

CASE REPORT

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Restoration of oral competence in double free flap reconstructions of massive lower facial defects with fascia lata slings – Case series and review of the literature

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ABSTRACT

Restoration of adequate oral competence is especially challenging in double free flap reconstructions of massive head and neck defects resulting from composite resections. Our report illustrates that oral competence in double free flap reconstructions of extensive oromandibular defects can be successfully restored with tensor fascia lata suspension slings.

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Introduction



Composite oromandibular resections of the face due to advanced oral cancer involve multiple structures such as lip, external skin, oral mucosa, tongue and mandibular bone, thus require complex reconstructions of extensive structural and functional defects. The reconstruction aims to restore the mandibular skeletal defect, provide sufficient skin coverage and create oral lining with an adequate oral competence and an intact swallowing mechanism. It, furthermore, aims to achieve a reasonable appearance of the face that allows for social interaction.

Pedicled flaps have been used for head and neck reconstructions, such as the pectoralis major musculocutaneous flap [1] or the latissimus dorsi musculocutaneous flap [2]. However, they do not always provide the necessary tissue components, and are especially insufficient if a bony reconstruction is required [3]. Another concept in head and neck reconstruction is flap prefabrication. This technique, however, is only suitable for selected patients and only allows for the creation of especially thin flaps which may not be viable if a composite reconstruction is needed [4]. With the advent of microsurgery, free tissue transfer has become the preferred method of reconstruction for large head and neck defects. Free vascularized bone grafts are today considered the gold standard in mandibular

reconstruction [5]. The free osteocutaneous iliac crest flap has been widely used for mandibular reconstructions, and combined with a portion of the internal oblique muscle, provides additional tissue to reconstruct intraoral mucosal defects [6]. However, with its reliable skin island, lengthy pedicle and larger bone supply, the free osteocutaneous fibula flap has surpassed the iliac crest flap and today is the preferred option for mandibular reconstruction in most centers [5]. It can be used to reconstruct the skeletal framework of the mandible from angle to angle and its reliable skin island can provide internal oral lining. Further benefits include a favorable donor site morbidity and a good potential for contouring [7].

In reconstruction of extensive composite defects, however, a single free flap may not fulfill both the bony and soft tissue requirements in terms of lining and volume, resulting in unfavorable functional and aesthetic outcomes [8,9]. The simultaneous use of a second free flap can be an appropriate solution to overcome these problems [10,11]. In recent years, several case series have been published, highlighting the feasibility and superiority of a simultaneous double free flap approach compared to the use of a single free flap in reconstructions of extensive composite head and neck defects [10–12].

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Functional outcomes after these complex reconstructions considerably vary in the literature, especially with respect to the restoration of oral competence [11,13]. So far, little attention has been paid to adjunct techniques in complex oromandibular reconstructions that help to durably maintain oral competence when the lower lip, chin and complete mandible are reconstructed with double free flaps. The use of tensor fascia lata slings to suspend the oral sphincter is a well-established procedure to restore oral competence in the static reconstruction of facial paralyses [14]. For the reconstruction of extensive lower lip defects, fascia lata suspension slings have been described as parts of free composite anterolateral thigh (ALT) flaps with good functional outcomes in terms of oral competence [15]. However, fascia lata suspension slings have not been used to restore oral competence in reconstructions of extensive composite oromandibular defects with double free flaps.

In this article, we report our experience in two cases of double free flap reconstructions in which oral competence was successfully restored by the suspension of an ALT free flap with a fascia lata graft.

Case 1

Patient 1 was a 56-year-old male patient who presented with a T4 N2c M0 squamous cell carcinoma infiltrating the entire lower lip, part of the upper lip, chin, neck, cheek and mandible (Figure 1, Panel A). After composite resection of the tumor and bilateral neck dissection, the final defect measured over 200 cm² including the intraoral buccal mucosa, the mandible (from angle to angle), lower muscles of facial expression, the oral commissure and modiolus on both sides, the entire lower lip, 50% of the upper lip, the chin and submental soft tissue (Figure 1, Panel B). The patient's mandibular and intraoral mucosal defect was reconstructed with a free fibula flap from the right leg with a skin paddle measuring 14 cm x 8 cm along with a 2.4-mm reconstruction plate. The fibula was adjusted to the shape of the mandible with two closing wedge osteotomies. The external soft tissue defect was reconstructed using an ALT flap from the right thigh with a skin paddle measuring 25 cm x 8 cm. The fibula flap was anastomosed to the right superior thyroid artery and the right facial vein. The contralateral superior thyroid artery and facial vein were used for the anastomosis of the ALT flap. In order to create oral competence the skin paddles of the ALT and fibula flaps were tailored and the folded ALT flap (reconstructed lower lip) was suspended with a rolled tensor fascia lata sling from the right thigh, which was anchored bilaterally on the anterior aspect of the zygoma (Figure 2).

Postoperatively the patient developed partial necrosis in the periphery of the ALT flap, which was most likely due to his history of significant smoking and drug abuse. After debridement the defect was covered with a right cheek advancement flap measuring 30 cm². The patient underwent adjuvant chemotherapy and radiation and his further recovery was uneventful. On 3-month and 7-month follow-up his tissue coverage was stable and oral competence was adequate (Figure 1, Panel C,D,E).

The patient was initially lost to follow-up, but presented 4 years later to the emergency room with a large open wound of his left mandible. He reported that he had been fishing and a fish hook had caught in his mouth leading to an infection. Over a 4-year-period he had been able to maintain his weight through an oral diet. PET and MRI scans were negative for any recurrent malignancy. After debridement of the wound the left half of the reconstruction plate was removed. The fibula bone underneath was bleeding and appeared to be viable. The superficial bone layer was debrided and specimens were positive for osteomyelitis. Upon debridement the defect measured 10 x 5 cm. An ALT flap with a skin paddle measuring 32 x 7 cm was harvested from the left leg together with a small cuff of vastus lateralis muscle in order to provide additional soft tissue coverage to the lower chin unit. The ALT artery was anastomosed to the left transverse cervical artery. The anterior and external jugular veins were used for the venous anastomosis. A bilateral commissuroplasty was performed because the patient had preoperatively suffered from relative microstomia.

Postoperatively the flap appeared to be vital and showed no signs of necrosis. Seven days postoperatively the patient was able to feed by oral soft diet (Figure 1, Panel F). A 6-week intravenous antibiotics treatment was administered.

Case 2

Patient 2 was a 45-year-old male patient who presented with a T3 N0 M0 recurrent squamous cell carcinoma involving the entire lower lip, chin, neck, cheek and mandible. He had undergone previous resections of his lower lip carcinoma and a left tonsillectomy a year before. He had received postoperative radiation and chemotherapy and presented with a recurrence of his cancer as well as osteoradionecrosis of the mandible requiring composite resection of his tumor and bilateral neck dissection.

The patient's mandibular and intraoral mucosal defect was reconstructed with a free fibula flap from the right leg with a skin paddle measuring 17 x 8 cm along with a 2.4-mm reconstruction plate. A closing wedge



Figure 1. A case of a 56-year-old male patient who underwent a composite resection of a T4 N2c M0 squamous cell carcinoma of the lower face as well as double free flap reconstruction with a free fibula – and ALT flap: Panel A: Patient 1 preoperative. Panel B: Patient 1 intraoperative after composite resection of his tumor. Panel C: Patient 1 after double free flap reconstruction with an ALT- and free fibula flap on 3-month follow-up. Panels D and E: 7-month follow-up. Panel F: Patient 1 7 days after reconstruction of the lip–chin unit with a second ALT flap 4 years after his initial double free flap reconstruction.

osteotomy was performed at the area of the mandibular symphysis on the fibula to allow for the bend of the fibula into the contours of the mandible. An ALT flap from the right leg with a skin paddle measuring 14×22 cm was used to reconstruct the external soft tissue. The left lingual artery and the internal jugular vein served as recipient vessels for the free fibula flap. The ALT flap was anastomosed to the ipsilateral facial artery and the internal jugular vein. As in the previous case, a tensor fascia lata sling anchored bilaterally on the anterior aspect of the zygoma was used to suspend

the lower lip reconstruction and restore oral competence (Figure 3).

On postoperative day 3 the patient presented with an acute arterial thrombosis of the ALT artery. The arterial anastomosis was revised and the left ascending pharyngeal artery was employed as a recipient vessel for reanastomosis to the ALT artery. Despite revision of the anastomosis, the flap progressed on to total necrosis likely due to the no reflow phenomenon. The patient received a second ALT flap from the left thigh with a 14×26 cm skin paddle. An end-to-side anastomosis

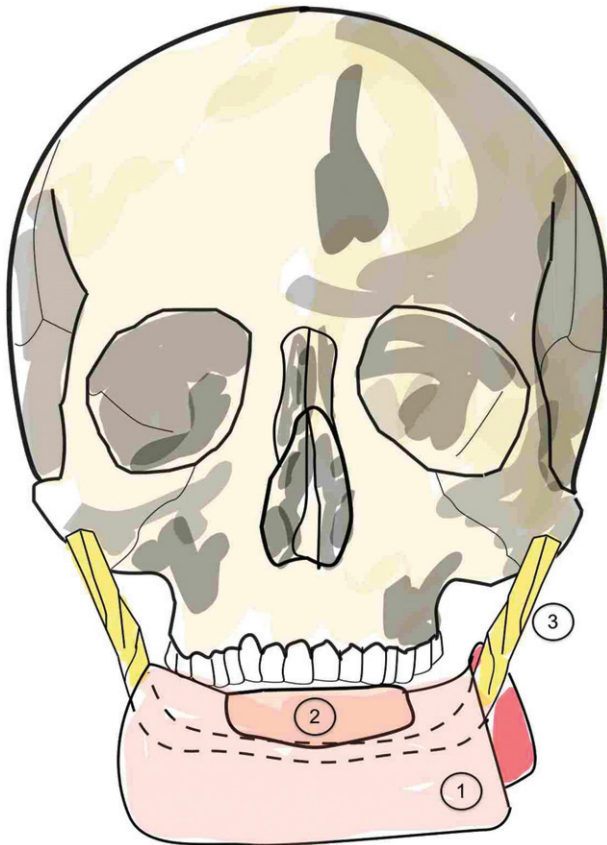


Figure 2. A free ALT flap folded around a rolled tensor fascia lata sling anchored to the zygoma bilaterally was employed to restore oral competence: (1) skin paddle of the free ALT flap; (2) skin paddle of the free fibula flap and (3) tensor fascia lata sling.



Figure 3. Tensor fascia lata graft in Patient 2 intraoperative after anastomosis and placement of the free fibula flap with reconstruction plate.

between the ALT artery and the right common carotid artery was performed. The right internal jugular vein served as recipient vessel for the venous anastomosis. The right neck was chosen since this area was likely less scarred from prior surgery. At the conclusion of the case

a strong Doppler signal over both artery and vein was heard and the flap appeared to be well perfused with good capillary refill. The patient's course was further complicated by superficial dehiscence and wound breakdown of the left ALT flap and he was taken to the operating room on postoperative day 14 for neck exploration and closure of the flap dehiscence.

The patient's arterial thrombosis was most likely the result of exuberant atherosclerosis due to a significant history of smoking, substance abuse and radiation. The second ALT flap survived completely and healed uneventfully. On 3-month follow-up the patient's tissue coverage was stable and he had adequate oral competence allowing him to tolerate an oral diet.

Discussion

Lip defects of less than 60% (of a total 200%: 100% lower lip + 100% upper lip) of oral aperture can be reconstructed with advancement flaps from the remaining lip [16]. Larger lip defects would result in considerable microstomia if reconstructed with advancement flaps, thus free flap reconstruction is usually required. The free muscular gracilis flap has been described as a reliable option for functional reconstruction of large full-thickness lower lip defects [17]. However, in our cases not only the complete lower lip, but also part of the upper lip (140–160%: 100% of lower lip + 40–60% of upper lip), the chin and the submental region had to be restored. A gracilis flap does not provide enough soft tissue coverage and therefore would not have been a viable option in our cases.

Based on prior studies, extensive composite defects of the lower third of the face are best reconstructed using a double free flap approach [18].

Jeng et al. described the use of fascia lata grafts in patients with extensive oromandibular defects in order to reconstruct the oral sphincter [11]. They anchored the reconstructed lip-chin unit to the remaining upper lip and wove the fascia lata grafts into the orbicularis muscle [11]. This technique, however, cannot be employed if most of the upper lip and orbicularis muscle had been resected as in our cases. We used a free fibula osteoseptocutaneous flap to reconstruct the mandible and the intraoral mucosal defect. An ALT flap provided ample tissue to reconstruct the external surface of the cheek, lips, chin and neck. Its pliability allowed us to suture it to the skin paddle of the fibula flap in order to reconstruct the gingivobuccal sulcus and the vermilion-cutaneous junction. A rolled tensor fascia lata graft anchored to the zygoma on both sides was used to suspend the folded ALT flap. The fascia lata suspension sling recreated the superolaterally directed

vector of the intact modiolus and counteracted the inferiorly directed vector of gravity that causes oral incompetence.

Functional outcomes with respect to oral competence considerably vary in the literature. Extensive resections in cases of advanced tumor stages may comprise the lower mimic musculature often resulting in postoperative oral incompetence. Drooling and loss of speech may be emotionally burdensome for patients and lead to social disintegration. Posch et al. reported oral incontinence in 67% of patients after reconstruction of head and neck defects with fibula and ALT flaps [13]. Bianchi et al., however, reported a good oral competence in 8 of 10 patients after reconstruction of extensive anterior oromandibular defects with double free flaps [19]. Jeng et al. who used fascia lata grafts to reconstruct the oral sphincter noted occasional drooling only in one of 10 patients after double free flap reconstruction [11]. Both our patients demonstrated a good oral competence after double free flap reconstruction with fascia lata slings. Patient 1 was able to maintain his weight through an oral diet after his extensive surgery over a period of 4 years.

Gabr et al. reported a fair to poor speech in 100% and poor chewing in 71% of their patients after double free flap reconstructions of head and neck defects [20]. Jeng et al., however, noted near normal speech and the ability to tolerate a soft diet in all patients following double free flap reconstructions [11]. Hanasono et al. report a speech intelligibility of in 80% or greater in 81% of their patients following multiple free flap reconstructions of head and neck defects. Seventy-two percent of the patients in their study were able to tolerate a soft or regular oral diet postoperatively [10]. Both our patients displayed little ability to speak, particularly since Patient 1 was a deaf mute. They had, however, the ability to chew and consume solid foods. Both our patients displayed little ability to speak, particularly since Patient 1 was a deaf mute. They had, however, the ability to chew and consume solid foods. Patient 1 suffered from postoperative relative microstomia. Therefore, a bilateral commissuroplasty was performed at the time of his second free flap reconstruction with an ALT from the left leg.

Previous studies have reported a mean survival time from 20 to 36 months following double free flap reconstructions of T4/Stage IV tumors [13]. In our cases, the longest follow-up was 52 months without malignant recurrence. Free flap survival in this region was reported to be 96–100% [11,13]. Patient 2 lost his first ALT flap on postoperative day 3 probably due to severe atherosclerosis, history of smoking and radiation. He recovered uneventfully after reconstruction of the lip–chin unit with a contralateral ALT flap.

Oral competence is a crucial outcome measure of reconstructions of extensive oromandibular defects since it critically affects the social reintegration of patients after surgery. Our report illustrates that tensor fascia lata suspension grafts can serve as a helpful tool to improve oral competence in double free flap reconstructions of extensive lower facial defects.

Declaration of interest

The authors declare that there are no conflicts of interest. The funding of this study was solely institutional.

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