Content available at: https://www.ipinnovative.com/open-access-journals

IP Annals of Prosthodontics and Restorative Dentistry

Journal homepage: https://www.aprd.in/

Case Report

The modified socket shield technique with immediate implant placement-A case report with procedural tips

Hema Kanathila[1]*, Ashwin Pangi[2], Suvidha Patil[1], Betsy Sara Thomas[3], Bharathi Poojary[4]

[1]*Dept. of Prosthodontics, Crown and Bridge, KAHER s KLE VK Institute of Dental Sciences, Belgaum, Karnataka, India*
[2]*Aesthetix Dental Clinic, Belagavi, Karnataka, India*
[3]*Malaysia MAHSA University, Selangor, Malaysia*
[4]*Sharavathi Dental College and Hospital, Shimoga, Karnataka, India*

ARTICLE INFO

Article history:
Received 23-08-2023
Accepted 26-10-2023
Available online 04-12-2023

Keywords:
Immediate implant
Socket shield
Aesthetics
Durability
Socket preservation

ABSTRACT

The tooth root always aids in preserving the surrounding hard and soft tissues, favouring their functionality and aesthetics. Resorption of the alveolar bone following tooth extraction leads to deficits in both the hard and soft tissues. In order to prevent resorption after extraction, immediate implant placement, the use of graft materials, and the use of barrier membranes have all been reported in the literature. Despite different degrees of cortical bone preservation, none of these procedures completely avoided mid-facial recession after immediate implant placement. The socket shield technique can be used to prevent this. Here, in this clinical case report we present "the modified socket shield technique" in achieving successful aesthetic and functional outcome with procedural tips.

1. Introduction

Alveolar bone development is low or diminished when teeth are missing.[1,2] Deficits in both soft tissue and hard tissue may result from the resorption of alveolar bone after tooth extraction. These deficiencies in the hard and soft tissues can have an impact on the final appearance and functionality of an implant supported treatment. When thinking about aesthetics, the maxillary anterior region is the most important area.[3,4] Additionally challenging is the patient's demand for a quick replacement in this area.

A number of methods to prevent resorption after extraction have been documented in the literature: immediate implant placement, guided bone regeneration, palatally positioned implants, and platform switching.[5,6] None of these techniques totally prevented the mid-facial recession after immediate implant implantation, despite the varying degrees of cortical bone preservation they demonstrated.

When a tooth is extracted, the vestibular section of the most coronal third of the root is typically left behind using the socket shield technique (SST).[7] The buccal/facial component of the root serves as a shield in this method, which was first described by Hurzeler et al., preventing the recession and resorption of the buccal/facial soft and hard tissues, respectively.[8] By preserving the periodontal ligament, its fibres, its blood supply, its cementum, and the surrounding bone, this approach aids in attaining periodontal ligament-mediated ridge maintenance. Although the idea underlying the socket shield technique is quickly becoming widely accepted among clinicians, there are only a very limited number of clinical research on the subject;[9] as a result, nothing is known about the

* *Corresponding author*.
E-mail address: hemak_19@yahoo.com (H. Kanathila).

https://doi.org/10.18231/j.aprd.2023.041

potential drawbacks and/or consequences connected with this approach. This case report on "the modified socket shield" discusses on the case selection, the technique (Figure 1) and tips for a successful treatment outcome of a patient with thin buccal cortical plate.

2. Case Description

A 38-year-old-male medically fit non-smoker patient visited our dental clinic for implant therapy to substitute his fractured maxillary right lateral incisor (Figure 2). The cervical fracture of the tooth with lack of ferrule made it unrestorable unless orthodontic forced eruption would be made. The patient requested an implant instead of having the tooth extruded through orthodontics. Grossly decayed tooth with good gingival and periodontal tissue was evident upon clinical examination.

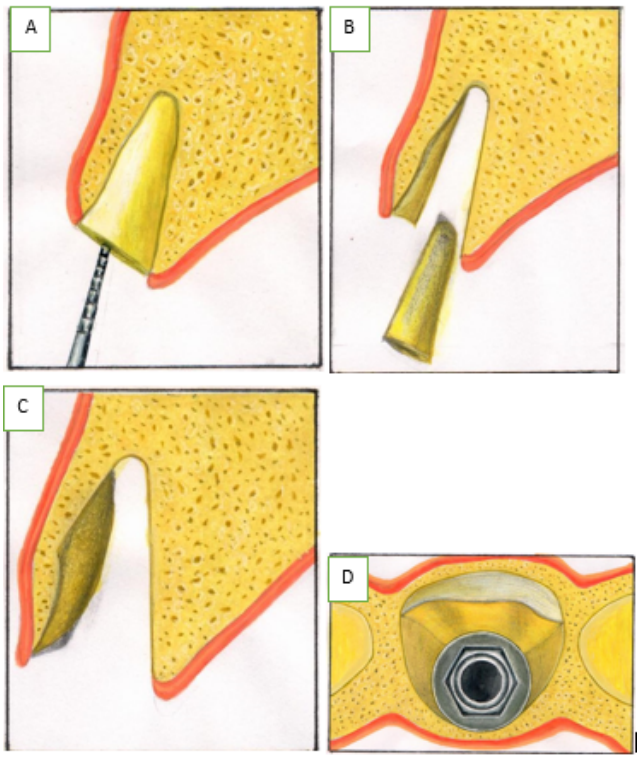

Figure 1: Socket shield technique; **A:** Sectioning of the root; **B:** Extraction of the palatal root fragment; **C:** Cross sectional view of Ideal shield design; **D:** Occlusal view of the shield

Cone beam computed tomography (CBCT) imaging series was recommended for the patient to determine whether there was enough bone in the region surrounding the tooth 12, for implant placement. CBCT was carried out using Kavo 3D OP Pro, with a 5x5 cm FOV (field of view). Multiple planes of reconstruction were used to gather the data as a volume collection. CBCT scans were utilised to more precisely estimate the amount of bone that might support an implant. Regarding the tooth 12,

Figure 2: Fractured maxillary right lateral incisor

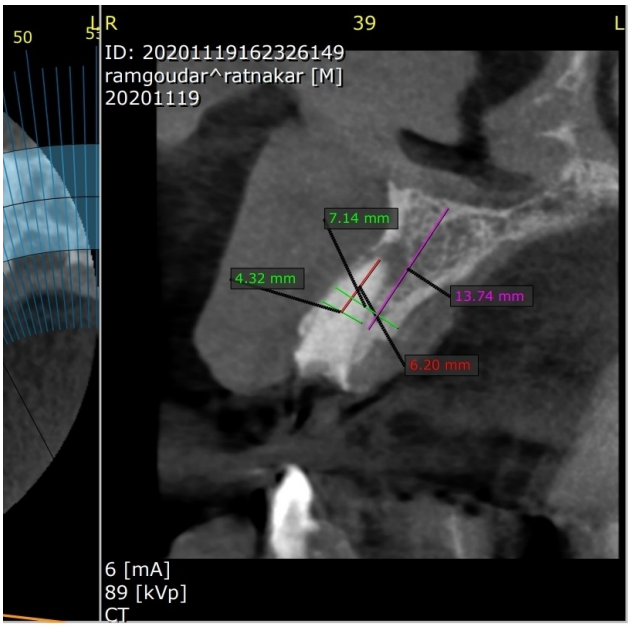

Figure 3: Pre-operative CBCT

Figure 4: Palatal section of the root along with the apex.

Figure 5: Implant placement

Figure 6: Screw retained permanent crown on right lateral incisor.

it displayed periapical radiolucency. The highest labio-palatal thickness measured 7.14 mm, and the alveolar crest to nasal floor distance was 13.74 mm (Figure 3). The CBCT examination also revealed the presence of a fragile buccal cortical plate that might fracture during extraction. Hence, the buccal fragment of the tooth was intended to be preserved by the socket-shield treatment. Based on the data, 4.2-mm diameter and 11.5mm length implant (Noris Implant manufactured by Noris Medical Dental Implant Company, Israel) was planned in order to place an implant that exceeded the socket length by 3mm to get primary stability.

2.1. Technique

The surgical site was anesthetized by infiltration and the tooth 12 was decoronated using a coarse-grained diamond bur till the crest of the bone. Care was taken in order to protect the adjacent tooth structures. A tapered diamond bur was then used to slice the tooth till the apical two-thirds, while holding it parallel to the long axis of the tooth. The buccal fragment was separated from the palatal component in the second phase by changing the bur's direction to an oblique one towards the buccal surface.

A periotome was used in the palatal portion to detach the ligaments from the bone. To avoid unintentional pressure in the facial direction and to support the facial root section at the bony plate, finger pressure was applied to the facial portion of the root. Then, the palatal root part was carefully removed without traumatizing the buccal root section and root apex (Figure 4).

A large round diamond bur was then used to thin the most coronal 2 mm of the interior aspect of the socket-shield. This formed a chamfer, which allowed for more prosthetic space and a soft tissue seal around the implant's prosthetic component. The socket-shield was then meticulously smoothened, with all sharp edges removed. This was done with a fine-grit long-shank bur. After curetting the extraction socket to eliminate the granulation tissue, the buccal root shield was examined for immobility with a pointed probe.

Because the bone was of the D4 type (CBCT analysis), implant osteotomy was performed with the Densah burs to densify the available bone in order to provide good primary stability. Osteotomy was performed palatal to the fully prepared socket-shield according to protocol, always remaining within the bone envelope. The implant was inserted 1.5 mm below the facial bone crest (Figure 5) and roughly 0.5 mm above the chamfer's apical limit. To avoid implant contact with the socket-shield, which could dislodge or even fracture it, and to allow for bone formation, the implant was placed in the lingual/palatal region. Following implant placement, a screw-retained temporary crown was fabricated and examined for occlusal contact to ensure zero functional loading. Post-operative antibiotics and analgesics were given, and the patient was called back after seven days for suture removal and a two-week post-operative review. After a 5-month postoperative clinical examination, we proceeded with the fabrication of the final restoration (Figure 6).

3. Discussion

Bone resorption caused by tooth extraction is one of the most common complications after extraction and implant placement in aesthetic areas, particularly in the anterior maxilla. Tooth extraction affects the periodontal ligament, which provides nutrients to the buccal bone plate via its vascular supply. Without this sustenance, the buccal bone plate undergoes physiologic resorption, which happens primarily within the first 4 to 6 months after tooth extraction.[10,11] This is followed by a contraction of the overlying soft tissues, which might worsen the situation and cause an aesthetic problem.

In order to avoid the detrimental effects of bone resorption of the buccal bone plate occurring following tooth extraction and to achieve the best possible aesthetic

results, the socket shield approach has been recommended in conjunction with the placement of post extraction implants in aesthetic areas.[8] There may be a number of reasons to remove the tooth and place an implant right away. However, there are more implicit requirements to keep the facial root section as a socket-shield.

Any shield movement during preparation might complicate or potentially induce a failed intervention, limiting the selected teeth to those that are non-restorable or have horizontal fractures above the level of the bone crest. Badly deteriorated teeth with root caries, severe apical pathology, teeth out of arch, and teeth with fenestrations are not recommended because preparing the shield and removing the palatal portion of the root without dislodging the shield would be difficult. This procedure should not be used on teeth with earlier or active periodontal disease, teeth with mobility or widened periodontal ligament, or teeth with vertical root fractures or horizontal fractures below bone, or on teeth with external/internal resorptions.[12]

A tooth that lacks a ferrule, rendering it unrestorable without supplementary crown lengthening surgery, is one of the most typical clinical circumstances that indicates socket shield. In the anterior region, crown lengthening for one tooth causes asymmetry and is usually avoided. There is currently no agreement on the appropriate socket-shield dimensions (length, thickness, etc.). According to research, a thinner socket-shield is more prone to flexure, fracture, and movement, particularly if the implant and its threads apply force against it.[13] It was also suggested that the facial root part be thicker (about half the thickness from the root canal to the outer surface) to make it stronger and more immune to any stresses. A larger, longer socket-shield also means more attachment to the bundle bone via its periodontal ligament, and hence better stability, reducing mobility.[14] This formed the basis for the shield thickness in our case.

In our present case, the implant was placed more lingual to the socket shield as implant in contact with the socket-shield may unintentionally dislodge or even fracture it. Researchers have suggested placement of implant 1.5 mm below the facial bone crest, and about 0.5 mm above the apical limit of the chamfer. Otherwise, limited bone may form between the socket-shield and the implant, and/or the socket-shield may be prone to pressure.[15]

The surgical technique described in our case had 3 important differences from the classical method described by Hurzeler et al.[16] First, the shield's thickness was lowered to 1.5 mm, with a concave profile. The shield thickness was maintained to be 1.5mm thick in order to resist fracture and resorption. Second, the most coronal section of the root is left at the bone crest level rather than 1 mm above. The biggest problem in supracrestal shield preparation was the exposure of the socket-shield through the overlying soft tissue. In our situation, the socket-shield was decreased to the bone level to prevent this. Third, no graft material was used in the gap between the shield and the implant, which is consistent with Siormpas and Mitsias,[17,18] but differs from Gluckman et al,[14,19] who proposed grafting the region with particulate material. Tarnow and Chu suggested, the direct implantation of implants into extraction sockets with an intact buccal wall permits healing and osseointegration despite a significant gap distance and without primary flap closure, a bone graft, or a barrier membrane.[20] Our case report is based on "the modified shield technique" which was given by Han et al, where the shield's thickness was retained at 1.5 mm, the most coronal part of the residual root was positioned at the level of the bone, and no grafting material was used in the space between the residual root and the implant.[21]

Socket shield procedure requires great precision and following the below guidelines could help the clinicians overcome the errors to a greater extent.

1. The root apex should be completely removed and thoroughly debrided during the preparation of the shield.
2. By the end of the preparation, the shield should be immobile and stable to avoid infection, resorption, extrusion, and eventual shield loss.
3. The shield must be sufficiently thin to avoid getting into touch with the implant. When shields are extremely thin, migration or mobility may occur.
4. The shield should have optimum thickness to resist detachment from the labial alveolar bone. Thicker shields impede implant placement and likely to make contact with the implant after placement.

The design and dimensions of an ideal shield can be summarized as

1. No apical or palatal part of the root should be included in the shield.
2. The length of the shield should be at least 8 mm or about two/third that of the original root, whichever is more.
3. Shield width is half the distance between the root canal space of the root to be sectioned and the labial bone.
4. The curvature of the labial bone from the mesial to the distal line angle should be followed.
5. The shield should be trimmed to the level of the crest of the labial bone.
6. The internal aspect of the shield should have a S-shaped curve or a bevel.

Selection of the implant diameter in socket shield should ideally consider maintaining a gap of 1–1.5 mm between the labial aspect of the implant in the coronal portion and the shield. And to establish good primary implant stability from the periapical bone, the implant should exceed the socket length by 2–3 mm. Therefore, the osteotomy preparation is

recommended to extend 2–3 mm beyond the socket apex on the palatal wall.

Although the clinical results obtained by socket shield technique can be considered encouraging, our literature research points out to the fact of 1 human histologic study in the current literature that support the advantage of this technique.[22] The paper reported histologic evidence of an immediate implant placed in the human anterior maxilla, according to the socket shield technique, and retrieved after 5 years. It indicated that the buccal bone plate had been maintained without resorption and that a healthy periodontal ligament was preserved. With a high percentage of bone-to-implant contact, the implant demonstrated osseointegration.

One of our case report's key limitations is that we could only follow up on this instance for one year after implant placement. To make more specific conclusions on the reliability of this "modified" socket shield approach, a longer follow-up period is required. At the one-year follow-up, we solely looked at clinical outcomes and did not carry out a 3-dimensional volumetric examination of tissue stability or use subtraction radiography, which would have allowed us to draw more specific conclusions about the method in this case. The greatest factor behind the success of socket shield technique is that, by keeping the buccal cortical plate in place during extraction, the root fragment that serves as the foundation for protecting both the hard and soft tissues is shielded from the external environment, which can result in infection or aesthetic problems.[23,24]

4. Conclusion

Within the limitations of our observations we found that " the modified socket shield technique" seems to be a successful procedure when combined with immediate implant placement, because the root fragment does not interfere with osseointegration and may be beneficial for the esthetics, by protecting the buccal bone from resorption and also reducing the need for bone grafts compared to the other techniques reported in literature. Because of the limited existence of case reports and studies, there should be a caution while practicing this technique. Hence, case selection and judgement by the practitioner in the use of Socket shield technique is considered to be utmost important for a successful outcome.

5. Take Home Message

1. Keeping the cornonal portion of the shield at the crest can reduce the chances of exposure of the shield through the soft tissue during healing.
2. Very thin shields are vulnerable to mobility and very thick shields can interfere with implant placement.
3. Excessive pressure and contact of the implant to the socket shield can dislodge /fracture the socket shield.
4. Incomplete sectioning of the root can cause accidental movement of the labial segment or inadvertent extraction of the entire root resulting in procedural failure.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Glocker M, Attin T, Schmidlin PR. Ridge Preservation with Modified "Socket-Shield" Technique: A Methodological Case Series. *Dent J*. 2014;2(1):11–21.
2. Schröder HE. Orale Strukturbiologie. Stuttgart, Germany: Georg Thieme Verlag; 1987.
3. Araújo MG, Lindhe J. Dimensional ridge alterations following tooth extraction. An experimental study in the dog. *J Clin Periodontol*. 2005;32(2):212–8.
4. Patel S, Parikh H, Kumar B, Barun B, Das M, Pandita A, et al. Socket shield technique, a novel approach for the esthetic rehabilitation of edentulous maxillary anterior alveolar ridges: A special case file. *J Dent Implants*. 2019;9(2):91–4.
5. Tonetti MS, Cortellini P, Graziani F, Cairo F, Lang NP, Abundo R, et al. Immediate versus delayed implant placement after anterior single tooth extraction: the timing randomized controlled clinical trial. *J Clin Periodontol*. 2017;44(2):215–24.
6. Al-Nsour M, Chan HL, Wang HL. Effect of the platform-switching technique on preservation of Peri-implant marginal bone: a systematic review. *Int J Oral Maxillofac Implant*. 2012;27(1):138–45.
7. Kumar PR, Kher U. Shield the socket: Procedure, case report and classification. *J Indian Soc Periodonto*. 2018;22(3):266–72.
8. Hürzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S, et al. The socket-shield technique: a proof-of-principle report. *J Clin Periodontol*. 2010;37(9):855–62.
9. Pour RS, Zuhr O, rzeler MH, Rafael CF, Edelhoff D, Liebermann A, et al. Clinical benefits of the immediate implant socket shield technique. *J Esthet Restor Dent*. 2017;29(2):93–101.
10. Covani U, Ricci M, Bozzolo G, Mangano F, Zini A, Barone A, et al. Analysis of the pattern of the alveolar ridge remodelling following single tooth extraction. *Clin Oral Implants Res*. 2011;22(8):820–5.
11. Araújo MG, Silva CO, Misawa M, Sukekava F. Alveolar socket healing: what can we learn? *Periodontol 2000*. 2000;68(1):122–34.
12. Garbure AS, Bhatavadekar NB. Current evidence on the socketshield technique: a systematic review. *J Oral Implantol*. 2017;43(5):395–403.
13. Gluckman H, Salama M, Toit JD. A retrospective evaluation of 128 socket-shield cases in the esthetic zone and posterior sites: Partial extraction therapy with up to 4 years follow-up. *Clin Implant Dent Relat Res*. 2018;20(2):122–9.
14. Gluckman H, Salama M, Toit JD. Partial Extraction Therapies (PET) Part 2: Procedures and Technical Aspects. *Int J Periodontics Restorative Dent*. 2017;37(3):377–85.
15. Gluckman H, Toit JD, 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(2):212–25.
16. Hurzeler MB, Zuhr O, Schupbach P, Rebele SF, Emmanouilidis N, Fickl S, et al. The socket-shield technique: a proof-of-principle report. *J Clin Periodontol*. 2010;37(9):855–62.
17. 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 post-loading. *Int J Oral Maxillofac Implants*. 2014;29(6):1397–405.
18. Mitsias ME, Siormpas KD, Kontsiotou-Siormpa E. A step-by-step description of PDL-mediated ridge preservation for immediate implant

rehabilitation in the esthetic region. *Int J Periodontics Restorative Dent*. 2015;35(6):835–41.
19. Gluckman H, Salama M, Toit JD. Partial Extraction Therapies (PET) Part 1: Maintaining Alveolar Ridge Contour at Pontic and Immediate Implant Sites. *Int J Periodontics Restor Dent*. 2016;36(5):681–7.
20. Tarnow DP, Chu SJ. Human histologic verification of osseointegration of an immediate implant placed into a fresh extraction socket with excessive gap distance without primary flap closure, graft, or membrane: a case report. *Int J Periodontics Restorative Dent*. 2011;31(5):515–21.
21. Chang-Hun H, Kwang-Bum P, Mangano FG. The Modified Socket Shield Technique. *J Craniofacial Surg*. 2018;29(8):2247–54.
22. Mitsias ME, Siormpas KD, Kotsakis GA, Ganz SD, Mangano C, Iezzi G, et al. The root membrane technique: human histologic evidence after five years of function. *Biomed Res Int*. 2017;p. 7269467. doi:10.1155/2017/7269467.
23. Esteve-Pardo G, Esteve-Colomina L. Clinical Application of the Socket-Shield Concept in Multiple Anterior Teeth. *Case Rep Dent*. 2018;p. 9014372. doi:10.1155/2018/9014372.
24. Baumer D. Socket shield technique for immediate implant placement -clinical, radiographic and volumetric data after 5 years. *Clin Oral Implants Res*. 2017;28(11):1450–8.

Author biography

Hema Kanathila, Professor https://orcid.org/0000-0002-5876-1377

Ashwin Pangi, Consultant

Suvidha Patil, Lecturer

Betsy Sara Thomas, Professor and Head

Bharathi Poojary, Reader

Cite this article: Kanathila H, Pangi A, Patil S, Thomas BS, Poojary B. The modified socket shield technique with immediate implant placement-A case report with procedural tips. *IP Ann Prosthodont Restor Dent* 2023;9(4):222-227.