

Prosthetic Rehabilitation of a Fractured Maxillary Central Incisor with Socket Shield Technique: A Case Report

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ABSTRACT

Socket shield technique is one of the recent and innovative methods to preserve the alveolar bone after tooth extraction. Though the research related to this technique is scarce and long-term outcome is yet to be known, this technique has been able to show a glint in preserving white and pink aesthetics. This is a case report of socket shield with immediate implant placement with respect to maxillary left central incisor followed by delayed loading in a 22-years-old male who had sub-optimal bone thickness in the labial aspect.

Keywords: Alveolar bone loss; immediate implant; socket shield technique.

INTRODUCTION

Although implant therapy is the most desirable treatment option for missing teeth, it is not always feasible where a discrepancy in the surgical site exists. Alveolar bone after teeth extraction undergoes dimensional change.^{1,2} This change affects not only implant placement but also the emergence profile of restored teeth and pleasing soft tissue contour. To prevent alveolar bone resorption, procedures like atraumatic extraction, grafting, socket preservation, immediate implant therapy and submerged root technique have been used but without satisfactory results.³ Hürzeler et al.⁴ first used the socket shield technique which was later modified by Bäumer et al.⁵ and Gluckman et al.⁶

CASE REPORT

This case report includes immediate implant placement utilising the socket shield technique in a 22-year-old male who came to the Department of Prosthodontics and Crown-Bridge, College of Dental Surgery of B.P. Koirala Institute of Health Sciences, Dharan, Sunsari, Nepal with a complaint

of fractured upper left central incisor due to road traffic accident (Figure 1).



Figure 1: Intraoral photograph showing fractured left central incisor (arrow).

Citation

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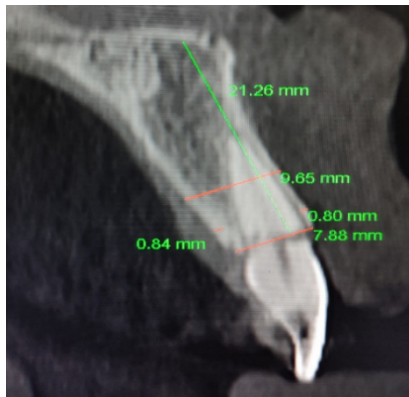


Figure 2: Cone beam computed tomography of maxillary left central incisor showing buccal bone thickness of 0.8 mm.

A thorough examination including cone beam computed tomography (CBCT) revealed that tooth cannot be saved even with orthodontic tooth extrusion and post and core due to insufficient crown root ratio (Figure 2).

The tooth of interest was examined for periodontal disease and mobility. Also, CBCT revealed buccal bone to be 0.8 mm which was less than desired. So, the immediate implant was planned with the socket shield technique. The patient's blood investigation was done. Coordination with the Department of Oral and Maxillofacial surgery was done to plan and execute the socket shield technique.

On the day of surgery, a prophylactic protocol for implant placement was followed which included 500 mg Amoxicillin capsule and rinsing with 0.2% chlorhexidine. The patient was locally anaesthetised with 2% lidocaine with epinephrine by giving infraorbital and nasopalatine nerve block. Then the clinical portion of the crown was sectioned with micromotor and carbide bur with abundant cooling



Figure 3: Mesiodistal sectioning of maxillary left central incisor.

as the fracture line was below the gingival margin and clinically invisible. Pulling out the fractured crown portion might have moved the apical root portion which could change the entire treatment procedure. After removing the crown, the cervical fractured portion was gently teased out with bur as well.

Root was obliquely sectioned till apical 2/3rd mesiodistally (Figure 3) with micromotor and carbide bur with abundant water cooling. Then the palatal portion of the root was gently removed with the coupland elevator without disturbing the buccal portion of root (Figure 4).

Then the buccal part of root was concaved and thinned with arotor and diamond bur leaving 2 mm as a shield (Figure 5). Care was taken not to damage the adjacent palatal and proximal bony socket wall and not to mobilise the buccal root portion.

Implant of 4.2*13 mm (Toureg-S™, Adin) was selected priorly depending upon the diagnostic cast



Figure 4: Removed crown and root portion.



Figure 5: Thinning of buccal shield and reducing it at the level of buccal bone.



Figure 6: Post-surgical view of implant after placement of cover screw.

and cone beam computed tomography. Osteotomy was carried on socket site following manufacturer's suggestions and drilling sequence, more towards palatal bone without disturbing buccal root fragment. After drilling with pilot drill, a radiograph was taken to verify angulation of possible implant position. Then successive drills were used to enlarge the osteotomy site to accommodate the implant. The socket was then thoroughly irrigated to remove debris and bone particles. The implant was inserted and primary stability was obtained. Bone graft (Geistlich Bio oss[®]) was packed in between implant and shield, followed by cover screw placement (Figure 6). The implant so placed had mesial, distal, and palatal bony walls. On the buccal side, it had the remaining buccal portion of the root which had a thin layer of dentine, followed by cementum, periodontal ligament, and bundle bone. The intraoral periapical radiograph was taken to verify the implant position (Figure 7).



Figure 7: Intraoral periapical radiograph of implant.

The surgical site was closed with a 3-0 silk suture. As the missing tooth was an anterior maxillary incisor, temporary pontic was bonded with composite (Figure 8) to improve aesthetic and patient self-confidence. A meticulous occlusal examination was done to relieve pontic from centric and eccentric contact.

The patient was prescribed with antibiotics (Amoxicillin 500 mg and Metronidazole 400 mg) three times a day, Proton Pump Inhibitor (Pantoprazole 40 mg) once a day for seven days and Flexon (Ibuprofen 400 mg and Paracetamol 325 mg) three times a day for three days. He was also instructed to rinse with 0.2% chlorhexidine three times a day for seven days. He was recalled after a week to remove the suture and assess the surgical site. Examination revealed uneventful healing.

After five months of implant placement, an intraoral periapical radiograph was taken which showed



Figure 8: Composite bonding of acrylic tooth for aesthetic portion as a provisional.



Figure 9: Intraoral periapical radiograph of implant at the time of second stage surgery.



Figure 10: Intraoral photograph showing cemented zirconia crown.

satisfactory osseointegration (Figure 9). Second stage surgery was carried out for placement of healing cap to obtain emergence profile of crown. The collar was left for two weeks followed by a closed tray impression technique and the impression was made with addition silicon putty and light body material. Then zirconia crown was fabricated by CAD CAM technique which was cemented with glass ionomer cement (Figure 10). The final result was satisfactory to both operator and patient.

DISCUSSION

Replacement of missing tooth along with associated soft and hard tissue of natural appearance is the main aim of present prosthodontic rehabilitation therapy. As the preservation of what remains is of utmost importance than replacement of what is lost, this socket shield technique helps in preserving the periodontal ligament which in turn saves alveolar bone from resorption.

Hürzeler et al.⁴ in 2010 first stated about socket shield technique in which they performed socket shield followed by immediate implant in a beagle dog. After four months, histological evaluation, and backscatter scanning electron microscopy revealed osseointegrated implants without any histologic inflammatory reaction and the tooth fragment devoid of any resorption processes. On the buccal side, the tooth fragment was attached to the buccal bone plate by a physiologic periodontal ligament. In the areas where the implant was placed into the fragment, newly formed cementum was demonstrated directly on the implant surface.

Bäumer et al.⁵ divided buccal shield into mesial and

distal parts. Also, graft was not used and implant was left without getting adequate primary stability. Yet the result after five months of implant insertion was similar to the original socket shield technique. Mitsias et al.⁷ also had similar result as Hürzeler et al.⁴ but he also didn't use graft. Gluckman et al. in 2017 suggested preparing the socket shield as far apical as possible using long shank root resection bur.⁸

Abadzhiev et al.⁹ reported a total of 26 conventional and socket shield technique with immediate implant cases in 25 individuals. The study showed very minimal (2%) bone and soft tissue loss in socket shield technique whereas 12% bone loss and 18% soft tissue loss in conventional implant after two years.

The most common complication in original socket shield technique is internal exposure¹⁰ of the shield but the modification by Gluckman et al.⁶ in 2018 by preparing the shield at the level of bone has minimised this complication.

This case also followed the socket shield technique modified by Gluckman et al.⁶ Unlike many reported cases, immediate loading was not done in this case but the patient was given a custom-made composite retained acrylic pontic as interim prosthesis mainly for aesthetic concern. The final definitive prosthesis was placed after five months of healing period followed by placement of gingival former for two weeks prior to final impression making. The resultant outcome was satisfactory to both patient and operator. No post-operative complications were seen and healing was uneventful.

The most difficult step encountered while doing this technique was blind vertical sectioning of the root and possible damage to the adjacent socket wall.

Treatment of missing teeth by means of implant therapy is flourishing all around the world. Its advantages over conventional ways weighs out more despite surgery, increased cost, and long treatment time. There are instances when inadequate alveolar bone exists on the labial aspect where socket shield technique can be utilised.

Socket shield technique has emerged as a complex yet enhanced technique and the collective outcome

of a decade is ecstatic. Many modifications have been made to the original technique described by Huřzeler et al⁴. These modifications have been able to overcome some complications of the original technique, so we can tell this socket shield technique is still on the verge of evolution. Though long-term follow-up studies are scarce, this technique has an important implication to preserve alveolar bone and retain the soft tissue contour.

Conflict of interest: None.



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