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PARTIAL EXTRACTION THERAPY FOR IMPLANTS: THE SOCKET SHIELD METHOD- A CASE REPORT

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ABSTRACT
Healing of extraction socket leads to the dimensional changes that will affect the placement of the implant and its emergence profile. Atraumatic extraction, socket preservation technique, and immediate implant placement decrease the alveolar bone resorption by maintaining the post extraction socket. Hürzeler et al. developed the socket shield technique, which involves preserving a buccal portion of the tooth during extraction to help prevent resorption of the buccal cortical bone. This approach aims to maintain the contour of the alveolar ridge and enhance the aesthetic outcomes of subsequent implant placement. This case report represents a 30-year-old female patient with grossly decayed maxillary left central incisor indicated for extraction replaced with an immediate implant. Socket-shield technique was designed for implant placement to protect buccal bone and to get the proper esthetic form. Two millimeters buccal fragment of the tooth was kept attached and the implant was placed in contact with tooth fragment. Three-month follow-up shows proper healing, and healthy peri-implant tissue shows that socket-shield technique with immediate implant placement will be a good alternative to preserve buccal cortical plate and implant placement, especially in the esthetic area.

INTRODUCTION
Extraction of tooth changes the dimension of the alveolar ridge, which has a direct effect on future implant prosthesis and its emergence profile, especially in the anterior region.[1]

Trauma during tooth extraction and the loss of the periodontal ligament are primary causes of alveolar bone resorption. To address this issue, various techniques have been developed to minimize resorption. Atraumatic extraction methods reduce damage to surrounding tissues, while socket preservation techniques, including grafting, help maintain the socket's volume. Additionally, immediate implant placement can prevent the collapse of cortical plates and preserve the bone dimensions, ultimately enhancing the outcomes for both function and aesthetics.[2]

Araújo and Lindhe (2005) suggested that following tooth extraction, the blood vessels in periodontium to the thin bone walls are severed, thereby causing facial bone plate resorption. Thus, it can be assumed that retaining a root may alter the occurrence of facial bone resorption.[3]

Hürzeler et al.(2010) were the first to demonstrate the socket-shield technique in a study on one beagle dog. Hemisection of mandibular premolar was performed and a buccal fragment of distal root was retained 1-mm coronal to the buccal bone plate. The immediate implant placement was done lingually to the retained root piece with or without contact with root fragment. No complications were seen, and the histologic study shows that the newly formed cementum was seen in the area between the titanium implant and retained root fragment.[2]

Partial root retention, partial extraction therapy, and root membrane technique are all terms used to describe this procedure.

Principle of Socket-shield technique
- The facial/buccal root section should be prepared in such a manner that its physiologic relation should remain intact to the buccal plate of tooth indicated for extraction.
- The attachment apparatus of periodontium should remain undamaged and vital as it prevents post-extraction socket remodeling and supports the facial/buccal tissues of sectioned tooth root.

- The sectioned tooth root should act as a socket shield and prevent buccofacial tissue recession of an implant.[4]

This case report shows a patient with thin buccal cortical plate and tooth indicated of extraction was replaced by immediate implant placement and socket-shield technique.

CASE REPORT

A 30-year-old, nonsmoker, and the systemically healthy female patient presented with a grossly decayed maxillary left central incisor. Clinical examination showed grossly decayed tooth with healthy gingival and periodontal tissue. After initial examination, the patient was advised for IOPA with respect to 11.

Cone-beam computed tomography (CBCT) showed the presence of grossly decayed 11 with a mean bone density of 427 HU (D3). Distance from the alveolar crest to the nasal floor was 16.03 mm, and distance from the root apex to the nasal floor was 7.28 mm, labio-palatal thickness showed a maximum of 9 mm and minimum of 5.32 mm. According to the CBCT finding, a 3.75-mm diameter and 10-mm length of the implant was selected for the placement to get proper primary stability. While examining the CBCT, it shows the presence of thin buccal cortical plate which may get fracture during the extraction, so socket-shield procedure was design to preserve a buccal fragment of the tooth.

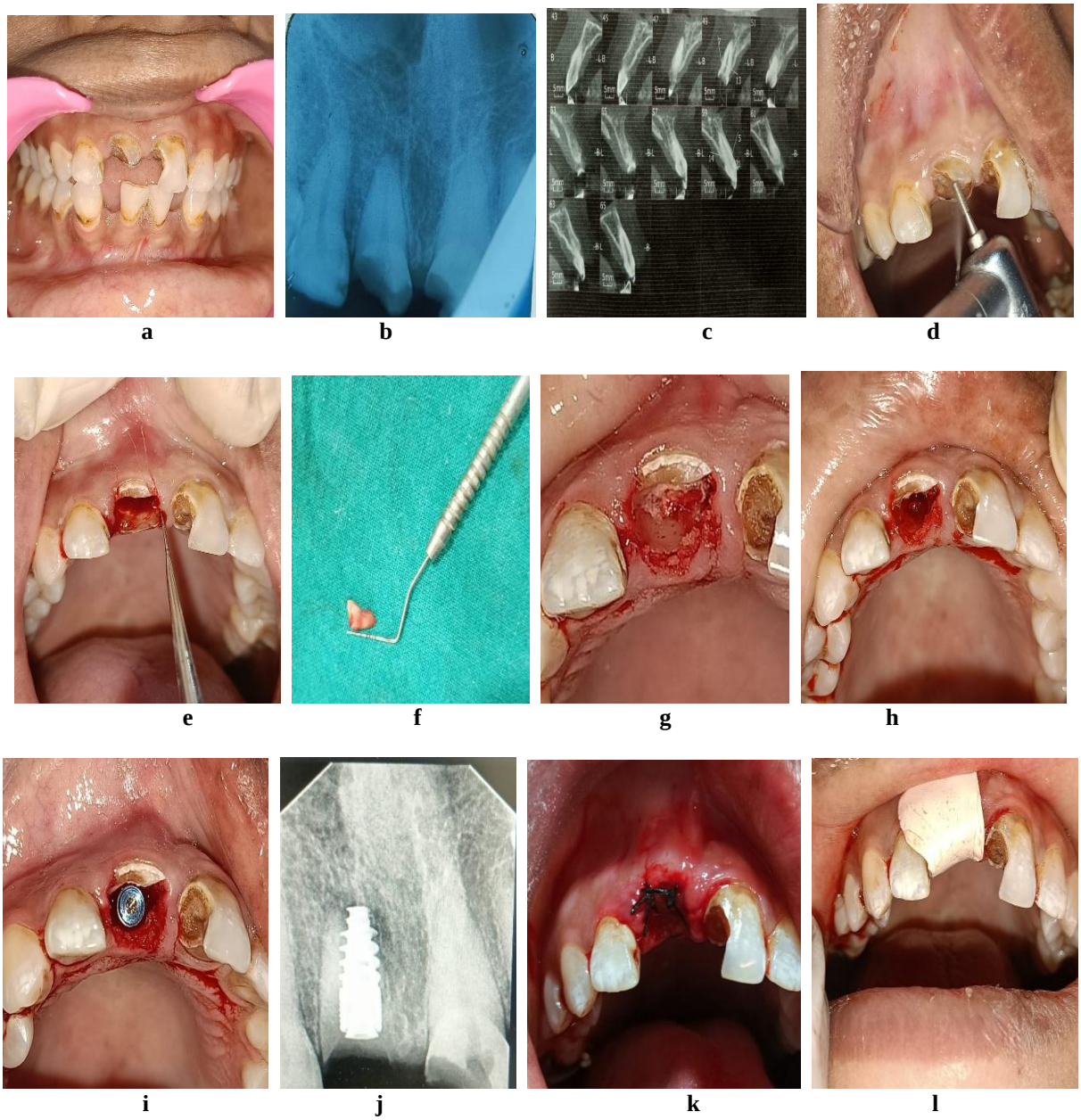

Fig. 1.a- Preoperative view shows grossly decayed 11. 1.b- Radiograph shows decayed 11. 1.c- Cone-beam computed tomography scan of 11. 1.d- Sectioning of root. 1.e- Extraction of palatal segment. 1.f- palatal fragment of tooth. 1.g- Preservation of buccal fragment of root. 1.h- osteotomy preparation. 1.i- Placement of the

implant irt 11. 1.j- Immediate postoperative radiograph. 1.k- Suturing done. 1.l- coe pack placed on surgerical site.

Instruments and Materials needed for socket-shield preparation[4]

- End-cutting diamond head bur
- Long shank root resection bur
- Contra-angled surgical fast handpiece
- Extra-large round diamond head bur
- Irrigated surgical motor
- Gingival protector
- Microforceps
- Microperiotomes.

Procedure

Patient underwent a standardized examination and diagnostic evaluation. The treatment plan for patient was subsequently discussed and mutually agreed upon. Alternative treatment options were provided, along with a clear explanation of the advantages and disadvantages of each option. Written informed consent was obtained from patient prior to proceeding with treatment.

Patient exhibited excellent periodontal health, characterized by low sulcus bleeding and plaque indices, as well as physiologic probing depths. Preoperative CBCT scans and periapical radiographs were obtained to assess the suitability of the intended implant site for the socket shield technique**.(fig. 1a and b)** Scaling and oral hygiene instructions were given two weeks before the partial extraction. Additionally, patient received prophylactic premedication with 2 g of amoxicillin one hour prior to surgery, and were instructed to rinse with 0.2% chlorhexidine mouthwash for one minute immediately before the procedure.

After local anesthesia administration, tooth 11 was decoronated using a coarse-grained round diamond bur down to the crest of the bone. The root sectioning was performed in two steps.**(fig 1d)**

First, a tapered diamond bur was used to section the root mesiodistally, parallel to the long axis of the tooth, stopping at the apical two-thirds.

In the second step, the bur's direction was altered to an oblique path toward the buccal surface to separate the buccal fragment from the palatal segment. The palatal portion was extracted atraumatically and remaining buccal fragment was trimmed by leaving only 2 mm as a shield. **(fig. 1e-1g)**

The osteotomy was started with lance drill to get a proper ditch, and then, the sequence of the pilot drill. Direction indicator was used after every drill to confirm the direction of osteotomy to the adjacent tooth.**(fig.1h)** Bioline 3.75-mm diameter and 10-mm length was placed, the primary stability of 35 Nmc was achieved with hand wrench, and the cover screw was placed. **(fig 1i)**

The implant platform was positioned 1 mm apical to the buccal marginal gingiva. The gap surrounding the implant was filled with a bone graft. To achieve buccal flap advancement, the buccal flap was released up to the mucogingival junction.**(fig 1j)** A horizontal matrix suture was then applied to ensure proper flap approximation and coe pack was placed.**(fig 1k-1l)**

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. **(fig 2a and b)**

Fig. 2a and 2b.

Fig. 3a and 3b.

After 3 months the gingival former were placed on implant site.**(fig 3a and b)**

Indications

- Facial/buccal bone plate will be preserved following extraction in cases of immediate implants.
- In vertically fractured teeth without any pulpal or periodontal pathology and where esthetics and preservation of tissue are important.
- In between two dental implants, to preserve interdental papilla.[5]

Contraindications

- Buccal bone loss as a result of a vertical fracture.
- Where routine oral surgical procedures are restricted such as patients on bisphosphonates, anticoagulants, radiation, and immunocompromised patients.
- If a fragment to be retained has root caries.
- Loss of buccal bone due to periodontitis.[6]

Advantages

- Economical
- No or minimal material required
- Less invasive
- Helps maintain esthetics.
- Peri-implant tissue preservation
- When an implant is placed in optimum position, buccal shield serves as a guiding structure
- Achieve complete osseointegration
- Avoid fibrous tissue formation surrounding the implant.[7]

Disadvantages

- Technique sensitive
- Resorption may occur in developing or previously existing endodontic or periodontal infection or inflammation of preserved root fragment
- Movable buccal root fragment
- The labial/buccal shield's long-term effects have not been investigated.[8]

Table 1: Classification of socket shield.[9]

Class	Site	Description	Indications
Type I	Buccal shield	Only on the buccal side, while the shield is between the socket's proximal line angles.	When both distal and mesial teeth are present in a single edentulous region.
Type 2	Full C buccal shield	When shield is in buccal and proximal aspect of the socket.	On either side of the proposed site, there is an existing implant There are two missing teeth on each side. On the one hand, there is an implant, and on the other, there is a missing tooth.
Type 3	Half C buccal shield	When shield is in buccal and one proximal aspect.	When one hand has a tooth and the other has an implant or a missing tooth.
Type 4	Interproximal shield	When shield is in distal or mesial aspect of socket.	When there is a need for a graft due to buccal bone resorption On the other side, there is a missing tooth or an implant.
Type 5	Lingual/ palatal shield	When shield is in the palatal or lingual aspect of socket.	For maxillary molars, this form of shield design is considered.
Type 6	Multiple buccal shields	When there are at least two or more shields in the socket.	Vertically fractured root.

Bäumer et al.(2015) conducted a volumetric analysis of a case treated with the Socket Shield Technique (SST), revealing minimal contour changes from tooth extraction to implant placement and during the follow-up period. Mucosal recession at the time of implant restoration was comparable to that of adjacent teeth. They concluded that SST is a minimally invasive technique during surgery and provides excellent esthetic outcomes by effectively preserving the facial tissue contours.[10]

In a 2018 randomized controlled trial, Bramanti et al. compared two immediate implant placement techniques: the Socket Shield Technique (SST) and the conventional insertion technique. At the 3-year follow-up, both techniques showed a 100% implant survival rate; however, the SST group demonstrated a superior pink esthetic score and improved marginal bone levels. The authors concluded that SST appears to be a safe option for implant placement, offering enhanced esthetic outcomes.[11]

Sun et al. (2020) evaluated the clinical and esthetic outcomes of immediate implant placement using a flapless approach combined with the Socket Shield Technique (SST). The authors concluded that SST enhances both esthetic and functional outcomes by preserving peri-implant tissues and maintaining the volume of alveolar bone. SST appears to be an effective method for implants in the esthetic zone.[12]

Modification of Socket-shield Technique

Several modifications have been introduced to the Socket Shield Technique (SST). One key modification involves the preservation of the inter-implant papilla, which is critical in cases of multiple adjacent implants in the esthetic zone. Another modification involves maintaining the shield thickness at 1.5 mm, positioning the most

coronal part of the residual root at the bone crest level (rather than 1 mm above it), and omitting graft material in the gap between the residual root and the implant. A few studies have explored these modified SST approaches with the goal of achieving predictable esthetic success for adjacent multiple immediate implants.[13]

Cherel and Etienne, 2014, observed complete preservation of the papilla between two central incisors after implant installation at 11 months without any side effects using modified SST.[14]

Gluckman et al., 2015, also used the modified SST for placing two implants besides each other, and the authors found esthetically good results by this method.[5]

Glocker et al. 2014 examined three cases using a modified socket shield technique and planned delayed implant placement. During re-entry, at 6 months, there was formation of new bone which was clinically evaluated as proof of principle.[6]

Mourya et al., 2019, in their systematic review established the effectiveness of the SST for the osseous architecture and stabilization of the facial gingiva. The authors concluded that SST should not be routinely practiced till further data are available. More clinical trials on SST are required to determine the procedure's clinical effectiveness.[15]

Complications

According to Gluckman et al.(2018) the most widely recorded complication related to socket-shield technique was the exposure (Internal and/or external) of socket shield, with a total of 17 exposed socket shields being identified. Twelve internal and 4 external shield exposures were recorded by Gluckman et al.[16]

Helsham[1960] in his clinical human study documented that 16.2% of fractured root pieces in a sample size of 2000 became symptomatic. Another histologic evaluation of fractured root pieces left back during extraction revealed that 27% of them had pathologies such as sinus tracks, inflammation, and cysts.[26] Furthermore, the root pieces showed signs of continuous resorption and repair with acellular cementum formation.[17]

More recently, complications of infection and bone loss were also demonstrated when implants were placed in contact with unnoticed retained root pieces at the time of extraction.

Clinical studies have reported various complications and adverse effects associated with the Socket Shield Technique (SST). The most common complication was crestal or buccal bone loss, accounting for 78.78% of all reported issues. Other complications included shield exposure and deep probing pockets. These findings suggest that the socket shield may pose a potential risk of infection to implants placed in close proximity. Additionally, loss of the socket shield, either through resorption or extraction due to infection, could result in the loss of the bone it preserves and may expose the implant surface.[18]

CONCLUSION

This case report on immediate implant placement using the Socket Shield Technique demonstrates successful preservation of post-extraction tissues and thin buccal bone, along with a successful implant restoration. The Socket Shield Technique shows promising results in preserving the post-extraction socket and holds significant value in implantology and esthetic dentistry. However, further studies are needed to evaluate the long-term success of this technique.[19]

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, et al. The socket-shield technique: A proof-of-principle report. J Clin Periodontol, 2010; 37: 855-62.
3. Araújo MG, Sukekava F, Wennström JL, Lindhe J. Tissue modeling following implant placement in fresh extraction sockets. Clin Oral Implants Res, 2006; 17(6): 615–24.
4. Sethiya, Kiran; Dhadse, Prasad; Jaiswal, Priyanka; Agrawal, Diksha. Socket-Shield Technique – A New Method for Bone Preservation. Journal of the International Clinical Dental Research Organization, 2023; 15(1): 3-7 Jan–Jun. | DOI: 10.4103/jicdro.jicdro_35_21
5. Glocker M, Attin T, Schmidlin PR. Ridge preservation with modified "socket-shield" technique: A methodological case series. Dent J, 2014; 2: 11-21.
6. Gluckman H, Du Toit J, Salama M. The socket-shield technique to support the buccofacial tissues at immediate implant placement. Int Dentistry, 2015; 5: 6-14.
7. Filippi A, Pohl Y, von Arx T. Decoronation of an ankylosed tooth for preservation of alveolar bone prior to implant placement. Dent Traumatol, 2001; 17: 93–5.
8. 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.
9. Kumar PR, Kher U. Shield the socket: Procedure, case report and classification. J Indian Soc Periodontol, 2018; 22: 266-72.
10. Bäumer D, Zuhr O, Rebele S, Schneider D, Schupbach P, Hürzeler M. The socket-shield technique: First histological, clinical, and

volumetrical observations after separation of the buccal tooth segment – A pilot study. Clin Implant Dent Relat Res, 2015; 17: 71-82.
11. Bramanti E, Norcia A, Cicciù M, Matacena G, Cervino G, Troiano G, et al. Postextraction dental implant in the aesthetic zone, socket shield technique versus conventional protocol. J Craniofac Surg, 2018; 29: 1037-41.
12. Sun C, Zhao J, Liu Z, Tan L, Huang Y, Zhao L, et al. Comparing conventional flap-less immediate implantation and socket-shield technique for esthetic and clinical outcomes: A randomized clinical study. Clin Oral Implants Res, 2020; 31: 181-91.
13. Kan JY, Rungcharassaeng K. Proximal socket shield for interimplant papilla preservation in the esthetic zone. Int J Periodontics Restorative Dent, 2013; 33: e24-31.
14. Cherel F, Etienne D. Papilla preservation between two implants: A modified socket-shield technique to maintain the scalloped anatomy? A case report. Quintessence Int, 2014; 45: 23-30.
15. 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: e12449.
16. Gluckman H, Salama M, Du Toit J. 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: 122-9.
17. Helsham RW. Some observations on the subject of roots of teeth retained in the jaws as a 396 result of incomplete exodontia*. Aust Dent J, 1960; 5: 70-7.
18. Lagas LJ, Pepplinkhuizen JJ, Bergé SJ, Meijer GJ. Implant placement in the aesthetic zone: The socket-shield-technique. Ned Tijdschr Tandheelkd, 2015; 122: 33-6.
19. Dayakar MM, Waheed A, Bhat HS, Gurpur PP. The socket-shield technique and immediate implant placement. J Indian Soc Periodontol, 2018; 22(5): 451-455. doi: 10.4103/jisp.jisp_240_18. PMID: 30210197; PMCID: PMC6128121.