A Large Maxillofacial Prosthesis for Total Mandibular Defect: a Case Report

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We successfully fabricated a large maxillofacial prosthesis for replacement of a total mandibular defect resulting from surgical failure to reconstruct the mandible. Although a number of reports have described procedures for fabricating midfacial prostheses, there is little information on prostheses to compensate for total loss of the mandible. A 54-year-old woman was referred to the Dentistry and Oral Surgery Division of the National Cancer Center Hospital with total loss of the mandible and the surrounding facial soft tissue. The facial prosthesis we used to treat this patient is unique in that it is adequately retained without the use of extraoral implants and conventional adhesives. This prosthesis is retained by the bilateral auricles and the remaining upper front teeth. We present details of the design of this large silicone maxillofacial prosthesis, with which we successfully rehabilitated the patient.

Keywords: maxillofacial prosthesis – tongue neoplasm – quality of life – Andy Gump deformity

INTRODUCTION

Restoration of facial defects resulting from ablation of facial neoplasms is a challenge for the head and neck surgeon, plastic surgeon and prosthodontist. Furthermore, the choice between surgical reconstruction and prosthetic restoration of large facial defects is a difficult and complex decision (1). We have experienced a patient in whom surgical reconstruction was unsuccessful and who was much distressed about facial disfigurement. We attempted prosthetic restoration for the patient with the cooperation of a hospital technician at UCLA. The facial prosthesis we fabricated is unique both in its large size and mode of retention. In this report, we present details of the design of this large silicone maxillofacial prosthesis and the dramatic improvement in the facial disfigurement that resulted.

CASE REPORT

A 54-year-old woman was referred to the Dentistry and Oral Surgery Division of the National Cancer Center Hospital in May 1997 with total loss of the mandible and the surrounding facial soft tissue. She had undergone radiation therapy with a dose of 70 Gy with chemotherapy for advanced cancer of the tongue in September 1993 and after this treatment, the patient had developed osteomyelitis. Because of exacerbation of osteoradionecrosis and local recurrence of the tongue cancer in April 1997, she underwent extensive necrotomy of the mandible and additional local resection of the tongue, followed by reconstruction with a lateral thigh flap and a fibula flap. However, these flaps failed to take because of thrombosis. Finally, the defect was primarily sutured involving the residual soft tissue around the defect.

At initial presentation, it was noted that the patient had Andy Gump deformity (2) because of the defect in the inferior portion of the face (Figs 1 and 2). The asymmetry of the maxillomandible prevented her from closing her lips. Oral food intake and speech were severely impaired and therefore the patient had been fed through a gastrostomy tube. Furthermore she had suffered from severe depression because of her low likelihood of social recovery. We started to fabricate a maxillofacial prosthesis with the aim of overcoming the patient’s cosmetic problem and improving her quality of life.

After applying petrolatum around the defect and maintaining an airway, a final impression of the defect was made with hydrocolloid impression material, using an individual acrylic resin impression tray (Fig. 3). A stone cast was made from the impression for the laboratory phase of prosthesis fabrication. The wax contours of the facial prosthesis were formed with the aid of a presurgical photograph of the patient. The wax prosthesis was
evaluated on the patient for esthetics and marginal adaptation (Fig. 4). However, the soft tissue around the defect lacked sufficient anatomic undercuts to retain the prosthesis and the remaining bony structures were inadequate for dental implants.

It was anticipated that the retention of this facial prosthesis might be obtained by hanging clear acrylic resin rods on the back of the patient’s bilateral auricles (Fig. 5). The inner part of the wax prosthesis was hollowed out to reduce its weight and to provide space for rotation of the neck. For support of the prosthesis interior, a basic framework was made using a combination of a U-shaped piece of acrylic resin and clear resin rods (Fig. 6). However, this was not adequate for retaining the weight of the prosthesis, so that the lower lip was separated from the upper lip by a gap of 1 cm. To obtain more retention, a lingual resin plate and two ball clasps for the upper front teeth were developed and then attached to the interior of the lower lip (Fig. 7). These devices enabled the patient to retain the prosthesis adequately without the use of adhesives or implants. Finally, the wax facial prosthesis was invested and cast with silicone, which was suitably colored with a base pigment to match the patient’s skin. External coloration was performed to match the patient’s skin (Fig. 8). The total weight of this prosthesis was only 80 g and it took 8 weeks to complete at a cost of approximately $4500.

The patient was pleased with the dramatic improvement of her disfigurement and was able to enjoy going shopping every weekend. Drooling of saliva was prevented by placing a few sheets of gauze on the inner side of the prosthesis. A change of gauze four or five times a day was unavoidable, but the patient became accustomed to this routine in a short time. The prosthetic reconstruction of the inferior portion of the patient’s facial contour has been psychologically beneficial (Figs 9 and 10).

**DISCUSSION**

A large number of surgical procedures have been advocated for mandibular reconstruction. The management of patients with defects secondary to resection of malignant tumors associated with the tongue, mandible and adjacent structures represents an especially difficult challenge (3). In the present patient, we had to consider a number of difficult conditions including a long mandibular defect involving the symphysis region and an avascular recipient bed. The surgical procedure we selected:

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**Figure 1.** Frontal view showing the total defect of the mandible.

**Figure 2.** Lateral view showing the defect in the inferior portion of the face.
combined free flaps: a lateral thigh flap and a fibular flap. As the bone material for repair of the mandibular defect, a fibular flap was the first choice because this provides a bone segment of more than 20 cm for transfer and has flexibility for replicating the contour of the resected mandible (4,5). Plastic surgeons have suggested that vascularized mandibular reconstruction is more advantageous and stable than an autogenous bone graft and bridging plates made of titanium (4-6). Extraoral fixation with titanium pins was not possible because the symphysis region of the mandible was lacking and there was not enough residual bone to provide support on both sides.

Failure of mandibular reconstruction occurred within a few days after reconstructive surgery, so we did not have enough time to evaluate the improvement of swallowing and speech function. The bilateral residual mandibular segments consisted of almost half of the rami and condyles. An orocutanous fistula then developed after closure of the defect. Although the conditions for reconstructive surgery were worse than before, we tried to find an alternative method. Generally, combination of a scapular bone flap with a forearm flap or an iliac bone flap with a forearm flap and other types of flap are available. However, this patient and her family expressed a desire for conservative treatment. Because the patient had been so psychologically stressed after the failure of the reconstructive operation, she requested non-surgical compensation for the defect. After discussing the treatment with the patient, we drastically changed our policy from surgery to a prosthetic method.

The method of retention of this prosthesis without adhesives or implants is unique and original, especially the use of clear acrylic rods to hang on the back of the bilateral auricles and the interior support for the large prosthesis provided by a U-shaped framework. We were unable to find any mention of large facial prostheses retained in this way in the papers we reviewed. The total weight of this prosthesis is only 80 g. The retentive force of a complete denture with an appropriate peripheral seal is reported to be more than 5 kg (7). Even if a patient is partially edentulous in the upper anterior region, fabrication of magnetic attachment devices, which have a 600 g retentive force per abutment tooth, on conventional dentures enable us to retain a prosthesis in the same way (8). We think this retentive method is applicable to patients with Andy Gump deformity.
Although functional recovery of mastication and deglutition were not achieved, the patient was very satisfied with the facial prosthesis we fabricated for cosmetic and psychological recovery and the results were better than we had expected. Generally, the use of extraoral implants provides the most useful means of retaining and stabilizing a facial prosthesis (9-11). However, implant placement on irradiated bone carries a high risk of developing osteoradionecrosis (12). Considering this condition, we ruled out implant placement in the bone adjacent at the initial stage of treatment planning.

Surgical reconstruction had been the only choice available in our hospital for repair of facial defects before we fabricated this prosthesis. We accept that this facial prosthesis for the patient may be viewed as only a temporary and alternative method for use instead of reconstructive surgery. However, the success of the prosthesis has provided us with another treatment option and therefore we advocate the use of facial prosthetic rehabilitation in combination with surgical reconstruction for improving the quality of life of patients with severe facial defects.
A large maxillofacial prosthesis

Figure 9. Front view with the facial prosthesis in place.

Figure 10. Side view with the facial prosthesis in place.

References