

The Socket Shield Technique: A Case Report with 5 Years Follow Up

Haseeb H Al-Dary^{1*}, Arwa Alsayed²

¹Private practice Amman Jordan and Kuwait

²Prince Saud Medical City, Riyadh Dental Center, Ministry of health, Riyadh, Saudi Arabia

*Corresponding Author: Haseeb H Al-Dary, Private practice Amman Jordan and Kuwait.

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Abstract

Tooth extraction is often accompanied by resorption of surrounding tissues, immediate implant protocols after extraction can provide a pleasing aesthetic result with good function in selected situations, but not on a predictable basis and have a higher risk for mucosal recession and volume loss, This is where the socket shield technique was introduced to keep from the remodeling of hard and soft tissues after extraction by keeping them attached to the socket shield, in another words keeping the structures which are the components of periodontium in the buccal aspect of tooth or root undamaged when planning to extract the tooth and placing the implant, so implant would be inserted behind the buccal tooth fragment which is left intact to the buccal plate of bone, the thing that would enhance the aesthetic outcome of implant borne prosthesis.

The technique seems to have a positive results, it has not been documented sufficiently. In this case report illustrated an implant was placed immediately after extraction with the technique, the report is documenting the follow up of more than 5 years of a stable aesthetic outcome.

Keywords: Socket Preservation; Socket Shield Technique; Immediate Implant

Introduction

Many materials and methods have been mentioned in the literature to maintain or preserve the fresh extraction socket especially to support the relatively thin buccal plate of the bone from getting collapsed, these include Immediate implants after extraction protocol [1,2], also bone substitutes material has been used [3-7], and/or barrier membranes [8,9], but those procedures have the ability to maintain the ridge dimension to a certain amount [5,7,10]. However, a complete preservation and/or entire regeneration of the extraction socket have not been documented yet [11].

The (Root Submergence Technique) RST was described by Salama., *et al.* By maintaining the root in the socket a much greater amount of surrounding tissue may be preserved than with the other commonly used socket preservation techniques, which almost always leads to crestal bone resorption and thus reduction of the height of the interdental papillae and width of the edentulous ridge. RST instead maintains the natural attachment apparatus of the tooth in the pontic site, which in turn allows for complete preservation of the alveolar bone frame [12]. On the other hand instead of leaving the whole root in RST. The Buccal fragment of the remaining root is being left in socket shield technique after a root sectioning is performed from the mesial to distal side of the remaining root as to separate it into 2 fragments, Buccal and Palatal/Lingual. So the buccal root fragment is being left while the rest of the tooth is being extracted [11], Leaving a space to place the implant behind it.

This would give the benefit of preserving the surrounding tissues likewise in RST and place the implant at the same time.

Case Report

A 40 years old patient, healthy female, non-smoker, and good oral hygiene showed to the office to replace 2 splinted PFM prosthesis covering upper central incisors, seeking for a better aesthetic look of the upper 4 incisor teeth (Figure 1-3). The 2 splinted crowns were

mobile, a radiographic examination revealed a non-restorable hopeless right central (Figure 4), and only a remaining root is left (Figure 5), with a gingival overgrowth covering the root.



Figure 1: Preoperative frontal.



Figure 2: Preoperative right side.



Figure 3: Preoperative left side.

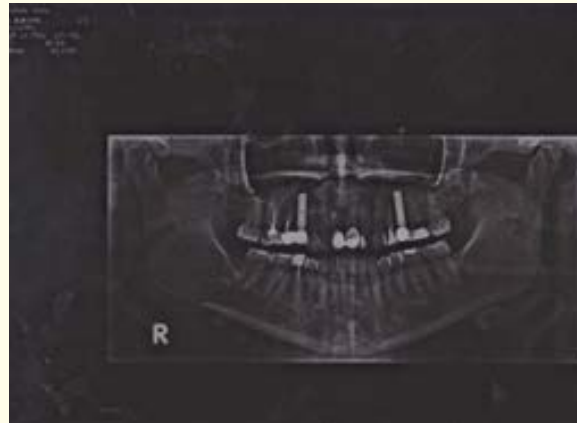


Figure 4: Preoperative OPG.



Figure 5: After removal of prosthesis a hopeless right upper central with an overgrowth hiding the root.

While radiographic examination showed no periapical lesion, Clinical examination of the root revealed no mobility.

The 2 splinted crowns were actually a cantilevered bridge borne by the left central. The gingival overgrowth was removed from the right central remaining root, the root was hemisected using a diamond fissure bur in a mesio-distal direction, cutting the root into 2 pieces (Figure 6), an atraumatic removal of the lingual piece of the root was performed (Figure 7,8), then the buccal piece was reduced leaving a thin layer of the root aspect intact to the buccal plate of the bone, taking a semi lunar shape extending between the interdental septum of the 2 neighbouring teeth adjacent to it, the coronal portion of the piece was reduced to the level of gingival sulcus using diamond round bur (Figure 9).



Figure 6: Splitting the tooth mesio-distally.



Figure 7: Palatal part of the tooth after extraction.



Figure 8: Palatal part of the tooth after extraction.



Figure 9: Socket shield after being prepared.

A (KOS® Single-piece, straight implant/ IHDE Systems) 12 x 3.2 was placed in the socket in a way leaving about 1mm space away from the remaining fragment (Figure 10,11), 2 Provisional splinted crowns connecting the left central with the implant were placed (Figure 12), care was taken to remove all centric and eccentric functional contacts. A post-op panoramic x-ray was taken (Figure 13) A soft diet was recommended for the duration of the implant-healing phase. The patient was advised to be careful not to bite on the anterior teeth and avoid using them while healing is in progress to obtain osseo-integration. A 5 months time have passed before permanent prosthesis was prepared (Figure 14, 15). A 4 single crowns (porcelain layered to zirconia) were placed on the 4 upper incisors (Figure 16, 17).

A photographic follow up of frontal and lateral views, and radiographic follow up was done for a period of time exceeding a 5 years after delivery showing a clinical stability of emergence profile of the prosthetic crown borne by the implant, the documentation compare between the preoperative photographs taken from the facial view and lateral view and postoperative photographs taken at different times through a 5 years after delivery, with the radiographs taken in different.



Figure 10: Occlusal view showing the implant after placement in relation with the socket shield.



Figure 11: Frontal view of the implant in place.



Figure 12: Frontal view of temporary prosthesis in place.

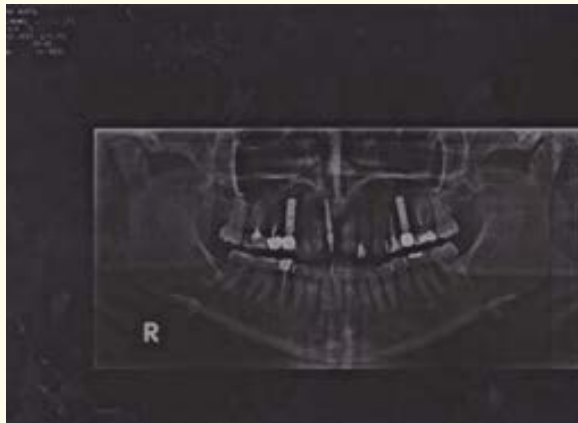


Figure 13: Postoperative OPG showing the implant in place.



Figure 14: Frontal view showing the soft tissue around the implant after healing and showing the prep of the teeth.



Figure 15: Occlusal view showing the soft tissue of the implant after healing and crowns placed on the rest of the teeth.



Figure 16: Frontal view showing crowns in place on same session of crowning on 13/6/2012.



Figure 17: Lateral view showing crowns in place on same session of crowning on 13/6/2012.

Groups of Pictures

First Group-Preoperative group,



Figure 21



Figure 22

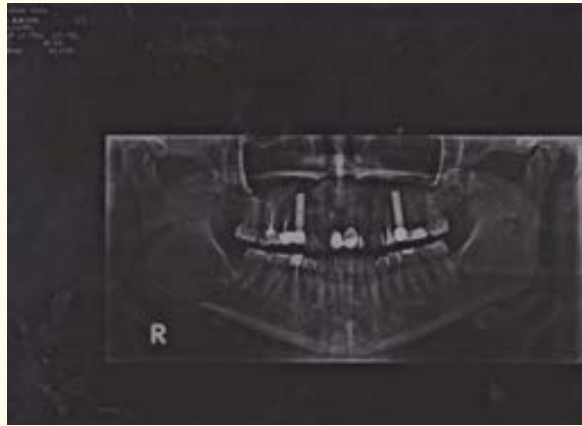


Figure 23

Second Group- was taken on 13/06/2012



Figure 31



Figure 32

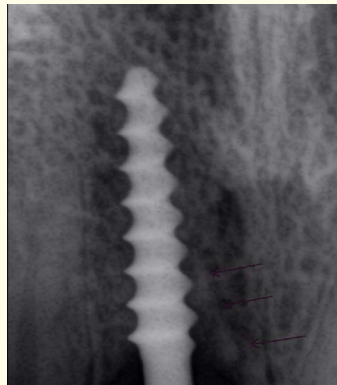


Figure 33

Third Group- group was taken on 16/11/2015

Figures 41,42,43



Figure 41



Figure 42



Figure 43

Fourth Group- was taken on 19/02/2017

Figures 51,52,53,54



Figure 51



Figure 52



Figure 53

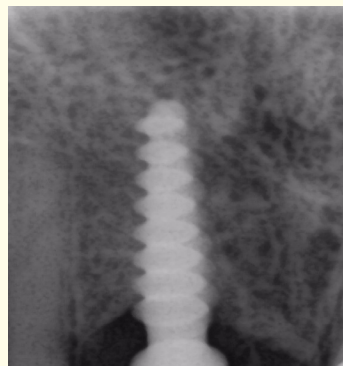


Figure 54

Discussion

In order to overcome the negative consequences of tooth extraction- Especially the bone preservation after extracting tooth associated with thin tissue biotype in which ridge resorption takes an apical and lingual direction, whereas a minimal ridge atrophy occur in association with thick biotype [13]. Various treatment approaches such as graft materials [3-7] and/or barrier membranes [8,9] have been advocated and described in the literature, However, a complete preservation and/ or entire regeneration of the extraction socket have not been documented yet [11]. So it is safe to assume that implants will never surpass the natural tooth's ability to preserve the surrounding bone and soft tissue height [12]. Many Studies were performed to evaluate the safety of remaining roots in alveolar bone and concluded that the roots would stay in the socket- unless infected or mobile because it might be felt that the roots may act as a mobile foreign body and become a nidus for infection or migration [14-16], further more it could preserve the bone and soft tissue dimensions. Filippi., *et al.* concluded that Decoronation (removal of crown and pulp, but preservation of the root substance) of ankylosed tooth is a simple and safe surgical procedure for preservation of alveolar bone prior to implant placement. It must be considered as a treatment option for teeth affected by replacement resorption if tooth transplantation is not feasible [17] performed a 12-week histologic evaluation of 12 vital submerged roots that were cut at 2 mm below the bone edge. They reported that eight of the roots had complete bone coverage on the cut surfaces, and all pulps were vitally retained [16]. Salama., *et al.* described the Root Submergence Technique (RST) and they concluded that not only it eliminates the risk of caries and periodontitis, but also, the retention of a natural tooth root allows for maximum preservation of the surrounding alveolar bone and soft tissues [12].

On the other hand a study was conducted in a beagle dog where only the buccal part of the root and its suprapariosteal attachment were preserved and furthermore no primary closure was obtained in combination with immediate implant. Placement following application of enamel matrix derivate showed that retaining the buccal aspect of the root during implant placement does not appear to interfere with osseointegration and may be beneficial in preserving the buccal bone plate [11]. The major findings of the histological analysis in this study were that the internal aspect of the root was covered with new cementum and new periodontal attachment.

In addition, in areas where the implant has been placed facing the root fragment, cementum could be detected on the implant surface. This can be seen in accordance with the study conducted by Buser., *et al.* (1990) concluding that in areas where the implant has been placed in close relationship to the root fragment, the examination of the undecalcified sections revealed a cementum layer on the implant surface with inserting collagen fibres [18].

Nyman., *et al.* has shown that exclusion of epithelial cells leads to periodontal regeneration due to cells from the periodontal ligament [19]. Within the limits of this experiment, it may be speculated that the blood clot between implant and root may have prevented the epithelium from colonising the root surface. Amler., *et al.* and Cardaropoli., *et al.* have histologically demonstrated that it takes approximately 4 weeks after tooth extraction to cover the extraction socket with epithelium [21,21]. It may be assumed that the same process occurs between the implant and the retained tooth fragment. As the blood clot prevents the epithelium from growing along the internal root surface, it appears that cells from the remaining periodontal ligament are capable of colonizing the root surface and regenerate new periodontal attachment [11].

In opposition to the mentioned studies M. Anthony Pogrel, mentioned that late migration of the root fragment does appear to occur in some cases, but is unpredictable [22].

In this case presented the shield preparation was performed using diamond burs, the use of bone trephine was reported in a previous case report [23].

The use of one piece implant in this case may be advantageous to reduce inflammation in peri-implant tissues, an experimental study conducted by Hermann., *et al.* showed that significantly increased amounts of crestal bone loss around two-piece vs. one-piece implants, which result in a significant more apical position of the gingival margin, also, the degree of inflammation in peri-implant tissues is less around one-piece implants compared to two-piece implants. These results may have important implications when dealing with aesthetic implant-borne restorations, which are based on healthy and vertically constant soft tissue dimensions over time [24].

In a study conducted by Abadzhiev, *et al.* with 25 patients comparing between socket shield technique approach with the conventional approach for immediate implant placement including soft and hard tissues grafting, in their report, the conventional approach was clearly inferior regarding the aesthetic outcomes and tissue changes [25].

In a study conducted by Baumer, *et al.* on 10 cases on socket shield technique for immediate implant placement, a clinical radiographic and volumetric data was collected, the study concluded that the technique is a promising treatment approach for implants in aesthetic zone [26], in this study an enamel matrix protein (Emdogain™, Straumann, Basel, Switzerland) was applied in order to try to initiate new cementum formation which could aid in the prevention of root resorption in long term, a 2 piece implants were used, and left for healing with an individualised healing abutments or an immediate provisional.

In this case presented enamel matrix protein was not used [27], a one piece implant was inserted and left for healing with an immediate provisional, and the shield was more extended to the inter-proximal areas with the adjacent teeth.

Extending the shield to the inter proximal area for the purpose of papilla preservation was used by Kan., *et al.* [28] who have reported a case with a modified shield technique for inter-implant papilla preservation with good success in maintaining the bone level and the periodontium, where the shield was located more in the inter-proximal than the buccal area.

Conclusion

From this case report with a 5 years follow up and the documentation of many studies available in the literature, socket shield technique may present a predictable technique of extraction socket preservation superior to the other techniques of preservation, and may produce a superior aesthetic out come in the aesthetic zone.

Yet the procedure is technique sensitive and may need to be performed by a trained or experienced practitioner.

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