Case Report

The socket-shield technique and immediate implant placement

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Abstract:
Healing of extraction socket leads to the dimensional changes which will affect the placement of the implant and its emergence profile. Atraumatic extraction, socket preservation technique, and immediate implant placement decrease the alveolar bone resorption by maintaining the postextraction socket. Hürzeler et al. introduced socket-shield technique by keeping a buccal fragment of the tooth to prevent the buccal cortical bone from resorption. This case report represents a 40-year-old male patient with grossly decayed maxillary left lateral incisor indicated for extraction replaced with an immediate implant. While examining cone-beam computed tomography, thin buccal cortical plate was noticed which may get fracture during extraction. Socket-shield technique was designed for implant placement to protect buccal bone and to get the proper esthetic form. Two millimeters buccal fragment of the tooth was kept attached and the implant was placed in contact with tooth fragment. Three-month follow-up shows proper healing, and healthy peri-implant tissue shows that socket-shield technique with immediate implant placement will be a good alternative to preserve buccal cortical plate and implant placement, especially in the esthetic area.

Key words:
Anterior implant, immediate implant, ridge preservation, socket-shield technique

INTRODUCTION

Extraction of tooth changes the dimension of the alveolar ridge, which has a direct effect on future implant prosthesis and its emergence profile, especially in the anterior region.[1] Trauma during extraction and loss of periodontal ligament were the lead cause of alteration; therefore, many techniques were introduced to prevent the resorption of alveolar bone. Atraumatic extraction, socket preservation, grafting, and immediate implant placement prevent alveolar resorption by preventing the collapse of cortical plates and maintaining the dimension. These techniques show the significant result in maintaining the postextraction alveolar bone, but no studies show the complete preservation of alveolar socket.[2]

Araújo and Lindhe suggested that following tooth extraction, the blood vessels in periodontium to the thin bone walls are severed, thereby causing facial bone plate resorption.[1] Thus, it can be assumed that retaining a root may alter the occurrence of facial bone resorption. Many studies showed that the retention of the decoronated root, vital or endodontically treated as root submerge technique, can preserve the alveolar bone.[3] Recent studies also proved that the placement of the implant in contact with retained root surface preserved the buccal bone and led to good emergence profile.[2]

Hürzeler et al. were the first to demonstrate the socket-shield technique in a study on one beagle dog. Hemisection of mandibular premolar was performed and a buccal fragment of distal root was retained 1-mm coronal to the buccal bone plate. The immediate implant placement was done lingually to the retained root piece with or without contact with root fragment. No complications were seen, and the histologic study shows that the newly formed cementum was seen in the area between the titanium implant and retained root fragment.[2] Modification of original technique was done by many researchers by preserving the palatal bone and proximal bone.[4] The promising result of these study shows socket-shield technique as a feasible alternative treatment option for thin buccal plate region area and periodontally healthy teeth.

This case report shows a patient with thin buccal cortical plate and tooth indicated of...
A 40-year-old, nonsmoker, and the systemically healthy male patient presented with a grossly decayed maxillary left lateral incisor [Figure 2]. An attempt to preserve tooth by root canal treatment failed. Clinical examination showed grossly decayed root canal treated the tooth with healthy gingival and periodontal tissue. After initial examination, the patient was advised for IOPA with respect to 22 which revealed root canal treated tooth with crown margin almost at the crestal bone level [Figure 3]. Cone-beam computed tomography (CBCT) showed the presence of grossly decayed 22 with a mean bone density of 427 HU (D3) [Figure 4]. Distance from the alveolar crest to the nasal floor was 17.03 mm, and distance from the root apex to the nasal floor was 7.36 mm, labio-palatal thickness showed a maximum of 9.07 mm and minimum of 5.54 mm [Figures 5 and 6]. According to the CBCT finding, a 3.3-mm diameter and 13-mm length of the implant was selected for the placement to get proper primary stability. While examining the CBCT, it shows the presence of thin buccal cortical plate which may get fracture during the extraction, so socket-shield procedure was design to preserve a buccal fragment of the tooth.

Before implant placement, a prophylactic protocol for implant placement by Misch was followed which included antibiotic 500 mg amoxicillin 1 h before surgery and rinsing with 0.12% chlorhexidine. The area to be operated was anesthetized by infiltration block. Tooth 22 was decoronated with a round coarse-grained diamond bur till the crest of the bone and straight diamond bur was used to remove the gutta-percha filling from the root. Sectioning of the root was done in two steps. In the first step, sectioning was done till apical two-third with the help of tapered diamond bur mesiodistally in parallel to the long axis of tooth direction. In the second step, the direction of the bur was changed to an oblique direction toward the buccal surface to detach the buccal fragment from the palatal [Figure 7]. The palatal portion was extracted atrautomatically with the help of Coupland elevator and remaining buccal fragment was trimmed by leaving only 2 mm as a shield [Figures 8 and 9]. The osteotomy was started with lance drill to get a proper ditch, and then, the sequence of the pilot drill, 2.8-mm drill, and 3.2-mm drill was used to enlarge the osteotomy site. Direction indicator was used after every drill to confirm the direction of osteotomy to the adjacent tooth. MIS NP 3.3-mm diameter and 13-mm length was placed, the primary stability of 35 Ncm was achieved with hand wrench, and the cover screw was placed [Figures 10 and 11]. The apicocoronal position of the implant platform was situated 1-mm apical to the buccal marginal gingiva, and the gap around the implant was filled with bone graft. The buccal flap was released till the mucogingival junction to get the buccal advancement of the flap, and horizontal matrix suture was used to get a proper approximation [Figure 12]. Postoperative antibiotics were prescribed and instructions were given, and the patient was recalled after 10 days for suture removal. No postoperative complication was noticed and healing was uneventful [Figures 13 and 14]. The temporary splinted acrylic crown was given, and the permanent restoration was followed after 3 months [Figures 15 and 16].

**DISCUSSION**

In this case report, socket-shield technique was used in an area where the buccal cortical plate was thin by keeping root fragment attached to the buccal bone and placement of immediate implant maintain the ridge contour. The results were in consistent with the original technique given by Hürzeler et al. No postoperative complication was seen and healing was uneventful.

Preservation of root segment to prevent alveolar bone resorption was shown in many studies. Salama et al. reported the root submerge technique, by keeping root submerge in the pontic area to preserve dimension of alveolar bone.

Histological studies of Hürzeler showed the cementogenesis between the implant surface and the retained root surface and clinically successful osseointegrated implant. It should be noted that the complete preservation of socket was not seen in many case reports, while Sirompas et al. showed a mean crestal bone loss of 0.18 mm and Chen et al. showed a mean buccal bone loss of 0.83 mm; this is in accordance with this case report where 1-mm buccal bone loss was seen.

Krump and Barnet showed a high success rate of immediate implant placement, and it has many advantages over the delayed loading by reducing the time for a final prosthesis, second-stage surgery and extraction socket provide the proper angulation for the direction of the implant and reduce the chance for the angulated abutment. In this case, the primary stability of 35 Ncm was achieved by extending osteotomy 3 mm beyond the extraction socket.

Space between the implant surface and the socket wall was filled with the bone graft as the lingual jumping distance was more than 1 mm. According to Botticelli, if the distance between the implant surface and the socket wall is 0.5–1 mm, there is no need for bone graft to fill the space, but if space is more than 1 mm, grafting is indicated.

**CONCLUSION**

This present case report of immediate implant placement with socket-shield technique shows successful preservation of postextraction tissue and thin buccal bone with successful restoration of the implant. Socket-shield technique shows the promising result in the preservation of postextraction socket and holds significant value in implant and esthetic dentistry. Further studies are required to find out the long-term success rate of this technique.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.
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Figure 1: Socket-shield technique

Figure 2: Preoperative view shows grossly decayed 22

Figure 3: Radiograph shows root canal treated 22

Figure 4: Cone-beam computed tomography scan of 22

Figure 5: Direction of implant placement

Figure 6: Mesiodistal position

Figure 7: Sectioning of root

Figure 8: Extraction of palatal segment
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Figure 9: Preservation of buccal fragment of root

Figure 10: Placement of the implant

Figure 11: Immediate postoperative radiograph

Figure 12: Closure of the flap

Figure 13: Two-month postoperative

Figure 14: Two-month postoperative radiograph

Figure 15: Placement of healing cap

Figure 16: Final restoration
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Conflicts of interest
There are no conflicts of interest.

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