Case Report

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IMMEDIATE DENTAL IMPLANT UTILIZING THE SOCKET SHIELD TECHNIQUE TO PRESERVE ALVEOLAR BONE DIMENSION FOLLOWING DENTAL EXTRACTION: A CASE SERIES

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ABSTRACT:

Tissue healing of alveolar socket subsequent to dental extraction undergoes a remodeling process which might leads to horizontal and vertical bone loss. Alteration of ridge contour may compromise the restoration- oriented three dimensional positioning of dental implants. Various methods of guided bone regeneration have been described to retain the original dimensions of the bone after dental extraction. Alveolar socket shield technique has demonstrated the potential in preventing buccal bone from resorption in experimental and clinical studies. This paper report a three cases of immediate dental implant using socket shield technique with one year follow-up results.

Keywords: Dental implant, Socket shield, buccal bone preservation

INTRODUCTION:

Dental implant therapy has become a common and well accepted modality for the replacement of previously missing teeth as well as for replacement of hopeless natural dentition. The predictability and maintenance of long-term clinical outcome of dental implants in function are directly related to the quality and quantity of the available bone for implant placement.[1]

The traditional Branemark protocol (late placement technique) sought to allow dental extraction sockets to heal for several months in accordance with a two-stage procedure that also involves 3 to 6 months of undisturbed healing after the implant placemen.[2-3] A series of biological processes such as bone resorption (vertically and horizontally), gingival collapse and migratory movements of the adjacent teeth to the extraction space were reported in the scientific literature during this period (refs – more than one). Other concerns have been raised around this protocol such as increased time of edentulism, longer treatment time and the need for additional surgical procedures.[4]

Authors believe that in order to achieve “proper” osseointegration, complete healing of the alveolar bone after tooth extraction is needed prior to implant placement.[2]

Lack of adequate implant stability due to the presence of gap between the socket wall and the implant (shape and size differences) is another factor that needs to be taken into consideration when

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immediate placement of the implant following tooth extraction subsequently, this would result in partial or complete fibrous encapsulation of the implant.[5] It was further assumed that infection related to the extracted tooth would jeopardize osseo-integration.[6]

Understanding the biological processes of hard and soft tissue healing following tooth extraction and around implants, in additional to the development of new implant surfaces and designs and development of advanced surgical techniques have allowed considerable improvements over traditional indications for dental implant therapy with increased predictability of success and better prognosis. A recent study showed that, in general, dental implants have a success rate of 90%-95% over 10 years.[7]

Nowadays, when patients present with hopeless teeth or retained roots, clinicians have the opportunity to plan the restorative therapy prior to the extraction of one or multiple teeth.

During alveolar socket healing after dental extraction, the hard tissue walls of the alveolar complex will eventually resorb, and the centre of the socket will be filled with cancellous bone and the overall volume of the extraction site will become markedly reduced[8] The buccul wall in particular is affected negatively in both horizontal and vertical dimensions. In addition , the soft tissues in the extraction site also undergo marked adaptive changes.[9]

Grafting alveolar sockets with different materials, and the use of mechanical barriers, have been proposed to prevent alveolar ridge reduction, secondary to bone modeling. Several clinical evaluated the outcome of such surgical protocols.[9] The results of these studies indicate that ridge contraction following tooth extraction can be diminished when combined with socket grafts and/or the use of mechanical barriers. Experimental studies in dog model.[10] have demonstrated that placement of bone substitutes in the fresh extraction socket failed to inhibit the processes of modeling and remodeling that took place in the socket walls following tooth extraction.

Partial Extraction Therapy (PET)

Collapse of the buccal contour of the ridge post extraction poses as a significant challenge in both restorative and implant dentistry.[11] (ref).

A wide variety of ridge preservation techniques have been introduced as well as soft tissue augmentative protocols. An alternative new approach, , is to use the tooth itself to maintain this anatomic profile.

Clinical studies have tested the hypothesis that root retention, either of vital or root canal treated teeth, may be able to avoid soft and hard tissue remodeling followed tooth extraction.[12-13-14] Filippi et al[12] reported a case of decoronation of an ankylosed tooth, they concluded that the later technique preserved the alveolar bone prior to dental implant placement . Few studies had demonstrated that the

decoronated roots in the alveolar process not only help maintaining bone volume but also enable vertical bone growth.[13]

The socket-shield technique (SST) involves the preparation of a tooth root section simultaneously with immediate implant placement and has demonstrated histological and clinical results that are highly promising to dental implant treatment.[14]

CASE DETAIL:

Case 1: A 38-year-old female, non-smoker and medically fit, presented with fallen Porcelain fuse to Metal (PFM) of previously root canal treated #21 and #22, on examination we found a cervical tooth fracture of #21 (Fig 1), treatment options were discussed with the patient and subsequently an implant supported crown for 21 and fabrication of new Zirconium crown for #22 option was chosen.

Clinical procedure:

Flapless operation was carried to preserve the facial and interproximal gingival contour; the tooth was carefully decoronated using a diamond bur. A 1–2mm thickness of root fragment had been left in the buccal aspect of the extraction socket after been separated from the rest of the tooth using rotating tungsten carbide instruments with irrigated sterile water (fig2). Particular attention was taken to avoid damage to the bone walls of the extraction socket, followed by conservative removal of

extracted palatal portion of the remaining root fragment (Fig3). The remaining buccal root section was coronally reduced to 1mm above the alveolar crest using round bur (Fig4).

The osteotomy was performed through the palatal side (fig5) then the implant (Dentis© 3.7 *12) was inserted and positioned slightly apical to the buccally preserved root fragment (fig 6). The gap between the shield and the implant was filled with bone graft (Inter-oss xenograft) and covered with collagen membrane and secured with cross suture.

Follow-up examinations were performed five days and three weeks post-surgery. Three months later, healing abutment was installed (Fig 8), The implant site showed uneventful healing. No socket-shield exposure was observed. After 10 days, open tray impression was taken for the final prosthesis (Fig,9) and a cemented type restoration single crown – was delivered and fixed according to the manufacturer's recommendations with a torque-control device using a titanium screw Fig (10,11,).A radiographic picture was taken to confirm inserted final restoration (fig 12)

Case 2: A 42-year-old female presented with fractured endodonticaly treated root # 22. The tooth deemed non-restorable and an implant supported crown was the treatment of choice.

Clinical procedure:

The same clinical steps as the first case were done, A 1–2mm thickness of root fragment in the buccal area of the extraction socket was separated from the

rest of the tooth using rotating tungsten carbide instruments, followed by extraction of the palatal side of the root (fig 13).

Then implant (Dentis© 3.7 *12) was inserted **3** mm apical to the root fragment (fig 14)

After 3 month follow up, the implant side showed socket shield exposure but no signs of infection (fig 15) The exposed shield was removed and the dental implant was completely surrounded by bone (fig 16). The decision was to use Sub-epithelial connective tissue palatal graft which had been harvested to prevent soft tissue collapse due to the shield removal. The graft was sutured to the buccal flap using horizontal mattress suturing technique, then the buccal flap was sutured around the healing abutment by horizontal mattress suturing technique as well. (fig17) .After a month, the tissue was healed without soft tissue collapse (fig18), and an open-tray impression technique was performed and definitive zirconia crown had been delivered. (Fig 19)

DISCUSSION:

After tooth extraction, the facial wall of the alveolar socket exhibits the most marked changes in dimension. [8] This results in a reduced vertical height and orofacial width of the alveolar bone. [15-16]

As mentioned, the buccal bone plate of the alveolar complex is the most affection post extraction due to remodeling. [17-19] The main cause of this reduction is the disappearance of bundle bone. The bundle bone (histological term) is a lamellar bone with approximate width of 0.2– 0.4 mm,[18] composed of circumferential lamellae, whilst the alveolar bone is also of the lamellar type, but composed of concentric and interstitial lamellae and bone marrow. There is an intimate relationship between the bundle bone and the periodontal ligament structures. This tissue inevitably resorbs post tooth extraction, leading to partial resorption of the alveolar bone. The buccal bone wall is a tooth-dependent structure.[10,18,20]

In the last four decades, root submergence has been reported in the literature with a long success.[13,21] where retained root is utilized and placed under the pontic site of implant supported bridges to support soft tissue and maintain a highly aesthetic pontic side. As a result, the socket-shield technique (SST) was introduced.

All partial extraction therapies require complete resolution of infection.[22,23] The two socket-shield cases reported in this report required preparation of the bucco-facial site? and removal of root canal filling material or neurovascular tissue to the apex. The purpose of retaining this carefully designed and prepared facial root section is to maintain the root's periodontal attachment with the facial bundle bone that is prone to collapse post-extraction.

In the first case report bone graft were used to fill the gap between the implant and root fragment because the gap space was more than 2 mm, this is in contrary to the study by Hurzeler etal[14] in which they used Enamel Matrix derivative with the immediate implant and the socket shield.

Like any other surgical techniques, there is a possibility of complications related to the socket-shield technique. In the second case, external exposure of the socket-shield happened. On other hand, Glukman et al[24] concluded that the most common complication is internal exposure of the socket shield.[24] One of the possibilities to solve such problem is smoothing of the sharp area that is exposed, another suggestion is ot use Subepithelial C.T graft, which has been utilized in this case after removing the fragment to add the benefit of increasing the width of keratinized tissue around the implant .

CONCLUSION:

There are many methods by which alveolar ridge collapse can be prevented, and one of these methods is using the tooth root. the socket shield technique is recommended to achieve osseo-integration with minimum inflammation. Nevertheless, more research is needed to confirm the findings.

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FIGURES:

figure 1 preoperative

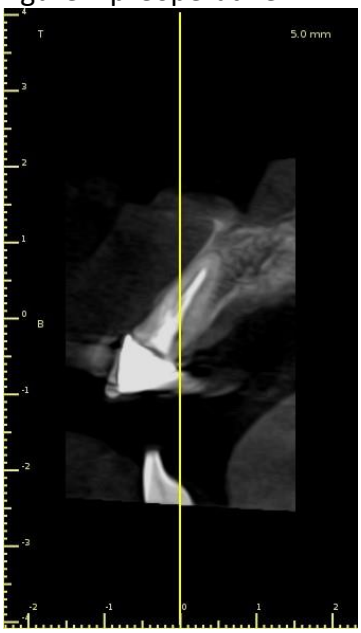

figure 1.1 proparative x ray

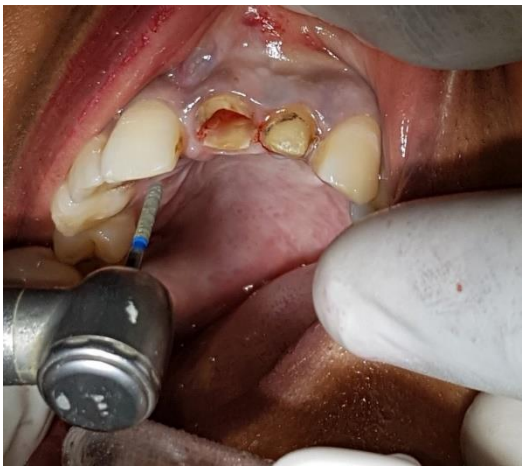

figure 2 separation of the tooth

figure 3 after removal of palatal part

Figure 4 reduce the buccal part 2mm

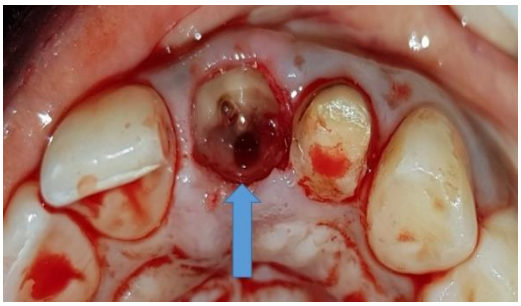

figure 5 after osteotomy

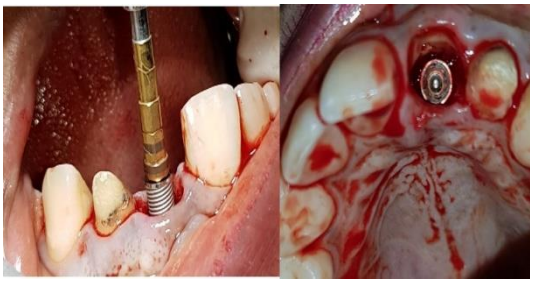

figure 6 implant insertion

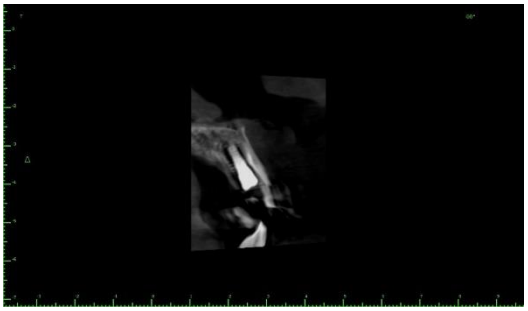

figure 6.1 CBCT radiograph after implant

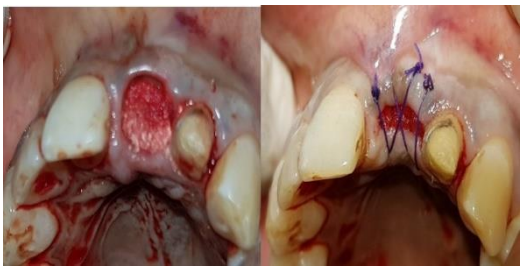

figure 7 after bone graft and suture

figure 8 insertion of healing abutment

figure 9 open tray impression

figure 10 final zircon crown

figure 11 final rown

figure 12 periapical x ray for final crown

figure 13 removal of palatal fragment

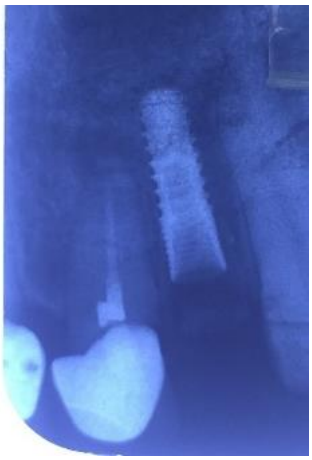

figure 14 radiographe after implant insertion

figure 15 exposure of socket sheild after 3 month

figure 16 after removal of the shield show bone level and the gap between gingiva and healing abutment

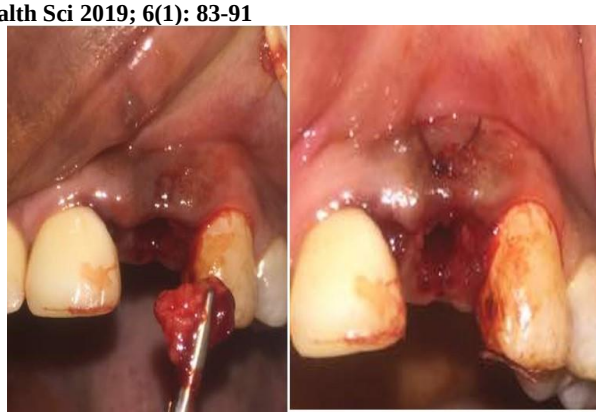

figure 17 Connective tissue graft suture to the flap

figure 18 healing after 4 weeks

figure 19 final prosthesis