

## Clinical Application of the Socket-Shield Concept for Immediate Implant Placement-A Case Report

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### ABSTRACT

A case of rehabilitation of the upper front teeth is presented. To prevent bone resorption following extractions, a socket-shield technique on all the extracted teeth was performed. The combination of a staged extraction approach, the sequence of provisionals together with the minimal bone loss of vestibular volume, allowed solving this high aesthetic demanding case in a satisfactory way for the patient both in duration of the treatment and in its final outcome.

**Key words:** Socket shield, Extraction, Implant, Preservation, Resorption

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### INTRODUCTION

Immediate implant placement is a well-recognized and successful treatment option after extraction of tooth [1]. After extraction of the teeth, the surrounding bone and gums can shrink and recede very quickly resulting in defects and collapse of the lips and cheeks. The loss of alveolar bone may be also occurring. These defects can create major problems in performing restorative dentistry whether the treatment involves dental implants, bridges or dentures. Different techniques such as immediate implant placement [2] and ridge preservation procedure [3] have been proposed to maintain the ridge dimension to a certain amount. Immediate implant placement has gained popularity because it may reduce treatment time, number of surgeries and post-extraction bone loss.

Jaw deformities from tooth removal can be prevented and repaired by a procedure called socket preservation. The procedure begins with traumatic tooth extraction. Every attempt

is made to preserve the surrounding bone and soft tissue, with an emphasis on being careful not to fracture the delicate buccal plate. Retaining a root for alveolar ridge preservation has been tested in several clinical studies. In a case report, decoronation of an ankylosed tooth demonstrated complete maintaining of the height and width of the alveolar ridge prior to implant placement [4]. Salama recommended a root submergence technique in which a natural tooth root was maintained and the surrounding tissue could be preserved at the pontic site [5]. The socket-shield (SS) technique provides a promising treatment adjunct to better manage these risks and preserve the post-extraction tissues in aesthetically challenging cases.

The SOCKET-SHIELD TECHNIQUE (SST) was first described by Hürzeler et al. [6]. He did a histologic evaluation in a beagle dog and showed no resorption of the root fragment and new cementum formed on the implant surface. Their clinical case demonstrated excellent buccal tissue preservation and clinically successful osseointegration of the implant. Joseph et al. [7] reported an alternative approach in a case utilizing a retained proximal root fragment to maintain the inter-implant papilla. Bäumer et al. conducted a pilot study concentrated

on the histological, clinical, and volumetric observation of the alveolar ridge and implant after applying this technique [8]. Healthy periodontal ligament of the tooth segment, minor volumetric change of the ridge contour, and direct bone-to-implant contact manifested that this technique is a feasible treatment option.

The principle is to prepare the root of a tooth indicated for extraction in such a manner that the buccal / facial root section remains in-situ with its physiologic relation to the buccal plate intact. The tooth root section's periodontal attachment apparatus (periodontal ligament (PDL), attachment fibers, vascularization, root cementum, bundle bone, alveolar bone) is intended to remain vital and undamaged so as to prevent the expected post-extraction socket remodeling and to support the buccal / facial tissues [9]. Hereafter a case is presented where the SS technique was carried out at implant placement.

#### CASE REPORT

A 35year old, healthy, and non-smoking male patient presented with a missing tooth on the upper right central incisor also complained of discolored tooth of upper left incisor (Figure 1).

On clinical examination, remnant of tooth was found. Radiographic examination showed root fragments embedded in the socket and root canal treated with 12 (Figure 2). Treatment

options were discussed with the patient and implant-supported single crown with socket shield technique was planned for replacing 11 followed by provisionalization.

Cone-beam computed tomography (CBCT) demonstrated thin buccal plate and sufficient residual bone apico-palatal to the root (Figure 3). Following local anaesthesia, the incision is made and the flap is reflected (Figure 4).

The root was then sectioned in a mesiodistal direction along its long axis as far apical as was possible using a long shank root resection bur (Figure 5) coupled to a hydrated high-speed handpiece. Sectioning divided the tooth root into facial and palatal halves with the intention of preserving the facial root section manipulated and attached to the tooth socket (Figure 6).

The remaining root section was then reduced coronally to 1 mm above the alveolar crest, and thinned slightly to a concave contour by careful application in an apico-coronal and mesiodistal direction with a long shanked round diamond bur. The tooth socket's palatal wall and apex were then curetted to remove any tissue or infective remnants and the root section was checked for immobility with a sharp probe. With the preparation steps complete, the tooth root hereafter was known as the socket-shield (SS) (Figure7).



Figure 1: Non-smoking male patient presented with a missing tooth.



Figure 2: Radiographic examination.

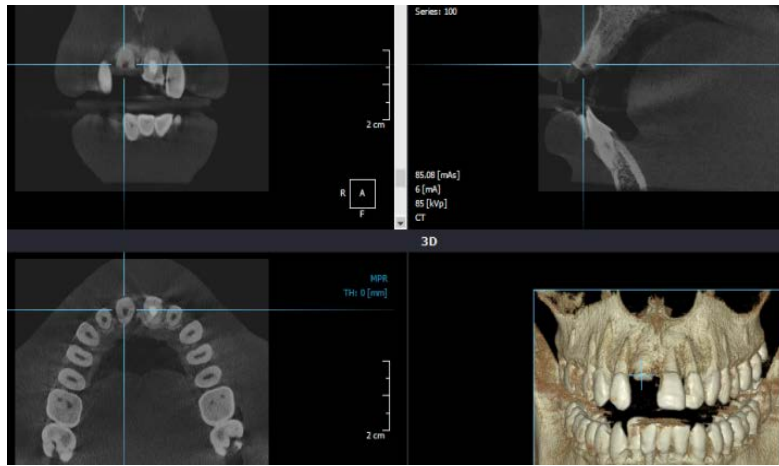


Figure 3: Cone-beam computed tomography (CBCT).



Figure 4: Incision.



Figure 5: Root was then sectioned.

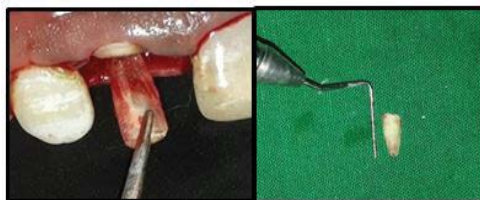


Figure 6: Sectioning divided the tooth root into facial and palatal halves.



Figure 7: Socket-shield (SS).



Figure 8: Implant.

An osteotomy was then sequentially prepared and a 4 x 13 mm internal conical connection implant (AnyRidge, MegaGen) was inserted palatal to the SS via a prosthodontically planned surgical guide with the implant table 2 mm below the facial crest (Figure 8). The implant gained primary stability from bone apical and palatal sufficient to immediately restore with a provisional restoration (Figure 9).

Healing was uneventful with no signs of infection or other complication at the 1 week and 1 month follow up visits (Figure 10). The patient was satisfied with the aesthetic and functional outcomes achieved. After 3 months of recall visits CBCT (Figure 11) was taken and tooth preparation was done (Figure 12). Implant was then restored with a screw retained metal porcelain crown restoration with 11 and metal porcelain crown with 12 (Figure 13).



Figure 9: Provisional restoration.



Figure 10: Healing.

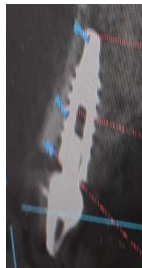


Figure 11: After 3 months of recall visits CBCT.



Figure 12: Tooth preparation.



Figure 13: Implant was then restored with a screw retained metal porcelain crown restoration with 11 and metal porcelain crown with 12.

## DISCUSSION

This case report confirmed that retaining a root fragment adjacent to the buccal crestal bone and placing an implant engaged to the palatal socket wall immediately are able to maintain the contour of the ridge. The implant can achieve osseointegration without any inflammation at peri-implant tissue. While histological examination is needed to verify the preservation of buccal bone plate and tissue regenerated between the shield and implant, the clinical outcome demonstrated the potential of socket shield technique to avoid noticeable alteration of ridge shape after tooth extraction [9].

In scientific literatures, immediate implant placement is a predictable procedure to accomplish osseointegration [10]. However, the biological response to tooth extraction, such as marked resorption of the buccal bone plate, is not altered when an implant is installed into the socket [11].

Simultaneously grafting the void between the implant and socket walls with bone substitutes in conjunction with a barrier membrane does not preserve the buccal bony wall either. Applying guided bone regeneration (GBR) and/or soft tissue augmentation at the external buccal surface of the ridge can only partly compensate but not prevent the resorption process [12].

Socket shield technique meets the demands of minimal invasion, tissue preservation, and no need of bone substitute materials. Baumer et al. proved that the remaining tooth segments showed healthy periodontal ligament at buccal side and no osteoclastic remodeling of the coronal part of the buccal plate [8]. Socket shield technique for ridge preservation can be applied not only for maintaining buccal contour of an edentulous ridge but also for keeping the inter-implant soft and hard tissue. In this case report, the application of socket shield technique combined with immediate implant placement for replacing a failing tooth obviously maintains the ridge shape. The implant-supported prosthesis functions well and healthy peri-implant soft tissue is observed. Further studies with larger scale of evidence and long-term follow up are needed to substantiate the validity of this technique.

## CONCLUSION

The Socket Shield technique shows promising results with respect to soft and hard tissue preservation in cases of post extraction immediate implant cases. However, the existing case reports are of limited scientific value and larger sample sized randomized controlled clinical trials are required to evaluate the clinical outcome of the procedure.

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