

Autograft Surgery Using the Condylar Fragment for Implant Placement

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• Abstract

The fracture of facial bone usually accompanies alveolar bone fracture and dislocation or fracture of teeth. Thus, aside from the reduction of fracture, the reconstruction of occlusion through the rehabilitation of lost teeth should be considered. The dislocation of tooth after trauma accompanying alveolar bone fracture needs bone grafting in case of implant treatment. Although autogenous bone graft shows good prognosis, it has the disadvantage of requiring a secondary surgery.

This is a case of a mandibular condyle head fracture accompanied by alveolar bone fracture. The condylar head fragment removed during open reduction was grafted to the alveolar bone fracture site, thereby foregoing the need for secondary surgery.

• Key word : condyle head fracture, autograft

I . Introduction

Aside from facial fracture, facial trauma usually accompanies loss of teeth and alveolar fracture. The

dental loss caused by trauma brings about the vertical and horizontal resorption of the alveolar bone²⁾. This requires additional treatment such as bone graft or ridge splitting to obtain sufficient bone volume during

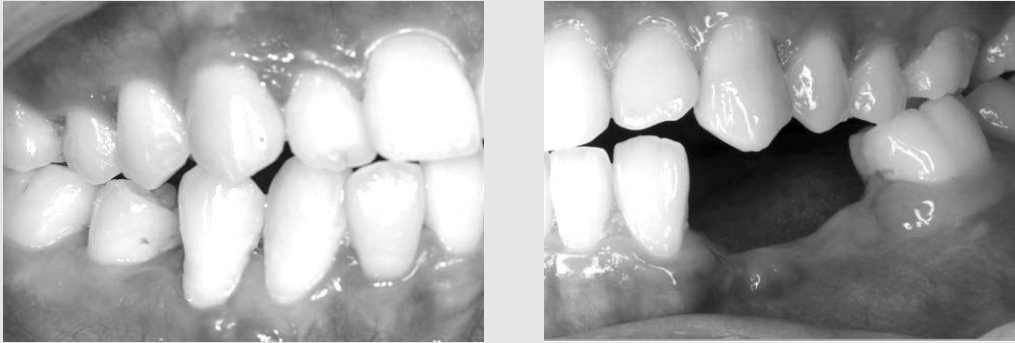


Fig. 1. Photography shows edge to edge bite and tooth missing and atrophic alveolar ridge on #33,34,35

implant-based reconstruction³⁾. The materials to be used for bone grafting include autograft, allograft, xenograft, and alloplast. In particular, xenograft and alloplast require long healing periods and have limited peri-implant osteogenesis since they generate bone through the osteoconduction mechanism. On the other hand, they require no donor site surgery and have sufficient volume of graft material⁵⁾. In contrast, autograft requires shorter healing period; it is also less vulnerable to the impact of reciprocal site conditions, thereby generating more sufficient bone volume since it forms bone through osteoinduction. On the other hand, donor site surgery is required for bone harvesting, and complications may occur at the site¹⁾. The use of autograft for largely defective regions (e.g., trauma) can be a good choice as long as the graft material is sufficient.

In this case wherein the patient had fractures in both the mandibular condyle and alveolar bone, the reduction of the fractured mandibular condyle and rigid fixation were hardly appropriate. Thus, autograft was carried out using the removed condylar fragments in the defective area of alveolar bone followed by implant-based reconstruction. The case report shall be discussed together with references.

II . Case Report

A 26-year old man visited the clinic to resolve the trismus and posterior occlusal interference on both sides. At that time, 28-mm mouth opening was found. In particular, he felt pain in the left condyle during opening. The damages resulting from his fall about 2 months ago included both mandibular condyle and fracture of the right mandible body, alveolar bone fracture of the left mandibular premolar, and

laceration in the mental region. At another hospital, he previously underwent miniplate rigid fixation under general anesthesia for the fractured right mandibular body by accessing the laceration region together with the extraction of the left mandible canine and first and second premolars and removal of alveolar bone fragment on the buccal side. At the time of the intraoral examination, crown fracture was found in the first and second premolars in the maxilla. The posterior occlusion showed edge-to-edge contact (Fig. 1). The left mandibular premolars had a sharp alveolar crest caused by the fracture of alveolar bone on the buccal side. As shown by the dental x-ray and CT scan, the mesial fragment was displaced toward the anterior-mesial-inferior side due to the right condyle neck fracture and sagittal fracture in the condylar space. In the periapical x-ray scan, a complicated crown-root fracture was detected in the first maxillary premolar (Fig. 2). The left condylar fragment displaced toward the anterior-mesial-inferior side seemed to cause sliding movement and pain during opening. Accordingly, for the treatment, the removal of the troublesome left condylar fragment was planned together

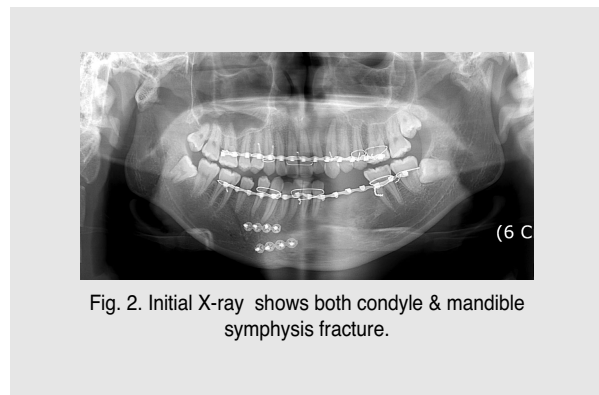


Fig. 2. Initial X-ray shows both condyle & mandible symphysis fracture.



Fig. 3. Photography show atrophic alveolar ridge and Implantation(Ankylos®, Dentsply)



Fig. 4. Photography show Implantation site that bone augmentation was done with condyle fragment & allograft(Orthoblast®, Isotis) and protected with collagen membrane(Lyoplant® Bbraun X 2ea)



Fig. 5. Post-operative panoramic radiograph and periapical X-ray

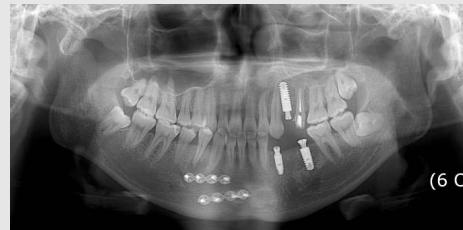


Fig. 6. Post-operative panoramic & photograph at 4months after operation.

with the extraction of the first maxillary premolar. Bone grafting and immediate implantation using the removed condylar fragment were planned in the left mandibular premolar region. For the right condyle side, conservative treatment was planned because vertical dimension was retained without any problem during opening. The left condyle fragment was removed through preauricular incision under general anesthesia. After the removal, the articular disc was repositioned. The 40-mm opening was examined. The removed condylar fragment was ground for bone grafting following the removal of soft tissue, mixed with allograft (Orthoblast®, Isotis), and stored. Immediately after the extraction of the first maxillary premolar, the implant (4.5x14mm Ankylos®, Dentsply) was placed. Similarly, implants (3.5x11mm, 4.5x11mm Ankylos®, Dentsply) were placed in the left lower canine and second premolar regions (Fig. 3). The prepared graft material was then implanted in the buccal site. Two absorbed membranes (Lyoplant®, Bbraun) were placed on the superior region; a

releasing incision was carried out in the periosteum while avoiding tension onto the mucosa. Primary closure was then performed (Figs. 4, 5). For 3 weeks, mouth opening exercises were done using a rubber ring. Approximately 4 months later, the secondary implant surgery was performed (Fig. 6). The implants were securely osseointegrated.



Fig. 7. Post-operative photographs at 8months after operation

Furthermore, in the periapical x-ray scan, the position of the alveolar crest was found to have been retained. Prosthetic treatment was performed two months later. Two months later, a 37-mm opening was detected, and no pain occurred during opening. Stable occlusion was observed without the previously existing occlusal interference, with the height of the alveolar crest consistently retained (Fig. 7).

III . Discussion

The mandible condylar fractures that commonly occur in the mandibular fracture may cause complications such as trismus, anterior open bite, and occlusal interference. Surgical and conservative treatments may be performed⁶. In particular, surgical treatment is performed when the loss of vertical dimension due to the displaced condylar fragment and trismus occur. Note, however, that its disadvantage is the possible occurrence of facial nerve palsy, scar, pain, or swelling⁶. If trismus occurs due to the displaced bone fragment particularly the displaced mesial condylar fragment, however, the removal of fragment is necessary because true ankylos may develop⁷. Given the big piece of fragment and loss of vertical dimension, the bone fragment should be reduced. In the case of small fragment, it should be removed since reduction is difficult. Moreover, the insufficient blood supply to the fragment may cause resorption after the reduction or bony ankylos⁶. In the area with the lateral bone fragment removed, temporary deviation occurs during opening. Consistent opening exercise will restore its normal function, however⁸. The opening exercise seems to help the mandible move toward the anterior side. New bone is generated in the fractured condylar region owing to Sox-9 and type II collagen⁹; otherwise, the growth factor reacts due to internal growth potency¹⁰. The removed condylar fragment as facial cancellous bone is believed to be rich in growth factor in the condylar region and advantageous for osteogenesis in case of fracture because it contains factors such as TGF- β , and BMP originating in new blood vessels¹¹.

In this case, the patient had condylar fractures on both sides, causing the displacement of the left fragment toward the anterior-mesial-inferior side. As such, he felt pain during the opening. The condylar fragment was too small to be reduced, although the outer condylar side retained vertical dimension. Thus, fragment removal was planned. After the

fragment removal, the opening was found to be as wide as 40 mm. The articular disc was also repositioned. Three days after the surgery, the intermaxillary fixation was removed, and the opening exercise was started using a rubber ring. Two months later, the opening remained at 37 mm. The peripheral soft tissue of the removed fragment was removed and ground and subsequently mixed with allografts containing growth factors. It was then placed in the defective area following implant placement. Resorbable membrane was used; to extend the period of resorption and prevent the movement of graft material due to flap movement, the 2 layers were superimposed¹². Four months later, a secondary implant surgery was performed; bone generation around the implants was observed. After prosthetic treatment, occlusal stability was noted. The alveolar crest was consistently retained as well. In this case, bone graft surgery was performed with the use of cancellous bone called condylar fragment rather than the cortical bone normally taken from autogenous bone. Compared to cortical bone, a certain level of bone generation was expected with cancellous bone despite its high probability of osteoinduction and low possibility of early bone resorption because it contains osteoblasts³.

With facial fracture surgery or with mandible sagittal splitting osteotomy for Class III patients, there are cases of removing a fragment that causes infection, functional disorder, and osteonecrosis or those wherein problems occur during mandibular posterior movement. In this case wherein implant placement is planned, performing implant placement using the removed fragment following bone grafting shortens the treatment period and minimizes complications in the donor site. Note, however, that the simultaneous occurrence of the removal of fragment and bone grafting may result in flap necrosis due to the expansion of the surgical area; thus leading to failed bone graft. As such, attention should be paid to the selection of indications.

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