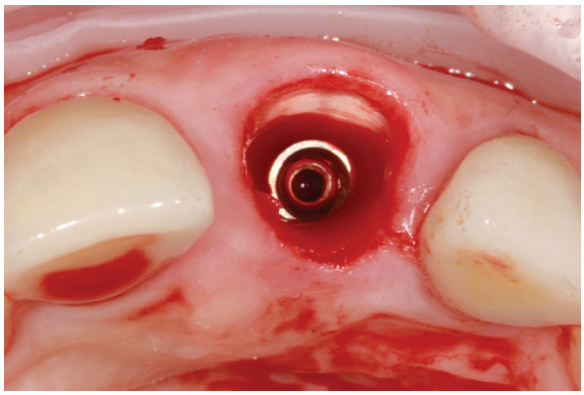
Socket Shield Technique Used in Conjunction With Immediate Implant Placement in the Anterior Maxilla: A Case Series

Vinh Giap Nguyen,* Dennis Flanagan,† John Syrbu‡ and Thomas T. Nguyen§



Introduction: Bone remodeling after tooth extraction and immediate implant placement will occur nonetheless and as a result, additional hard and soft tissue augmentations are often necessary to compensate for the loss of alveolar ridge dimension. The socket shield (SS) technique has shown encouraging clinical results in maintaining original ridge morphology, and thus, may be used as an alternative protocol for the conventional immediate implant placement in the esthetic zone.

Case series: The authors report three cases of SS technique used in conjunction with immediate implant placement in an anterior maxilla. The patients were followed for a period of 2 to 6 years, and the evolution of the soft and hard tissue surrounding the implants was documented.

Conclusions: The SS technique produces virtually no change in the hard and soft tissue dimensions with relatively minimal invasive surgical interventions and shorter treatment time. *Clin Adv Periodontics* 2020;00:1–5.

Key Words: Bone regeneration; dental implants; esthetic; immediate implant; partial extraction therapy; socket shield technique.

Background

The advantages of immediate implant placement include less extensive surgical interventions, reduced treatment time, lower treatment cost, and less patient morbidity.[1–4] A predictable protocol for long-term success and aesthetic outcomes has been proposed that includes atraumatic extraction,[5] palatal implant placement,[2] sub-crestal placement,[6] smaller implant diameter,[7] platform switch design,[8] and buccal soft tissue augmentation.[9] In addition, concomitant grafting the buccal gap and immediate provisionalization has a positive impact on the crestal bone and soft tissue profile, according to a study by Tarnow et al. in 2015.[10] Despite the excellent outcome, immediate implant placement still has some drawbacks. Bone remodeling after extraction will occur regardless of the immediate placement of a dental implant. Preservation of gingival morphology and ridge dimension is possible only when additional hard and soft tissue procedures are applied to compensate for labial bone modeling post-extraction.[9–11]

Although more long-term evidence is needed, the socket shield (SS) technique has clinically shown promise in maintaining original ridge morphology.[12–14] In this technique, the root of the tooth is sectioned in such a way that a thin fragment of root, or a "shield," is left attached to labial bone while the remainder of the root is completely removed. As the labial periodontal attachment is left undisturbed, no osteoclastic activity appears to be triggered labial to the shield. An immediate implant may be placed without additional bone or soft tissue graft.

*Private Practice in Brossard, Brossard, QC, Canada

†Private Practice, Groton, CT

‡Department of Family Dentistry, University of Iowa College of Dentistry and Dental Clinics, Iowa City, IA

§Division of Periodontology, Department of Oral Medicine, Infection and Immunity, Harvard School of Dental Medicine, Boston, MA

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TABLE 1 Preoperative and postoperative volumetric changes

Case #	Tooth number	Soft tissue ridge width (mm)		Δ	Bony ridge width (mm)		Δ
		Preoperative	Postoperative		Preoperative	Postoperative	
1	9	9.1	9.0	−0.1	7.5	7.3	−0.2
1	10	8.3	8.2	−0.1	6.3	6.0	−0.3
2	10	8.8	8.8	0.0	5.9	6.1	0.2
3	9	9.7	9.7	0.0	7.3	7.3	0.0
Mean RP		9.0	8.9	−0.1	6.8	6.7	−0.1
SD		0.6	0.6	0.1	0.8	0.7	0.2

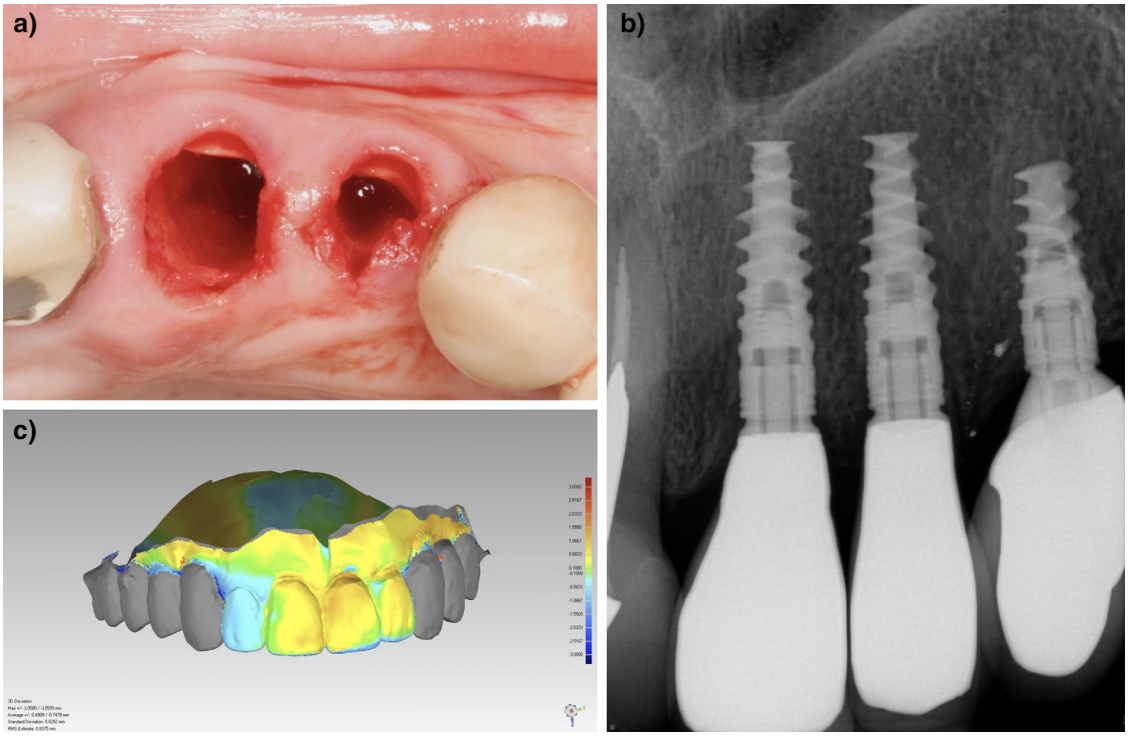

FIGURE 1 a Root fragments just before the final shaping.**1b** A periapical radiograph taken at 6 years after the insertion of the final crowns on implants.**1c** Volumetric analysis between the digital scans of the preoperative and 6-year postoperative dental casts shows little dimension alteration.

Clinical Presentation, Management, and Outcomes

All three cases of SS technique were performed at the author's private practice in Montreal QC between 2012 and 2016. The patients were followed for a period of 2 to 6 years, and the evolution of the soft and hard tissue surrounding the implants was documented. All patients exhibited an excellent periodontal condition with periodontal indexes falling within normal limits. Using a straight fissure surgical bur[‖] with a high-speed handpiece, the root fragments were prepared and left attached to the facial bone plate while the remainder of the roots were elevated and removed. The shields were left 1 mm coronal to the buccal bone margin as described by Bäumer et al.[14] All the immediate implants were placed 2 mm subcrestal, in the palatal position and no bone graft was placed in the buccal gap. Ridge mapping templates were used to record before and after ridge dimensions (Table 1). No complications have been recorded and the patients reported minimal discomfort. All participants provided informed written and verbal consent before treatment.

[‖] Messinger, Centenniel, CO.

Case 1

A healthy 72-year-old female patient was seeking implant treatment to replace her fractured maxillary left central and lateral incisors. The teeth were deemed non-restorable and required removal of the roots. The patient consented for immediate implant treatment using the SS technique. The shields were prepared (Fig. 1a) and osteotomies done

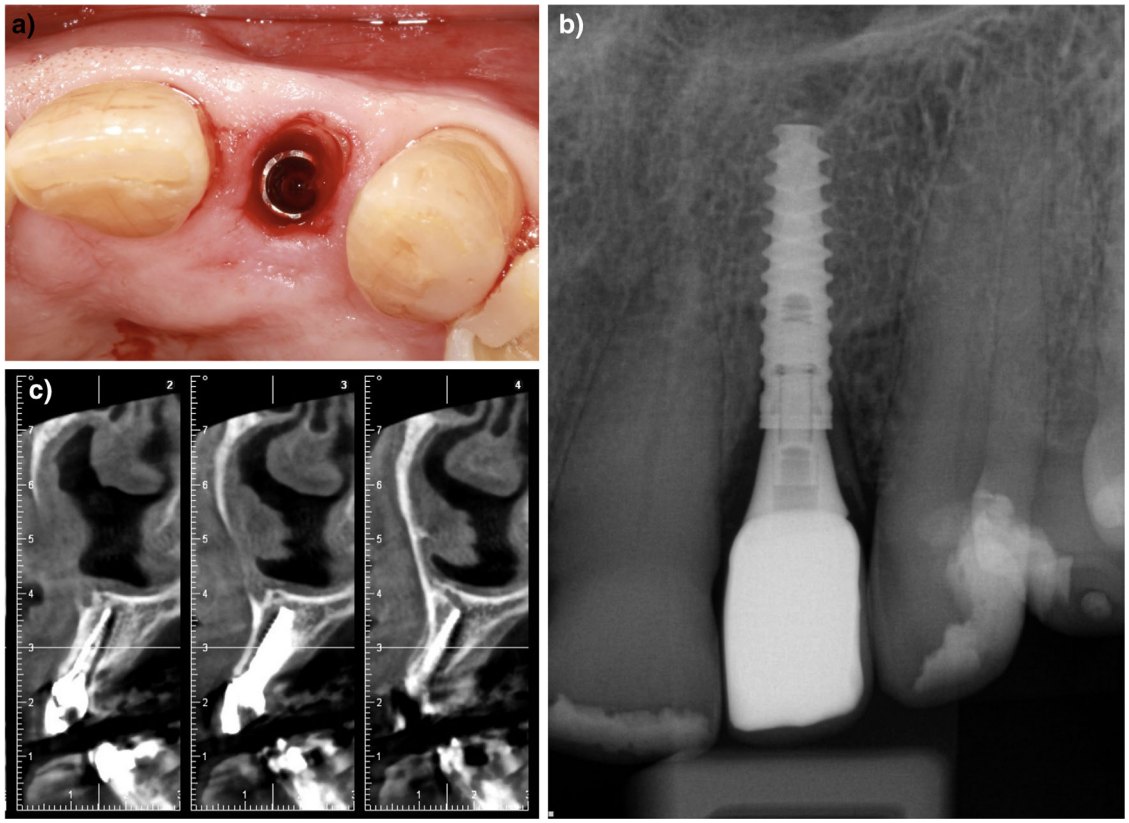

FIGURE 2 a Socket shield preparation and immediate implant placement.**2b** A radiograph at 5 years after the prosthetic insertion.**2c** A cone beam computed tomography (CBCT) image at 5 years after the prosthetic insertion.

to receive 3.5 × 13 mm implants.[¶] Two splinted acrylic screw-retained crowns were installed as immediate non-functional- occlusion provisional prostheses. The final impression was taken at 4 months postoperative and individual screw-retained ceramic crowns were delivered. Six years after the insertion of the final prostheses, the SS procedure appears to preserve not only the buccal marginal bone but also the inter-implant papilla (Figs. 1b and 1c).

Case 2

A vertical root fracture necessitates the removal of the maxillary lateral incisor of an 87-year-old male patient. An immediate implant combined with the SS technique was done. A 3 × 15 mm implant[¶] was inserted (Fig. 2a). The final impression was taken at 4 months postoperative and a screw-retained crown was delivered (Fig. 2b). Five years after the prosthetic insertion, hard and soft tissue appear very stable (Fig. 2c).

Case 3

A healthy 62-year-old female patient with a high smile line selected an immediate implant treatment option using the SS technique to replace her maxillary left central incisor because of a vertical root fracture (Fig. 3a). The SS preparation and immediate implant placement were done following the same protocol described in previous cases. A 3.5 × 13 mm implant[¶] was placed to obtain a 35 N/cm torque and an average ISQ of 65 (Fig. 3b). A screw-retained provisional crown was fabricated chairside and installed at the same appointment. Four months after the implant placement, the final impression was taken and a screw-retained crown was delivered (Fig. 3c). Well preserved hard and soft tissue profiles are observed 2 years after the prosthetic insertion (Figs. 3d and 3e).

Discussion

Although most studies on the SS technique have been presented as case series,[12–14] a recent larger retrospective study has shown encouraging results.[15] In the SS technique, the root fragment appears to prevent the modeling of the labial bone plate, and thus, the original buccolingual dimension of the socket is not altered. The small diameter implants and palatal placement were chosen to allow ≈1 mm clearance between the implant and the root fragment. This clearance allows bone forming on the buccal aspect of the implant and also to prevent inadvertent pressure on the root fragment. Although it is

[¶]Nobel Active, Nobel Biocare, Kloten, Switzerland.

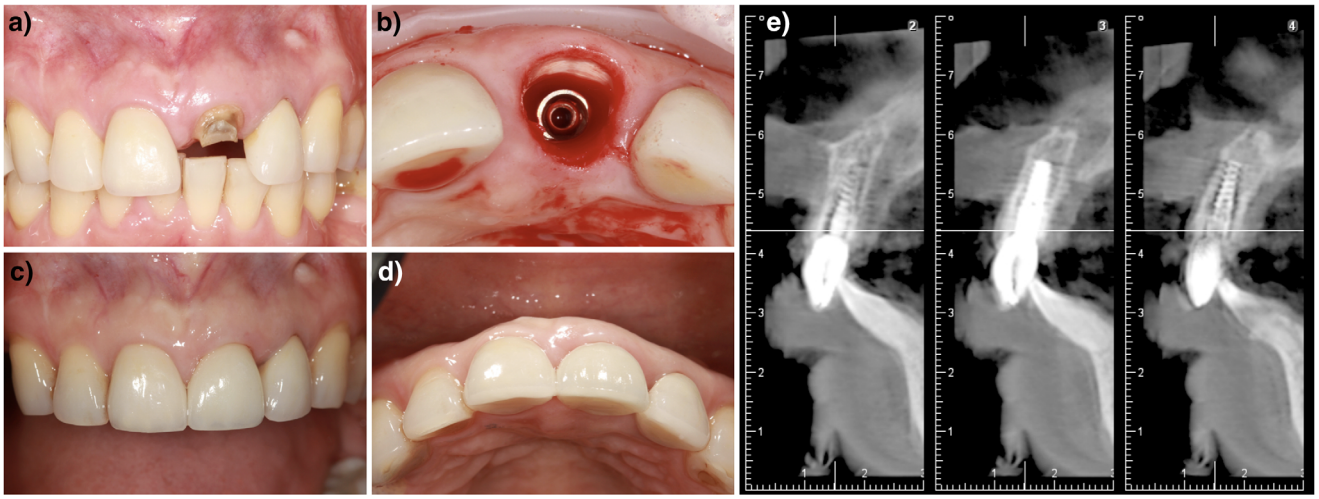

FIGURE 3 a Frontal image. Vertical root fracture of the maxillary left central incisor. **3b** Immediate implant position. **3c** Frontal view of the crown 3 years after the prosthetic insertion. **3d** Occlusal view of the crown 3 years after the prosthetic insertion. **3e** A CBCT image at 3 years postoperative.

recommended that a bone graft material should be used to fill the labial gaps of immediate implants that are wider than 2 mm, gaps narrower than 2 mm are observed to heal spontaneously.[16] In accordance with this observation, such a practice was not essential in the narrower labial gap of the SS placement in all our three cases. The buccal bone plate does not appear to be altered in the presence of the shield. It is, therefore, up to the surgeon's discretion whether to graft the buccal space.

Conclusion

The present clinical case series shows that the SS technique produces virtually no change in the hard and soft tissue dimensions with relatively minimal invasive surgical interventions and shorter treatment time. The technical protocol, modeled after the immediate implant placement, appears to provide excellent aesthetic outcomes and stable short-term results. More evidence is, however, required for the long-term efficacy of the SS technique.■

Summary

Why are these cases new information?	■ This case series showed that the socket shield (SS) technique produces virtually no change in the hard and soft tissue dimensions with relatively minimal invasive surgical interventions and shorter treatment time.
What are the keys to successful management of these cases?	■ Thorough planning is crucial when using the SS technique. ■ Cone beam computed tomography is necessary in order to appreciate root position in relation to the existing alveolar bone.
What are the primary limitations to success in these cases?	■ The SS is a very technique sensitive procedure and requires a significant learning curve and practice. ■ Careful case selection is essential to perform this technique successfully.

Acknowledgment

The authors reported no conflicts of interest related to this case series.

CORRESPONDENCE
Dr. Thomas T. Nguyen, Interim Director of Predoctoral Periodontology, Harvard School of Dental Medicine, 188 Longwood Avenue, Boston, MA 02115. E-mail: thomas_nguyen@hsdm.harvard.edu

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○ indicates key references.