

Successful immediate implant loading—According to the **Socket Shield** Technique

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Figs. 1a & b: Initial situation before partial extraction of the fractured tooth and immediate implant placement. The epigingival fracture made a horizontal reduction of the root unnecessary.

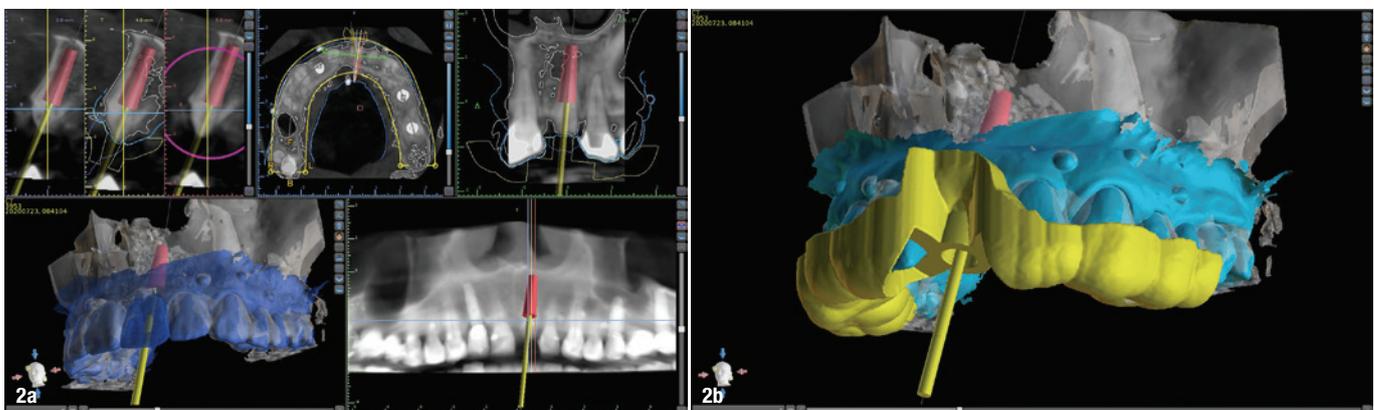
Introduction

In 2010 a novel approach to preserve the soft and hard tissues following tooth extraction was reported.¹ Clinical studies had suggested that retaining roots of hopeless teeth may avoid tissue alterations after tooth extraction. The authors proposed the retention of a buccal aspect of the root during immediate implantation to prevent alveolar bone loss following tooth extraction. The proof-of-concept study in beagle dogs showed that retaining the buccal aspect of the root during implant placement does not appear to interfere with

osseointegration and may be beneficial in preserving the buccal bone plate. Since then, the Socket Shield Technique has been further evaluated clinically in its application as originally described by Hürzeler et al. or in complex situations such as multiple adjacent implants with pleasing aesthetic results.¹⁻⁴ The latest critical literature review by Blaschke et al. about the clinical data support on the Socket Shield Technique summarised promising outcomes with the Socket Shield Technique, its high potential to reduce the need for invasive bone grafts around implants in the aesthetic zone, but also concluded that clinical data to support is very limited.⁵ Nevertheless, this technique cannot be implemented in routine dental practice without caution as it is quite technique-sensitive and thus, should be reserved for the experienced surgeon. The following case report describes an immediate implant placement, fully guided applying the Socket Shield Technique as an efficient treatment concept, with a favourable cost-benefit ratio and highly aesthetic outcome.

Clinical case

In the following case a 69-year-old male with good health condition (ASA I) presented in the office with a fracture of a central incisor. The full mouth had been previously restored with lithium disilicate crowns due to the severe attrition the teeth suffered as a consequence of the intense bruxism and clenching the patient reported. Anterior crowns were



Figs. 2a & b: The DICOM files as well as the intra-oral STL files were imported into a software (Blue Sky Bio) to plan the ideal implant position. Finally, a surgical guide was printed.

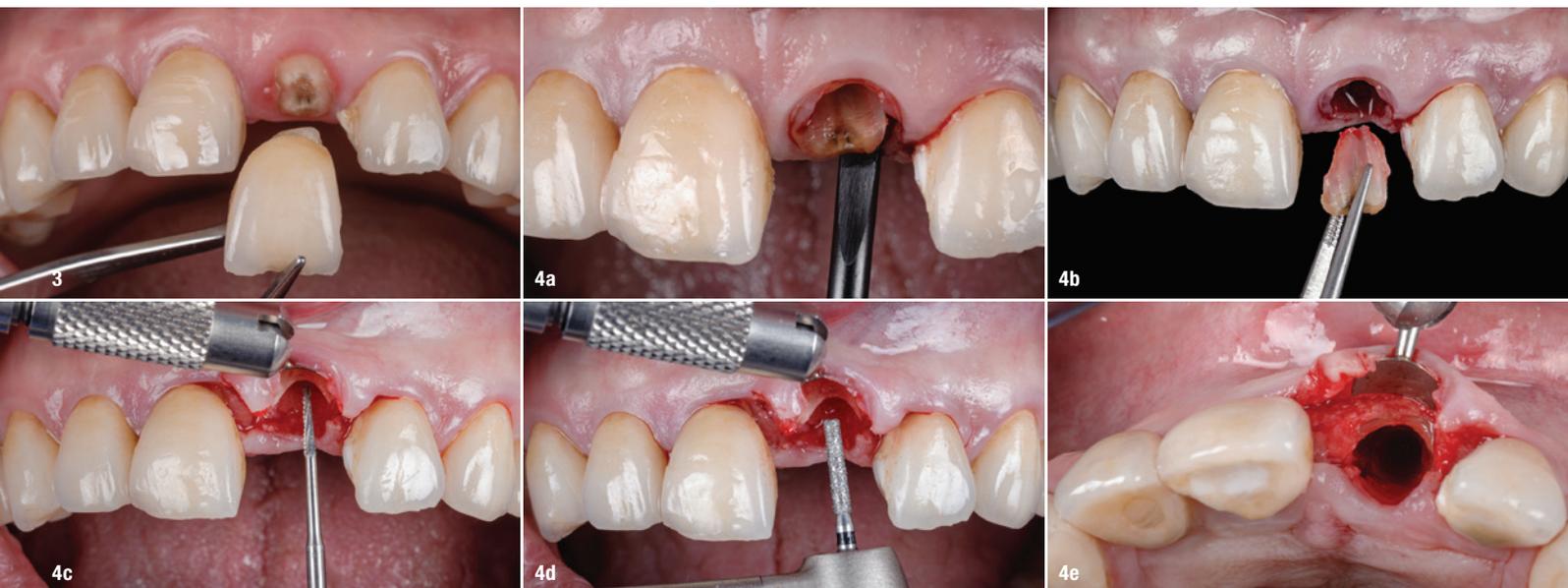
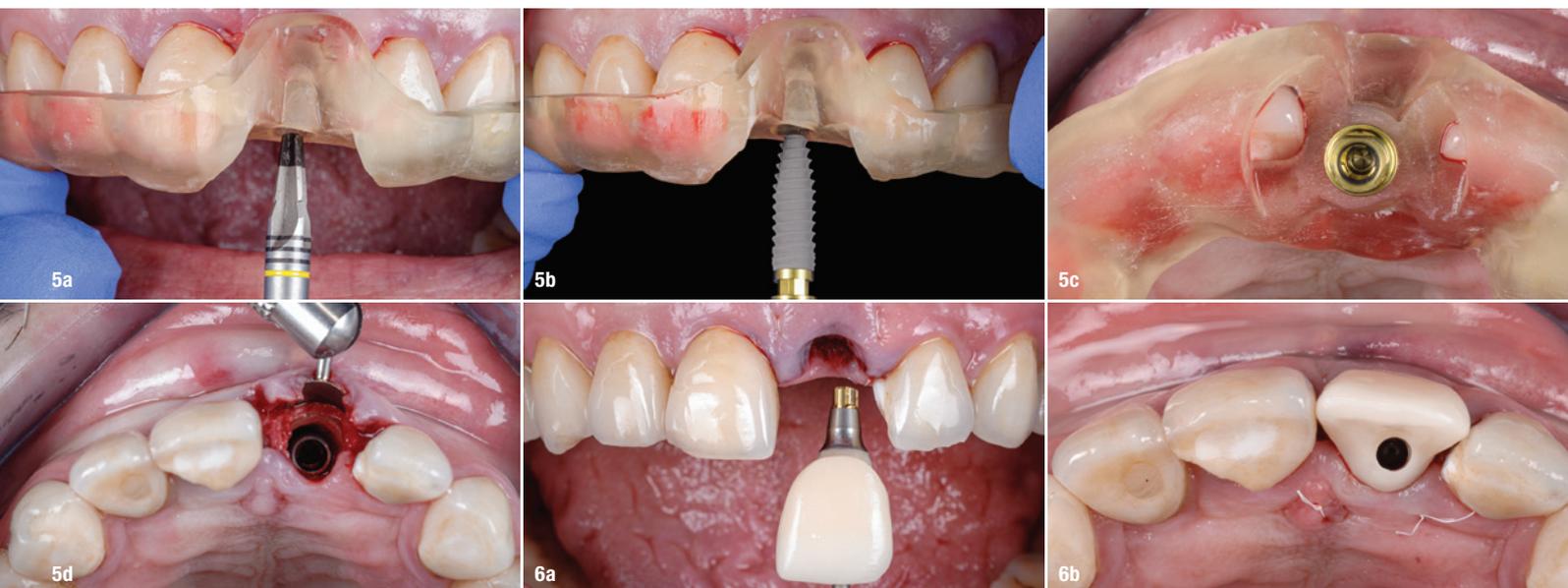


Fig. 3: After impression taking, the fractured crown was sent to the laboratory technician to copy the shape and colour. **Figs. 4a–e:** Partial tooth extraction with Socket Shield approach: bisection of the root, extraction of the palatal parts and contouring of the buccal shield.

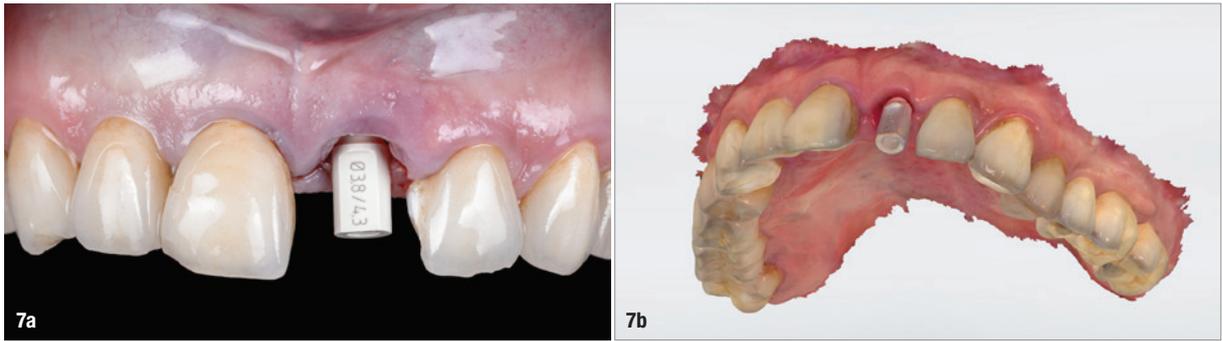
splinted but even so the crown of the tooth broke horizontally at gingival level. The pulp sensitivity test of the fractured tooth with CO₂ snow was negative, the peri-coronal tissue was irritated, but showed absence of active purulent infections. Hard and soft tissue showed no signs of bone loss or recession, in comparison of the soft tissue and bone support of the two maxillary quadrants there was no difference from one quadrant to the other. Radiologically the root remnant showed no alterations or signs of fracture (Figs. 1a & b). Oral hygiene was good. Tooth conservation was assessed to be feasible but seemed rather unpredictable due to the

lack of enough dentine to predictably support a crown in the long term. Another alternative was to extract the root and to retreat the adjacent teeth with a fixed bridge. After a discussion of the treatment options and the respective risks and benefits, the patient agreed to substitute the tooth by an implant. The crown of the fractured tooth was temporarily positioned in place with the help of flowable composite.

An intra-oral scan of both maxillary and mandibular jaw (3Shape, TRIOS) to produce the guide template was taken. For planning of the implant position a CBCT scan was done



Figs. 5a–d: Fully guided placement of the implant into the exact 3D prosthodontic position, in distance to the root shield. Care was given to not change the position of the buccal root shield. **Figs. 6a & b:** The interim restoration had been designed based on the intra-oral scan. It could be screwed onto the implant immediately after the surgery to close the extraction wound and preserve the soft tissue.



Figs. 7a & b: A scan body is used to immediately register the 3D position of the implant.

(Planmeca Promax 3D Plus) paying special attention to the integrity of the cortical plate and the quantity of bone present in the apical area to be able to properly stabilise the implant. The DICOM files as well as the intra-oral STL files were imported into a software (Blue Sky Bio). These files were superimposed and a virtual wax-up helped to create the exact virtual position of the implant with an ideal prosthodontic emergence profile. Finally, a surgical guide was designed and immediately printed at the office with the help of a high-quality 3D printer (Nextdent 5100, 3D Systems; Figs. 2a & b). An alginate impression was taken to elaborate a thermoplastic vacuum formed provisional and the patient was released with a crown integrated into the removable template to temporarily solve the aesthetic problem. Antibiotics and AINES were prescribed for the day of the surgery. Also, the patient was advised to rinse his teeth with an antiseptic solution (0.2% chlorhexidine, DENTAID) the day before the surgery to reduce the bacteria load in the mouth. The crown of the fractured tooth (Fig. 3) was handed to the dental technician for orientation to build the screw-fixed temporary restoration on the implant for day of surgery.

The guide template—previously designed by superimposing the intra-oral scan. STL file and the CBCT.DICOM files—was tested for exact fit and after local anaesthesia (4% articaine with 1:200,000 epinephrine) partial tooth extraction was performed. Weighing tissue resorption due to flap mobilisation against good overview on the surgery site, a very small dimensioned buccal full thickness flap preserving the papilla

was mobilised in order to better control later tooth fragment preparation and the surrounding tissue. Before implant bed preparation, the root was bisected vertically and the palatal aspect of the root was removed (Figs. 4a–e). Further dentine parts were removed in individual pieces, focusing to extract the entire root tip. The guide template was seated to prepare the implant bed through the root remnants. Sterile saline coolant was used during the entire drilling procedure. Only a small part of the root in the crestal area on the buccal side was intentionally left in place preserving the facial part of the periodontal ligament and as a consequence the bundle bone (Fig. 4e). As accurate tooth fragment preparation and implant placement is the key to successful treatment with the Socket Shield Technique,⁶ the buccal root piece needed a little reshape with a lancet drill to thin it and such to guarantee that the dentine would not be in direct contact with the implant for proper bone formation.

A PROGRESSIVE-LINE (CONOLOG 3.8x13mm) implant was placed fully guided in the palatal part of the extraction socket in the correct 3D prosthodontic position (Figs. 5a–d). As being an apically tapered implant and threads down to the apex, this implant was chosen for the surgery as it enables to anchorage well within the basal bone but still not endangering the buccal lamella in the apical area. Also, the pronounced thread design makes it easy to reach very good primary stability even in situations with poor quality bone. Reaching an insertion torque of more than 35Ncm, the implant qualified to be restored immediately with a screw-



Figs. 8a & b: Radiological control of the position of the buccal root remnant and the implant. **Fig. 9:** After 8 weeks and removal of the provisional restoration the peri-implant region impresses by a voluminous and healthy soft tissue. **Fig. 10:** The final zirconia crown was produced following a fully digital workflow.



Figs. 11a & b: After seating the final prosthesis, slightly chipped adjacent crowns were repaired with composite. **Fig. 12:** Final situation the day the crown was delivered. **Fig. 13:** Follow-up 6 months later.

retained one-piece provisional crown (Figs. 6a & b). Therefore, a scan body had been screwed in immediately after implant placement to register the 3D position of the implant and scanned digitally (Figs. 7a & b). The interim restoration was designed in the office after importing the STL file into a professional software (Exocad dentalCAD) and after half an hour the provisional was manufactured with a milling machine (Ceramill Motion 2 5X, Amann Girrbach). Afterwards the wound was microsurgically sutured (Cytoplast 6/0 PTFE) to fix the flap in position. The interim restoration was cemented onto a Ti-base (CONELOG Titanium base CAD/CAM crown, CAMLOG) with a resin cement (SpeedCEM plus, Ivoclar Vivadent). This customised healing abutment placed immediately after the implant placement covered exactly the extraction wound and helped in maintaining the soft-tissue contours. A control radiograph confirmed the right position of the implant, the position stability of the shield and the correct distance from the tooth shield to the implant (Figs. 8a & b). After 2.5 months of healing, an optimal soft-tissue emergence profile was obtained (Fig. 9) and final restoration was delivered after 10 weeks (Figs. 10–12). Six months after insertion of the final restoration the crown is perfectly integrated (Fig. 13).

Conclusion

This case illustrates an experimental technique for preserving a buccal root segment in conjunction with immediate implant placement and provisionalisation. The Socket Shield Technique shows to be a valuable technique to minimise buccal contour changes after tooth extraction, leading to increased volume stability of the mucosa adjacent to the

inserted implant. Even if the clinical application of the Socket Shield Technique is still difficult to perform and very technique sensitive, with an apically tapered implant geared to high primary stability like PROGRESSIVE-LINE, the dentist has good control of the implant position and can reach a rather favourable cost-benefit ratio when using this technique. With this case it is also shown that the implant used is a reliable option for immediacy cases with fully-guided options, taking advantage of a fully digital workflow.

about the author



Dr Ramón Gómez Meda holds a degree in dentistry from the University of Santiago de Compostela. In addition, he holds a Master's degree in Occlusion and Temporomandibular Dysfunction and has completed a Post-graduate course in Periodontics and Implantology. Since 2001, he has been leading a private practice in Ponferrada

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