

Functional and aesthetic immediate reconstruction of the mandible using a cast pure-titanium reconstruction plate.

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抄録：鑄造・純チタン製の下顎頭付再建用プレートと新鮮自家腸骨ブロック骨の移植により即時再建をはかり、2年以上を経過した2例について報告した。経過は良好で下顎運動機能を回復し、同時に顔貌の審美的形態の回復を得ることができた。

Key words : mandibular reconstruction, cast pure-titanium plate.

In reconstruction of mandibular bone defects involving the mandibular head, attempted and aesthetic restoration has been contrived by many investigators. However, a number of problems still remain to be dealt with. Especially, transplantation of a long bone segment has frequently resulted in marked postoperative resorption of the graft from both ends. Causing instability of the mandibular movement, as well as difficulty in attaching a denture. At the same time aesthetic reconstruction has often been regarded as hopeless, because of the depres-

sion of the chin on the grafted side. However, we have recently accomplished restoration of the stabilized occlusal function and aesthetic satisfaction by the combined use of a pure-titanium, mandibular condyle integrated reconstruction plate (TMP) and a fresh autogenous iliac bone block graft. This paper describes 2 cases of successful reconstruction.

Case reports

Case 1 : The patient was a 31-year-old man. He began to notice occasional discharge of pus from the gingiva of the left lower

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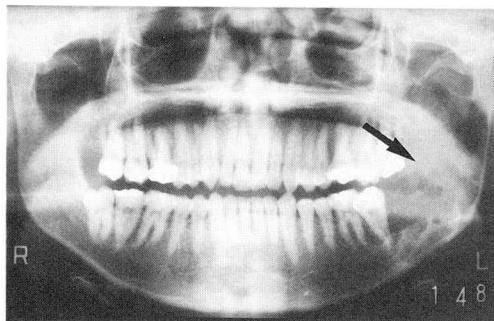


Fig.1 Multilocular bone resorption and osseous bulging in the entire left mandibular ramus.

third molar region from march, 1981. In Jan., 1982, this tooth was loosened and extracted at a dental clinic. Then, the patient became aware of a painless swelling chiefly in the region of the left mandibular angle. Because of gradual enlargement of the swelling, he came to our department on May 24, 1984. Local examination revealed a diffuse osseous bulging from the anterior margin of the left mandibular ramus to the buccal side of the angle. On palpation, it gave a pergameneous feeling. Figure 1 shows the panoramic X-ray view at the initial diagnosis. The diagnosis of ameloblastoma was established by histopathological examination. On June 26, 1984, under general anesthesia the mandible including the coronoid process and condyle was resected along with the tumor from the left first molar region. It was immediately followed with reconstruction. Initially, for reconstruction of the defect the inferior alveolar nerve, the left auricular nerve used for grafting was exposed and cut at 8cm. Under surgical microscopic control, the mesial and distal ends were anastomosed by funicular sutures using 8-0nylon. An iliac segment $6.5 \times 5.5 \times 1.5$ cm in size was resected from the left iliac bone. The cortex was removed on one



Fig.2 Reconstruction procedure ; matching of the curvature during operation to the preoperative original value for reconstruction of the mandible.

side only. The segment was sectioned into 3 blocks. A 99.5 %-titanium (TMP) was meticulously shaped using a specially-prepared tool to make a curve that best fit the facial symmetry. During this process, using a mandibular reconstruction precision gauge devised in 1984 by one of the authors, careful attention was paid to the contour of the mandibular angle by bending the TMP during the operation to a curvature that conformed to the preoperative original curvature measured with the gauge (Fig.2). Three pure titanium screw were used for fastening the bone graft. As shown in Fig.3, the autogenous iliac bone block was fixed to the lingual side of the plate, with the cortex-removed side adapted buccally and the cortex-preserved side lingually. It was firmly fixed to the TMP using 2-0 chromic

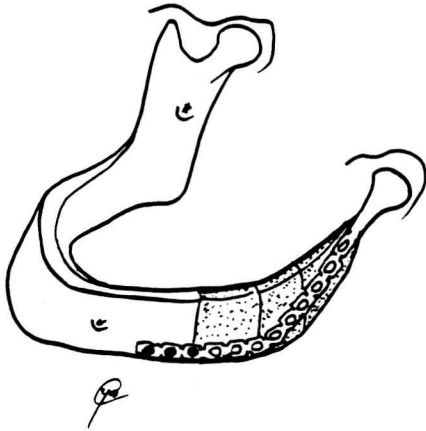


Fig.3 Schematic presentation illustrating the relation between the pure-titanium reconstruction plate integrated with a mandibular condyle and the iliac bone graft in case 1.

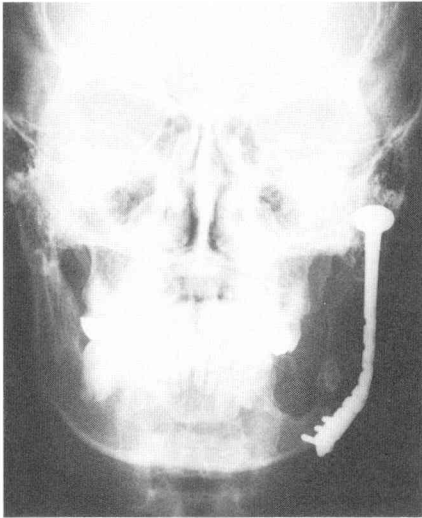


Fig.4 P-A X-ray view and frontal facial view at 2 years and 11 months after operation. Functional and aesthetic reconstruction was achieved.

yarn. Also intermaxillary bridge was placed for 4 weeks postoperatively. A partial denture was fit to the left lower first and second molars. The postoperative facial structure as shown in an X-ray film in Fig.4 is satisfactory. The sensation of sensory paralysis over the left mental area almost disappeared in the 9th postoperative month. The mandibular movement at 2 years and

6 months after operative, as recorded by a saphon visi-trainer was somewhat restricted toward the right tendon side but disclosed almost the same normal pattern of movement as preoperatively.

Case 2 : The patient was a 46-years-old woman. From early Sept., 1984 she began to feel pain in the left cheek during mastication. She visited a dental clinic on Oct. 5. Because



Fig.5 P-A X-ray view in Case 2 at initial diagnosis. It shows a marked bone resorption of the left mandible.



Fig.6 Intraoperative view showing immediate reconstruction of the left mandible.

the X-ray examination revealed resorption of the mandibular bone, she was referred to our department on Oct. 7, 1984. The face had a depression at the area of the left mandibular angle. An intraoral examination showed the existence of only the right canine and the left second premolar in the lower jaw, severe atrophy of the alveolar ridge of the left lower molar region, instability of the local denture and displacement of

the mentum toward the left from the medianus was noted. X-ray showed complete bone resorption from the region of the left lower canine to the left mandibular condyle (Fig.5). Biopsy led to the histological diagnosis of massive osteolysis. Semimandibulectomy of the left mandible was performed on Oct. 29, 1984. Reconstruction was achieved, as in Case 1, by transplantation of 4 autogenous iliac bone blocks fixed with the TMP (Fig.6). To maintain a large arch of occlusion, the reconstruction process proceeded with the attachment of a resin plate.

The aesthetic result were good. By kinesiographic recording of the mandibular movement, the critical range of mandibular movement was found to have increased to a normal level as well as an increased speed and smoothness at 1 year and 2 months after operation. Furthermore, electromyography showed increased activation of the temporal muscle. As shown in Fig.7, the postoperative course remained uneventful at 2 years and 7 months.

Discussion

Preservation of the mandibular condyle has been reported to be helpful in functional and aesthetic reconstruction of the mandible^{1,2}. We consider preservation of the condyle to be most important. However, unavoidable removal of the condyle is occasionally encountered as in the cases presented in this paper. Various methods have been proposed for reconstruction of such cases^{3,4}. A three-dimensional bendable mandibular reconstruction plate (3-DBRP), which is made from an alloy of Ni, Cr, Fe and Mn and which is often used, has been considered to have a potential adverse effect

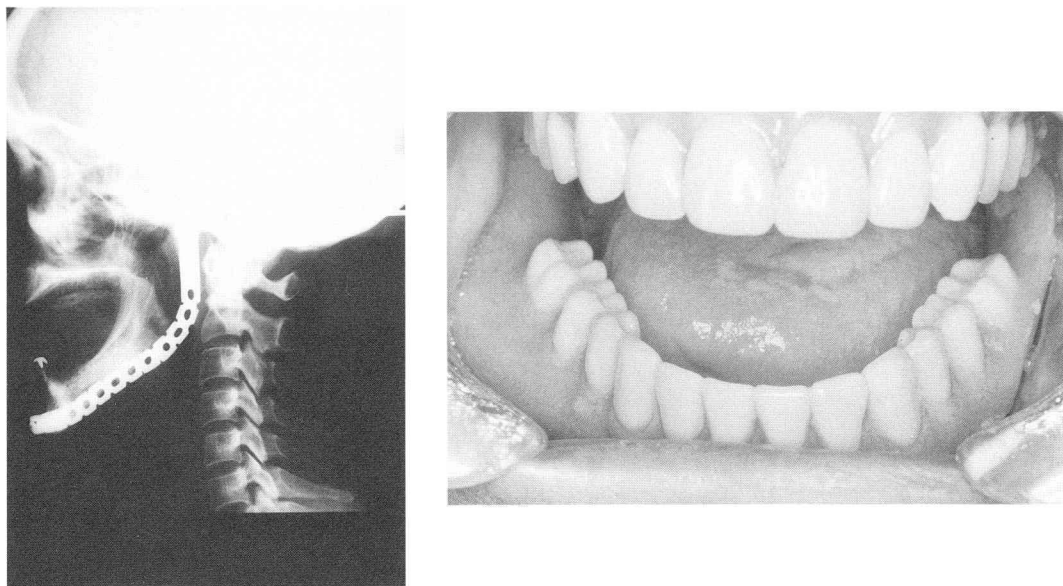


Fig.7 Lateral X-ray view of the reconstruction plate of mandible at 2 years and 7 months after operation. It shows the stabilized denture.

on tissues. Therefore postoperative removal of a 3-DBRP has been also advocated^{5,6)}.

On the other hand, Raveh et al.⁶⁾ have attempted reconstruction of the mandibular condyle in 2 patients using titanium-coated hollow screws and a reconstruction plate. They have reported that the plate become neither loosened nor exposed. Furthermore, they also obtained satisfactory results in a similar attempt in patients with malignant irradiation tumor. We recently accomplished successful casting and the manufacture of 99.5 %-titanium reconstruction plates and achieved successful reconstruction using plate. Especially in the present 2 cases reconstructed with the head-integrated construction plate made of 99.5%-titanium. The plate exerted no adverse effect on either the bone graft or the surrounding tissue even after more than 2 years. It seemed to have stabilized in the tissue.

A pure-titanium cast is characterized by its light weight and toughness (tensile

strength 75-90 kg/mm², elongation 12-20% and hardness 160-190 HB). It is also characterized by its nontoxicity to cells and high affinity to the tissue. These important characteristics have been supported by scientific research⁷⁾.

This material remains inactive on the surface and forms an oxidized film. This property provides a biological stability which is not found in other metals. Nevertheless, we intend to continue a long-term observation.

Conclusion

Immediate reconstruction of the mandible was undertaken by the combined use of a cast pure-titanium reconstruction plate integrated with a mandibular condyle and a fresh autogenous iliac bone graft. Two examples with a postoperative history of over 2 years are presented. The reconstruction resulted not only in restoration of satisfactory mandibular movement but also

in a satisfactory aesthetic structure of the mandible.

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Abstract : Immediate reconstruction of the mandible was undertaken by the combined use of a cast pure-titanium reconstruction plate integrated with a mandibular condyle and a fresh autogenous iliac bone graft. Two examples with a postoperative follow up over 2 years are presented. The reconstruction resulted in restration of not only the satisfactory mandibular movement but also in a satisfactory aesthltic structure of the mandible.

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