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

IP Annals of Prosthodontics and Restorative Dentistry

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

Review Article

Partial extraction therapy – The socket shield: An overview

Sheetal Jadhav[1], Naisargi P. Shah[2], Hitesh Ramdas Sawant[3], Avantika Vijaysingh Jadhav[1], Jyotsna Sethumadhavan[1], Sanpreet Singh Sachdev[4]*

[1]*Dept. of Prosthodontics and Crown and Bridge, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Navi Mumbai, Maharashtra, India*
[2]*Dept. of Prosthodontics, Crown & Bridge, Terna Dental College, Navi Mumbai, Maharashtra, India*
[3]*Dept. of Orthodontics and Dentofacial Orthopedics, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Navi Mumbai, Maharashtra, India*
[4]*Dept. of Oral Pathology and Microbiology, Bharati Vidyapeeth (Deemed to be University) Dental College and Hospital, Navi Mumbai, Maharashtra, India*

ARTICLE INFO

Article history:
Received 20-03-2024
Accepted 20-04-2024
Available online 15-05-2024

Keywords:
Dental Implants
Prosthodontics
Rehabilitation

ABSTRACT

Extraction of teeth leads to significant loss of alveolar bone dimensions, most of which occur within the first six months. Placement of dental implants in the jawbones requires a sufficient quantity of alveolar bone to restore the masticatory functions and prevent pathological bone fracture and subsequent failure of the implant. Partial Extraction Therapy refers to the retention of the roots up to the level of the alveolar crest during extraction to maintain the alveolar bone width and height. Socket shield technique, a subset of PET, involves the preservation of one portion of the root, most commonly the buccal two-thirds. As the buccal root is preserved along with the periodontium the overlying buccal bone remains intact avoiding hard and soft tissue complications. The present review aims to describe various aspects related to the SST in a simplified and concise manner.

1. Introduction

Extraction of the tooth sets up a cascade of reactions in the surrounding alveolar bone in an attempt to heal the socket. This is generally associated with some degree of loss in the alveolar bone dimensions. Residual ridge resorption is a continuous process and occurs most rapidly in the first six months of extractions. Estimated dimensional loss of alveolar bone has been accounted to 29-63% horizontally and 11-22% vertically after 6 months following tooth extraction.[1]

The loss of the supporting alveolar bone and subsequent apical migration of the overlying gingival tissue result in interdental spaces between the teeth. These spaces contribute to an unaesthetic appearance owing to the presence of the so-called 'black triangles'.[2] The condition is especially of concern when present in the maxillary anterior region as it affects the esthetics of the patient. The intervention of the resorption process can be done by rehabilitating the edentulous ridges with dental implants. Furthermore, if rehabilitation of the lost tooth is to be done by means of dental implants, it is crucial to maintain an adequate amount of supporting alveolar bone and vascularity around the tooth socket to prevent inadvertent failure of the implant.[3]

* *Corresponding author.*
E-mail address: sunpreetss@yahoo.in (S. S. Sachdev).

https://doi.org/10.18231/j.aprd.2024.019

To prevent the collapse of the cortical plates and maintain the dimension of the alveolar ridge, various strategies have been devised over the years. Ridge preservation techniques, hard and/or soft tissue augmentation procedures, socket preservation, and immediate implant placement have been used in the past to compensate for this loss.[4] Although varied degrees of success have been reported, these procedures have failed to demonstrate optimal preservation of the alveolar socket.[5]

Partial Extraction Therapy (PET) is one such procedure that provides optimum esthetics with minimum surgical interventions and requires shorter treatment times. PET collectively involves root submergence, Socket-shield technique (SST), Proximal socket-shield technique, and Pontic shield technique.[6]The present review aims to provide a comprehensive overview of the various aspects related to SST in implant dentistry such as its indications, procedure, advantages, and limitations. The review holds an objective to elucidate the complexities related to SST in a simplified manner to the clinicians aiding them to understand the concept better.

2. The Socket Shield Technique

The SST, first proposed by Hurzeler et al., involves the preservation of the root of a tooth with intact buccal bone, preserving the periodontium and bundle bone.[4,5,7]Thus, it is also known as Partial root retention or root membrane technique. With the preservation of a portion of the tooth root, the loss of PDL is avoided, thereby reducing the remodeling and resorption of hard and soft tissue associated with tooth extraction.[8]The indications and contra-indications of the SST are listed in Table 1.

2.1. Classification

Kumar PR and Kher proposed the classification for various types of socket shields that can be employed to preserve the soft and hard tissue and to maintain the height of the interdental papilla (Table 2).[9]The classification provides an understanding of the preparation design and treatment planning. (Figure 1)

2.2. Surgical procedure

The SST technique involves several sequential tooth preparatory and implant placement steps. Initially, the tooth is decoronated under local anesthesia with a high-speed handpiece under coolant using diamond rotary instruments at the gingival level.[10,11] The root is then sectioned vertically in a mesiodistal direction. Intraoral periapical radiographs or alternatively, Gates Glidden drills may be used to determine the length of the root. The palatal sections of the root are mobilized within the socket with the aid of peritome/microelevators following which it is removed by microforceps.

A concave structure is prepared on the facial part of the root with the rotary instruments. Additionally, the socket shield is reduced to approximately half the thickness from the canal to facial limits.[4,11] Curettage of the apical portion of the socket is performed to eliminate debris or pathological tissues present within the socket. The roots are then reduced coronally using large diamond burs up to the level of the alveolar crest. An internal beveled chamfer is created to accommodate the S-shaped prosthesis emergence.[10] Implant osteotomy should be prepared apical and palatal to the fully prepared socket and the Implant is placed according to conventional protocol. To compensate for the jumping distance, graft material can be used if the space is larger.[12]

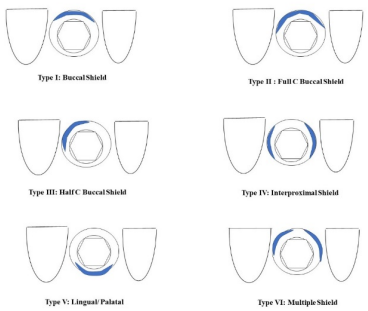

Figure 1: Different types of socket shields

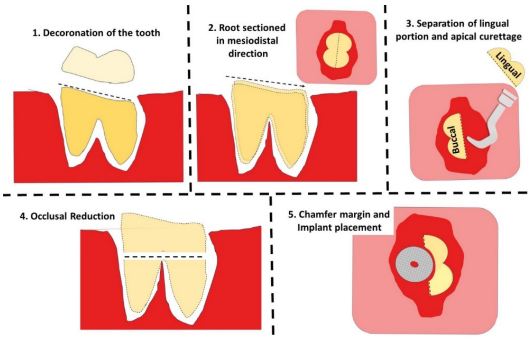

Figure 2: Surgical procedure of the socket shield technique

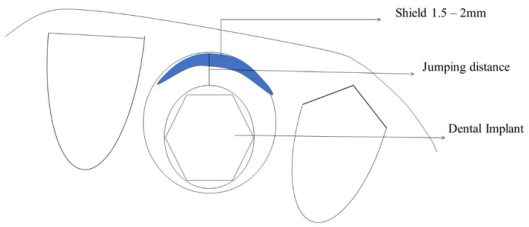

Figure 3: The jumping distance in implant and socket shield context

Table 1: Indicationsand contra-indications of the socket shield technique

Indications	Contra-indications
Unrestorable tooth crown or tooth indicated for extraction	Periapical pathosis
Absence of periapical pathology	Internal or External resorption
Preservation of alveolar ridge to prevent buccal ridge collapse	Presence of bony perforation
Fractured tooth crown	Teeth with poor prognosis
Planned immediate implant placement	Teeth with excessive mobility
Papilla preservation Patients with high smile line	Root caries

Table 2: Classification of the socket shields and their specific indications

Type	Name	Description	Indications
Type I	Buccal Shield	The buccal portion of the socket between the proximal line angles of the tooth.	Single missing tooth
Type II	Full C Buccal Shield	Buccal and the interproximal portion on both sides of the socket.	Implant/missing tooth present on either side of the proposed edentulous site.
Type III	Half C Buccal Shield	Buccal part and one of the interproximal parts.	Edentulous socket with adjacent tooth on one side and implant/ missing tooth on the other side.
Type IV	Interproximal Shield	In the mesial or distal part of the socket	In case of buccal bone resorption requiring graft, and an adjacent side with a missing tooth/implant where significant bone loss may occur interproximally if the tooth is extracted completely.
Type V	Lingual Palatal Shield	Lingual/palatal side of the socket.	Extractions involving mandibular or maxillary molars.
Type VI	Multiple buccal shields	Two or more shields in the socket	Cases of vertical root fracture

2.2.1. The overall procedure for SST is depicted inFigure 2
An interim crown can be placed if adequate implant stability is achieved (ISO > 70), or a custom trans gingival abutment is attached if ISO < 60. The interim crown should have minimal or no contact in maximum intercuspation or excursive movements. [10]

3. Advantages and Limitations

The SST offers numerous advantages over the conventional surgical techniques for preservation of alveolar bone width comparatively to which it is less invasive. [13,14] Conventional bone and soft tissue augmentation procedures require a donor site. The need for a donor graft is eliminated in SST, and this eliminates the complications associated with a second surgical site. [4] Although some preparatory procedures are required, the overall duration of treatment time is reduced because of the preservation of the socket dimensions. The technique provides optimal esthetic results by effectively preserving the soft and hard tissue contours. The preservation of the interdental papilla by an interdental socket shield further enhances the esthetic results for the patient. [13,14]

While there are various advantages for which clinicians may opt for SST, some of its inherent limitations must be borne in mind. The SST procedure is technique-sensitive and thus, requires a high degree of clinical and technical expertise. [4] Additionally, there is a requirement for absolute immobilization of the socket shield when they are adapted to the socket walls. It is imperative to remove the shield in case it moves during the surgical procedure for any reason. [9]

4. The 'Jumping' Distance

According to Han CH et al., 72.6% bone-to-implant contact was present when the SST was used to preserve the buccal bone plate with healthy periodontal tissue. [15] The authors observed that all implants survived one-year post-placement with very few complications. It is recommended that there should be at least 1.5mm of space between the shield and the implant. Should the distance between the bone and implant increase to more than 3 mm, bone grafting procedures are warranted. This distance of 3mm, is thus, referred to as "Jumping Distance". [16] (Figure 3) It has been suggested to fill in the gap between the implant and the buccal portion of the root with particulate grafting material. [11]

On the contrary, Siormpas and Mitsias were of the view that grafting is not required to fill in the gaps between the implant and the socket shield as the method inherently preserves the PDL and associated vasculature. [17] Placing an implant immediately post-extraction into the sockets with an intact buccal wall can achieve adequate healing and osseointegration without the aid of any flap, graft material, or membrane despite the presence of a large gap. [18]

Hurzeler et al utilized heterologous graft material in cases where the jumping distance was 2 mm or more. [19] Other authors have suggested that grafting must be performed only if the distance is greater than 1mm. [16,20]

The gap between the dental implant and buccal shield when filled with PRF has exhibited prompt osteogenesis and an osteoconductive environment while providing an anti-infectious state. The growth factors from the PRF, such as platelet-derived growth factor and vascular endothelial growth factor promote bone regeneration and microvascular formation in the newly regenerated bone.[21,22] PRF also acts as an anti-inflammatory medium during the bone-healing period.[18]

5. Conclusion

The SST provides favorable results in preserving the alveolar ridge immediately post-extraction and providing optimal esthetic outcomes. The technique is less invasive eliminating the need for a second surgical donor site and thus, more favorable to the patients. The present review would serve to provide the clinicians with necessary information relevant to the SST in an easy-to-comprehend manner.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Tan WL, Wong TL, Wong MC, Lang NP. A systematic review of post-extractional alveolar hard and soft tissue dimensional changes in humans. *Clin Oral Implants Res*. 2012;23(5):1–21.
2. Singh VP, Uppoor AS, Nayak DG, Shah D. Black triangle dilemma and its management in esthetic dentistry. *Dent Res J (Isfahan)*. 2013;10(3):296–301.
3. Lian Z, Guan H, Ivanovski S, Loo YC, Johnson NW, Zhang H, et al. Effect of bone to implant contact percentage on bone remodeling surrounding a dental implant. *Int J Oral Maxillofac Surg*. 2010;39(7):690–8.
4. Tolstunov L, Hamrick JF, Broumand V, Shilo D, Rachmiel A. Bone augmentation techniques for horizontal and vertical alveolar ridge deficiency in oral implantology. *Oral Maxillofac Surg Clin North Am*. 2019;31(2):163–91.
5. Pagni G, Pellegrini G, Giannobile WV, Rasperini G. Postextraction alveolar ridge preservation: biological basis and treatments. *Int J Dent*. 2012;p. 151030. doi:10.1155/2012/151030.
6. Chitnis A, Mistry G, Puppala P, Shetty O. Partial extraction therapies-A review. *Int J Dentistry Res*. 2019;4(3):108–11.
7. 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 Restorative Dent*. 2016;36(5):681–7.
8. Shaheen RS. Partial extraction therapy: A review of the clinical and histological human studies. *Int J Prev Clin Dent Res*. 2021;8(1):16–9.
9. Kumar PR, Kher U. Shield the socket: Procedure, case report and classification. *J Indian Soc Periodontol*. 2018;22(3):266–72.
10. Schwimer CW, Gluckman H, Salama M, Nagy K, Toit JD. The socket-shield technique at molar sites: A proof-of-principle technique report. *J Prosthet Dent*. 2019;121(2):229–33.
11. Gluckman H, Nagy K, Toit JD. Prosthetic management of implants placed with the socket-shield technique. *J Prosthet Dent*. 2019;121(4):581–6.
12. Elaskary A, Abdelrahman H, Elsabagh HH, El-Kimary GI. Does grafting the jumping gap in immediately placed anterior implants using vestibular socket therapy influence labial bone thickness? *J Oral Maxillofac Surg*. 2022;80(8):1398–407.
13. Pour RS, Zuhr O, Hürzeler M, Prandtner O, Rafael CF, Edelhoff D, et al. Clinical benefits of the immediate implant socket shield technique. *J Esthet Restor Dent*. 2017;29(2):93–101.
14. Gjurovski SR, Stojmenova VT. The benefits of using the socket shield technique in partial extraction therapy: an article review. *MEDIS Int J Med Sci Res*. 2022;1(1):21–4.
15. Ch H, Park KB, Mangano FG. The modified socket shield technique. *J Craniofac Surg*. 2018;29(8):2247–54.
16. Botticelli D, Berglundh T, Buser D, Lindhe J. The jumping distance revisited: An experimental study in the dog. *Clin Oral Implants Res*. 2003;14(1):35–42.
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 postloading. *Int J Oral Maxillofac Implants*. 2014;29(6):1397–405.
18. 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(50):13175. doi:10.1097/MD.0000000000013175.
19. 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.
20. Dayakar MM, Waheed A, Bhat HS, Gurpur PP. The socket-shield technique and immediate implant placement. *J Indian Soc Periodontol*. 2018;22(5):451–456.
21. Chatterjee A, Debnath K. Comparative evaluation of growth factors from platelet concentrates An in vitro study. *J Indian Soc Periodontol*. 2019;23(4):322–8.
22. Mourya A, Mishra SK, Gaddale R, Chowdhary R. Socket-shield technique for implant placement to stabilize the facial gingival and osseous architecture: A systematic review. *J Investig Clin Dent*. 2019;10(4):e12449. doi:10.1111/jicd.12449.

Author biography

Sheetal Jadhav, Assistant Professor https://orcid.org/0000-0002-6192-6304

Naisargi P. Shah, Professor and HOD https://orcid.org/0000-0003-1678-8413

Hitesh Ramdas Sawant, Assistant Professor https://orcid.org/0000-0002-3907-5427

Avantika Vijaysingh Jadhav, Assistant Professor https://orcid.org/0009-0006-7938-2444

Jyotsna Sethumadhavan, Assistant Professor https://orcid.org/0000-0001-6498-1096

Sanpreet Singh Sachdev, Assistant Professor https://orcid.org/0000-0001-7655-8180

Cite this article: Jadhav S, Shah NP, Sawant HR, Jadhav AV, Sethumadhavan J, Sachdev SS. Partial extraction therapy – The socket shield: An overview. *IP Ann Prosthodont Restor Dent* 2024;10(2):97-100.