Management of a dental implant displaced into the mandibular bone marrow space: Case reports

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When an implant fixture is displaced to the bone marrow defect site of the mandible, damage to the inferior alveolar nerve may occur. To minimize postoperative side effects, an accurate radiological evaluation should be made and the best method of removal should be considered. Here, we report two cases of implant removal in patients referred to our hospital who had an implant fixture displaced by a mandibular bone marrow defect, and we also propose a standardized method for removal of the implant. Two patients were referred to our clinic with displacement of an implant fixture to the mandibular bone marrow space. For removal of the implant, a trapezoidal bone window was designed with the buccal cortical bone of the drilling hole as the superior margin. An osteotomy was performed on the cortical bone. The implant was gently moved upwards and removed. Healing was uneventful with no neurological complications.

Key Words: Alveolar bone grafting, Cancellous bone, Dental implant, Implant displacement, Inferior alveolar nerve injury

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INTRODUCTION

Since the first introduction of the osseointegrated implant by Brånemark [1], implants have been widely used as restoration method of missing tooth. Restoration of missing teeth using implants has shown a high success rate. However, as more surgeries progress, various complications have also been reported [2]. The main complications that may occur during implant surgery may be due to the carelessness of the operator or lack of preoperative radiological evaluation. Inadvertent placement of implant may cause damage to the surrounding anatomical structures, such as the root of the

adjacent teeth, the inferior alveolar nerve. In severe cases, it will completely pass through the cortical bone and appear to be displaced into the surrounding structure.

In the case of maxillary displacement, the implant fixture may be displaced into the maxillary sinus at the time of implant placement. There have been enough reports of case reports, causes, and removal methods for implants displaced into the maxillary sinus [3,4]. As a method for removing an implant completely displaced into the maxillary sinus, it is standard to remove it through the formation of an additional bony window into the maxillary sinus. If the displaced implant moves to the surrounding paranasal

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sinus and is difficult to secure the field of vision by intraoral access, the removal method through functional endoscopic sinus surgery is mainly used [4].

In the case of mandibular displacement, there is a displacement to the bone marrow defect of mandibular body though it is not common [5–15]. If the implant fixture is displaced to the bone marrow defect site of the mandible, damage to the Inferior alveolar nerve may occur. Therefore, in order to minimize possible postoperative side effects, accurate radiological evaluation should be made and the best method of removal should be selected [13]. However, only a few papers report cases of mandibular displaced implants and their treatment.

In this paper, we report a case of implant removal in patients referred to our hospital with implant fixture displaced by a mandibular bone marrow defect, and proposes a standardized removal method of the implant.

Case

Case 1

A 72-year-old female patient was referred to Department of Oral and Maxillofacial Surgery due to the displacement of the implant fixture of left second molar region to the mandibular bone marrow space. Her medical history was unremarkable (American Society of Anesthesiologists class I). A panoramic radiograph showed that the fixture (4.0 mm wide, 10.0 mm long) was displaced inferiorly, approximately 12 mm below the alveolar ridge (Fig. 1). In the cone beam computed tomography (CBCT) image, the inferior alveolar nerve was in contact with the lingual side of the

Fig. 1. Implant displaced into the left mandibular bone marrow space in panoramic view.

displaced implant (Fig. 2).

Trapezoidal bone window was designed with the inferior base length of 10 mm and the longitudinal length of 13 mm with the buccal cortical bone of the drilling hole as the superior margin. Osteotomy was performed on the cortical bone using a Piezosurgery device (Mectron Piezosurgery Device™; Mectron S.p.a., Carasco Genoa, Italy). After removing the bone window, the surrounding blood clot was carefully removed through saline irrigation and suction to ensure visibility. The implant was gently removed upwards by grasping the exposed upper part without any damage to the mandibular neurovascular bundle. The bone window has been placed in its original location. To prevent nerve injury after surgery, bone graft was not performed. To prevent nerve injury by hematoma or edema, dexamethasone was applied onto the nerve mucoperiosteal flap was replaced and sutured (Fig. 3).

Amoxicillin, prednisolone and nonsteroidal anti-inflammatory drug were prescribed for 1 week after surgery. The sutures were removed 7 days postoperatively, and the healing was uneventful. no neurological complications were noted.

Case 2

A 48-year-old male with no remarkable medical history

Fig. 2. Implant was located into the bone marrow space and near the inferior alveolar canal.

Fig. 3. (A) Trapezoidal osteotomy was performed using a piezoelectric device. (B) The implant was removed. (C) The bony window was replaced in the original position. (D) Wound closure.

Fig. 4. Implant displaced into the left mandibular bone marrow space near the inferior border in panoramic view.

was referred to our hospital because the implant was displaced downward during implant placement of the mandibular left second molar region. A panoramic radiograph showed that the fixture (4.0 mm wide, 10.0 mm long) was displaced inferiorly, approximately 10 mm below the alveolar ridge (Fig. 4). In the CBCT image, the inferior alveolar nerve was expected to be adjacent just below the displaced implant (Fig. 5). The removal of implant fixture followed the same procedure as that of case 1. Trapezoidal bone window was designed with the inferior base length of 10 mm and the longitudinal length of 11 mm with the buccal cortical bone of the drilling hole as the superior margin (Fig. 6). Three months after surgery the healing was uneventful, and no neurological complications were noted.

Fig. 5. Implant was displaced into the bone marrow space and closed to the inferior alveolar canal.

DISCUSSION

Implant displacement into the mandibular bone marrow is mainly due to the focal osteoporotic bone marrow defect [5], which is expected to be associated with women with osteoporosis. However, previous reports suggest that implant displacement could occur in patients without osteoporosis [13]. In addition, there may be an empty space in the bone marrow area for a specific reason such as simple

Fig. 6. (A) Trapezoidal osteotomy was performed using a piezoelectric device. (B) Soft tissue-like marrow was observed. (C) The implant was removed. (D) The bony window was replaced in the original position.

bone cyst, or there may be a local insufficiency of the trabecular bone with no particular reason [14]. Therefore, the location of implantation and bone density below the location of implantation should be confirmed through preoperative CBCT images. When the trabecular pattern below the implantation site is not observed on CBCT images, it is necessary to be aware of the displacement of the implant. And in order to maximize the cortical bone engagement, technical procedures such as under-drilling are required.

In most of previously published articles, the implant fixtures displaced into the mandibular bone marrow space were removed in two ways. The first method is to remove it through the crestal approach [7,9,10]. This method provides to surgeon limited vision. Also, since the size of the drilling hole in the cortical bone is the same as the diameter of the upper part of the implant fixture, it is not easy to come out and additional bone removal is required. This additional bone removal can be a disadvantage for future implant fixation.

The second method is the lateral approach [8,12,13]. This method can secure a better field of view, but the shape of the bony window should be considered. Since the mandibular bone marrow space is not a complete hollow space like the maxillary sinus, the formation of a typical rectangular bony window like the maxillary case may make it difficult to secure sufficient field of view.

The bone window design used in these cases are trapezoidal bone window design, of which upper margin is the buccal area of the implant hole and lower margin is the upper part of the displaced implant. The bone window design would be the most advantageous for minimally invasive implant removal [11]. This is because the bone removal part that was previously used for implant placement can be fully utilized. Since the cortical bone of the buccal side is removed from the alveolar bone, it is advantageous to secure the field of view. Also, since the displaced implant fixture is not fixed in the medullary space, it can be passively removed upwards once the fixture is located. Damage to surrounding anatomical structures, such as the inferior alveolar nerve, will also be least, as removal of the implant fixture does not require rotation or horizontal movement in the medullary space. Finally, trapezoidal bony windows are less likely to move up and down or forward and backward after refitting. Since the upper cortical bone area is included, the bone window itself is less likely to be displaced into the medullary space, thus providing stable healing without fixing through the miniplate.

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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