www.ajohas.com

Asian Journal of Oral Health and Allied Sciences

Case Report

Enhancing socket shielding with the synergy of bone graft and titanium platelet rich fibrin: A case report

Anisha Singh[1], Anil Kumar Jha[1], Chetan Chandra[1], Sunakshi Soi[1]

[1]Department of Periodontology, Saraswati Dental College and Hospital, Lucknow, Uttar Pradesh, India.

***Corresponding author:**
Anil Kumar Jha,
Department of Periodontology,
Saraswati Dental College and
Hospital, Lucknow,
Uttar Pradesh, India.

anil10429@gmail.com

Received: 21 June 2025
Accepted: 15 July 2025
Published: 05 August 2025

DOI
10.25259/AJOHAS_33_2025

Quick Response Code:

ABSTRACT

A dental implant is considered the most reliable treatment modality for the replacement of a missing tooth. Insertion of the implant immediately after extraction may accelerate resorption of buccal bone, followed by esthetic concerns. The socket shielding technique is an innovative surgical method advocated to curtail the resorption of alveolar bone and preserve a portion of the tooth, thus creating a natural emergence profile for the patient. In this case report, we introduce a novel approach to socket shielding combined with immediate implant placement, utilizing allograft and titanium platelet-rich fibrin.

Keywords: Immediate implant, Socket shielding technique, Sticky bone, Titanium platelet rich fibrin

INTRODUCTION

Extraction of tooth alters the dimensions of the alveolar ridge, especially in the anterior region by impacting the emergence profile and implant prosthetic rehabilitation.[1] Extraction causes injury to both soft and hard tissue of the periodontium. After an extraction, the blood vessels supplying the thin bone walls in the periodontium are severed, leading to facial bone resorption.[1] Many studies suggested that preserving a tooth that can be decoronated, vital, or endodontically treated using a submerged technique can preserve the integrity of alveolar bone.[2] Various researches also proved that the implant placement with close proximity to the retained tooth surface can preserve buccal bone and provide a superior emergence profile.[3] The socket shielding technique (SST) was first performed by Hürzeler *et al.* on a beagle dog.[3] Hemisection was performed in mandibular premolar and the buccal fragment of distal root was preserved 1 mm coronal to the buccal bone plate, followed by immediate implant placement, which was done lingually to the preserved root piece in the animal study conducted on a beagle dog.[3] Healing was satisfactory and uneventful without complications, while the histologic study revealed new cementum formation between the titanium implant and the preserved root fragment.[3,4] The SST allows preservation of the labial section of periodontal ligament (PDL), thus facilitating the attachment of remaining PDL to cementum and surrounding peri-implant bone. This integration helps the peri-implant tissue resemble normal periodontal tissues more closely, offering enhanced protection against injury to the soft tissue.[5]

The injury caused during the surgery can be curtailed by incorporation of various biomaterials, like platelet concentrate.[6] The platelet concentrates have been employed extensively in dentistry for over 30 years. A range of growth factors are released from this concentrate, including platelet-

derived growth factor (PDGF)-alpha and beta, transforming growth factor (TGF) and insulin-like growth factors aiding in healing.[7] If growth factors are incorporated with bone grafts, it can modulate healing with integration in a refined way.

The present case report catalogues a surgical case of an endodontically treated tooth in maxillary front tooth region-12 (right maxillary lateral incisor) with a deficit buccal bone plate. Immediate implant placement with SST was advocated for the concerned tooth. The labial portion of the tooth fragment was shielded, followed by incorporation of biomaterials-allograft and titanium platelet-rich fibrin (T-PRF) between the tooth and implant surface to hasten soft- and hard-tissue healing.

CASE REPORT

A healthy, non-smoking female patient of 52 years consulted the department of Periodontology at Saraswati Dental College and Hospital, Lucknow, with the chief complaint of persistent pain and swelling for 2 months around an endodontically treated tooth (12-right maxillary lateral incisor) with significant loss of crown structure, and wanted permanent rehabilitation for the same. The tooth-12 was found to be grossly decayed on clinical evaluation, despite having undergone root canal treatment [Figure 1]. Furthermore, the patient had a thin gingival biotype. For a definite picture, radiographic evaluation was done through cone-beam computed tomography (CBCT), which clearly showed grossly decayed 12 with the bone density lying in the range of 350–850 HU (D3) [Figure 2]. The maximum distance of 14.4 mm was demarcated from the alveolar crest to the nasal floor, while the minimum distance was 12.7 mm. The labio-palatal width was 6.7 mm at the crest and middle third, while the apical third was 8.3 mm [Figure 2]. Based on the radiographic evaluation, the implant of 3.0 mm × 11.5 mm was singled out to achieve adequate primary stability. The presence of a thin bucco-cortical plate could be appreciated in CBCT report, thereupon advocating the use of SST to preserve buccal fragment of 12. CBCT also showed periapical pathology at the apex of 12.

Figure 1: Clinical examination before surgery.

Two weeks before the surgery, the patient received full mouth scaling and oral hygiene instructions. Before the surgery, informed written consent was acquired from the patient for the publication of the present case report and its associated images. On the day of surgery, a prophylactic regimen by Misch was ensued by administering 625 mg amoxiclav 1 h before surgery followed by application of 0.12% chlorhexidine rinse.[8] After local anesthesia administration with 2% lignocaine solution and 1:80000 adrenaline (Lignox^{R} 2% A Indoco Remedies LTD.) for infraorbital nerve block and nasopalatine nerve block to locally anesthetize the surgical site, the crevicular incision was given along with the gingival margin of 12, followed by two vertical releasing incisions using a blade. Next, the facial flap was raised along with the palatal flap using a periosteal elevator (Hu-freidy P-24) to achieve complete exposure and accessibility of the implant site [Figure 3]. A high-speed carbide bur with a long shank was used to section the tooth-12 mesiodistally [Figure 4]. The palatal segment of the tooth was carefully luxated and removed from the socket using a Coupland elevator, preserving 2 mm of tooth facially as a shield. The socket was thoroughly debrided, followed by irrigation with 1% metronidazole solution.

The initial osteotomy site was created using a lance drill, followed by sequential drills including pilot drill, 2.0 mm drill and 2.8 mm drill to expand the osteotomy site. After each drilling step, a direction indicator Parallel Pin was used to ensure the alignment of osteotomy with the adjacent teeth. CloseFit™ Dental Implant (Adin OsseoFix™ Surface-Conical Connection) of size 3.0 mm × 11.5 mm was manually placed in the prepared osteotomy site, achieving primary stability up to 35 N cm using a hand wrench, followed by cover screw placement over it [Figure 5]. The implant was submerged 1.5 mm apically from the alveolar crest. The space between the facial fragment of the shielded tooth and the implant surface was filled with allograft (ColoCast^{R} Collagen Particles DFDBA-ColoGenesis) and T-PRF. For the preparation of T-PRF, 10 mL of blood sample was drawn from the antecubital vein of the patient's right arm.[9] The drawn blood was transferred to a grade IV titanium tube [Figure 6].[9] The sample was immediately centrifuged for 12 min at 2,700 rpm using a fixed-angle Rotar tabletop centrifuge machine (OSCAR OPTIK Fixed-Angle Rotor) at room temperature.[9,10] The red blood cell pellet was separated from blood clots using scissors, and the T-PRF was placed over the PRF box [Figure 7a].[9] Slow and homogenous pressure was gently applied to compress the T-PRF in the PRF box [Figure 7b]. The compressed membrane remains uniformly saturated with serum. This compression method of platelet-rich fibrin (PRF) using the PRF box omits the loss of a substantial amount of extrinsic growth factors.[11] The

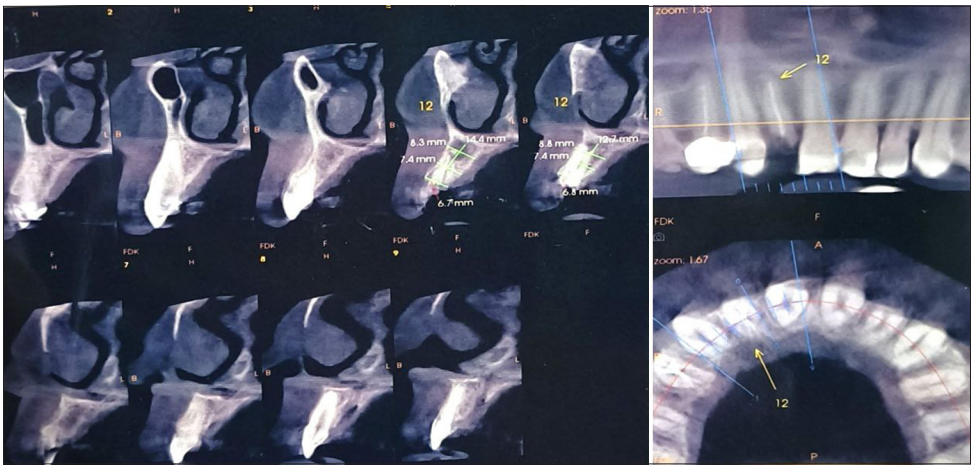

Figure 2: Radiographic evaluation before surgery.

Figure 3: Elevation of labial flap.

Figure 4: Horizontal sectioning of the root.

Figure 5: Labial shield preservation and immediate implant placement.

Figure 6: Grade IV Titanium tubes and 10 mL procured blood sample from the patient.

serum exudate collected after compression was used to mix the allograft bone biomaterial (ColoCast[R] Collagen Particles DFDBA-ColoGenesis) [Figure 7c]. The bone graft was then used to fill the marginal gap between the buccal plate and the implant [Figure 8]. The compressed T-PRF membrane was used as a barrier over the already placed bone biomaterial [Figure 9]. The facial and palatal flaps were coaptated tightly

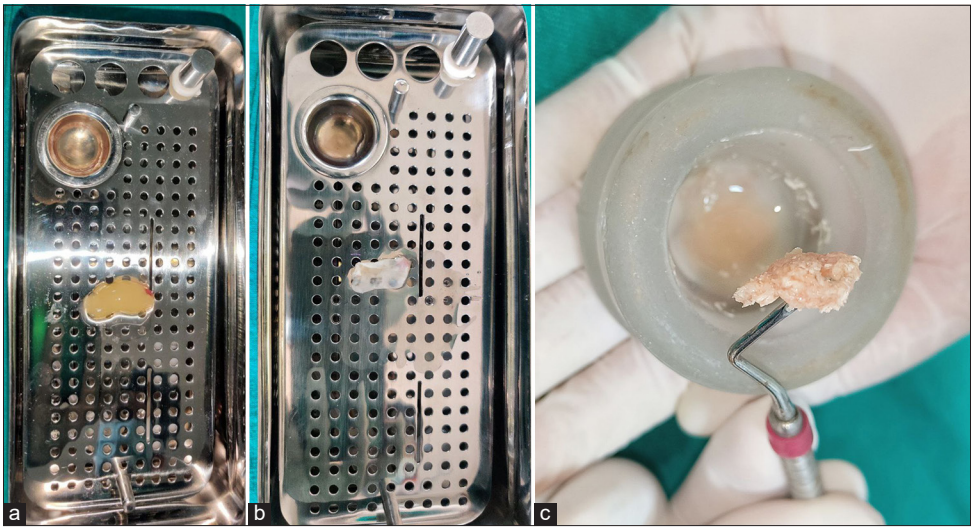

Figure 7: (a) Titanium platelet-rich fibrin (T-PRF) clots collected in platelet-rich fibrin box. (b) The clot was transformed into homogeneous membranes. (c) Allograft bone biomaterial (ColoCastR Collagen Particles-ColoGenesis) was added to serum exudate of compressed T-PRF mixed with allograft.

Figure 8: Bone graft was placed between buccal plate and implant.

Figure 9: Compressed titanium platelet-rich fibrin placed as barrier membrane over the already placed bone allograft.

using 4-0 absorbable Vicryl surgical suture [Figure 10]. An intra-oral periapical radiograph was taken postoperatively [Figure 11]. The patient was kept on systemic antibiotic coverage (Amoxiclav 625 mg) thrice daily for the next 7 days, along with analgesics (Ibuprofen 400 mg) twice daily for 7 days. Post-operative and oral hygiene instructions were provided to the patient, including rinsing with 0.12% chlorhexidine solution twice daily for 7 days and avoiding brushing and flossing at surgical sites. The suture removal was scheduled during the patient's first follow-up visit, which was on the 7th day after surgery. The healing was progressing uneventful and satisfactory with no new complaints pertaining to the site operated. A provisional splinted acrylic crown was placed at the site. The periapical lesion had been resolved after 3-month post-surgery, allowing for subsequent prosthetic rehabilitation after placement of the healing abutment [Figure 12].

DISCUSSION

The presented case report describes a case of socket shielding according to the most recently proposed guidelines.[12] The synergy of biomaterials along with T-PRF was advocated for better soft- and hard-tissue healing. The SST recommends the sectioning of the root in mesio-distal direction, followed by atraumatic extraction of the remaining palatal tooth segment. This culminates in the preservation of the labial/facial root segment in the alveolar socket.[3] The sectioned

Figure 10: Coaptation of facial and palatal flap using 4-0 absorbable Vicryl surgical suture.

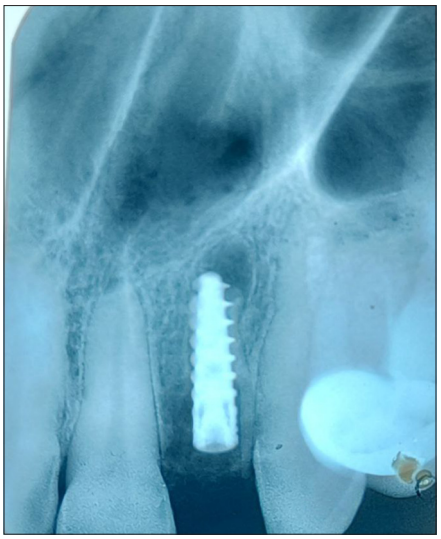

Figure 11: The preserved labial segment of tooth can be appreciated in the radiograph.

Figure 12: Healing abutment placement after 3 months.

root fragment with intact PDL serves as a shield for the socket. This approach allows the implant surface to interface directly with the residual labial root, thereby retaining the periodontal root-PDL complex in the labial aspect of the implant site. The root segment is more robust to resorption relative to alveolar bone, and the PDL connects the residual root to the gingival margin, which increases the structural integrity as compared to the customary implant gingival interface in normal peri-implant tissue. Consequently, this complex interface may support the avoidance of the recession of the gingival margin around the implant.

In a histological study conducted by Gray and Vernino,[13] they established that a calcified material like cementum could develop around the implant without eliciting inflammation. This calcified structure function analogs to the osseointegration, which laid the foundation for SST.[13]

Hürzeler *et al*.[3] pioneered the SST, their study conducted on a beagle dog model, showed promising histological outcomes, including newly formed cementum at the interface of the implant and preserved root segment. However, adjunctive biomaterials were not incorporated, unlike in the current case report. The present case report builds on this foundation by incorporating allograft and T-PRF into the SST protocol, addressing limitations observed in the original SST approach.

Various authors have substantiated the leverage of T-PRF as it takes a longer time to disintegrate, consequently persisting in the tissue for a longer duration compared to other fibrins available.[9] In the current case report, the addition of T-PRF aided in the acceleration of soft-tissue regeneration through the release of PDGF, TGF-beta 1, and vascular endothelial growth factor.[9] It enhances epithelial closure, angiogenesis, and fibroblast proliferation, contributing to faster and more predictable healing around the implant.[14] T-PRF, along with bone graft, acted as a matrix and depot of growth factors that stimulate osteoblast proliferation and bone matrix formation, further improving osseointegration of the dental implant.[15-17] The fibrin matrix in T-PRF modulates inflammatory response and thus reduces post-operative inflammation and pain. By supporting early bone healing and reducing marginal bone loss, T-PRF contributed to improved primary and secondary implant stability.[17] This creates a favorable healing environment and may lower the risk of peri-implantitis.

Clinical implications and advantages

The integration of SST with allograft and T-PRF in this case offers several clinical advantages:

1. Enhanced buccal bone preservation: The SST inherently preserves the buccal bone plate, and the addition of

biomaterial supports further bone regeneration and stability
2. Accelerated healing: The bioactive molecules in T-PRF promote faster healing of periodontium, potentially reducing the overall treatment time
3. Improved esthetic outcomes: Maintaining the buccal bone and soft-tissue contours is crucial in the anterior maxilla for optimal esthetic results.

CONCLUSION

The synergistic use of SST with bone graft and T-PRF presents a promising approach for the immediate insertion of an implant in the anterior maxilla. This combination leverages the strengths of each modality to enhance tissue preservation, accelerate healing, and improve esthetic outcomes. Further validation of the findings and establishment of a standardized protocol require clinical studies with extensive sample sizes and longer follow-up appointments.

Ethical approval: The Institutional Review Board approval is not required.
Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent.
Financial support and sponsorship: Nil.
Conflicts of interest: There are no conflicts of interest.
Use of artificial intelligence (AI)-assisted technology for manuscript preparation: The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

REFERENCES

1. Amler MH, Johnson PL, Salman I. Histological and histochemical investigation of human alveolar socket healing in undisturbed extraction wounds. J Am Dent Assoc 1960;61:3244.
2. Salama M, Ishikawa T, Salama H, Funato A, Garber D. Advantages of the root submergence technique for pontic site development in esthetic implant therapy. Int J Periodontics Restorative Dent 2007;27:521-7.
3. Hürzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S. The socket-shield technique: A proof-of-principle report. J Clin Periodontol 2010;37:855-62.
4. Holbrook SE. Model-guided flapless immediate implant placement and provisionalization in the esthetic zone utilizing a nanostructured titanium implant: A case report. J Oral Implantol 2016;42:98-103.
5. Kan JL, Rungcharassaeng K. Proximal socket shield for interimplant papilla preservation in the esthetic zone. Int J Periodontics Restorative Dent 2013;33:24-31.
6. Guo T, Nie R, Xin X, Wang H, Qi M, Yu K, *et al*. Tissue preservation through socket-shield technique and platelet-rich fibrin in immediate implant placement: A case report. Medicine (Baltimore) 2018;97:e13175.
7. Choukroun J, Diss A, Simonpieri A, Girard MO, Schoeffler C, Dohan SL, *et al*. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part IV: Clinical effects on tissue healing. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:56-60.
8. Resnik RR, Misch C. Prophylactic antibiotic regimens in oral implantology: Rationale and protocol. Implant Dent 2008;17:142-50.
9. Tunalı M, Özdemir H, Küçükodacı Z, Akman S, Fıratlı E. *In vivo* evaluation of titanium-prepared platelet-rich fibrin (T-PRF): A new platelet concentrate. Br J Oral Maxillofac Surg 2013;51:438-43.
10. Bains VK, Mahendra J, Mittal M, Bedi M, Mahendra L. Technical considerations in obtaining platelet rich fibrin for clinical and periodontal research. J Oral Biol Craniofac Res 2023;13:714-9.
11. Dohan DM, Choukroun J, Diss A, Dohan SL, Dohan AJ, Mouhyi J, *et al*. Platelet-rich fibrin (PRF): A second-generation platelet concentrate. Part II: Platelet-related biologic features. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2006;101:e45-50.
12. Gluckman H, Du Toit J, Salama M, Nagy K, Dard M. A decade of the socket-shield technique: A step-by-step partial extraction therapy protocol. Int J Esthet Dent 2020;15:212-25.
13. Gray JL, Vernino AR. The interface between retained roots and dental implants: A histologic study in baboons. J Periodontol 2004;75:1102-6.
14. Ustaoğlu G, Paksoy T, Gümüş KÇ. Titanium-prepared platelet-rich fibrin versus connective tissue graft on peri-implant soft tissue thickening and keratinized mucosa width: A randomized, controlled trial. J Oral Maxillofac Surg 2020;78:1112-23.
15. Ustaoğlu G, Ercan E, Tunali M. The role of titanium-prepared platelet-rich fibrin in palatal mucosal wound healing and histoconduction. Acta Odontol Scand 2016;74:558-64.
16. Uzun BC, Ercan E, Tunalı M. Effectiveness and predictability of titanium-prepared platelet-rich fibrin for the management of multiple gingival recessions. Clin Oral Investig 2018;22:1345-54.
17. Olgun E, Ozkan SY, Atmaca HT, Yalim M, Hendek MK. Comparison of the clinical, radiographic, and histological effects of titanium-prepared platelet rich fibrin to allograft materials in sinus-lifting procedures. J Investig Clin Dent 2018;9:e12347.

How to cite this article: Singh A, Jha AK, Chandra C, Soi S. Enhancing socket shielding with the synergy of bone graft and titanium platelet rich fibrin: A case report. Asian J Oral Health Allied Sci. 2025;15:11. doi: 10.25259/AJOHAS_33_2025