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Case Report

Clinical and Radiographic Analysis of Immediate Implant Placement with Socket Shield (SS) Technique: A Case Report with a 1-Year Follow-Up

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Abstract

With the revolution in implant dentistry, an increasingly high esthetic demand has produced a challenge when replacing missing teeth in the esthetic zone. Dimensional changes after tooth extraction are compensated for with different socket preservation techniques, and, sometimes, hard and soft tissue augmentations are needed to minimize these hard and soft tissue dimensional changes. A new innovative technique, called the socket shield (SS) technique, was developed to overcome the soft and hard tissue alterations that occur following tooth extraction. In this technique, a buccal root fragment is retained to preserve the blood supply provided from the periodontal ligament to the buccal alveolar bone. This case report will present the clinical and radiographic outcomes of the SS technique with immediate implant placement.

Keywords: *Immediate Implant; Partial Extraction Therapy; Socket Preservation; Socket Shield*

Abbreviations

SS: Socket Shield; CBCT: Cone Beam Computed Tomography; PET: Partial Extraction Therapy

Introduction

Dental implants provide a revolutionary option to replace missing teeth. With time, the demand for function as well as esthetic has increased for patients seeking implant treatment. Replacing a single missing tooth in the esthetic area with dental implants is a challenge for dental care providers as it mainly depends on the peri-implant mucosal tissue in relation to the adjacent teeth [8]. Many studies reported dimensional changes in the residual alveolar ridge after tooth extraction [1,2]. In humans, dimensional changes after tooth extraction can reach up to 4 mm of facial-palatal thickness in the maxillary anterior area [14,15]. This is due to the loss of blood supply to the buccal bone provided by the periodontal ligament, which occurs after tooth extraction [19]. Moreover, it is known that the buccal bone thickness is identified as a critical factor to predict buccal bone resorption and dimensional changes after tooth extraction [5]. Areas of facial bone thickness of 1 mm or less showed 7.5 mm or 62% vertical bone loss after 8 weeks of extracted tooth healing site [6]. This is critical because the facial bone thickness of the maxillary anterior area is found to be less than 1 mm in 90% of cases [3,12,13,19], which means that this facial bone mainly consists of cortical bone that is prone to resorption due to the lack of innate blood supply and has to rely on

the periosteum and the periodontal ligament for blood supply [9]. These structural alterations, if not addressed, will negatively impact the esthetic and functional outcome of the implant therapy [7]; therefore, many surgical and clinical techniques have been developed to overcome and limit the structural and dimensional changes that occur after tooth extraction. One of these techniques is known as "socket shield (SS)", which was introduced by Hürzeler., *et al*. in 2010 [11]. This technique was later known as part of a group of surgical procedures called partial extraction therapy (PET), all aimed to reduce or limit alveolar ridge collapse after tooth extraction [19]. The socket shield is a technique that maintains the buccal or facial root section of a tooth by surgically sectioning a tooth mesiodistally, removing the palatal segment of the root and leaving the facial root section in place followed by an immediate implant placement in the operative area. This will allow the area to maintain its structural dimensions by leaving the blood supply of the periodontal ligament intact to support the facial bone in the targeted area [11]. Several studies have been conducted to assess and evaluate the success of the socket shield technique and they all showed promising results [4,16,18,10]. One clinical randomized controlled trial of 40 patients that compared the SS technique with conventional post-extraction implant therapy showed statistically significant results regarding marginal bone levels and pink esthetic score [4]. A retrospective study conducted on 128 cases using the SS technique for up to 4 years showed that 123 out of 128 implants survived; however, the complication rate was 19.5%. The complications were identified to be one of the following: implant failure to integrate with the bone, postoperative infection, socket shield exposure and socket shield migration [10].

Objective of the Study

The objective of this case report was to evaluate and assess the clinical and radiographic outcome of the socket shield technique combined with immediate implant placement after 1 year of final restorative crown placement.

Case Presentation

This case focused on a 30-year-old healthy non-smoking patient referred to the periodontology clinic for evaluation of a fractured crown of the right maxillary central incisor. After clinical and radiographic examination, the tooth was deemed unrestorable as the fracture line was extended 3 mm subgingivally, compromising the crown root ratio of the tooth. Cone beam computed tomography (CBCT) showed sufficient apical and buccal bone for immediate implant placement with no periapical lesion. The area was planned for immediate implant placement using the socket shield technique. The risk and benefits of the procedure and treatment plan options were explained to the patient, and a signed written consent form was acquired from the patient. Oral hygiene instructions and scaling were performed on the patient as part of phase I therapy 6 weeks prior to the partial extraction and immediate implant procedure.

After administration of local anesthesia (2% lidocaine with 1:100,000 epinephrine, Dentsply Pharmaceuticals, USA), the root of the right maxillary central incisor (Figure 1) was sectioned mesiodistally using a long needle diamond bur. The palatal part of the root was removed, and the buccal part of the root was thinned to reach 1 mm in thickness. The buccal shield was handled with special care in order to avoid any forces that might laxate the buccal root section. Using a round diamond bur, the buccal shield was adjusted and trimmed to be flushed with the crestal buccal bone level. Then, the remaining part of the socket was debrided and thoroughly irrigated with sterile normal saline. After ensuring buccal shield stability, a 3.5 x 12 mm implant (RBT laser lok, Biohorizons IPH, Birmingham, AZ, USA) was placed 1 mm apical to the crestal bone and the buccal shield with the addition of mineralized allograft bone particles (FDBA, Mineross, Biohorizons IPH, Birmingham, AZ, USA). Initial implant stability was 45 Ncm. Then, a temporary abutment was placed and adjusted with the addition of flowable compost to capture the existing tissue form and emergence profile. Following this, the old crown was loaded over the temporary abutment to finalize the temporization of the area. No sutures were used in this case. Postoperative instructions were given to the patient, and the patient was prescribed antibiotics (amoxicillin 500 mg) every eight hours daily for 7 days, ibuprofen 600 mg every 8 hours daily for 4 days for pain relief and 0.2% chlorhexidine gluconate mouth wash every 12 hours daily for 2 weeks. The patient was recalled for postsurgical re-evaluation after 1 and 2 weeks. The final implant crown was placed after 3 months of implant placement. The patient was recalled for clinical and radiographic (periapical radiograph) evaluation and maintenance after 6 months, and after 1 year for clinical (Figure 2) and radiographic evaluation (CBCT) and maintenance.

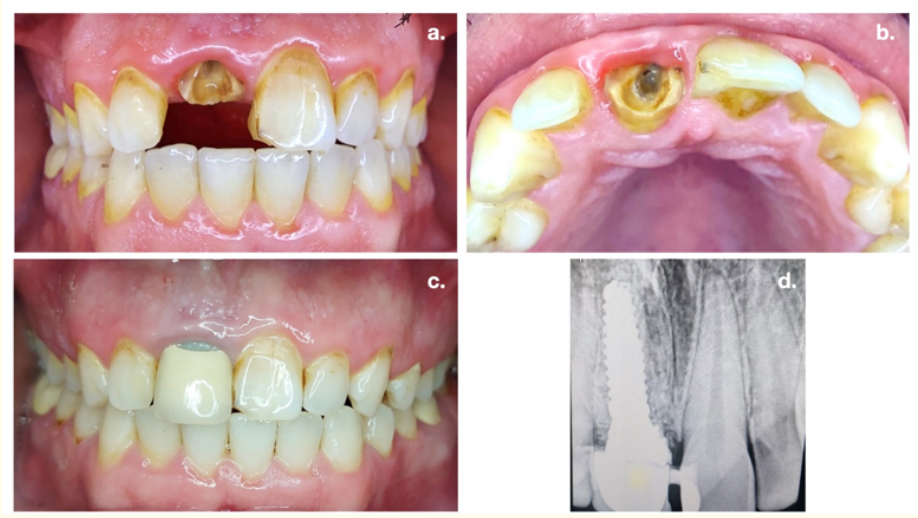

Figure 1: *Dental implant placement: (a) Frontal view of a non-restorable right maxillary central incisor. (b) Occlusal view of the non-restorable right maxillary central incisor. (c) Frontal view of the area after tooth fragment extraction and implant placement with immediate temporization using the patient old crown. (d) Periapical radiograph showing the implant placement*

Figure 2: *Final implant restoration. (a) Frontal view of the surgical site after 3 months of the procedure. (b) Occlusal view of the surgical site after 3 months of the procedure. (c) Final implant crown after 1 year of function.*

Crestal bone height was measured to be around 11 mm (Figure 3) before and after extraction and implant placement. Bucco-lingual dimensions were measured in two areas, the crestal bone area and the middle of the root area. The crestal bone area was measured (8.3 mm) before extraction and was 7.9 mm after 1 year of the SS technique and implant placement (dimensional change: 0.4 mm). As for the middle of the root area, both measurements were comparable at 8.7 mm and 8.6 mm, before and after surgical intervention, respectively.

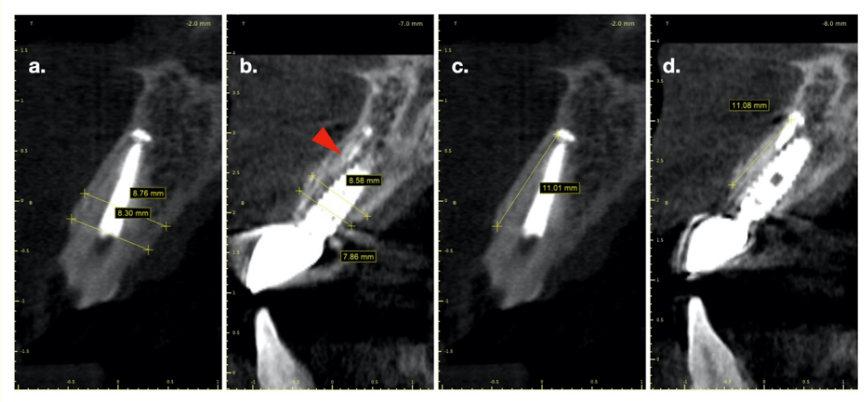

Figure 3: *Sagittal view of the implant site. (a) Preoperative bone width measurements show 8.3 mm for crestal bone area and 8.76 mm for middle root area. (b) Postoperative bone width measurements show 7.86 mm for crestal bone area and 8.58 mm for middle root area. (c) Preoperative bone height is 11 mm using the excess root canal treatment as reference point for apical measurement. (d) Postoperative bone height is 11 mm. (Arrow) socket shield (ss) is evidently present alone the implant.*

Results and Discussion

Despite the fact that the socket shield (SS) technique was initially introduced in 2010 [11], there is still insufficient evidence to support it. However, this surgical technique shows tremendous potential to preserve or minimize extraction site bone and soft tissue dimensions. In this report, there were no intraoperative and postoperative complications related to the use of immediate implant placement via the SS technique. Clinical and radiographic examination showed that the buccal and crestal buccal bone showed minimal to no dimensional changes.

In a retrospective study evaluating 128 SS cases for up to four years, 25 implants showed complications (19.5%) [10]. Five implants failed to osseointegrate, and the remaining complications were manageable and did not affect the survival rate, which was 96.1%. Other complications included internal exposure of the SS (12 cases), external exposure of the SS (4 cases), infection in the area of the shield (3 cases) and migration of the shield (1 case). The management range from a simple reduction in the SS in cases of internal exposure or migration of the shield to removal of the shield and soft and hard tissue augmentation was needed in cases of external exposure or infection of the shield [10].

In a recent systematic review analyzing six articles comparing the SS technique and conventional immediate implant placement, the SS technique showed reduced vertical and horizontal alveolar bone remodeling and resorption, better preservation of the buccal plate and a better outcome regarding esthetics when compared with conventional immediate implant placement. However, the methods of bone dimension evaluation varied greatly between articles [17].

The socket shield (ss) technique has excellent potential to preserve the soft and hard tissue in extraction sites. However, more randomized controlled clinical trials are required to assess the viability and practicality of this technique. Furthermore, more studies are needed to determine the clinical criteria needed to perform it.

Conclusion

The socket shield (ss) technique has excellent potential to preserve the soft and hard tissue in extraction sites. However, more randomized controlled clinical trials are required to assess the viability and practicality of this technique. Furthermore, more studies are needed to determine the clinical criteria needed to perform it.

Conflict of Interest

The author declares no financial interest and no conflict of interest exists.

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