

SOCKET SHIELD TECHNIQUE: A COGNIZANCE IN IMPLANTOLOGY

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Abstract:

Implant placement immediately after tooth extraction is often accompanied by resorption of surrounding tissues. These resorption processes complicate dental rehabilitation, particularly in connection with implants. Various methods of guided bone regeneration (GBR) have been described to retain the original dimension of the bone after extraction. Most procedures use filler materials and membranes to support the buccal plate and soft tissue, to stabilize the coagulum and to prevent epithelial in growth. The recently popularized socket-shield technique involves intentional retention of a section of the remnant root at the time of immediate implant placement, thereby preserving the buccal/proximal bone from resorption. This technique can prove to be very helpful for implantologists when planning implants in aesthetic region.

Keywords: Immediate implant treatment, Partial extraction therapies, socket shield

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INTRODUCTION:

The extraction of teeth is associated with the distinctive dimensional changes in the surrounding bone and soft tissues. The tooth loss triggers the remodeling reaction as part of a healing process, involving various alveolar bone resorption degrees, mainly affecting the buccal lamina. The periodontal membrane of the tooth primarily vascularizes the bundle bone. Hence, this part of the alveolar bone is compromised by the extraction, to such an extent that the buccal lamella is insufficiently nourished, leading to its resorption.^{1,2} Therefore, such tooth loss and subsequent ridge collapse continue to burden the aesthetic restorative implant treatment as it compromises the restoration oriented three-dimensional positioning of the implant, which requires optimal support & stability of surrounding hard and soft tissues.³

In an attempt to minimize the three-dimensional changes to the facial contour, different techniques have been described in literature. These include incorporation of bone graft into the implant socket gap, bone grafting on the facial aspect of the socket, placement of subepithelial connective tissue grafts, and immediate placement of an implant. However, applying these methods to extraction sockets could not ultimately preserve the coronal part of the facial bone walls, comprised almost entirely of bundle bone walls.^{4,5}

Apart from these, Root retention has been suggested to preserve the ridge dimensions in pontic sites for tooth-borne and implant supported fixed partial dentures. The recently introduced socket-shield technique (SST) by Hurzler and his coworkers appear to be a viable treatment option for stabilizing the facial osseous and gingival architecture. Although

preliminary clinical and histologic studies seem to be promising, the procedure is technique sensitive.

LITERATURE REVIEW:

Araujo and Lindhe suggested that following tooth extraction, the blood vessels in periodontium to the thin bone walls are severed, causing facial bone plate resorption. Thus it can be assumed that retaining a root may alter the occurrence of facial bone resorption.⁶

In a case report by Von Arx et al., decoronation of an ankylosed tooth demonstrated complete maintenance of the alveolar ridge's height and width before placement of implant.⁷

Salama et al. recommended a root submergence technique in which a natural tooth root was maintained and the surrounding tissue could be preserved at the pontic site.⁸

Davarpanah and Szmukler published a case series of five patients showing that in immediately placed implants where direct implant contact with ankylosed tooth fragments was ensured, were preserved without any signs of abnormal changes over a follow-up period of two years.⁹

Hurzeler et al. introduced a newer method, the socket shield technique, in which a partial root fragment was retained around an immediately placed implant to avoid tissue alterations after tooth extraction. Histologically, in beagle dog showed no resorption of the root fragment and new cementum formed on the implant surface.¹⁰

Joseph & Kitichai reported an alternative approach utilizing a retained proximal root fragment to maintain the inter-implant papilla.¹¹

Bäumer et al. conducted a pilot study concentrating on the histological, clinical, and volumetrical observation of the alveolar ridge and implant after applying the socket shield technique. 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.¹²

CONCEPT OF SOCKET SHIELD TECHNIQUE:

The socket shield technique, firstly introduced by Hurzeler and his coworkers in 2010, comprises retaining the coronal buccal/ facial root portion,

ensuring the physiological preservation of labial and buccal bone structures & the implant palatally to this natural tooth fragment or the shield. The results of their clinical case reported the excellent buccal tissue preservation and clinically successful osseointegration of the implant.

The technique's principle is to prepare the root of a tooth indicated for extraction in such a way 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, attachment fibers, vascularization, root cementum, bundle bone, alveolar bone) is intended to remain vital and undamaged to prevent the post-extraction socket remodeling and to support the buccal/facial tissues.

CLINICAL PROCEDURE:

1. After administering the local anesthesia, the crown of the tooth to be extracted is decoronated with a coarse-grained diamond bur.
2. The root portion of the tooth is sectioned mesiodistally with a long shank root resection bur (Komet, Germany) coupled to a hydrated high-speed handpiece, dividing the root into facial and palatal halves. The facial root section here should remain unmanipulated and attached to the tooth socket.¹³
3. Conservative extraction of the palatal root fragment should be performed using periosteal luxators, and forceps. Periosteal luxators are inserted between the palatal root section and the alveolar socket wall to sever the PDL and the section of the root can then be carefully delivered so as not to disturb the facial root section.
4. The gingiva is retracted using a customised retractor, specially designed for the socket shield technique made up of titanium & the remaining facial root section is then reduced to coronally so that it remains 1mm above the alveolar crest. This may help to maintain the supracrestal gingival fibers, and help to stabilize the gingival levels.
5. The facial root fragment should then be prepared with the surgical carbide creating uniform thickness (1.5 to 2.0 mm) to ensure strength. It should, however, be thin enough not to interfere with implant placement.⁴

6. The tooth socket's palatal wall and apex should then be curetted to remove any tissue or infective remnants, and the root section is checked for immobility with a sharp probe.¹³
7. With the preparation steps complete, the tooth root hereafter is known as the socket-shield.
8. If planned for immediate implant placement, a sequential osteotomy is performed, and a selected implant is placed palatal to the socket shield.
9. The gap between the shield and implant surface is either left to be filled with blood clot formation, or the jump gap is bone grafted. Primary stability of the implant is achieved from the palatal and apical bone.¹³

INDICATIONS:

1. Vertical fractures of teeth without pulpal pathologies
2. Potential indications include their use as a part of a delayed or late implantation approach.
3. Optimization of pontic support in crown bridge reconstructions.
4. To improve the prosthesis base for removable dentures.

CONTRAINDICATIONS:

General contraindications:

Usual restrictions of oral surgical procedures:

1. Bisphosphonate medication.
2. Immunosuppression.
3. Radiation therapy.
4. Anticoagulation therapy etc¹⁴

Local contraindications:

Absent buccal lamina develops, for instance, after vertical root fractures or periodontitis.

ADVANTAGES:

1. Tissue preservation-preserves healthy peri-implant tissues.
2. The buccal shield serves as a guiding structure when placing implants in the optimum position.
3. Applicable in sites with endodontic apical pathology.
4. Cost-effective.
5. Minimal invasiveness. (single surgery)
6. Minimal material requirement.

7. It offers a feasible option for vertically fractured teeth.^{13,15}

DISADVANTAGES:

1. Technique sensitive.
2. Not yet reliable or predictable.
3. Long term behavior of the buccal shield has not yet been wholly clarified.^{13,15}

CONCLUSION:

Maintaining the facial peri-implant soft tissue level and osseous topography following the implant procedures is essential to the overall esthetic outcome. The Socket Shield technique offers a promising solution to the difficulties encountered while managing the post-extraction tissues & is cost-effective and minimally invasive. The void in the literature reporting on the technique's long-term success requires prudent participation of clinicians to contribute to the knowledge base before the procedure can be routinely prescribed for ridge preservation simultaneous to immediate implant placement. At present, the technique is highly promising and holds significant potential for the field of aesthetic and restorative implant dentistry.

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