Pedicled partial thickness clavicular graft for oromandibular reconstruction

Wenquan Zhao, DDS, MD,[a] Jianhua Liu, DDS, MD, PhD,[a] Dong Wei, DDS, MD,[a] Junhua Xu, DDS, MD,[b] and Huiming Wang, DDS, MD, PhD[a]

Objective. To report our experience on pedicled partial-thickness clavicular graft (PPCG) for oromandibular reconstruction.
Study Design. PPCG was used for oromandibular reconstruction after tumor resection in 23 patients with early-stage gingival carcinoma but were eager for postoperative dental implant therapy for restoration of good occlusal function. PPCG was harvested during neck dissection. The sternocleidomastoid (SCM) myocutaneous flap was also harvested in 18 cases. Dental implants were placed in the clavicular graft of 19 cases, and the other 4 declined because of financial concerns. Postoperative viability of the flaps and the dental implants were assessed.
Results. All the clavicular grafts survived without necrosis and implant-supported dentures of 19 patients provided satisfactory occlusion and masticatory function. Complications, although low in occurrence, included partial skin pedicle loss, nonunion between the clavicular graft and the remaining inferior border of the mandible, and clavicular bone fracture.
Conclusions. PPCG is a simple but reliable procedure for reconstruction of severe alveolar defects. Correct preoperative evaluation and precise surgical technique contribute to higher success rates and lower complication rates. It is a viable reconstructive option for early-stage gingival carcinoma requiring neck dissection without postoperative radiation therapy.
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For reconstruction of mandibular defects and surrounding soft tissue bulk lost after tumor resection, conventional procedures are the autogenous bone flap and free vascularized bone flap. Free osseous myocutaneous flaps of the fibula[1] or ilium[2] have been used, as well as double free flaps,[3] to reconstruct composite defects of the mandible and surrounding soft tissue. These flaps are suitable for large mandibular defects but are excessive for smaller-sized alveolar defects, which are not commonly reconstructed. As such, these patients are frequently unable to regain good occlusal function because the bone defect complicates simple restoration with dentures.

We have successfully used sternocleidomastoid muscle (SCM) myocutaneous flaps (SCMMF) to repair oral soft tissue defects[4,5] in recent years. We have used the fundamental principles behind a successful SCMMF and modified it to harvest the pedicled partial-thickness clavicular graft (PPCG). From July 2009 to February 2011, we used this graft to repair severe alveolar defects in 23 cases, and here we report the outcomes of our cases.

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[a]Department of Oral and Maxillofacial surgery, The First Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou, P. R. China.
[b]Department of Dental Implantation, The First Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou, P. R. China.
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MATERIALS AND METHODS

Ethical approval for this study was obtained from the Research Ethics Board of the Ethics Committee, The First Affiliated Hospital, Zhejiang University. This study was in compliance with the Helsinki Declaration, and each subject in the project signed a detailed informed consent form. The 23 patients ranged in age from 39 to 65 years (mean 46.7 years). The pathology reports included 18 cases of squamous cell carcinoma (SCC), 3 of adenocarcinoma, and 2 of mucoepidermoid carcinoma. Sixteen cases were in stage I (T1N0M0), and 7 were in stage II (T2N0M0) (Table I).

All the patients received extensive tumor resection and ipsilateral neck dissection. Tumor resection was done with a marginal resection of the mandible, leaving a severe alveolar defect ranging in size from 3 cm × 0.6 cm to 5.5 cm × 1.4 cm.

Tumor resection and neck dissection

Marginal resection of the mandible was done simultaneously as tumor resection, with preservation of the inferior border of the mandible. Ipsilateral modified neck

Statement of Clinical Relevance

We introduce a modified method, pedicled partial thickness clavicular graft, for reconstruction of severe alveolar defect after tumor resection. This is a simple but reliable procedure. Correct preoperative evaluation and precise surgical technique contribute to higher success rates.

Table I. Patients (n = 23) with early-stage gingival carcinoma

						Complications		
No.	*Age (y)*	*Gender (F/M)*	*Diagnosis Staging*	*SCMMF (Y/N)*	*Dental implant (Y/N)*	*Partial loss of the skin pedicle (Y/N)*	*Fracture of clavicle (Y/N)*	*Wide gap between mandible and bone graft (Y/N)*
1	44	M	SCC/II	Y	Y	N	Y	N
2	39	F	SCC/I	Y	Y	N	N	N
3	43	M	SCC/I	N	Y	N	N	N
4	52	F	MEC/I	Y	N	N	N	N
5	41	F	SCC/II	Y	N	Y	N	N
6	41	M	SCC/I	Y	Y	N	N	N
7	52	F	SCC/I	Y	Y	N	N	N
8	48	M	SCC/II	Y	Y	N	N	Y
9	51	M	SCC/I	N	Y	N	N	N
10	45	M	SCC/I	Y	Y	N	N	N
11	41	M	SCC/I	Y	Y	N	N	N
12	52	F	MEC/I	Y	Y	N	N	N
13	44	F	SCC/I	N	Y	N	N	N
14	46	F	AC/I	Y	Y	N	N	N
15	43	M	SCC/II	Y	Y	N	Y	Y
16	48	F	SCC/I	N	Y	N	N	N
17	52	M	SCC/II	Y	N	N	N	N
18	45	M	AC/I	Y	N	N	N	N
19	49	M	SCC/II	Y	Y	Y	N	N
20	65	F	SCC/I	N	Y	N	N	N
21	42	F	SCC/I	Y	Y	N	N	N
22	49	M	SCC/I	Y	Y	N	N	N
23	42	M	AC/II	Y	Y	N	N	Y

SCC, Squamous cell carcinoma; *MEC*, mucoepidermoid carcinoma; *AC*, adenocarcinoma; *SCMMF*, sternocleidomastoid muscle myocutaneous flap.

dissection was done, sparing the accessory nerve, internal jugular vein, and SCM. The superior thyroid artery and the accompanying vein were carefully protected (Figure 1). During the operation, we confirmed through frozen biopsy that there were no metastatic cervical lymph nodes.

Preparing the flap

Before the operation, finite element analysis (FEA) (Figure 2) was done to assess the size of the bone graft that the clavicle could provide while preserving the function and continuity of the sternoclavicular and acromioclavicular joints. After the neck dissection stage of the surgery, the partial-thickness clavicular graft was harvested (Figures 3 and 4). Where necessary, the SCMMF was also prepared accordingly should its use be warranted later.

Repair of the defect

The clavicular bone graft and SCMMF were rotated and tunneled into the oral cavity along the medial side of the mandible to repair the severe alveolar defect, and mini-titanium plates were used to fix the bone graft.

Postoperative management

Negative pressure drainage was used to reduce the dead space between the defect and the partial-thickness clavicular osteomyocutaneous flap. Oral rinses twice daily and oronasal feeding were performed in the subsequent 5 days to maintain good oral hygiene and nutrition, respectively. We assessed the postoperative viability of the bone graft, and all complications were recorded during a follow-up period of 8 to approximately 55 months. No patients received radiotherapy or chemotherapy (none had metastatic cervical lymph nodes or positive surgical margins), but all were closely reviewed over the course of treatment.

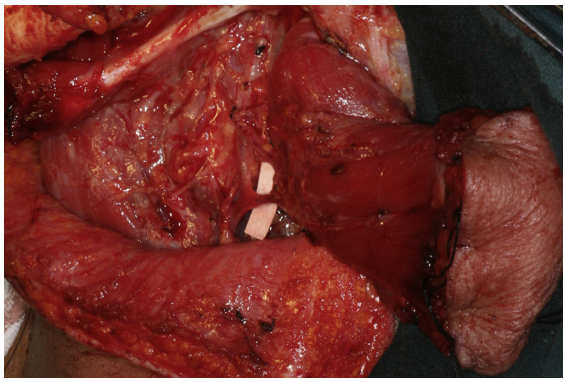

Fig. 1. The superior thyroid artery and the accompanying vein are carefully protected.