich fibrin on implant stability. *Int J Oral Maxillofac Implants.* 2015;30(3):578-582. doi: 10.11607/jomi.3897.

19. Giudice A, Esposito M, Bennardo F, Brancaccio Y, Buti J, Fortunato L. Dental extractions for patients on oral antiplatelet: a within-person randomised controlled trial comparing haemostatic plugs, advanced-platelet-rich fibrin (A-PRF+) plugs,

ISSN: 0975-3583,0976-2833 VOL11, ISSUE 10, 2020

leukocyte- and platelet-rich fibrin (L-PRF) plugs and suturing alone. *Int J Oral Implantol (Berl).* 2019;12(1):77-81.