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Influence of preservation of the alveolar ridge on delayed implants after extraction of teeth with different defects in the buccal bone

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Abstract

Our aim was to evaluate the influence of preservation of the alveolar ridge on delayed implants with different defects in the buccal bone. We enrolled 60 patients who had one posterior mandibular tooth extracted. Cone-beam computed tomography (CT) was used to measure the buccal bone defects in the alveolar ridge before the tooth was extracted (level A=3 to 5 mm, and level B=more than 5 mm). After the tooth had been extracted, the socket either had the alveolar ridge preserved (trial group) or it was left to heal spontaneously (control group). The changes in the dimensions of the alveolar ridge from preoperatively to 6 months postoperatively were evaluated by cone-beam CT. Suitable implants were inserted 6 months later, and their length and diameter recorded. The implant stability quotient was evaluated for the following 3 months. The dimensions of the bone in the alveolar ridge in the trial group were significantly less than those in the control groups in both levels. Fifty-seven patients required implants (except 3 in level B in the control group). There were more longer and wider implants in the trial group than in the control group in Level B. 3 months after implantation, there were no significant differences in implant stability quotients between the groups, though in the control group, Level B, the mean (SD) value was 69.50 (1.00) while in the other groups values were all above 70 at 3 months. We conclude that when the defect in the buccal bone was more than 5 mm, the alveolar ridge preservation demonstrated a remarkable effect in preserving the alveolar ridge dimension and delayed implantation.

Keywords: Alveolar ridge preservation; Bone graft; Delayed implant; Buccal bone defect; Implant stability.

Introduction

Nowadays modern implantology is developing rapidly worldwide, with a success rate of about 96%.[1,2] Dental implants are reliable and effective, but the placement of the implant can be limited by deficiency of the alveolar ridge of which resorption of bone is the most common cause after extraction of a tooth. This results in reduction of the height and width of the alveolar ridge, and lack of available residual bone for placement of an implant. The dimension of the bone of the alveolar ridge will influence the length, width, and primary stability

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of the implant, and will also affect its long-term function and success rate.

After decades of research, preservation of the alveolar ridge has become widely used in the augmentation of bone. It is a procedure in which the socket is filled with autogenous bone or graft material immediately after extraction of the tooth to minimise the amount of horizontal and vertical volume lost and to maximise formation of new bone after removal of a tooth. [3] It can also be combined with guided bone regeneration.

Preservation of the alveolar ridge is effective but technically sensitive, as it requires particular surgical skills and is costly to the patient. Another drawback is the potential for a number of complications, including wound infection and rejection. There have been many reports of preservation of the alveolar ridge with different graft materials, but these did not focus on the defects in the buccal bone or the relations between defects in buccal bone and delayed implants.

We therefore organised this study to explore the influence of preservation of the alveolar ridge on delayed implantation after extraction of teeth in patients who presented with different defects in the buccal bone. Our goals were to evaluate the effects of preservation of the alveolar ridge on different buccal bone defects, and to find out if it is necessary to preserve the alveolar ridge for all types.

Patients and methods

The study was done from April 2011 to March 2013 at the State Key Laboratory of Military Stomatology, Department of Oral Surgery, School of Stomatology, The Fourth Military Medical University, according to principles outlined by the Declaration of Helsinki. The protocol was approved by the Ethics Committee, and each patient gave signed informed consent.

Sixty patients (28 women and 32 men; mean (range) age 43 (20-65) years) were enrolled in the study. We suggested to all patients that one posterior mandibular tooth be extracted and treated with a delayed implant. The patients were required to have sockets with buccal bone defects before extraction of more than 3 mm on preoperative cone-beam CT. All patients were healthy non-smokers, not pregnant or breast-feeding, not showing any signs of acute inflammation or medically compromising conditions, and not taking any drugs which could affect their ability to have the operation under local anaesthesia or delay the healing of bone and soft tissue.

Materials

We used Bio-Oss® collagen (Geistlich Pharma AG, Wolhusen, Switzerland, 100 mg), Bio-Gide® membranes (Geistlich Pharma AG, Wolhusen, Switzerland, 25 mm x 25 mm) and the Straumann® implant system (Institut Straumann AG, Switzerland).

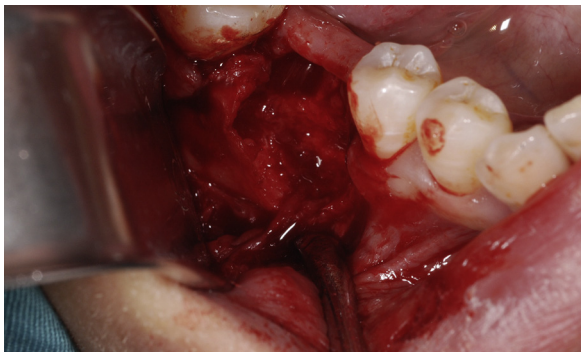

Fig. 1. Full-thickness mucoperiosteal flap raised after the tooth had been extracted.

Protocol

Preoperatively each patient had a cone-beam CT (Galileos, Sirona Dental Systems GmbH, Germany), and the 60 patients were divided equally according to the levels of buccal bone defects in the alveolar ridge. Those whose defects were between 3 -5 mm were described as level A, and those whose defects were 5 mm or more were level B. Patients were randomly assigned to the trial or control group. In the trial groups the sockets were filled with Bio-Oss® collagen and covered with Bio-Gide® membranes, and in the control groups they were left to heal spontaneously.

Surgical technique

Penicillin VK 250 mg was given 1 hour before operation to all patients, and in the trial group every eight hours for 3-5 days postoperatively. The tooth was extracted under local anaesthesia (articaine with 1:100000 epinephrine) using an atraumatic technique. After curettage of the socket in the trial group, we made two vertical incisions (mesial and distal) in the buccal side of the socket. A full thickness mucoperiosteal flap was lifted (Fig. 1) and the sockets were filled with Bio-Oss® collagen without excessive force (Fig. 2),[4] then covered with Bio-Gide® membrane (Fig. 3). A relief incision was made and primary closure was done with 4/0 silk. The patients were advised not to wear any prosthesis,

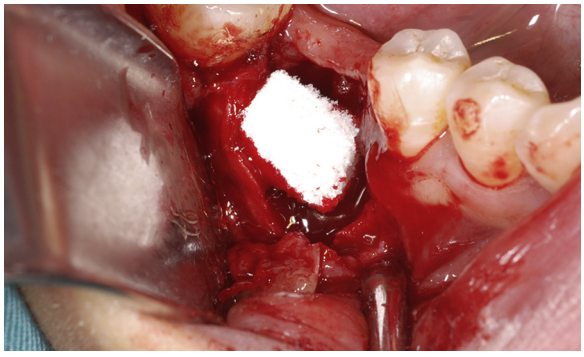

Fig. 2. For the bone graft a full-thickness mucoperiosteal flap was raised and the socket filled with Bio-Oss®.