A contemporary approach in preserving buccal structures

Immediate implant placement using the Socket Shield Technique

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Following an initial surge in popularity during the late 1990s, the concepts of immediate implant placement and immediate provisionalisation have regained significant attention in clinical practice. From a patient-centered perspective, these protocols offer numerous advantages—including shortened treatment times, fewer surgical interventions, reduced postoperative morbidity, and improved comfort through fixed interim restorations.

Nonetheless, in the early stages of immediate implantations, especially in the aesthetic zone, failures and complications could not be ruled out. The assumption that an immediate implantation could influence or halt the resorption processes of the alveolar bone after tooth extraction turned out to be incorrect.

Robust scientific evidence now confirms that post-extraction ridge resorption is a physiological process that cannot be prevented. The extent of this resorption is largely dictated by individual phenotypic factors, such as buccal bone thickness, soft-tissue volume, and periodontal biotype.[1]

Should immediate implant placement still be considered in the aesthetic zone, meticulous case selection and a thorough understanding of the resorptive processes and their underlying causes are absolute prerequisites (conditio sine qua non).[2]

Incorrect case indication or suboptimal surgical technique may lead to significant long-term aesthetic complications due to hard- and soft-tissue resorption. These may manifest as buccal translucency or exposure of the implant surface—outcomes that, from the patient's perspective, are often perceived as complete aesthetic failures.

Since corrective surgical interventions, such as secondary connective tissue grafting, offer limited predictability and success in such scenarios, the only viable solution in most cases involves explantation, reaugmentation of the site, and complete implant re-treatment.

In recent years, in addition to improved understanding of appropriate case selection, several key factors have emerged as critical for the successful management of risks associated with immediate implant placement. Foremost among these is the correct positioning of the implant within the aesthetic zone. Implants should be planned with a palatal offset and placed at a sufficient distance from the buccal alveolar wall.[3] In this context, the use of guided surgery systems with digital planning of the implant position (Computer-Aided Surgery, CAS) can be of significant benefit (Fig. 1).

Surgical guides serve as valuable tools for precise implant placement, particularly in immediate implantation cases where there is often only partial contact between the implant and the surrounding bone (Figs. 2+3).

In addition to correct implant positioning, the management of resorptive processes is the most critical factor for achieving long-term success in the aesthetic zone. The current literature describes two primary approaches to address this challenge.

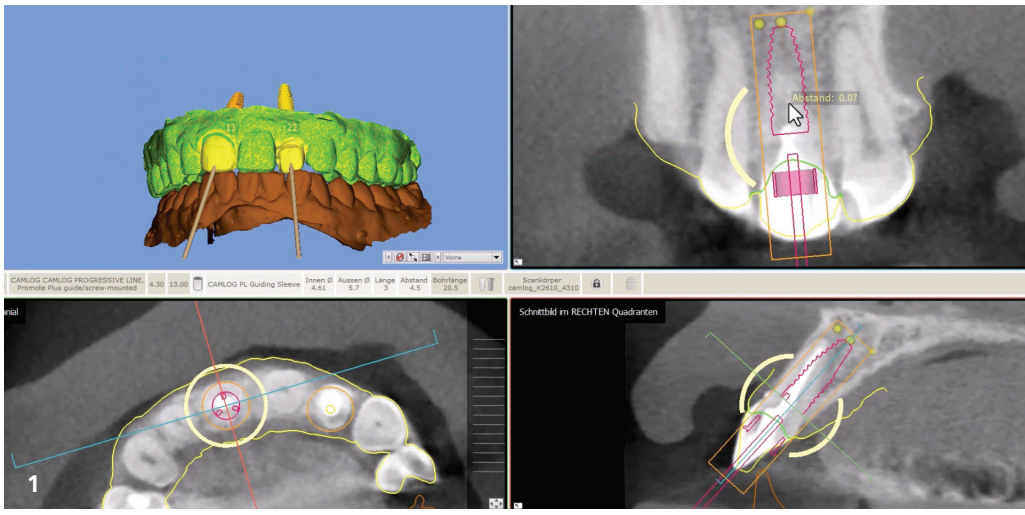
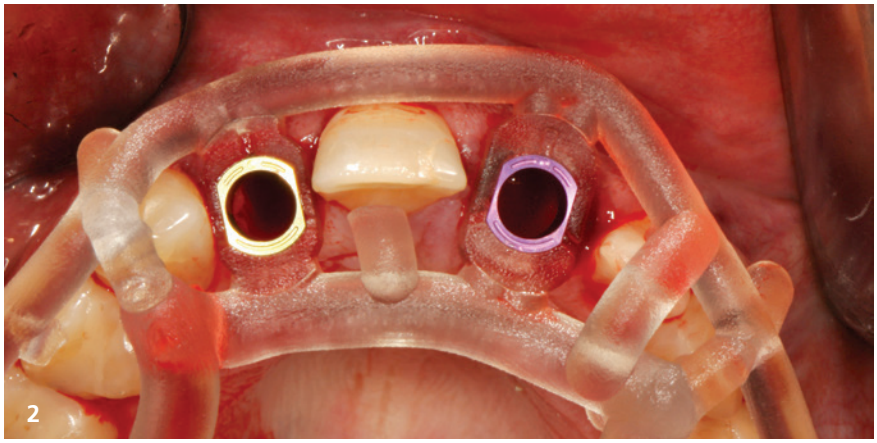


Fig. 1: Implant position planning using CAS software.



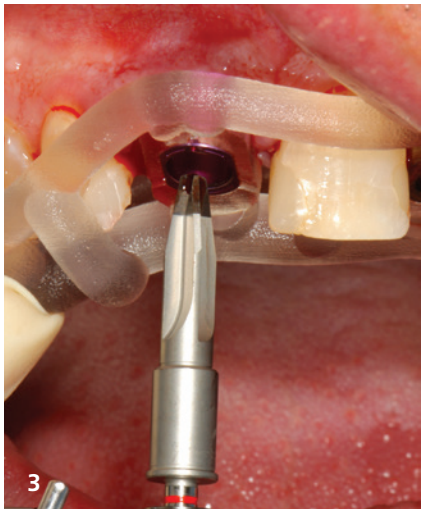


Fig. 2: Surgical guide fabricated based on digital planning. – **Fig. 3:** Guided osteotomy using the surgical template.

The first approach involves filling the gap between the implant and the buccal bone wall with a non-resorbable bone substitute material. While this method does not prevent resorption of the buccal bone plate, it may help maintain the original alveolar volume to a significant extent.[4] This technique can be further enhanced by soft-tissue augmentation using a subepithelial connective tissue graft.

The second approach aims to actually reduce or even prevent buccal bone resorption. This method focuses on preserving the so-called "bundle bone," the inner layer of alveolar bone, which receives its vascular supply almost exclusively from the periodontal capillary plexus surrounding the natural tooth. Upon tooth extraction, the periodontium—and thus the associated vascular network—is entirely disrupted, resulting in the loss of perfusion to the bundle bone. This vascular loss leads directly to bone resorption.

The extent of this resorptive process is strongly influenced by the anatomical thickness of the buccal bone plate—being most pronounced when the buccal wall is naturally thin.[5]

In 2010, the research group led by Hürzeler introduced a novel technique for "partial tooth extraction".[6] The core concept behind this approach is the preservation of a portion of the buccal root segment to maintain the vitality of the periodontal vascular plexus. For this reason, the technique is referred to in the international literature not only as the "Socket Shield Technique" but also as a "Partial Extraction Technique".

Since its original publication, the method has undergone several modifications, yet its fundamental principle remains unchanged.[7,8]

The following case report presents a detailed step-by-step explanation and clinical application of this technique.

Case report

A 61-year-old female patient presented to our practice in May 2021 requesting implant placement in region # 14. Her medical history revealed a penicillin allergy; she was a non-smoker and periodontally healthy. The tooth had undergone prior endodontic treatment and exhibited a palatal cusp fracture extending into the pulpal floor.

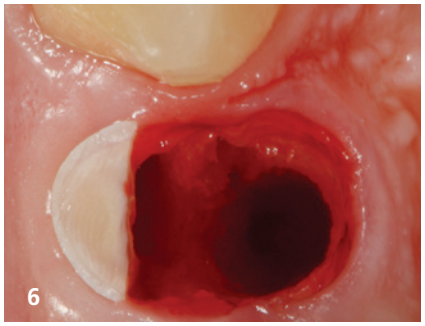
The tooth was therefore deemed non-restorable. Both the surrounding alveolar bone and soft tissue were intact; however, the patient exhibited a thin gingival phenotype, which is associated with a higher risk of post-extraction resorption (Figs. 4+5).

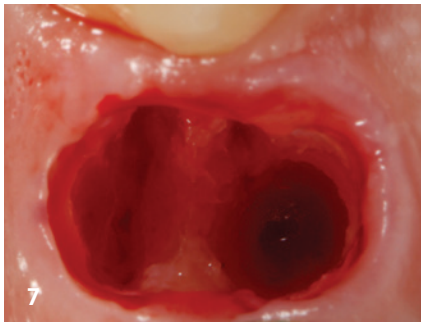
Following a comprehensive consultation and evaluation of all treatment options, a decision was made in agreement with the patient to proceed with immediate implant placement using the Socket Shield Technique.

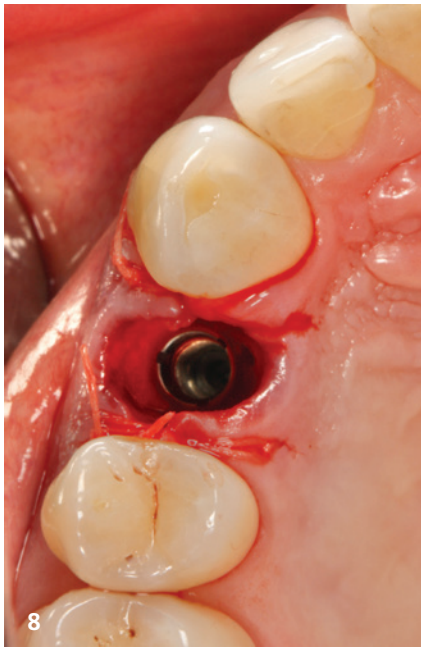
The procedure began with decoronation of the tooth, followed by separation of the roots at the pulpal floor using a fine Lindemann bur. After careful removal of the palatal root, the buccal root fragment was thinned using a Lindemann bur and diamond burs (Figs. 6+7).

The goal of the Socket Shield Technique is to completely remove the apical portion

Fig. 4: Buccal view of tooth #14. – **Fig. 5:** Occlusal view of tooth #14.







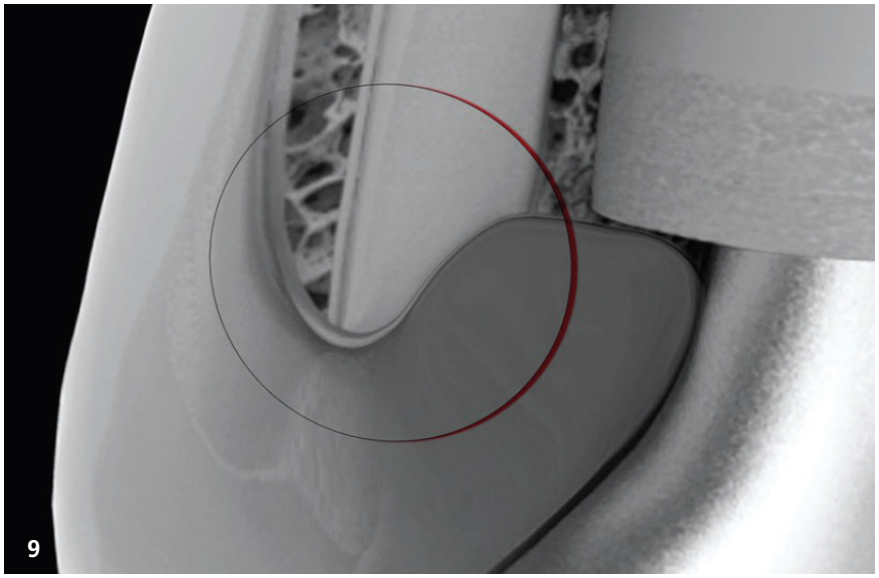


Fig. 6: Alveolus following removal of the palatal root segment. – **Fig. 7:** Alveolus after thinning of the buccal root fragment. – **Fig. 8:** Immediate implant placement; gap augmented with autologous bone chips. – **Fig. 9:** Schematic representation of the Socket Shield Technique (Source: Schwimmer CW et al., *The Journal of Prosthetic Dentistry*, 2019).

of the root while preserving the crestal part of the buccal root, along with the surrounding periodontal ligament. This preparation must be carried out with precision and minimal trauma to avoid damaging the periodontal structures.

The immediate implant placement was then performed using a CAMLOG PROGRESSIVE-LINE implant (CAMLOG), with a slightly palatal positioning. A small gap between the implant and the root segment was intentionally left, which was subsequently augmented with autologous bone chips (Fig. 8). The principle of implant and Socket Shield positioning is detailed in Figure 9.[9]

During the implant placement, both the insertion torque and ISQ values (resonance frequency analysis, RFA) were recorded to accurately assess primary stability. The insertion torque was 55 Ncm, and the ISQ values were 78/78 (Osstell Beacon®, W&H). According to the Osstell ISQ scale (Fig. 10), the primary stability was within a range that allows for immediate loading with a non-occlusally supported single crown.

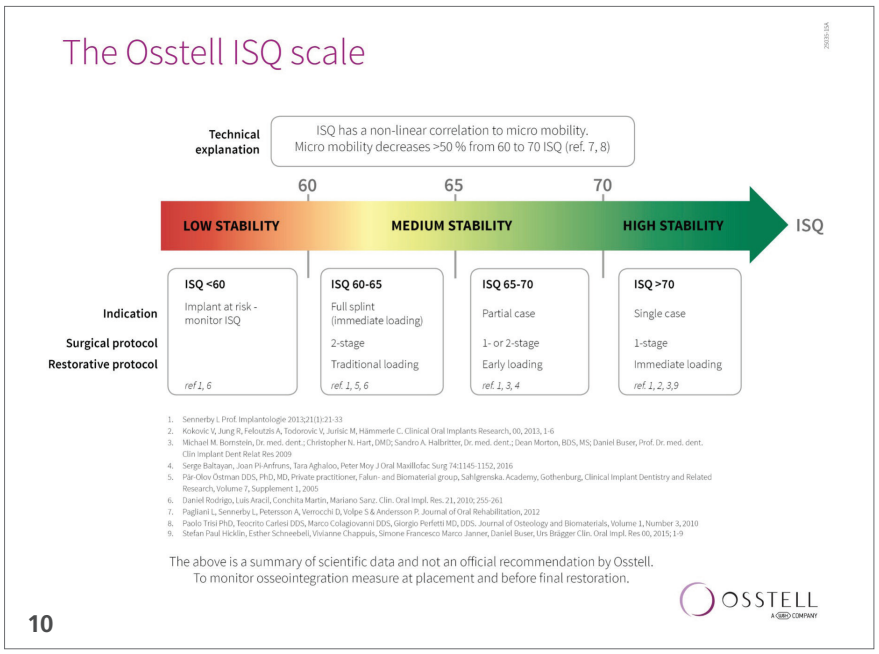
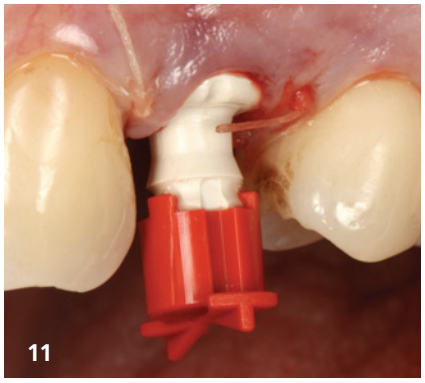
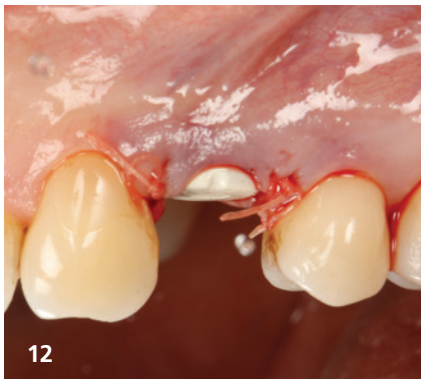
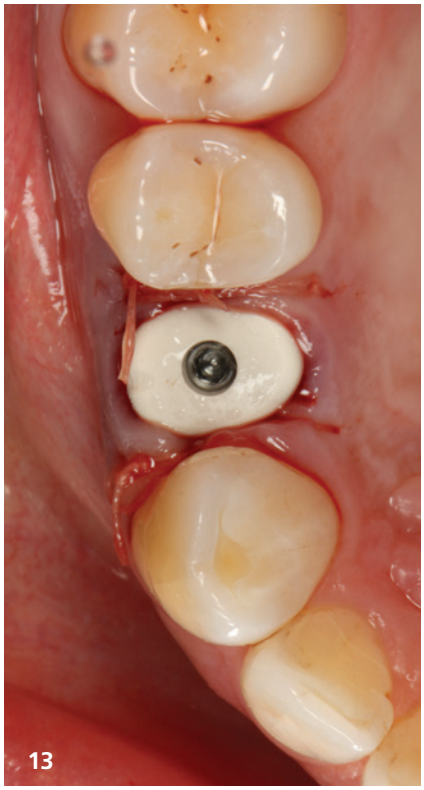


Fig. 10: ISQ values and interpretation for primary stability assessment.







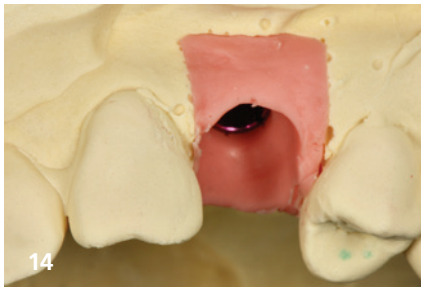


Fig. 11: Intraoperative impression using a semi-customised impression post. – **Figs. 12+13:** Semi-customised gingival former *in situ*. – **Fig. 14:** Master model with gingival mask, following semi-customised impression post. – **Fig. 15:** Clinical situation six days post-op. – **Fig. 16:** Long-time provisional restoration placed six days post-op.

An intraoperative impression was taken using a custom PEEK impression coping (DEDICAM®, CAMLOG) to transfer the planned emergence profile into the model (Fig. 11). Following the impression, the implant was temporarily restored with a custom PEEK gingiva former (DEDICAM®, CAMLOG), and the patient was dismissed with instructions for postoperative care (Figs. 12+13).

The postoperative course was uneventful. The patient did not require any pain medication at any point and reported no visible extra-oral swelling or hematoma. Six days post-surgery, the gingiva former was removed. The clinical situation was largely uneventful, with only mild swelling noted in the papillary area. The laboratory-fabricated, long-term provisional crown (acrylate, occlusally screwed, designed as a one-piece hybrid abutment crown with a titanium bonding base) was placed with an insertion torque of 25 Ncm. The crown featured centric occlusal contacts, but no guidance was intentionally provided for laterotrusive movements to avoid applying extra-axial chewing forces to the im-

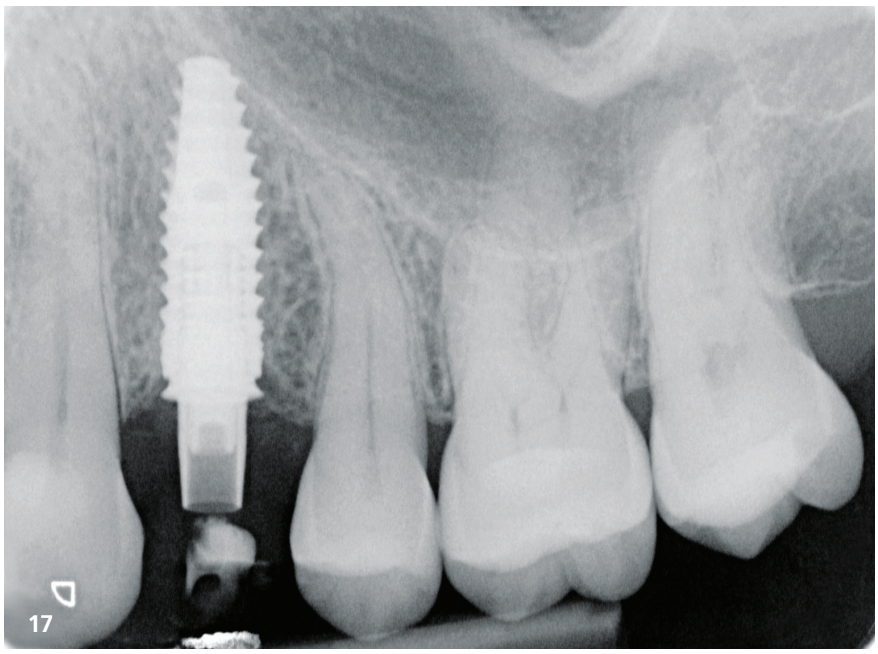
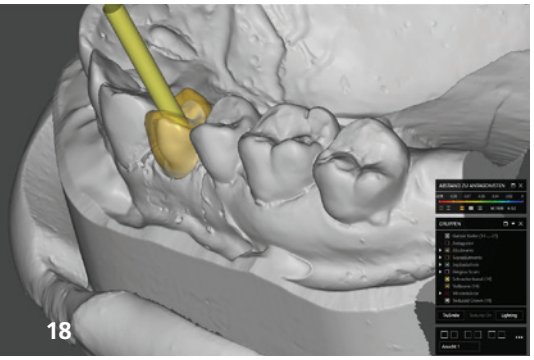


Fig. 17: Postoperative radiographic evaluation 48 hours after implant placement.



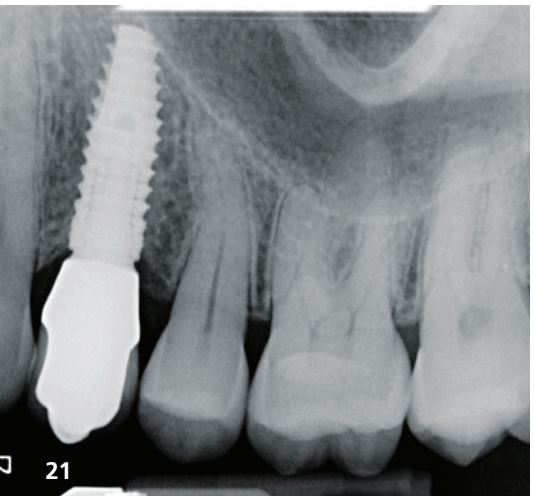


Fig. 18: CAD/CAM design of the final restoration (fully veneered zirconia hybrid abutment crown). – **Figs. 19+20:** Definitively placed hybrid abutment crown on implant #14 – **Fig. 21:** Radiograph of implant #14 with final crown in place.

plant during the healing phase (Figs. 15+16). The control X-ray (Fig. 17) shows the implant with the long-term provisional crown in place. The material used is not radiopaque.

After a complication-free healing period of twelve weeks, the long-term provisional crown was removed, and a new ISQ measurement was performed to assess the quality of osseointegration. The values of 81/83 indicated complete osseointegration of the implant, allowing for the final restoration to proceed. The master model from the day of surgery was used for the final prosthetic fabrication.

Since the Socket Shield Technique generally results in minimal volumetric changes to both hard and soft tissues during the healing process, no new impression or intra-oral scan was necessary. Both hard and soft tissues appeared unchanged in comparison to the model situation (Fig. 18). The final restoration was designed as a one-piece hybrid abutment crown (zirconia, fully veneered) on a titanium bonding base (CAMLOG) and was placed without the need for any adjustments (Figs. 19–21).

Conclusion

The Socket Shield or Partial Extraction Technique represents a relatively new variant of immediate implantation. The goal is to maintain the vitality of the periodontal ligament in the buccal region by deliberately and carefully preserving a portion of the buccal root, thereby minimising resorption of both the buccal hard and soft tissues.

Although this technique is surgically demanding and time-consuming, the aesthetic outcomes and excellent patient acceptance (shorter healing times, extremely low postoperative morbidity, and the possibility of immediate restoration without a removable provisional) justify the effort. It offers a viable alternative to established treatment protocols.

With a current observation period of approximately 14 years, a final evaluation of the technique through scientific studies is still pending. However, existing studies suggest comparable long-term stability and complication rates to those of established techniques.[10]

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References

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