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A CLINICAL CASE REPORT: SOCKET SHIELD TECHNIQUE IN PREMOLAR EXTRACTION AND ITS ROLE IN BONE RETENTION

Dentistry

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ABSTRACT

Introduction: The socket shield technique (SST) is a method for preserving alveolar bone and soft tissue following tooth extraction. While commonly used in anterior teeth, application of SST has been rarely documented in premolars. **Case Report:** A 45-year-old male underwent maxillary first premolar extraction using SST. After removing the tooth, a partial root fragment was left to preserve the buccal bone, followed by socket grafting. **Results:** Post-treatment, follow up was done after 3,6 and 12 months. Clinical and radiographic assessments showed stable bone volume and soft tissue contour. **Conclusion:** This case demonstrates the socket shield technique's effectiveness in preserving alveolar ridge architecture in premolar extractions.

KEYWORDS

Socket Shield; Bone Trephine; Buccal Tooth Fragment; Immediate Implant.

INTRODUCTION

Tooth extraction, though often a necessary component of dental care, can lead to significant challenges in preserving the natural architecture of the alveolar ridge. The subsequent loss of bone volume at the extraction site can complicate restorative procedures, particularly in esthetic zones or areas requiring implants. Over the years, various methods have been developed to minimise post-extraction bone resorption, with the Socket Shield Technique (SST) emerging as a promising solution.

The Socket Shield Technique, introduced by Hürzeler et al. in 2010(1), involves the partial preservation of the tooth root (socket shield) during extraction to serve as a barrier that protects the buccal bone plate and the surrounding soft tissues. This technique aims to maintain the integrity of the alveolar ridge, reducing both bone resorption and the need for additional grafting procedures, while also promoting better outcomes for immediate implant placement.

While the Socket Shield Technique has shown considerable success in anterior teeth, its application in premolar regions, particularly in terms of esthetic outcomes and long-term stability, remains less documented. Premolars(2), with their differing root anatomy and spatial considerations, present unique challenges for the implementation of SST. This case report highlights the use of the Socket Shield Technique in the extraction site of a maxillary premolar and discusses the clinical outcomes, including ridge preservation, soft tissue response, and implant placement feasibility.

The aim of this case report is to evaluate the potential of the SST in preserving alveolar ridge dimensions in premolar extraction sites and to provide insights into its effectiveness and limitations in clinical practice.

Case History

A 40-year-old patient was referred to the department of prosthodontics and crown and bridge for the replacement of the maxillary premolar. Patient had a chief complaint of unesthetic smile. Pt did not give any significant medical history. Patient gave history of extraction of 45,46,47 and history of Root Canal Treatment in 16, 17, 24. On clinical examination, grossly decayed 24 was seen along with caries in 25,26. The teeth had a thin periodontal biotype, as determined by transparency of a periodontal probe inserted in the sulcus with no attachment loss . The smile line was low. Despite previous endodontic surgery, prognosis was hopeless due to a short root, and a recurrent apical infection in 24.

Preoperative clinical and radiographic examination showed non restorable teeth with gross caries, short bifurcated roots and widened of periodontal ligament space seen. On CBCT examination thin buccal and lingual bony plates were seen.(fig no 1)

Considering the clinical situation and patient's desire, a treatment plan was devised to proceed with SST on 24 followed by Pfm crown. The concern was to reduce the risk of complications by soft tissue management and address the problem of reduce and bone support.

After nonsurgical therapy by scaling and root planing with oral hygiene instructions, on the day of surgery the patient received 2 g Amoxicillin 1 hour before intervention.

A preoperative chlorhexidine mouth rinse.

Local anesthetic was injected into the oral mucosa and palatally (2% lidocaine with epinephrine 1:100,000).

Roots were sectioned in two parts without flap elevation using long shank carbide bur (Fig 2). Only the buccal part of the roots was preserved in order to maintain the papilla and buccal cortical plate of the 1st premolar.

The buccal parts of the roots were left intact while the lingual root was meticulously removed using periotome and Bayonet forceps. It was important that there were no loose remnants left. (Fig 3)

Granulation tissue was removed and the alveolar bone was disinfected with iodine socket rinse (Beta- dine). The buccal part of root was then reduced and buccal shield was prepared which was left firmly intact. Then implant sites were prepared slightly on the palatal side of the bottom of the socket using sequential drilling. Conical implant (Osstem) was placed completely within the confines of the socket using the sterile surgical technique prescribed by the manufacturer (Fig 4).

Implant shoulders were positioned laterally 1.5 to 2 mm from the adjacent teeth, 3 mm apical to the anticipated gingival margin, and 1 mm apical to the height of the most coronal wall of the alveolus. Implants was inserted with a 45 Ncm torque to obtain an optimal primary stability.

Provisional crowns were made with a concavity on the subgingival mesial part to avoid any pressure on the root fragment (Fig 5). It was placed a few hours after surgery, with a slight pressure to support the soft tissues. The occlusion was adjusted to clear all contacts in maximum intercuspation and in lateral and protrusive excursions. Any

occlusal contacts during centric and eccentric movements on the provisional restoration were eliminated.

The patient was instructed to consume a soft diet and to avoid placing food in the surgical area during the first 6 weeks as well as to rinse twice daily with 0.2% chlorhexidine digluconate.

After 3 months of healing, provisional crown was well integrated with healthy periodontal tissue providing excellent emergence profile. Radiographic control and clinical examination of the torque resistant value indicated that osseointegration was achieved (Fig 6).

Abutment was tried (Fig 7). The same concavity was produced mesially and the rest of the emergence profile of the abutment was made to support the soft tissue. The definitive abutments was screwed to the implant, and the definitive crown was cemented onto the abutment. Marginal mucosa was clinically healthy (Fig 8). The periapical CBCT 1 month after crown cementation showed a satisfactory relationship between the platform and the bone level of the distal aspect of the alveolus.

At 3 and 6 months after crown cementation (7 and 10 months respectively after implant placement), clinical and radiographic parameters were optimal. The interproximal papilla, the gingival buccal margin levels, and the interproximal bone level showed no change over this period of time

DISCUSSION

This clinical case involves complicating factors such as periapical infection, and retained root fragment, all of which pose risks for immediate implant placement. Clinical studies on immediate implant placement in chronically infected periapical sites indicate that a history of endodontic infection is a predictor for implant failure(3). Factors like contamination during surgery, persistence of unseen pathogens, insufficient debridement, and the size of the lesion can contribute to implant failure. However, if the site is properly cleaned and debrided, with antibiotic therapy as part of the procedure, immediate implant placement can still be successful(4). A prospective study of 50 patients showed a 92% success rate for immediate implants in infected sites, supporting the viability of this approach in cases of endodontic failure(5).

In this case, a small gap was maintained between the implant and socket walls, so that spontaneous healing can occur(6), while larger gaps may require bone substitutes, which carry an increased risk of infection. Timing of implant placement is crucial, with delayed procedures generally showing higher failure rates(7). Therefore, a minimally invasive technique with reduced morbidity was chosen. Recent studies have demonstrated that submerged roots can maintain their natural attachment apparatus when used in implant-supported prostheses(8). After root resection, the roots were submerged beneath a coronally advanced mucosal flap, preserving the surrounding alveolar bone structure. This technique aligns with findings that the proximal periodontium can help sustain the papilla level, supporting the concept that submerged roots can maintain bone and soft tissue integrity over an extended period(9).

In this case, the initial plan was to extract the root completely and place an immediate implant. However, during the CBCT evaluation, thin buccal plate was noticed along with fenestration. As a result, the surgical approach was modified to preserve the labial root segment. For labial plate preservation, typically the socket shield technique (SST) is recommended. In this scenario, the labial root segment also play a crucial role in maintaining the periodontal tissue by anchoring the bone plate to the implant. The remaining periodontal ligament also preserved a strong connection between the tooth fragment and the labial gingiva, providing better support than a typical peri-implant gingival connection, thus helping prevent gingival recession.

The labial bone plate at the site of tooth was thin, consisting mainly of bundle bone with poor blood supply. During the surgery, elevating the flap on the labial side could have further compromised the blood supply from the periosteum. These factors contribute to the vulnerability of the residual alveolar ridge to resorption. However, despite these challenges, the bone achieved stability in both vertical and horizontal dimensions within 4 months following implant placement. This outcome suggests that the residual ridge was effectively supported and preserved by the remaining tooth fragment, which was stabilized by the periodontal ligament and ankylosed bone.

In this case, SST for tissue preservation at the implant site was successful in maintaining peri-implant tissue. The final restoration exhibited proper function and no significant gingival contour recession was observed in this case. The Socket-Shield was effective in preserving the peri-implant tissue and contour; furthermore, PRF could promote bone regeneration in the gap between the implant and residual root segment. Because of the current location of the labial-shield, our case showed slight resorption on the interpapillary area; therefore, further studies are needed to support our conclusion, such as cases with larger labial shields that expand over the interpapillary area, in order to better protect the peri-implant soft tissue from recession.

The Socket Shield Technique (SST) offers a valuable approach to preserving alveolar ridge dimensions and soft tissue integrity following tooth extraction, even in premolar sites. While its application in the anterior region has been well-documented, this case report demonstrates that SST can also be successfully utilized in premolar extractions to minimize bone resorption, facilitate immediate implant placement, and enhance esthetic outcomes. However, careful consideration of the tooth's root anatomy, the extraction site's bone quality, and the technique's execution are critical to achieving optimal results. With further research and clinical experience, SST may become a more widely accepted method for preserving ridge architecture and improving outcomes in implantology, even in the premolar regions.

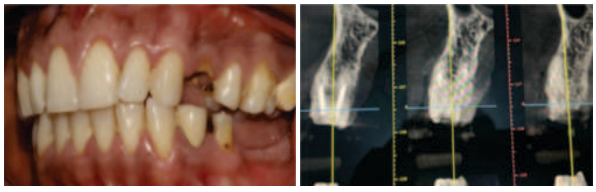

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Fig No 1 Preoperative

Fig No 2 Sectioning Of Root

Fig No 3- Intact Buccal Root

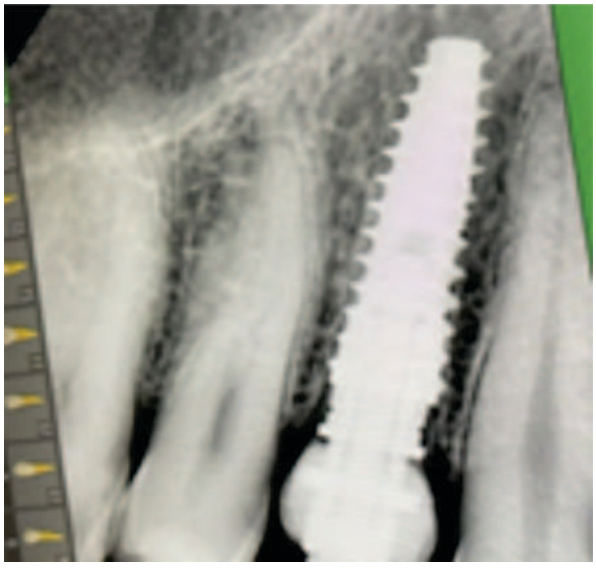

Fig No 4- Implant Placement

Fig No 5- Provisionalisation

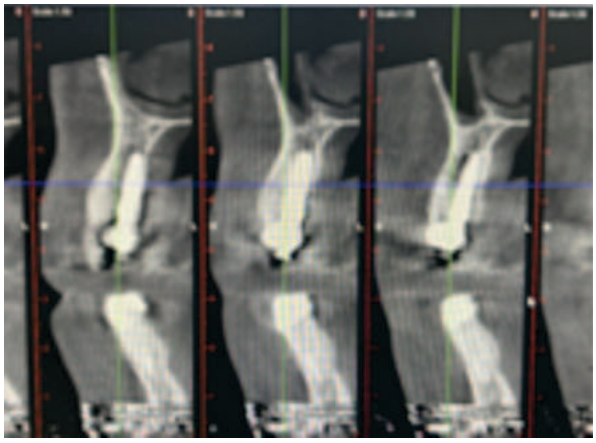

Fig No 6 - 3 Month CBCT

Fig No 7 Abutment Trial

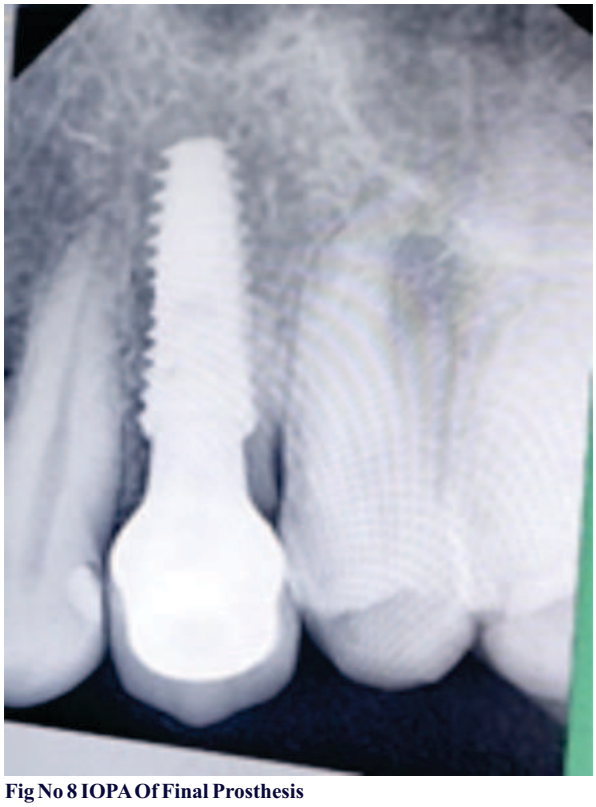

Fig No 8 IOPA Of Final Prosthesis

Fig N0 9 Final Prosthesis

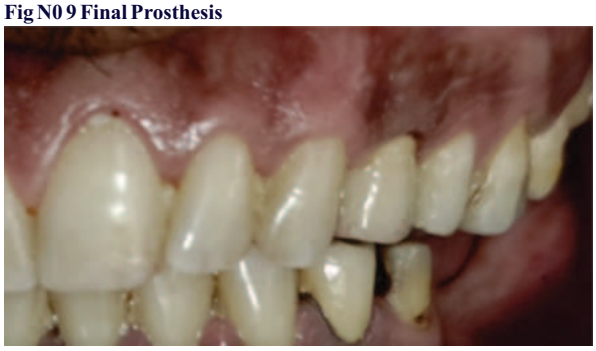

Fig No 10 Prosthesis After 6 Month Follow Up

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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