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Immediate implant placement into posterior sockets with or without buccal bone dehiscence defects: A retrospective cohort study

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ABSTRACT

Objectives: To evaluate bone reconstruction and soft tissue reactions at immediate implants placed into intact sockets and those with buccal bone dehiscence defects.
Methods: Fifty-nine internal connection implants from four different manufacturers were immediately placed in intact sockets(non-dehiscence group, n = 40), and in alveoli with buccal bone dehiscence defects: 1) Group 1(n = N10), the defect depth measured 3–5 mm from the gingival margin. 2) Group 2(n = 9), the depth ranged from 5 mm to 7 mm. The surrounding bony voids were grafted with deproteinized bovine bone mineral (DBBM) particles. Cone beam computed tomography(CBCT) was performed immediately after surgery (T1), and at 6 months later(T2). Radiographs were taken at prosthesis placement and one year postloading(T3). Soft tissue parameters were measured at baseline (T0), prosthesis placement and T3.
Results: No implants were lost during the observation period. For the dehiscence groups, the buccal bone plates were radiographically reconstructed to comparable horizontal and vertical bone volumes compared with the non-dehiscence group. Marginal bone loss occurred between the time of final restoration and 1-year postloading was not statistically different(P = 0.732) between groups. Soft tissue parameters did not reveal inferior results for the dehiscence groups.
Conclusions: Within the limitations of this study, flapless implant placement into compromised sockets in combination with DBBM grafting may be a viable technique to reconstitute the defected buccal bone plates due to space maintenance and primary socket closure provided by healing abutments and bone grafts.
Clinical significance: Immediate implants and DBBM grafting without using membranes may be indicated for sockets with buccal bone defects.

1. Introduction

Immediate implant placement into fresh sockets has been shown to be a predictable alternative to delayed approaches [1–3]. Immediate implants do not affect the marginal bone loss or the occurrence of postoperative infection in comparison with implants placed in mature bone [4]. The pre-extraction lesions of natural teeth may result in defected buccal bone plates and soft tissue recessions. Elian et al. categorized the fresh sockets into three types based on the presence or absence of the buccal hard and soft tissue [5]. For type I sockets where facial soft tissue and buccal plate of bone are both intact, implant treatment is highly predictable. For type II sockets where facial soft tissue is present but the buccal plate is partially missing, postoperative soft tissue recession may occur [5]. As a result, different bone regenerative procedures have been suggested to treat sockets of this type [6–9].

A number of studies demonstrated improved bone regeneration of buccal dehiscence defects with the application of bone grafts and collagen membranes [10–12]. Betti et al. reviewed available articles to evaluate the evidence that barrier membranes prevent bone resorption [13]. However, the evidence is weak because of lack of adequate control groups in most studies. Some controlled trials[14,15]found no particular advantages of barrier membranes in graft preservation compared with periosteal coverage alone. Moreover, without the use of bone grafts under the membrane, the inadequate space making effect may result in compromised bone healing, due to collapse of absorbable membranes [16]. The indication of barrier membranes used to prevent bone resorption is still disputable.

The purpose of this study was to evaluate bone reconstruction and soft tissue reactions at immediate implants placed into type I and type II sockets using DBBM particles and no membranes at the time of tooth removal.

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2. Material and methods

2.1. Patient recruitment

This retrospective cohort study was approved by the ethical committee of the West China Hospital of Stomatology, Sichuan University (WCHSIRB-D-2015-083). The study included patients treated consecutively at the Department of Oral Implantology, West China Hospital of Stomatology, Sichuan University, between the years 2013 and 2015. The inclusion criteria were:1)posterior single tooth indicated for extraction due to caries, periapical lesions, nonactive periodontal disease, *endo*-perio disease, and tooth fracture. 2)sufficient native bone to allow for immediate implant insertion. 3)availability of complete CBCT scans, radiographs and clinical records. Exclusion criteria before enrollment were: 1)acute infection in the area that will receive an implant. 2)heavy smokers(> 10 cigarettes per day). 3)pregnant women. 4) compromised lingual bone walls due to pre-extraction lesions. 5)presence of buccal soft tissue recession.

2.2. Clinical procedures

All surgical procedures were performed by an experienced surgeon (Y. M.). Hopeless molars were decoronated and sectioned into individual roots before surgery. Under local anaesthesia, pre-extraction osteotomy was made through natural roots (Fig. 1). The residual roots helped to guide and stabilize the drills. Before the last drill, the root fragments were carefully extracted without flap elevation. The mesiodistal widths of the buccal bone defects were measured with a vernier caliper(HISING, Shandong, China). Using the gingival margin as a reference, the mid-facial depths of dehiscence defects were measured with a probe (Hu-Friedy Co., Chicago, USA). All sites were distributed into three groups. In Group 1, the dehiscence depth ranged from 3 mm to 5 mm. In Group 2, the defect depth measured between 5 mm and 7 mm. For the non-dehiscence group, the buccal bone plate was intact (type I socket). The fresh sockets were then thoroughly curetted to remove any visible apical/periodontal granulation tissue. The last osteotomy drill was used for final preparation. Internal connection implants(Institut Straumann AG, Basel, Switzerland; NobelActive®, Nobel Biocare, Göteborg, Sweden; Dentium Korea,Seoul, Korea; Osstem Implant Co., Ltd., Busan, Korea), 4.0–6.0 mm in diameter and 8–12 mm in length, were immediately inserted. Implant platforms were located at 3 mm below the buccal gingival margin. The insertion torque exceeded 35 N cm for all implants. Transalveolar sinus floor augmentation was performed in cases with limited bone height. Following implant insertion, marginal gaps around the implants and the buccal dehiscence defects of test sites were densely filled with DBBM particles (Bio-Oss, Geistlich Biomaterials, Wolhusen, LU, Switzerland). A healing abutment, with diameter close to that of the fresh socket, was installed to facilitate primary wound closure. (Fig. 2)All implants were non-submerged during healing.

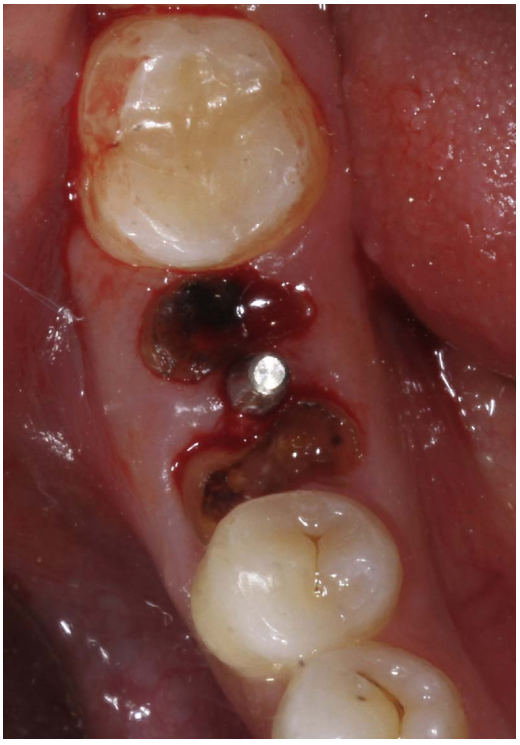

Fig. 1. Pre-extraction osteotomy was made through natural roots.

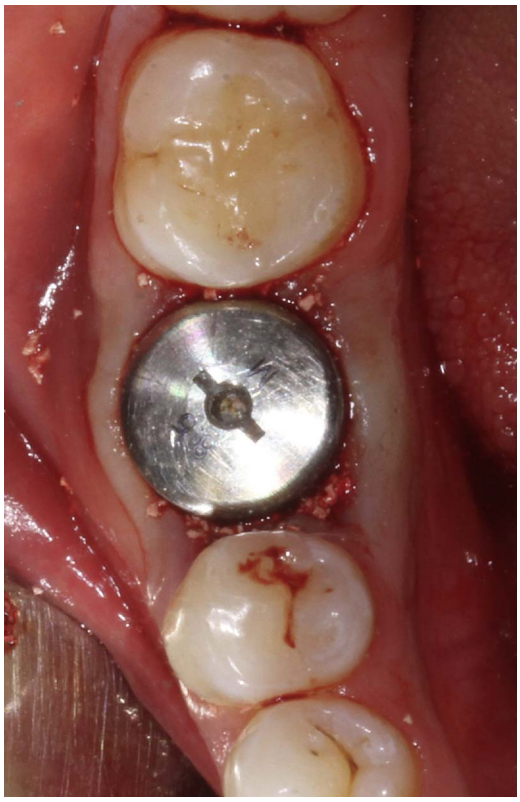

Fig. 2. A wide healing abutment was installed to facilitate primary wound closure.

Amoxicillin was administered to every patient for five days. Mouth rinsing with 0.12% chlorhexidine three times a day for a week was prescribed.

After a healing period of at least 6 months, the prosthetic treatment was completed. The implants were restored with cemented crowns. Patients were scheduled for recall one year following restoration.

2.3. Radiographic evaluation

CBCT (3DAccuitomo 170®, J. Morita Mfg. Corp., Kyoto. Japan) was performed immediately after surgery(T1) and at 6 months later(T2). Periapical standard radiographs were obtained with a paralleling device (Dentsply/Rinn Corporation, Elgin, IL, USA) at the time of final crown delivery, and at one year after prosthetic loading(T3).

All measurements were done by the same researcher. The following landmarks were defined(Fig. 3) on CBCT images:

1. Implant platform(P)
2. Top of buccal bone crest (C)
3. Outer border of buccal plate(OC)
4. Implant surface(S)