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DENTAL TECHNIQUE

A socket shield technique: Preparation of the shield under oral microscopy

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ABSTRACT

The socket shield technique has been used to enhance the esthetics of immediately placed implant-supported prostheses in the esthetic zone. However, the technique has rarely been used in clinical practice because of high technical sensitivity, limited field of view, and the risk of intraoperative and postoperative complications. A technique is presented for carefully preparing labial socket shields under oral microscopy, which can reduce surgical difficulty and improve the precision of socket preparation. (J Prosthet Dent 2025;134:28-32)

After tooth extraction, the absorption and remodeling of soft and hard tissues in the alveolar ridge crest will affect the esthetic outcome of implant-supported restorations.[1,2] In 2010, Hürzeler et al[3] introduced the socket shield technique (SST). Since then, its advantages over traditional immediate implant placement in maintaining the contours and esthetics of the original soft and hard tissues have been reported in systematic reviews with meta-analyses.[4–6] However, the SST has not become a routine clinical procedure because of a reported complication rate of 19.5%, higher than the 8% with traditional immediate implant placement.[7,8] Complications have been reported to include exposure, migration infection of tooth roots, and failure of osseointegration.[9–11] Recently, static digital surgical guides[12,13] and dynamic navigation technology[14,15] have been used for the SST. However, drawbacks have still been reported,[16–19] and the SST remains rarely used. Many of these drawbacks can be avoided with the use of an oral microscope.[20–24]

This technique report describes the preparation of a labial socket shield for a patient with a nonrestorable fractured left maxillary central incisor through a root shield tool box and under an oral microscope. Combined with the digital guide, the implant was positioned precisely, and the esthetic result was stable during 2 years of follow-up.

TECHNIQUE

1. After local infiltration anesthesia, use a root shield tool box (Root Membrane Kit; Megagen) assisted by an oral microscope (OMS2380; Zumax) to prepare a socket shield for the left maxillary central incisor. With the gutta percha in the root canal as a landmark, use a conical drill (Initial Shaper; Megagen) to gradually bisect the tooth root in the mesiodistal direction (Fig. 1).
2. During the bisection, locate the mesiodistal dental tissues at one-third of the distance of the fractured root to ensure the clarity of the surgical field. Then, gradually increase the depth, thus avoiding excessive cutting and damage to the mesiodistal alveolar bone or adjacent teeth and avoiding bone burns because of insufficient cooling (Fig. 2).
3. As the diameter of the gutta percha becomes small, indicating proximity to the apical region, reduce the rotation speed to protect the weak labial bone plate and minimize the risk of bone windowing (Fig. 3).

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Figure 1. Tooth root separation in mesiodistal direction with gutta percha as guide.

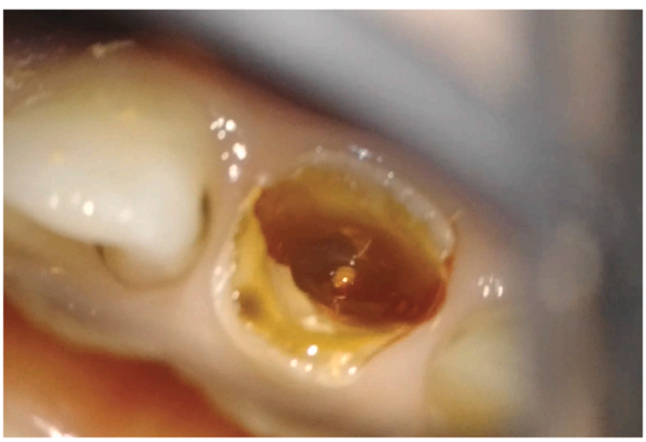

Figure 2. Tooth tissues at one-third of crown first sectioned.

4. If the field of view is insufficient, use a cone drill (Initial Shaper Is1; Megagen) to trim and thin the palatal root, thus enhancing visualization (Fig. 4).

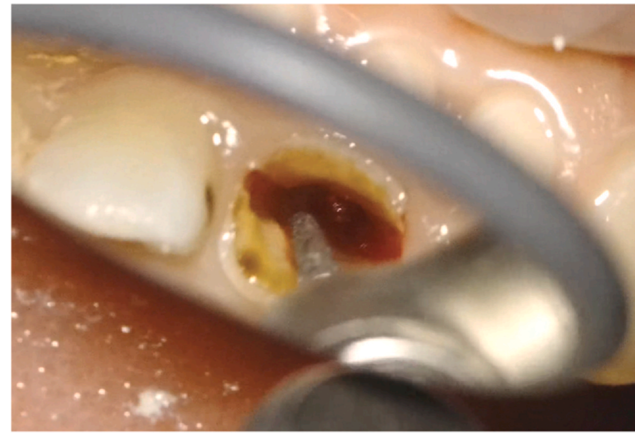

Figure 4. Thinning tooth root and clear surgical field.

5. The disappearance of the gutta percha typically means that the preparation depth has reached the periodontal ligament cavity and that the root separation has been basically completed (Fig. 5). Since alveolar bone is softer than dental tissues, use an explorer (DG16; Dentsply Sirona) to assist in determining whether or not complete separation has been achieved.
6. If separated, use a luxating elevator (L3C; Yatian) to loosen the palatal root section and use a needle holder (J32020; Jinzhong) to extract it (Fig. 6). During the extraction, observe carefully whether the labial root section has a tendency to move. If so, check whether the root was completely sectioned.
7. After the palatal portion has been extracted, use a round drill (Round Diamond; Megagen) and a shoulder drill (Final Shaper FS2; Megagen) to trim the coronal dentin to about 0.5 to 1 mm above the crestal bone (Fig. 7).
8. Then, use the round drill again to trim the lingual side of the socket shield until it form a C-shape and leave as much palatal space as possible. Use a periodontal

Figure 3. Diameter of gutta percha diameter becoming small.

Figure 5. Removal of gutta percha and completion of root separation.

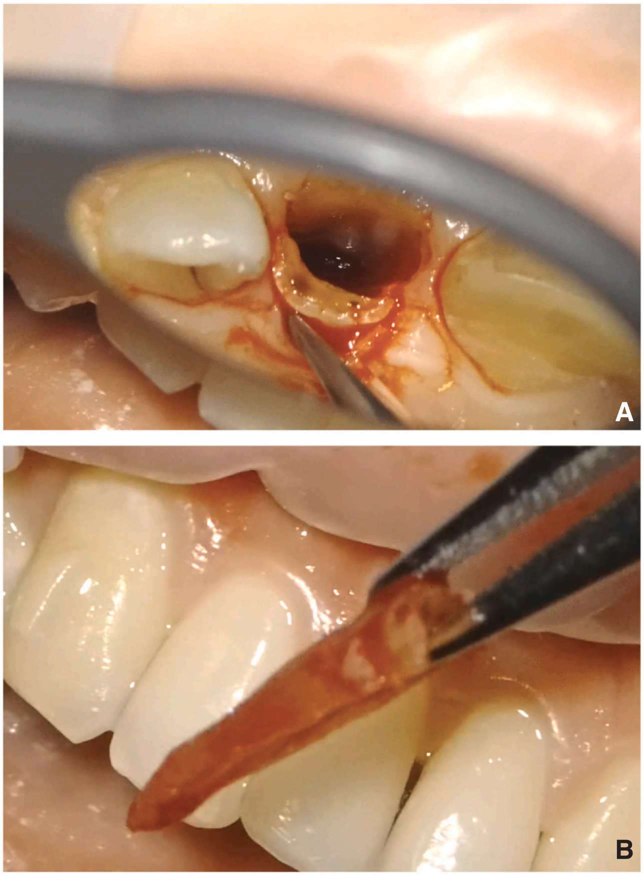

Figure 6. Releasing palatal socket and extraction.

Figure 7. Trimming coronal dentin.

probe to confirm the final thickness of the coronal part of the socket to be 1 to 1.5 mm. After that, round and blunt the sharp edges and debride and rinse the alveolar socket thoroughly with sterile saline (Fig. 8).

9. Finally, place the implant immediately and place the interim restoration.

Ten months after delivery of the definitive restoration, the transgingival contour was healthy and no socket was exposed. Re-examination at 24 months showed bone resorption of 0.9 and 0.3 mm of the mesial and distal margins, respectively. The CBCT scan showed that the labial plate was stable, and the red and white esthetic scores[25,26] were 13 and 9, respectively (Fig. 9).

DISCUSSION

Severe gingival recession and labial contour collapse have been commonly reported complications associated with routine immediate implantation, particularly in the esthetic zone.[9] In contrast, the SST has demonstrated superior outcomes in preserving the original soft and hard tissue volumes, leading to more stable and predictable esthetic results.[9] However, the widespread adoption of SST has been hindered by its technical complexity, limited visibility, and high complication rates.[10,11] These challenges underscore the need for a simplified and more reliable approach to socket preparation.

Static digital surgical guides and dynamic navigation technology have been introduced to enhance the precision of SST, although they are not without limitations. Static guides provide a restricted surgical field and may not accommodate the elastic nature of gingival tissues, making accurate positioning difficult. Additionally, these guides lack the flexibility to adapt to real-time intraoperative changes, which is particularly problematic in patients where the labial bone plate of the anterior teeth is less than 1 mm thick. The margin of error in such scenarios is minimal, and even slight deviations can result in bone fenestration.[16] Furthermore, the production of static guides is often time-consuming, and the cumulative errors associated with their use can compromise the clinician's tactile sensitivity, further increasing the risk of complications.[17,18]

Dynamic navigation technology, although promising, is still in its infancy regarding SST applications. Current literature reports the use of only a 2-mm twist drill for

Figure 8. Prepared socket with clear field of view allowing direct observation of apical area.

preparation,[14] and the technology lacks a specialized navigation software program tailored to SST. The preoperative design and registration processes are also cumbersome and time-consuming. Other barriers include expensive equipment, limited clinical introduction, inadequate research, and insufficient evidence supporting efficacy.[19]

The present technique advocates the use of oral microscopy in SST. Oral microscopy provides higher magnification and superior lighting conditions, improving surgical field visualization. With an overall magnification range of ×2 to ×30[20] and adjustable focal length and depth of field, oral microscopy provides a continuous and clear visual field, which is an improvement on a single fixed ×2 to ×8 magnifier.[21] The light intensity of oral microscopy, typically exceeding 600 lumens, along with its coaxial light system, ensures accurate and shadow-free projection.[22] These features allow for the precise identification of small anatomic structures, even in the apical region, thereby reducing the risk of complications such as labial bone fenestration.[20] The average success rate of procedures performed under microscopy has been reported to be 93.5%, compared with 88.1% with a magnifier.[27] Moreover, microscopy enables clinicians to differentiate between tooth roots and bone visually, minimizing damage to adjacent structures.[19]

Unlike the emerging dynamic navigation technology, oral microscopy has a well-established history, dating back to 1981. Its adoption rates among American endodontists rose from 52% in 1999 to 90% in 2007.[24] This widespread acceptance underscores the feasibility and reliability of using microscopy for SST. However, oral microscopy does have limitations, including a learning curve and the need for additional training. Multisample clinical studies are required to refine the application and operation protocols of oral microscopy in SST.

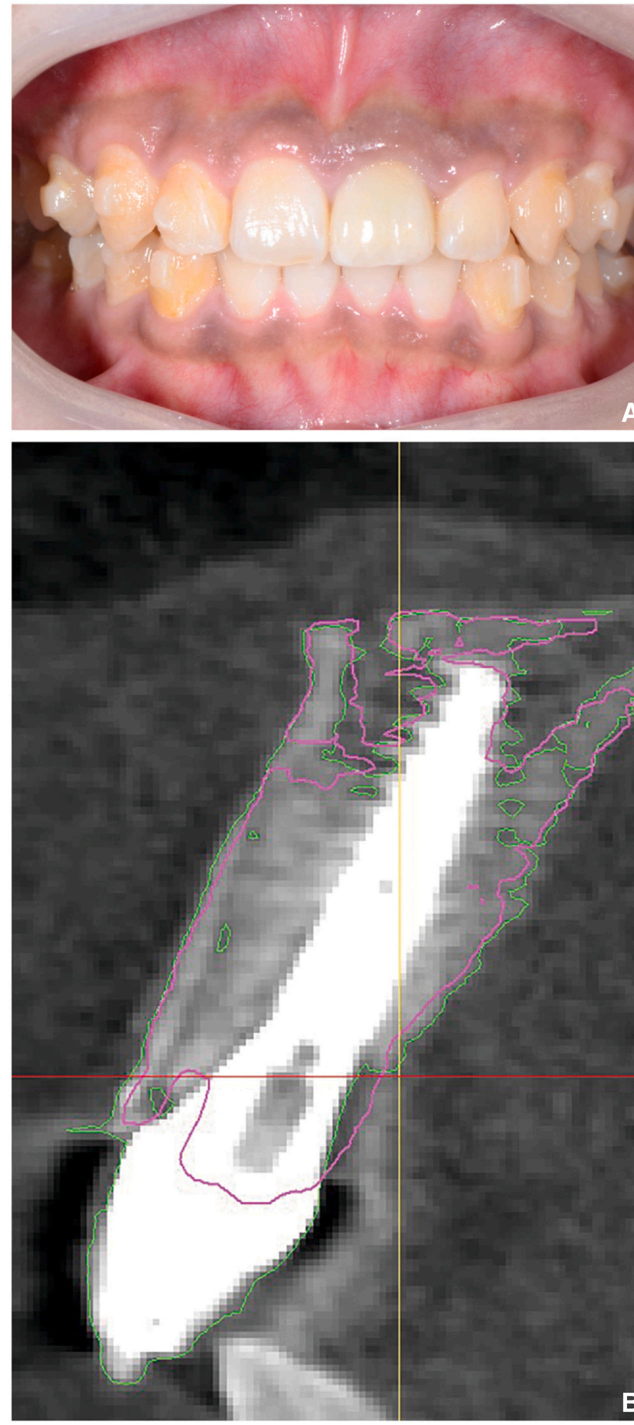

Figure 9. Two-year follow-up showing good esthetic outcome and stable hard tissues.

SUMMARY

The socket shield technique remains a complex and challenging surgery, but the integration of oral microscopy can significantly improve the surgical field of view and simplify socket preparation. However, clinical research is still needed to standardize and popularize this method.

PATIENT CONSENT

Ethical approval and written informed consent were obtained from the patient prior to the preparation of this technique report.

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