ABSTRACT

Bone generally tends to resorb around the extraction socket. The buccal bone loss occurring after extraction occurs in vertical and horizontal direction. Complex hard and soft-tissue reconstruction requires achievement of esthetically acceptable results in these types of cases. The socket-shield technique (SST) involves the sectioned segment of the root and the buccal two-third of the root preserved in the socket. So, the periodontium consisting of bundle bone and buccal bone remains intact. The implant is placed immediately lingual to this shield. This conserves the alveolar ridge height and buccal-facial contour providing superior aesthetics. This case report shows the placement of an implant in the maxillary premolar region using the socket shield technique.

Key words: extraction socket, immediate implant placement, socket shield.


INTRODUCTION

After extraction, bone formation occurs during healing of the socket. The bundle bone is the first bone to be resorbed whereas the alveolar bone is gradually resorbed throughout life. Thus, remodeling process results in a ridge morphology reduced in vertical height and more palatal in relation to the original tooth position. Loss of alveolar ridge height and width takes place externally. This alteration in the ridge contour compromises the restoration-oriented three-dimensional positioning of the implant which mainly requires sufficient support and stability of surrounding the surgical site.

In esthetic regions, height and thickness of labial and interproximal bone walls are the important factors for adequate pink and white esthetic outcomes, which can be achieved by the color, shape, and other characteristic features of the marginal mucosa and interdental papilla. There are different techniques available to maintain the ridge contour and its dimension to a certain amount such as immediate implant placement and ridge preservation procedure.
However, these techniques are unable to sufficiently preserve the coronal part of facial bone. This entire procedure comprises almost the entire bundle bone.\(^1\)\(^,\)\(^2\) According to Araújo and Lindhe, after extraction of tooth, the blood vessels to the thin bone walls in the periodontal area are detached which causes resorption of the buccal or facial cortical plate. Thus, it can be considered that retaining a root may alter the appearance of buccal bone resorption.\(^3\) This article describes a case of a patient having a failing tooth whose alveolar ridge is preserved by the “socket shield technique” and immediate implant placement.

**CASE REPORT**

A 58-year-old, healthy male patient reported with the chief complaint of difficulty in mastication due to fractured tooth in the upper right back region of the jaw. On clinical examination, a complicated crown-root fracture was seen with the upper right second premolar. It was then restored with composite resin temporarily. On radiographic examination, the fracture line which was seen extended 3 mm apical to the palatal region of the gingiva. Tooth 16 and 17 were already restored by an implant fixture which showed healthy peri implant mucosa. Periapical radiograph of 15 which was taken before removing the tooth fragment showed moderate bone resorption and apical radiolucency. CBCT image showed thin buccal bone and sufficient hard tissue in the apico-palatal area of the root. Patient was interested in getting fixed prosthesis restoration. Considering the radiological examination and his oral hygiene maintenance habits, implant-supported prosthesis was suggested as the choice of treatment to replace the failing right maxillary second premolar. The implicated treatment plan was an immediate implant placement using the socket shield technique and flapless surgical procedure without damaging the adjacent implants. Complicated crown-root fracture with tooth 15 was restored temporarily by composite resin. (Fig.1 & 2) Tooth 16 and 17 restored by implants showed healthy peri implant mucosa.

![Fig.1: Tooth 15 restored temporarily with composite resin.](image1)

![Fig.2: CBCT showed moderate bone resorption and apical radiolucency with 15.](image2)
Tooth 15 was decoronated with coarse-grained diamond bur and the root was segmented to create a shield for preparation of osteotomy drills. The palatal root fragment was extracted with periotome and forceps conservatively. The socket was debrided gently and irrigated with normal saline. Implant bed preparation in the palatal wall of the socket was achieved and a root-form implant was placed without interaction to the shield. A gap between the buccal plate shield and implant surface was left for blood clot formation. (Fig.3,4)

Fig.3, 4: - Thin buccal plate & Shield was prepared.

The apico-coronal position of the implant platform was located 1mm apical to the palatal margin. Partial-thickness flap was elevated on the buccal side for soft tissue augmentation and figure-of-eight sutures were placed. Healing abutment was connected to the implant. (Fig.5,6) This resulted in healing of the peri implant soft tissue and surface probing depth around the implant. After 4 months, in order to reduce the cement extrusion into the peri-implant sulcus area, pre- and post-operative stone models were compared for the ridge alteration after this interventional technique. Final metal ceramic crown was placed in situ. The gingival height of 15 was maintained.

Fig. 5,6: - Healing abutment & titanium implant abutment.

At this stage, a silicon putty impression was made from the pre-operative stone model to record the ridge morphology. The impression was separated in bucco-palatal direction at tooth 15 and placed on the post-operative model for comparison by using adjacent teeth as guidance. The amount of horizontal resorption of the buccal surface was measured using these models. Very less amount of buccal and palatal surface resorption was observed when a comparison between the two models were made. A thin and evenly dispersed luting agent was provided for cementation. Excess luting cement was removed after placing the implant crown onto the silicone index. Final metal ceramic crown was cemented by maintaining gingival height (Fig.7,8). One-year follow-up manifested as the persistent morphology of
alveolar ridge. Peri-implant mucosal tissue showed an absence of inflammatory reaction after one year. (Fig.9,10)

Fig.7,8: - Final metal ceramic crown in situ and radiograph after temporary crown cementation.

Fig.9,10: - 1 year follow-up showed constant alveolar ridge morphology & no inflammation.

DISCUSSION

This case report confirmed that retaining a buccal root fragment in the socket and placing an immediate implant engaged in the palatal plate of socket wall maintains the form and contour of the ridge. The implant is not only well osseointegrated but also has no peri-implant tissue inflammation. This technique fulfills the requirement of a minimally invasive surgical procedure along with preservation of tissue and also eliminates the need of any bone substitute materials. 4,5

Socket shield technique for ridge preservation can be considered not only for maintaining buccal ridge contour of an edentulous area but also for maintaining the inter-implant hard and soft tissue surface. Baumer et al. verified that the remaining tooth fragments showed healthy periodontal ligament at the labial side with no osteoclastic remodeling at coronal part of the buccal plate. They also considered the clinical volumetric change in the contour of alveolar ridge and showed a mean loss of 0.88mm in labial plate with a maximum of 1.67mm and a minimum of 0.15mm.5 Kan and Rungcharassaeng used proximal socket shield procedure in combination with immediate implant and provisionalization on a failing tooth. The well-preserved inter-implant papilla and good esthetic results after 1-year of follow up were observed in this case report.4 Socket shield technique was first introduced by Hürzeler et al in 2010 where the buccal root portion ensured the physiological preservation of labial or buccal bone structures if the implant is placed in contact to this natural tooth fragment shield.6
The Principles of Socket-Shield (SS) Technique: - 7, 8, 9
1. Preparation of the root indicated for extraction in such a way that the buccal root fragment remains in-situ with its physiologic relation.
2. The tooth root section’s periodontal attachment apparatus (periodontal ligament, attachment fibers, root cementum, vascularization, alveolar bone and bundle bone) remain vital and undamaged to prevent the post-extraction socket remodeling and to support the buccal tissues.
3. The prepared root section acts as a socket shield which prevents the recession of tissues buccal to an immediately placed implant.

Indications: -
Vertical fractures of teeth without pulpal injuries, where the tissue preservation and esthetics are essential.

General Contraindications: -
All normal restrictions of oral surgical procedures: immunosuppression, bisphosphonate medication, anti-coagulation, radiation therapy, etc.

Local contraindications: -
Deficiency of buccal bone which develops for instance after vertical root fractures.

Advantages: -
1. It helps to ensure physiological preservation of buccal bone structures if implant is placed in contact to the natural tooth fragment (shield).
2. Tissue preservation - preserves peri-implant tissues.
3. Buccal shield serves as a guiding surface when placing implants to optimum position.
4. Osteointegration can be achieved completely.
5. Fibrous tissue formation around implant can be avoided.
6. Minimal invasive procedures required.
7. Minimal material requirement.
8. It helps to maintain aesthetics.

Disadvantages and Limitations: -
1. Resorption associated with usual biological long-term complication that might occur in the presence of pre-existing periodontal or endodontic infections or inflammations of the retained root fragments.
2. It is technique sensitive.
3. Displacement of buccal root fragment can occur.

CONCLUSION

The Socket shield technique is gaining popularity amongst the clinicians throughout the world. It seems that if the correct clinical requirements are met and the technical handling of the operator is appropriate, this technique could diminish the resorption of the labial tissues after extraction of the tooth.
REFERENCES