

Rehabilitation of a bilateral maxillectomy patient with a free fibula osteocutaneous flap*

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SUMMARY Rehabilitation of patients who have undergone bilateral maxillectomy is difficult because of extensive loss of bone and soft tissue. In this clinical report, prosthodontic rehabilitation of oral function in a bilateral maxillectomy patient combined with a new fibular osteocutaneous flap, which was designed to have two oronasal slits for the retention of an obturator prosthesis, was described. A 58-year-old man with a maxillary alveolar carcinoma underwent bilateral maxillectomy. The defect was reconstructed using a vascularized fibular bone wrapped circumferentially with a peroneal flap, which was fixed with miniplates between the right malar prominence and cut edge of the left zygoma remaining two slits anterior and posterior to the graft. Two and half weeks after the surgery, a delayed surgical obturator was delivered and an obturator prosthesis was delivered 6 weeks after the surgery. This obturator prosthesis could be extended into the slits to engage the tissue undercuts, and

was stable during use. Mastication, deglutition, articulation and the mid-facial profile of the patient were rehabilitated. After installation of the obturator prosthesis, relining of the prosthesis base was carried out alongside the healing process of the graft, and adjustment of occlusions and high-pressure spots was carried out. No clinical disorders were observed either in the grafted tissue or the obturator prosthesis with a 3-year prognosis. Newly designing a fibular osteocutaneous flap combined with tissue-borne obturator prosthesis is one successful approach to the restoration of oral function, and increases the patient's quality of life after bilateral maxillectomy.

Keywords: obturator prosthesis, reconstruction, osseouscutaneous free fibula graft, rehabilitation, bilateral maxillectomy

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Introduction

Rehabilitation of patients with bilateral maxillectomy is challenging. In unilateral maxillectomy patients, functional problems concerning mastication, deglutition, and articulation caused by oronasal or oroantral incompetence can be rehabilitated to close to normal function and appearance with a tissue-borne obturator prosthesis (1). However, when it comes to rehabilitation of bilateral maxillectomy patients, it is very difficult to achieve functional rehabilitation by means of prosthetic

methods alone because of instability of the prosthesis resulting from extensive bone and soft tissue loss. An osteocutaneous flap with osseointegrated dental implants is reported to be necessary for the functional rehabilitation of these patients (1–4), but it is not always possible for a patient to undergo the further surgical procedures needed to embed fixtures for dental implant abutments in the grafted bone. If dental implant treatment is ruled out, surgical rehabilitation may not enhance and can even interfere with the eventual prosthetic treatment (5). To cope with these conditions, rehabilitation of oral function with a tissue-borne obturator prosthesis combined with a free fibular osteocutaneous flap linking between the right malar

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prominence and cut edge of the left zygoma was planned in a bilateral maxillectomy patient without any support from dental implants. The 3-year prognosis of treatment of the patient is described below.

Materials and methods

Clinical report

A 58-year-old man with a maxillary malignant tumour was referred to the Tokyo Medical and Dental University's Clinic of Maxillofacial Prosthetics before surgical resection of the tumour for functional post-surgical rehabilitation in July 2000. As squamous cell carcinoma was widespread, occupying the left maxillary sinus, resection of bilateral nasal cavity and bilateral maxillectomy except for the right retromolar tuberosity was planned (Fig. 1a and b). As resection was intended to be extensive, reconstructive surgery alone could not rectify the structure and profile of the patient. Post-surgical rehabilitation of the patient was discussed among head and neck surgeons, plastic surgeons and maxillofacial prosthodontists and reconstructive surgery using a fibular osteocutaneous flap followed by prosthetic rehabilitation with an obturator prosthesis was planned before the surgery. As the properties of the free fibular osteocutaneous flap were different from those of the gingival and alveolar ridge, providing a stable conventional denture on the skin of a free flap is difficult and occasionally impossible (6).

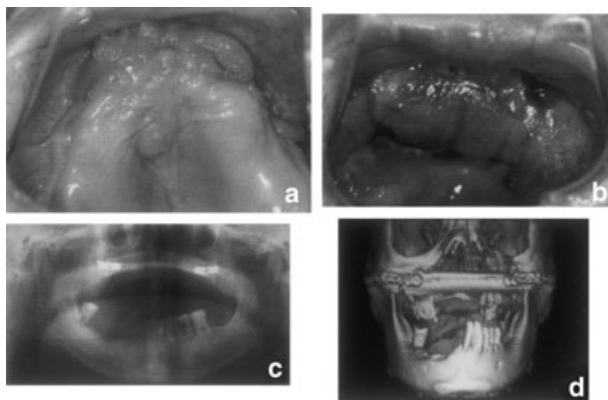


Fig. 1. Intraoral condition before and after the surgery. (a) The maxilla before surgery. (b) Intraoral view of reconstructed maxilla 18 days after the surgery. (c) Orthopantomograph after the surgery. (d) A reconstructed image of computer tomography after the surgery.

To make tissue undercuts where tissue-borne obturator prosthesis seek the retention, a new vascularized fibular bone graft was designed, which was wrapped circumferentially with its skin portion, and fixed with miniplates between the right malar prominence and cut edge of the left zygoma remaining two slits anterior and posterior to the graft.

Results

Two and half weeks after surgery, the patient was again referred to the Clinic of Maxillofacial Prosthetics for prosthetic rehabilitation. A free fibular osteocutaneous flap was situated where the hard palate had been present and a right retromolar tuberosity remained. The peroneal artery and vein were anastomosed to the facial artery and anterior jugular vein. Two carefully designed oronasal slits were observed anteriorly and posteriorly to the osteocutaneous flap (Fig. 1c and d). An impression of the maxilla was made using irreversible hydrocolloid impression material (Algiace Z)* (Fig. 2a). The delayed surgical obturator was installed in the patient 3 days after the impression (Fig. 2b–e) and was stable enough to facilitate the speech and swallowing of the patient.

As the patient's intraoral structure was quite different from those of conventional maxillectomy patients, a processed record base was prepared to maximize the stability of a wax rim during maxillo-mandibular registration and a try-in of a wax trial obturator prosthesis (Fig. 3) (7). Because of healing of the osteocutaneous flap, further engagement of undercut was obtained with the anterior process of the processed record base (Fig. 4a and b). The obturator prosthesis was delivered 6 weeks after the surgery. The fabricated obturator prosthesis was stable during use (Fig. 4c and d). It provided both functional rehabilitation of mastication, deglutition and articulation and also the aesthetics of the face by restoration of the contours of the midfacial area (Fig. 5b). Three years after delivery of the obturator, no clinical disorders were observed either in the grafted or remaining tissue (Fig. 6). Only normal treatment procedures such as adjustment of the denture base and occlusion were carried out after installation of the prosthesis.

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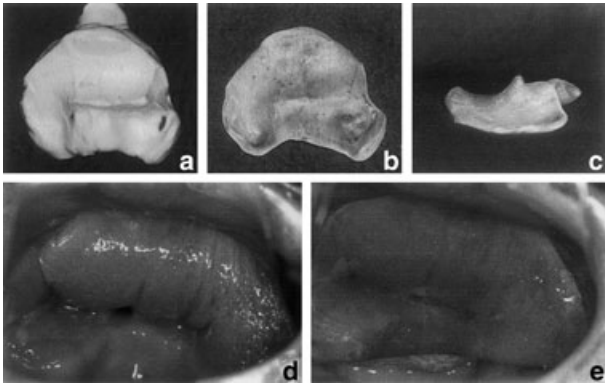


Fig. 2. Fabrication of surgical obturator. (a) Irreversible hydrocolloid impression of the grafted maxilla. (b, c) Mucosal and lateral view of the surgical obturator. (d) Intraoral view of reconstructed maxilla 21 days after surgery. (e) The surgical obturator in position.

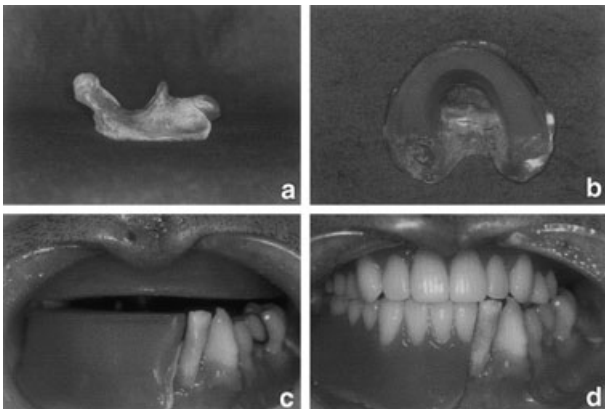


Fig. 3. Fabrication procedure of obturator prosthesis. (a) Lateral view of the processed record base. (b) Bite plate for registration of jaw relationship. (c) Registration of jaw relationship. (d) Try-in of the wax obturator prosthesis.

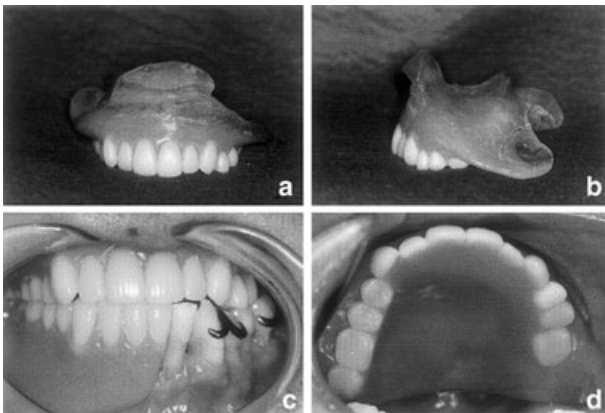


Fig. 4. Fabricated obturator prosthesis. (a, b) Frontal and lateral view of the obturator prosthesis. (c, d) Frontal and occlusal view of the obturator prosthesis in position.

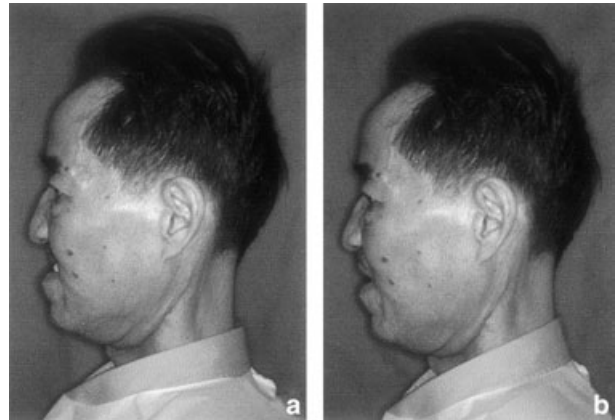


Fig. 5. Profile of midface area. (a) Profile of the patient without and (b) with the obturator prosthesis.

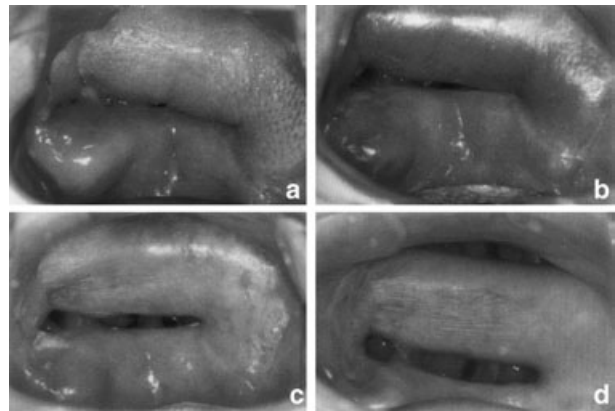


Fig. 6. Temporal change of intraoral structure of the patient. (a) 2 months, (b) 8 months, (c) 15 months and (d) 26 months after the plastic surgery. No clinical disorders were observed on the supporting tissues.

Discussion

The alveolar height and depths of the buccal and lingual sulci tend to be blunted after plastic surgery: what is normally a well-defined alveolar ridge is replaced by a relatively flat surface that is unsatisfactory for either retention or stabilization of a tissue-borne obturator prosthesis (1). Further, denture support and retention are optimal if the soft tissue over the load-bearing bone is thin and immobile (4). When intraoral soft tissue is replaced with a cutaneous flap, the soft tissue over the bone becomes thick and mobile. These conditions affect the stability of the denture resting on the cutaneous flap (1). In this clinical report, the fibular osteocutaneous flap was grafted to space of the maxillary defect

remaining oronasal slits anteriorly and posteriorly to the osteocutaneous flap. The grafted fibula bone gives support against the occlusal force and the oronasal slits provide the undercut to enable the denture to be retained. In particular, extension of anterior process of the obturator prosthesis to the anterior slit makes it possible to utilize an undercut engaging with the antrum and posterior process extending into the posterior slit counteracting to the anterior process to ensure retention.

Originally, the dental implants anchored against the grafted fibula bone were planned, as osseointegrated implants are reported to be essential for stability of prosthesis on the free osteocutaneous flap (1, 4). However, this plan had to be cancelled, as radiotherapy (50 Gy) was performed on the remaining tissue after surgery. The observed shrinkage of the skin covering the graft was likely to be not only because of the healing process of grafted tissue but also the result of radiotherapy.

As a 3-year prognosis of this case, dentures became acceptably stable during speech, mastication and swallowing without the need for mechanical support from osseointegrated dental implants. Furthermore, no clinical disorders were observed on the grafted tissue.

Quality of life is an important issue for the patients with nasopharyngeal cancer. Radiotherapy is a good treatment modality which can preserve the function and shape of the organ. Although radiotherapy is preferred, some side-effects are found (8). The present report is the first case which free fibula graft was performed with intentionally prepared oronasal slits. Further study was required to compare the prognosis of the new method with other treatment modalities such as radiotherapy and other surgical methods.

Conclusion

Controversy still exists as to whether defects in cases like this should be reconstructed. This operation is one of the methods to enhance the result of rehabilitation in

bilateral maxillectomy patients followed by use of a free fibular osteocutaneous flap, especially when dental implants cannot be indicated, within the limitation of our 3-year prognosis of the case.

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