

Case Report*Open Access, Volume 2***The socket-shield technique and early implant placement for tooth rehabilitation: A case report****Getúlio Batista de Oliveira¹; Mariana de Almeida Basilio²; Nara Santos Araujo¹; Patricia Ramos Cury^{3*}**¹PhD student, Postgraduate Program in Health and Dentistry, School of Dentistry, Federal University of Bahia, Salvador, Bahia, Brazil.²Adjunct Professor, Department of Clinical Odontology, School of Dentistry, Federal University of Bahia, Salvador, Bahia, Brazil.³Adjunct Professor, Department of Periodontics, Postgraduate Program in Health and Dentistry, School of Dentistry of the Federal University of Bahia, Salvador, Bahia, Brazil.***Corresponding Author: Patricia Ramos Cury**

Faculty of Dentistry, Federal University of Bahia, Av.
Araújo Pinho, 62. Canela 40110-150, Salvador, Bahia,
Brazil.
Email: patcury@yahoo.com

Abstract

For a long time, different approaches to minimize the dimensional ridge alteration following tooth extraction have been described even though none of them was capable to avoid alveolar bone loss. The Socket-Shield Technique (SST) seems to be an alternative for alveolar bone preservation in dental extraction planning. This technique conventionally uses a flapless approach and the buccal root portion retention to prevent bone loss. This case report describes the SST with an early implant placement in a patient who presented the non-restorable tooth # 15 due to the extensive cavity. After six months of the implant placement a porcelain-fused-to-metal crown was fabricated and screwed into the implant with a satisfactory esthetic and functional result. The SST is a non-invasive and effective approach to tooth extraction and rehabilitation, especially in the aesthetic zone. Approximately two-year follow-up shows a satisfactory aesthetic maintenance.

Keywords: Alveolar ridge preservation; Minimally traumatic extraction; Socket shield technique; Tooth extraction.

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Introduction

Soft and hard tissue alteration always happens following tooth extraction. The amount of tissue loss depends on the buccal alveolar bone wall thickness [1], prominent roots [2] and surgical trauma [3-5]. Fifty percent of bone width loss happens in the first year after tooth extraction [6]. Different approaches to minimize the dimensional ridge alteration following tooth extraction have been described [7-10], but they were not capable to avoid bone loss even though high cost techniques have been applied [11,12]. Even an immediate implant may fail to prevent undesirable remodeling bone walls of the tooth socket [13,14].

The root submergence technique maintains the decoronated tooth submerged at or below the alveolar bone level. The maintenance of periodontium ligament yields an alveolar bone nourishing and that is why the bone resorption of this technique is minimal [15]. Based on this concept, Hürzeler *et al.* [12] developed *the Socket-Shield Technique (SST)* for alveolar bone preservation with immediate implant placement. They observed that when a tooth portion is retained at the tooth socket the dimensional ridge alteration is minimal. A Proximal Socket Shield (PSS) for interimplant papilla preservation in the

aesthetic zone is a technique for bone crest maintenance between the implants [8]. Despite being mostly used with immediate implant placement, Glocker *et al.* [16] related a case series of SST and implant placement six months later. During re-entry they observed new bone formation in the alveolar bone and residual ridge preserved. Pour *et al* [17] used a CAD/CAM fabricated surgical guide to facilitate correct implant placement in a socket shield approach. Miltiadis *et al* [18] published in detail a step-by-step description of the root-membrane technique (another way to nominate SST) and stated that this technique facilitated clinical stability of soft tissue contours during 3 years of follow-up. A retrospective case series of 10 patients treated with the SST showed a low degree of contour changes of the alveolar bone combined with high esthetic outcomes in a five-year follow-up [19]. All those studies reported satisfactory results. However, some emphasized the technique sensitivity [8,16,18,19].

Case report

A 45-year-old woman, with good health status was referred to clinic of the School of Dentistry of the Federal University of Bahia for tooth # 15 rehabilitation. The patient showed a thick gingival biotype, an open bite which she stated that she never desired to treat, and a high smile line (Figure 1a). The clinical examination and the periapical radiograph revealed a non-restorable tooth # 15 (Figure 1b). The residual bone height would not be satisfactory for immediate implant placement. After explaining the risks and benefits of many treatment options, including orthodontic treatment, fixed prosthesis and removable partial denture, the patient consented to the SST and an implant-supported restoration. A consentment term was then signed by the patient.

Before initiating the surgical procedures, the patient rinsed her mouth with 0.12% chlorhexidine gluconate. A local anesthetic (2% mepivacain with epinephrine 1:100.000, *DFL*) was injected into the mucosa buccally and palatally. The provisional cement was removed with a spherical diamond bur (1012, *KG Sorensen*) and, in the buccal side, the coronal root portion was worn with a wheel diamond bur (3053, *KG Sorensen*) to the bone level. Under abundant saline cooling the root was sectioned in the mesial-distal direction with a long flame diamond bur (3195, *KG Sorensen*) (Figure 2a). After that, with the same bur, the root buccal portion was cut into a concave shape. The root palatine portion was carefully luxated using of a modified lever form through and making gentle movements (Figure 2b). Then, it was removed with root forceps. The picture shows the root palatine portion (Figure 2c).

After administration of local anesthesia, a 6 mm diameter circular free gingival graft was removed from the palatal region with circular scalpel (*hospital and dental instruments, maximus, Brasil*) (Figure 2d). The epithelial tissue was removed from the gingival sulcus with a wheel diamond bur (3053, *KG Sorensen*) and the dental extraction alveolus was filled with blood collected from the graft donor area (Figure 2e). The donor area was carefully sutured with several x-shaped stitches (nylon 4.0

strand, *ethicon*) and the gingival graft was sutured on the alveolar wound with single stitches (nylon 5.0 strand, *ethicon*) (Figure 2f). The coronal cut tomography image shows the shield linked to the buccal alveolar bone (Figure 3a). The sagittal cut tomography image shows the proximity of the tooth alveolus bottom with maxillary sinus (Figure 3b).

Two grams of amoxicillin (*EMS Sigma Pharma LTDA, Brazil*) and 8 milligrams of dexamethasone (*EMS Sigma Pharma LTDA, Brazil*) were used 30 minutes before the surgery and 500 milligrams of dipyrone (*Medley Industria Farmaceutica Ltda, Brazil*) every 6 hours for 48 hours. The patient was instructed not to brush at the surgical area but to rinse with 0.12% chlorhexidine gluconate twice a day (*A Formula - Farmácia De Manipulação, Brasil*) for two weeks. After one week, the patient returned to remove the suture from the donor area and after two weeks the suture from the gingival graft was removed.

One hundred days following the SST, the coronal cut tomography image showed a socket healing and the root buccal portion (Figure 4a). The healing process occurred uneventfully and ridge width was maintained (Figure 4b). The same medication protocol for the SST surgery was applied for implant placement. A palatalized incision was made on the alveolar ridge mucosa and a partial thickness flap was elevated. The width of the preserved alveolar ridge could be seen with the presence of the root buccal portion attached to the buccal alveolar wall (Figure 4c). After implant bed preparation, a conic Morse cone dental implant (3.75x10.0, *PROS*) was installed in correct three-dimensional position close to the shield without touching it (Figure 4d). The periapical radiograph showed the positioning of the implant (Figure 4e). The surgical wound was carefully sutured with single stitches (nylon 5.0 strand, *ethicon*) (Figure 4f).

After four months implant installation, the re-opening was performed with the circular scalpel ("*Punch*" 5,1 mm – *ICE*) and a healing cap was installed and kept for 7 days. Prior to molding, a provisional healer was made with the healing cap and self-curing acrylic (*alike, GC*) that was screwed over implant and remained for 7 days for conditioning the gum (Figure 5a). The alveolar ridge volume was preserved and the conditioned gum was observed (Figure 5b). The dental impression was performed by using addition silicone (*express, 3M*) and the casts were made in type IV gypsum (*durone, Dentsply*). The PFM crown was made of nickel-chromium metal (*High Bond*) and feldspathic porcelain (*Noritake*). The crown was screwed directly to implant, the screw pass hole was filled with composite resin (*Filtek® P60 3M ESPE*) and the occlusal contact adjustment was done. The harmony of the PFM crown with the neighboring teeth was achieved (Figure 5c). The periapical radiograph showed the satisfactory fitting of the PFM crown (Figure 5d). After 30 days of crown installation, the patient returned to the reassessment. She was very satisfied with the final results and the clinic exam showed a healthy soft tissue around the tooth crown (Figure 5e). Six months later, the patient returned for an evaluation scheduling and the soft tissue around the tooth crown was in a healthy and stable condition (Figure 5f).

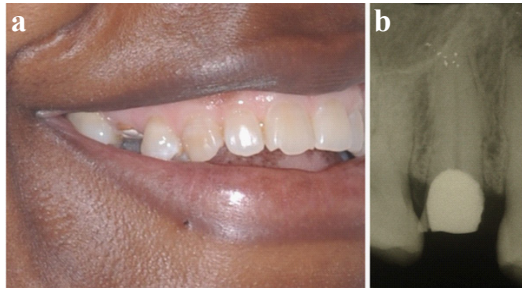


Figure 1: (a) Patient high smile line shows the absence of tooth # 15; (b) periapical radiograph of tooth # 15.

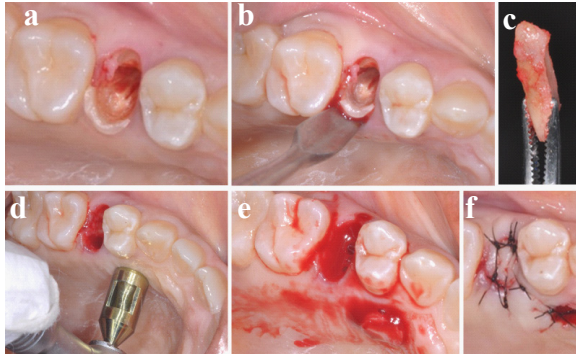


Figure 2: (a) Tooth root # 15 sectioned; (b) root buccal portion into a concave shape and the root palatine portion luxated; (c) root palatine portion and the shield cut position; (d) harvesting of a circular free gingival graft; (e) tooth alveolus filled with clotted blood; (f) gingival graft sutured on the alveolar wound.

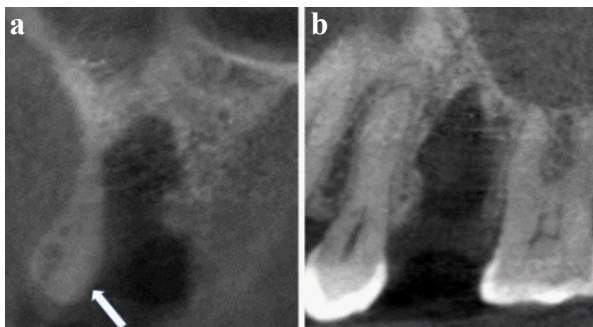


Figure 3: (a) Coronal cut tomography image showing the shield (white arrow); (b) sagittal cut tomography image showing the proximity of the tooth alveolus bottom with maxillary sinus.

Discussion

The patient's aesthetic demand combined with the proximity of the root apex with the maxillary sinus, indicated that the good treatment option for this case was an early implant placement. This case report showed that retaining a well-defined concave shaped root buccal fragment into the tooth socket resulted in an alveolar ridge preservation. In addition, it was possible to install an early dental implant in the ideal position without difficulties. In the present case, no graft material was used to alveolar preservation but only the shield and clotted blood to fulfill the tooth socket and a soft tissue graft harvested from the palate to coverage the wound. The SST overcomes the high cost of biomaterials used in the guided bone regeneration techniques. Contrary, most alveolar preservation techniques apply expensive materials and invasive approaches [11,16-19].

Many authors have advised the high sensitivity of this technique and therefore should not be recommended as a routine dental practice [8,16-18,20]. The author of this clinical case has made an extensive training on pig's jaws before performing the surgeries in patients.

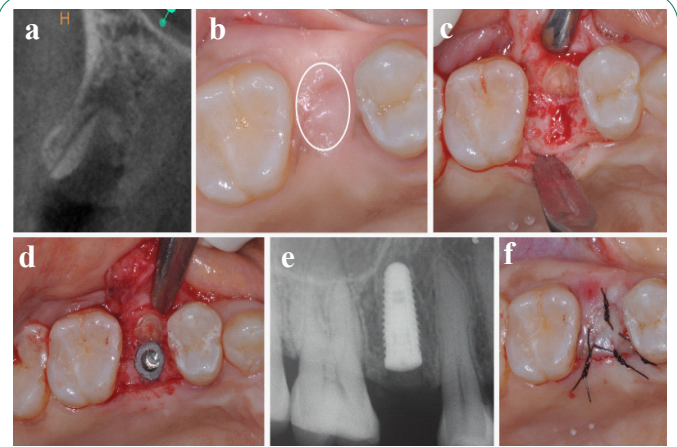


Figure 4: (a) Tomography image of the root buccal portion after 100 days; (b) gingiva graft integrated on alveolar ridge tissue (inside the circle); (c) clinical view of the alveolar ridge with the shield; (d) conic morse cone dental implant installed; (e) periapical radiograph of the implant; (f) surgical wound sutured with single stitches.

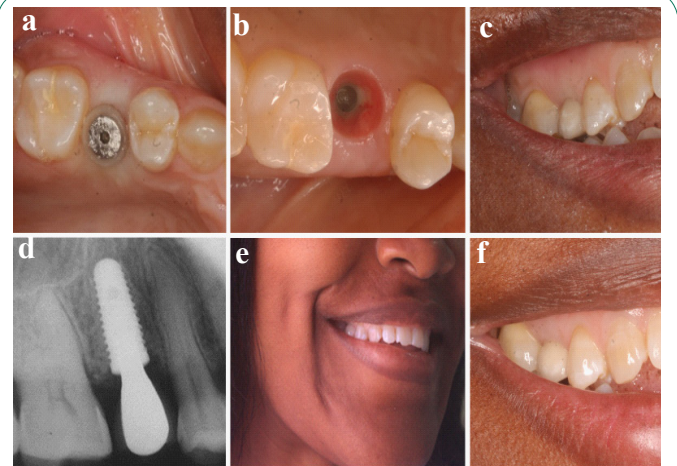


Figure 5: (a) Provisional healer made with the healing cap and self-curing acrylic; (b) gingival conditioning; (c) lateral view of porcelain-fused-to-metal crown - tooth # 15; (d) periapical radiograph of the porcelain-fused-to-metal crown; (e) patient's smile; (f) six-month follow-up. Note the soft tissue healthy and stable.

Conclusion

This case report showed an alveolar bone preservation approach in an esthetic demand area. The SST demonstrated the maintenance of contour tissue that facilitate three-dimensional implant positioning. The low cost of this technique with good esthetic result and the maintenance of the healthy tissue contour surrounding the metal-ceramic crown encourage the dentists to indicate this technique. Nevertheless, further studies with long-term follow-up are necessary to consolidated this technique. Besides that, good training on animal model is necessary before performing this technique in human beings.

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