

## Retaining and Regaining Esthetics in the Anterior Maxillary Region Using the Socket-Shield Technique

### Abstract

With the advancement in the implant in dentistry, improvement in the implant designs and placement protocol has enhanced the esthetics outcomes in the anterior zone. Yet the preservation of the peri-implant soft tissue and providing an appropriate emergence profile to the implant crown prosthesis, the tissue grafting procedures are necessary to overcome the ridge contour change. However through the socket-shield technique, the bone resorption process is preserved, and the contour of the buccal gingiva is maintained, thereby preventing its collapse and achieving good aesthetic results. This case report describes the placement of an implant in the upper anterior region and rehabilitation with a cement-retained crown prosthesis using the socket-shield technique and the patient being followed up for 6 months with good results.

**Keywords:** Anterior implant, gingival contour, immediate implant placement, socket-shield technique

### Introduction

Extraction of tooth brings about different dimensional changes to the alveolar ridge, which affects the treatment protocol involved with the implant placement in the anterior zone, and maintaining the emergence profile becomes difficult due to the collapse of the buccal bone and soft tissues.<sup>[1]</sup> Thus, to minimize bone resorption and maintain the buccal bone contour various techniques were suggested, such as atraumatic extraction process with socket preservation technique, buccal bone grafting procedures, flapless extraction procedures, and immediate placement of the implant. These procedures showed substantial result, and there was a certain amount of bone resorption seen with these procedures and grafting procedures took a longer duration of time for the formation of the new bone. Thus complete socket preservation could not be achieved in a short time span.<sup>[2]</sup>

Araújo and Lindhe proposed that the prime cause for facial bone resorption after a tooth extraction is the insufficient blood supply to that area as blood vessels in periodontium are severed.<sup>[1]</sup> Thus, retaining a root can alter the occurrence of facial bone resorption.

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Hürzeler *et al.*, in the year 2010, first described the use of the socket-shield technique in the anterior zone.<sup>[2]</sup> According to them in this procedure, a root fragment is left behind deliberately while extracting the tooth, specifically in the buccal aspect of the tooth to prevent the soft-tissue collapse and maintenance of the buccal contour.

In this procedure, the root is prepared in such a way that the buccal/facial section remains *in situ* with a buccal plate intact. Then immediate placement of implant was done lingual to the remaining root piece with or without contact with root fragment with a jumping gap between the implant and the root fragment.<sup>[2]</sup> As this study showed the optimum result in preservation and support to the buccal bone, it served as an alternative treatment plan in the rehabilitation of the patients with grossly decayed upper anterior teeth and thin buccal bone, and this is indicated for the patient in whom the post and core treatment not possible and where aesthetics of the anterior teeth is of major concern for the patient.

This case report discusses a patient with failed post and core treatment in relation to maxillary right central incisor as the tooth was indicated for the extraction, so

**How to cite this article:** Dash S, Mohapatra A, Srivastava G, Choudhury GK, Sahoo PK. Retaining and regaining esthetics in the anterior maxillary region using the socket-shield technique. *Contemp Clin Dent* 2020;11:158-61.

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Submitted : 08-Jan-2020

Revised : 13-Mar-2020

Accepted : 17-Apr-2020

Published : 07-Aug-2020

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### Access this article online

#### Website:

www.contempclindent.org

DOI: 10.4103/ccd.ccd\_16\_20

#### Quick Response Code:



immediate implant placement through the socket-shield technique was opted as a treatment option.

## Case Report

A 40-year-old, non-smoker and healthy male patient reported to the Department of Prosthodontics, Institute of Dental Science, Bhubaneswar with the chief complaint of a grossly decayed maxillary right central incisor. An attempt was made to preserve tooth through endodontic treatment followed by post and core build-up which gradually failed. Clinical examination revealed a grossly decayed endodontically treated tooth with healthy gingival and periodontal tissue [Figure 1a]. Radiographic examination with respect to 11, which revealed endodontically treated tooth with crown margin almost at the crestal bone level. Cone-beam computed tomography (CBCT) showed the presence of grossly decayed 11 with a mean bone density of 1384 HU (D3). Distance from the alveolar crest to the nasal floor was 15.4 mm, and labio-palatal thickness showed a minimum of 5.9 mm [Figure 1b and c]. According to the CBCT, a 3.8-mm diameter and 13-mm length of the Equinox Myriad Plus Implant was decided for the placement to achieve appropriate primary stability. The CBCT examination also showed the presence of a thin buccal cortical plate that could have fractured during the extraction of the tooth, and hence the socket-shield treatment procedure was proposed, which preserved the buccal fragment of the tooth.

The area to be operated was anesthetized using 2% lidocaine with 1:100,000 epinephrine local anesthetics by infiltration block. Tooth 11 was decoronated with a round coarse-grained diamond bur till the crest of the bone, and straight diamond bur was used to remove the gutta-percha

filling from the root. Sectioning of the root was done in two steps. In the first step, sectioning was done till apical two-third with the help of tapered diamond bur mesiodistally in parallel to the long axis of tooth direction. In the second step, the direction of the bur was changed to an oblique direction toward the buccal surface to detach the buccal fragment from the palatal. The palatal portion was extracted atraumatically, and the remaining buccal fragment was reduced by leaving only 2 mm as a shield. Then, sequential osteotomy was done in the maxillary right central incisor region by the pilot drill (2.0 mm-diameter) followed by 2.3 mm drill, and 3.8 mm drill was done up to the length of 13 mm mark. The parallelism of the osteotomy site was checked and after confirming the parallelism, the Equinox Myriad Plus implant was placed into the maxillary right central incisor region (3.8 mm × 13 mm) with the insertion torque of 20Ncm [Figure 1d]. Radiographic confirmation was done, and cover screws were inserted.

The apicocoronal position of the implant platform was situated 1-mm apical to the buccal marginal gingiva, and the gap around the implant was filled with bone graft. The buccal flap was released till the mucogingival junction to get the buccal advancement of the flap, and the horizontal matrix suture was used to get a proper approximation. Postoperative antibiotics were prescribed and instructions were given, and the patient was recalled after 10 days for suture removal. No postoperative complication was noticed, and healing was uneventful.

5 months later, radiographs were taken to check for the osseointegration of the implant. Cover screws were then removed, following which healing abutment was placed [Figure 2a and b]. After 5 days, the patient was again recalled, the customization of the healing abutment was done through the addition of light-cured composite resin (3M-ESPE) to obtain the adequate soft-tissue contour and emergence profile [Figure 2c]. After 7 days, upon the removal of the custom healing abutment, a healthy soft-tissue contour was noted [Figure 2d] then the impression was made using the closed tray impression technique using prefabricated abutment [Figure 2e]. The laboratory fabricated a cement-retained porcelain fused to metal crown the margin of the crown was positioned 0.5 mm below the gingival margin to avoid negative aesthetic influence from the inner metal substructure.

After try-in, the abutment was screwed and the access hole was sealed with Teflon tape [Figure 3a]. The crown was cemented on to the abutment using the type-1 luting glass ionomer cement [Figure 3b]. Patient follow-up was done after 7 days, 1 month, and 6 months subsequently [Figure 4].

## Discussion

Immediate placement of implants in high-risk aesthetic zone poses a challenge for the clinician. Because not only it is difficult to obtain a prosthesis that mimics the natural

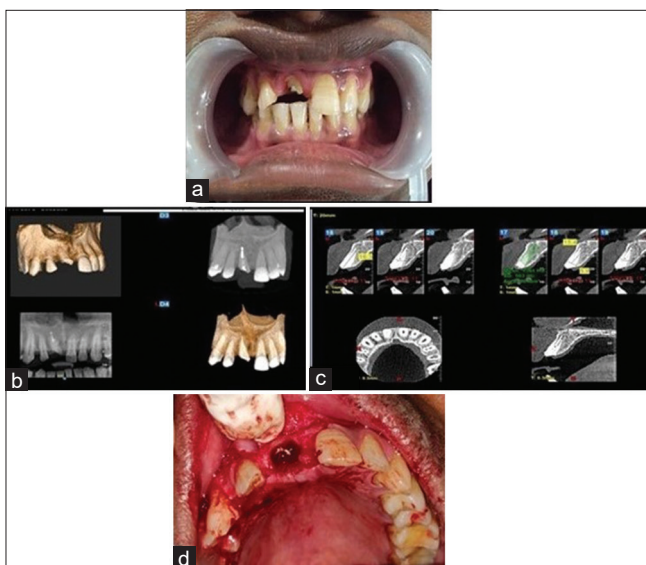
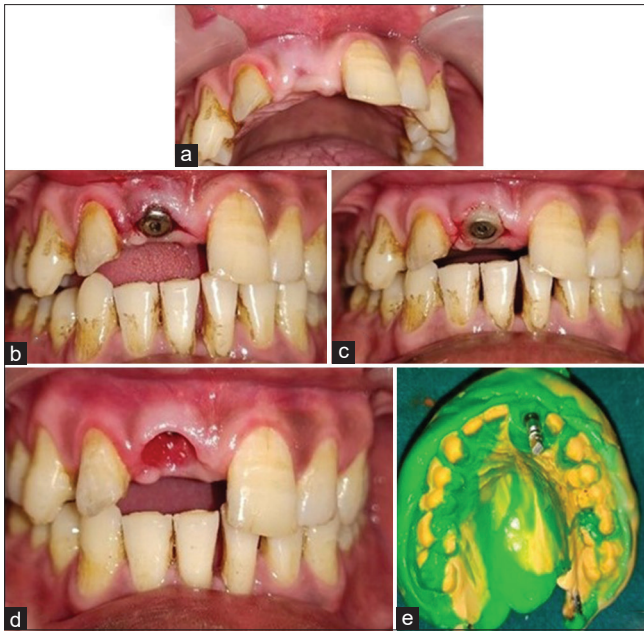
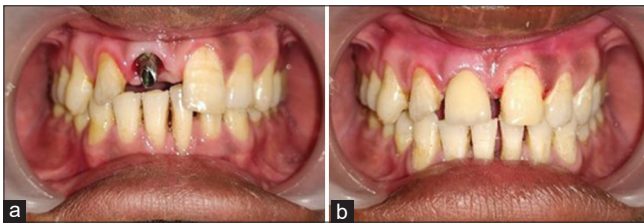


Figure 1: (a) Preoperative intraoral photograph. (b and c) Cone-beam computed tomography of the upper anterior region where the implant has to be placed. (d) Equinox Myriad Plus Implant placed in the 11 regions using socket shield technique



**Figure 2:** (a) Healed implant site after 4 months. (b) Stage-2 surgery (healing cap placed). (c) Customization of the healing abutment. (d) Obtaining the emergence profile as that of the contralateral tooth. (e) Closed tray impression made with transfer copings and lab analog



**Figure 3:** Cementation of definitive crown porcelain fused to the metal crown prosthesis. (a) abutment placed (b) After placement of definitive prosthesis



**Figure 4:** Postoperative follow-up photograph

crown but also maintaining the buccal bone without any bone resorption is difficult.<sup>[3,4]</sup>

Maintenance of the buccal bone can be done with the socket preservation or grafting of the extraction site

with xenografts. However, it is a technique sensitive and cumbersome procedure. The amount of bone present at the surgical site after these procedures might be less. Thus, in this case report, we used the socket-shield technique along with immediate implant placement as a method to preserve the buccal bone and maintain the ridge contour. The results were inconsistent with the original technique given by Hürzeler *et al.*<sup>[2]</sup> The socket-shield technique allowed us to preserve the bone at the proposed implant site, while the thin and prone to resorption buccal bone was retained.<sup>[5,6]</sup>

The socket-shield technique seems to be a complicated procedure. However, it was necessary to point out the technique sensitivity of this novel technique, which requires adequate armamentarium. Various kits are available for the socket-shield procedure such as K0297 PET: Partial Extraction Therapy System-Brassler USA and Megagen Root Membrane Kit. The procedure still presents certain risks such as displacement of the palatal root fragment, perforation of the healing buccal mucosa. However, these errors can be avoided using the proper technique during extraction procedure and while reducing the height of the retained root fragment up to the height of the alveolar ridge. To accomplish successful osseointegration, it necessary that the implant should be positioned in a three-dimensional orientation so that all its three boundaries are formed by the palatal bone, and there is a jumping gap between the root fragment and implant in the buccal aspect.<sup>[7]</sup>

An esthetic final implant-supported restoration was achieved through a harmonious relationship between the implant and the peri-implant soft tissues. This was determined through the position and contour of the gingival margin, placement of the temporary crowns with phased out maturation of gingival tissue until it finds support by the prosthetic components and final prosthesis that enhances, influences and allows gingiva to acquire the same dimensions and positions and contour as its contralateral natural tooth. For the present case an alternative method of customized healing abutment was used to achieve emergence profile of the peri-implant tissue.<sup>[8]</sup>

Prevention of the alveolar bone resorption by preserving the root fragment was supported in many literatures.<sup>[9,10]</sup> Salama *et al.*, in the year 2007, proposed the root submerged technique where the root part of the crown is submerged in the pontic area to preserve the alveolar bone and prevent any tissue collapse and bone loss.<sup>[11]</sup>

Siormpas *et al.* conducted a study in 2014 for the assessment of the cases with immediate implant placement by pertaining the buccal aspect of the root fragment. They reported the data based on the survival of the immediately implants placed in the anterior maxilla for 46 patients. At the end of the follow-up period, all implants showed a 100% survival rate. Radiographically, a good crestal bone stability without any resorption was observed. One complication was found among the studies where the apical



part of the root resorbed of single retained root part, but this did not interfere in the process of osseointegration of implant to the bone.<sup>[12]</sup>

In 2017, Gharpure and Bhatavadekar published a systematic review on the socket-shield technique where they assessed various studies and case series were done using the socket-shield technique and weighed its biological plausibility and long-term clinical prognosis. They evaluated 23 studies, from these, they found certain complications such as buccal and crestal bone loss, failure to osseointegrate, periodontal ligament, and cementum formation on implant and pocket formation and peri-implantitis.<sup>[13]</sup>

Furthermore, the socket shield technique has no long term clinical studies to be recommended as a standard treatment protocol. The systemic reviews have showed documentation of 3–5 years with case reports and case series. The clinician has their own expertise to assess and decide when and how to apply this technique for the placement of implants.

## Conclusion

Placing dental implants in the anterior maxilla zone and its rehabilitation process forms a complex procedure where any mistake can lead to poor esthetics and can change the appearance of the patient. Hence, this leaves us with no room of error. In this case report of immediate implant placement with the socket-shield technique shows successful preservation of postextraction tissue and thin buccal bone with the successful restoration of the implant. The socket-shield technique shows promising result in the preservation of postextraction socket and holds significant value in implant and esthetic dentistry.

## Consent for publication

The patient has given valid and informed consent for publication of this case and related images.

## Declaration of patient consent

The authors certify that we have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands the name and initials will not be published and due effort will be made to conceal the identity, but anonymity cannot be guaranteed

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## 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;61:32-44.
2. 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.
3. Mangano FG, Mastrangelo P, Luongo F, Blay A, Tunchel S, Mangano C. Aesthetic outcome of immediately restored single implants placed in extraction sockets and healed sites of the anterior maxilla: A retrospective study on 103 patients with 3 years of follow-up. *Clin Oral Implants Res* 2017;28:272-82.
4. Yan Q, Xiao LQ, Su MY, Mei Y, Shi B. Soft and hard tissue changes following immediate placement or immediate restoration of single-tooth implants in the esthetic zone: A systematic review and meta-analysis. *Int J Oral Maxillofac Implants* 2016;31:1327-40.
5. Araújo M, Linder E, Lindhe J. Effect of a xenograft on early bone formation in extraction sockets: An experimental study in dog. *Clin Oral Implants Res* 2009;20:1-6.
6. Schropp L, Wenzel A, Kostopoulos L, Karring T. Bone healing and soft tissue contour changes following single-tooth extraction: A clinical and radiographic 12-month prospective study. *Int J Periodontics Restorative Dent* 2003;23:313-23.
7. Pal A, Singh D, Bhandari A, Rawat P, Swarnakar TK, Swarn A. The socket shield technique. *Int J Curr Res* 2018;10:67200-4.
8. Abd El Salam, El Askary. *Fundamentals of Esthetic Implant Dentistry*. Ames, Iowa: Blackwell Munksgaard; 2007.
9. Reames RL, Nickel JS, Patterson SS, Boone M, El-Kafrawy AH. Clinical, radiographic, and histological study of endodontically treated retained roots to preserve alveolar bone. *J Endod* 1975;1:367-73.
10. O'Neal RB, Gound T, Levin MP, Del Rio CE. Submergence of roots for alveolar bone preservation. I. Endodontically treated roots. *Oral Surg Oral Med Oral Pathol* 1978;45:803-10.
11. 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.
12. Gharpure AS, Bhatavadekar NB. Current evidence on the socket-shield technique: A systematic review. *J Oral Implantol* 2017;43:395-403.
13. Siormpas KD, Mitsias ME, Kontsiotou-Siormpa E, Garber D, Kotsakis GA. Immediate implant placement in the esthetic zone utilizing the "root-membrane" technique: Clinical results up to 5 years postloading. *Int J Oral Maxillofac Implants* 2014;29:1397-405.