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Vertical augmentation using the mandibular body bone for repair of failed implants: a case report

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An implant may fail due to insufficient osseointegration between the supporting bone and the implant. Surgical removal of a failed implant is unavoidable with severe bone loss and an infectious state. In this case, a wide-ranging bone graft surgery is needed. The mandibular body bone (MBB) is an autogenous bone that could be a donor site for an alveolar bone graft. An MBB graft is easy, simple, and safe. This study reports a successful bone graft that used only MBB to repair a failed implant site. **(JOURNAL OF DENTAL IMPLANT RESEARCH 2015;34(2):41-45)**

Key Words: Mandibular body bone graft, Failed implant

INTRODUCTION

It is a prerequisite to secure the amount of alveolar bone for dental implants. An autobone graft on the atrophic alveolar ridge has a comparatively predictable result because it has osteoconduction and osteoinduction. The use of the mandibular body bone (MBB) has several advantages. The MBB technique is a simple, safe, and rapid method of obtaining a sufficient amount of cortical bone[1]. Moreover, it has less injury at the donor site, no external scar formation, easy surgical accessibility, and a short healing period. The harvested bone material can be used as the block-type or the particle-type, according to the case. Patients whose dental implant fixture had been removed show vertical alveolar bone deficiency with inflammation. In these patients, vertical augmentation with a bone graft material is a challengeable treatment. In this case, we performed a successful bone graft using only the MBB and reported it.

CASE REPORT

A 44-year-old man visited our department complaining of pain at his implant site. He had undergone implant surgery on his mandible left second premolar three years ago elsewhere. However, he said the prosthesis fell out after the surgery. The implant site showed moderate inflammation that included swelling, bleeding, and a pus-like discharge. He had no systemic infection symptom and medical morbidity. A radiographic examination was performed with a panoramic view.(Fig. 1) It showed severe alveolar bone loss. Vertical bone loss was carried to the end of the implant fixture. Removal of the implant was planned to treat the infection and for re-implantation. The implant fixture was removed and curettage was performed.(Fig. 2)

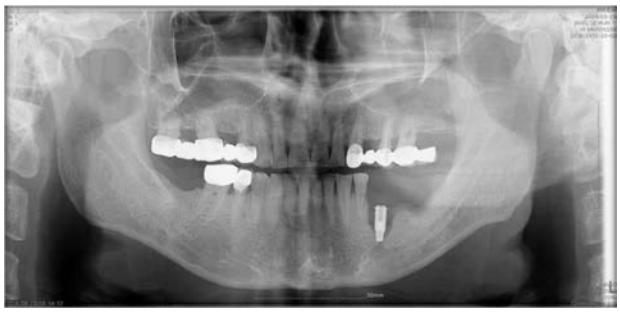

Fig. 1. Pre-operative panoramic view of the horizontal and vertical bone losses in the #35 implant.

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An absorbable collagen sponge (Ateloplug®, Bioland, Korea) was positioned in the defect site. An oral antibiotic medicine was prescribed for two weeks.

After four months, the panoramic view showed insufficient alveolar bone for the implant surgery, so an additional bone graft was required.(Fig. 3, 4) The buccal bone of the #35 extraction site was 4.6 mm high. The patient underwent a surgical procedure under sedation for maximum relaxation and freedom from pain. The mandible left was chosen for the donor site and the recipient site. Local anesthesia was administered with 2% lidocaine that contained epinephrine. The incision was similar to intraoral sagittal split osteotomy. The incision began at the anterior aspect of the ramus at the midpoint between the upper and lower molars. It ran down the facial vestibule and extended the residual tooth distal to both the donor and recipient sites. The mucoperiosteal flaps were raised. The crest bone was indented with a round bur. An osteotomy cut was made with a reciprocating saw just medial to the external oblique ridge. Each end of this cut was connected to the vertical osteotomy cut in the lateral cortex, which was extended to the inferior border. These three osteotomies were not carried out beyond the cortical bone. This minimized the chance of injury of the inferior alveolar neurovascular bundle. The rectangular block bone was separated with an osteotome. The harvested bone was refined to fit the size of the crest area of the graft. It was fixed with a 1.5 mm titanium screw (9 mm length, KLS Martin) without any possibility of micromovement. The residual block bone was particulated with a bone mill and placed beside the block bone and between the gaps.(Fig. 5, 6) The absorbable collagen membrane (OssGuide™, Bioland, Korea) was trimmed and covered the bone. A fibrin sealant (2 ml Tisseel, Baxter Healthcare Corporation, Glendale, CA) was applied. The buccal flap was elongated through a periosteal releasing incision to gain full and tension-free coverage. The incisions were closed with 4-0 Ethilone through a horizontal mattress with interrupted sutures. The wound healed well without dehiscence.

After four months of healing, the grafted area was prepared for the implantation. Post-surgical radiological ex-

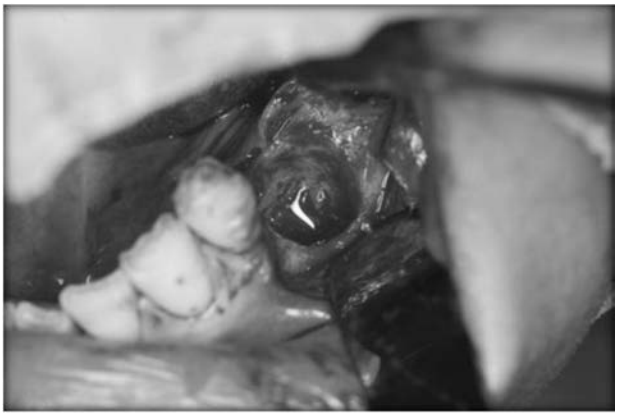

Fig. 2. Excessive bone defect after removal of the failed implant.

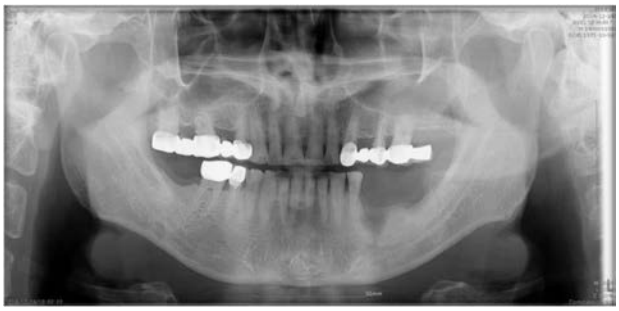

Fig. 4. Panoramic view before the mandibular bone graft.

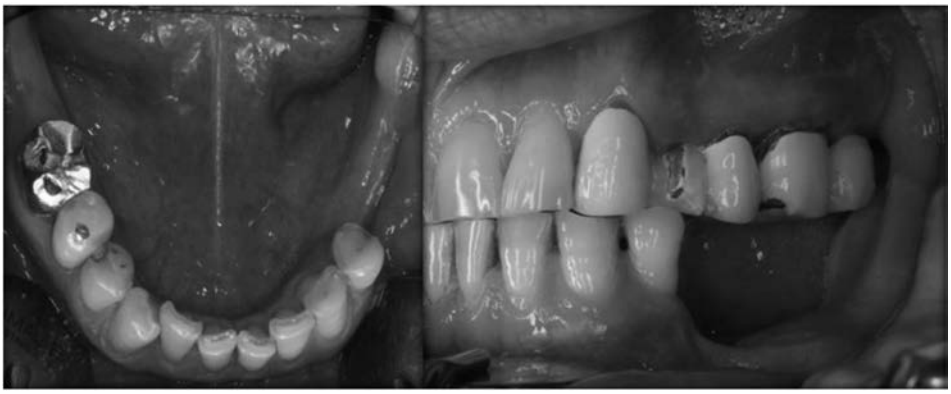

Fig. 3. Intraoral view before the mandibular body bone graft.

aminations were performed using dental CT.(Fig. 7) Bone formation was confirmed. The alveolar bone was 14.9 mm high and 4.6 mm wide. An incision was made on the crestal ridge.(Fig. 8) The screw was removed. Implants (Shinhung, Φ 5.0×11.5 mm) were installed for the second premolar and first molar sites.(Fig. 9, 10) The implant was stable and well-maintained, without any clinical symptom. The crown prosthetic treatment is in progress.

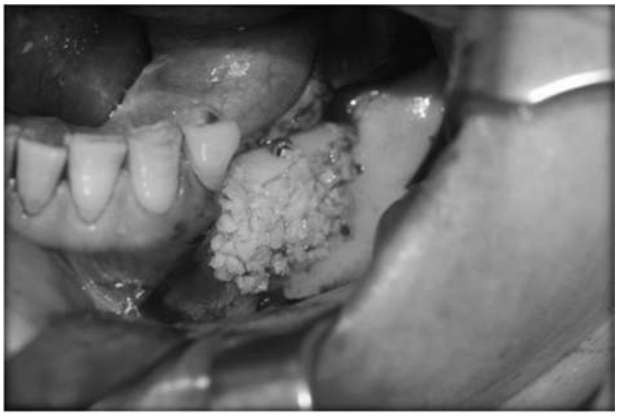

Fig. 5. Mandibular body bone grafted as a block and particulated form.

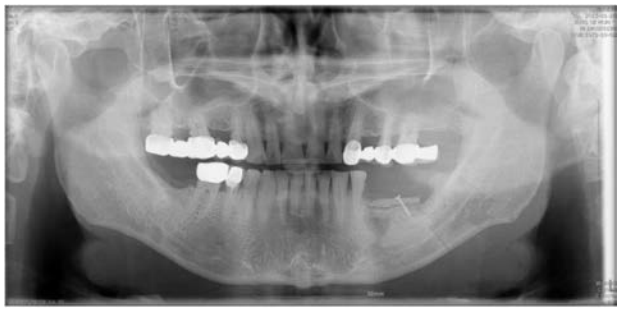

Fig. 6. Mandibular body bone restoration of the lost horizontal and vertical alveolar bones.

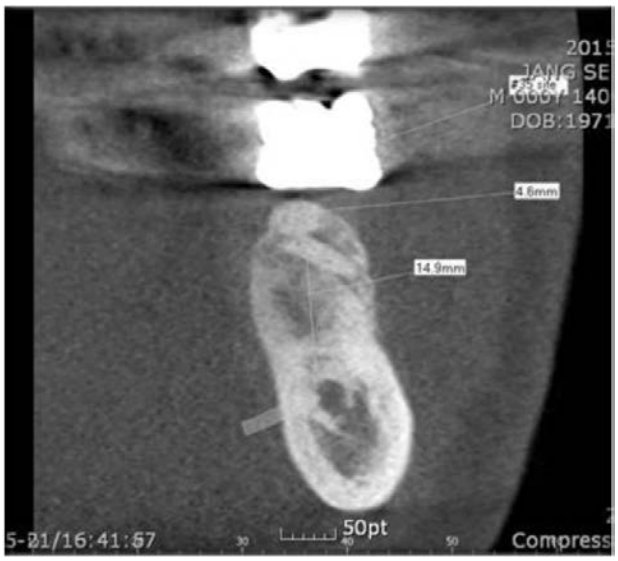

Fig. 7. Newly grafted bone incorporated in the recipient site.

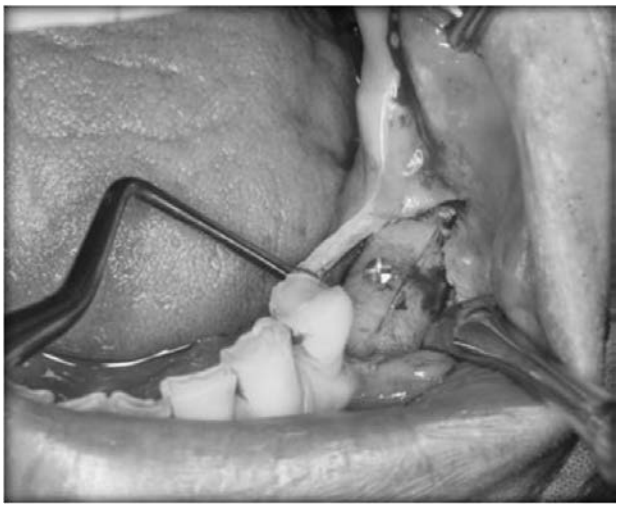

Fig. 8. Block bone graft well-preserved without resorption or inflammation

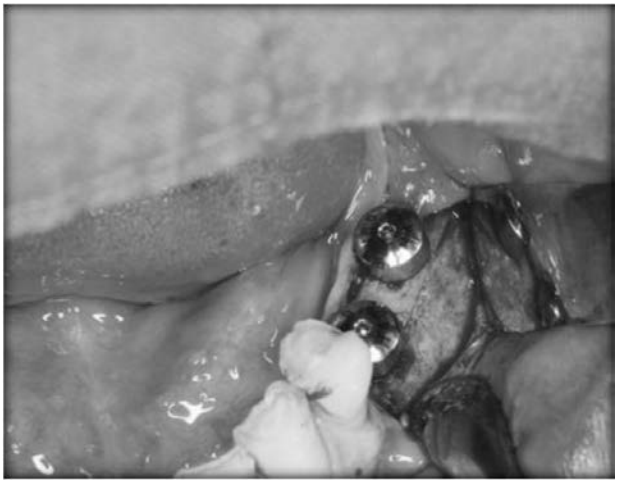

Fig. 9. Two implants installed with healing abutments.

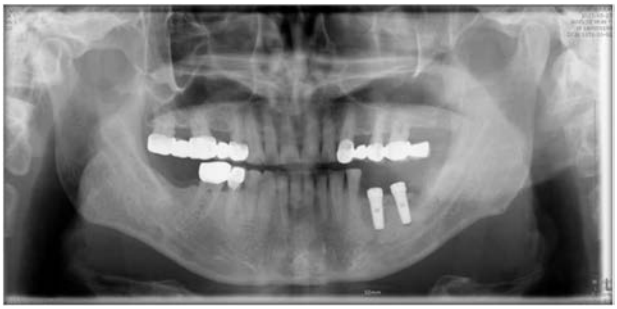

Fig. 10. Implants (Shinhung, Φ 5.0×11.5 mm) installed for the second premolar and first molar sites.

DISCUSSION

Nowadays, a dental implant can often be found in a partially edentulous patient. However, if the osseointegration between the supporting bone and the implant is insufficient, the implant will fail. Similar to a tooth, infection can occur around the implant. Peri-implant diseases constitute the destructive inflammatory process that affects the soft and hard tissues surrounding implants. While peri-implant mucositis occurs in the soft tissues, peri-implantitis also affects the supporting bone[2]. This is the result of the complex interactions between the bacterial and host factors. Bacterial infections and biomechanical loading have been known as important causal factors of bone destruction. Poor oral hygiene, a history of periodontitis, and cigarette smoking are the risk factors. Diabetes with poor metabolic control and alcohol consumption are considered associated with peri-implant diseases. Genetic traits and the implant surface are the limited evidence of peri-implantitis[3,4]. The treatment of peri-implant disease should include anti-infective methods. Mechanical cleansing, antimicrobial mouth-rinsing, and laser therapy are the non-surgical treatments. These methods could enhance mucositis lesions, but have limited effects[5]. The surgical treatments are debridement and decontamination of the implant surface[6]. Once marginal bone loss occurs, it is difficult to stop. Removal of the implant is recommended if the osseointegration is less than one- third of the implant fixture.

In this case, the existing implant failed, as shown in the clinical and radiographic exams. Peri-implant infection with suppuration and severe vertical bone loss occurred. The implant was removed and showed a large extra-bony defect. Horizontal and vertical augmentation was needed.

In a bone graft, the missing bone is replaced with autologous bone, allograft, xenograft, and alloplastic materials. The intramembranous autogenous bone graft is the gold standard because it has osteogenesis, osteoinduction, and osteoconduction abilities. When large amounts of bone are required, the autogenous bone is considered the first choice. It can be harvested from many different sites. The often accessed donor sites include the iliac crest, skull, tibia, or mandible. From the intraoral, mandibular symphysis, the ramus, the mandibular body, the maxillary tuberosity, and the palatal bone could be used as donor sites.

The mandibular body bone graft has many advantages[1]. It has only one surgical field. There is no visible scar and no cosmetic sequelae. If sagittal mandibular osteotomy will be performed anyway, the graft is obtained with little additional time and effort. There is minimal surgical morbidity. Potential complications are those of dentoalveolar surgery, including infection, hemorrhage, swelling, and pain. The worse case, alveolar nerve damage or iatrogenic fracture of the mandible, could occur. To prevent injury of the inferior alveolar nerurovascular bundle and the tooth roots, the osteotomies did not go deeper than the inner surface of the cortical bone[7]. In this case, the inferior alveolar nerve was not exposed. The patient had no nerve symptom. To prevent unintended fracture, sagittal and vertical osteotomy was clearly required, and the osteotome should be used with caution.

With the panoramic view taken during the first visit, the implant fixture location and angulations were not ideal. The initial alveolar bone quality might have been inappropriate for the implantation. It would have been difficult to maintain the implant, so it failed. The initial implant should have been removed due to severe bone loss and an infectious state. Both the surgeon and the patient had to be patient enough to wait for a long time for recovery from the implant failure. In this case, it took four months to control the infections. After the MBB graft, four additional months were needed for the healing time. The patient also had to endure multiple surgeries. Therefore, accurate diagnosis and initial implant planning are very important. The surgeon should consider many things, including the bone quality and quantity, the type of prosthesis, and the patient preferences.

For the bone grafting, a particulate or block bone type could be used. The particulate bone should not be moved and should be supported from the alveolar ridge. Substances such as fibrinogen concentrate might be needed to aggregate the small particles. The particulate bone should be well-covered with a support membrane that includes an absorbable, non-absorbable, or titanium mesh. It is ineffective, and the bone formation is not good. A block bone could be rested on a recipient bone and is well-maintained in its original form.

Close contact with the block bone and the recipient site

is very important[8,9]. It should be maintained without any micromovement. The stable bone could be fixed with a screw[10,11], plate, or implant[12,13]. It is difficult to maintain the space with a particulated bone graft for an extensive bone defect because the particulated bone receives the soft tissue pressure directly. A block bone graft may be considered a priority if there are extensive horizontal and vertical extra-bony defects. Complex surgical techniques are required to fix the block bone with screws. The surface of the bone defect is uneven, but the block bone graft is flat. The block bone can be put down with the periosteal elevator, but is difficult to completely fix. The block bone must be refined to fit the defect area. A lateral veneer graft and an onlay graft are predictable procedures using MBB. In this study, vertical augmentation was possible even with an extensive defect without a support membrane material such as a reinforced titanium membrane. The MBB was well-maintained in its original position for four months. The bone formed well and was efficiently implemented to the alveolus without any gap. The autogenous onlay block bone graft should be healed for about four months before the implant[14,15]. In this case, the implant surgery was performed after a four-month bone graft. Both sides of the MBB can also be used if partial edentulous patients need a bone graft on both sides of their mandible or maxilla.

An MBB graft is an easy and simple method of recovering a wide range of vertical bone lost, especially if the surgeon clearly understands the mandibular anatomy and is familiar with BSSO surgery.

CONCLUSION

In this case, an extensive alveolar bone defect occurred in a patient after the implant failure was successfully treated with a mandibular body bone graft. After the implantation, there has been no harmful clinical symptom or alveolar bone loss around the implant fixture to date. This case was reported due to the good results of this study on vertical augmentation using a mandibular body bone graft.

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