

Bilateral Tunneled Supraclavicular Island Flaps for Simultaneous Reconstruction of Massive Facial Defect and Intraoral Lining

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Abstract: Reconstructive procedures in the head and neck region use a wide range of flaps for defect closure. The methods range from local, mostly myocutaneous flaps and skin grafts to free microsurgical flaps. To ensure a satisfactory functional and aesthetic result, good texture and color of the flap are always essential. Moreover, the donor-site defect needs to be reduced, with no resulting functional or aesthetic impairment. The supraclavicular island flap has been used successfully for difficult facial reconstruction cases, providing acceptable results without using microsurgical techniques. As a complementary study to the publication by Heitland and Pallua (*Plast Reconstr Surg* 2005;115:1591), we report our preliminary clinical experience with bilateral tunneled supraclavicular island flaps for simultaneous reconstruction of massive facial defect and intraoral lining in massively progressed invasive squamous cell carcinoma of the lower lip with severe intraoral extension.

This thin flap is easy and quick to harvest, has a reliable pedicle, and has minimal donor-site morbidity. It is now the authors' flap of choice for many common head and neck reconstructive problems.

Key Words: Supraclavicular island flap, massive facial defect, intraoral lining reconstruction, squamous cell carcinoma

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The supraclavicular island flap has been used successfully for difficult facial reconstruction cases, providing acceptable results without using microsurgical techniques. As a complementary study to the publication by Heitland and Pallua,¹ we report our preliminary clinical experience with bilateral tunneled supraclavicular island flaps for simultaneous reconstruction of massive facial defect and intraoral lining in massively progressed invasive squamous cell carcinoma (SCC) of the lower lip with severe intraoral extension. The visibility of the head and neck during social contact and the fact that these regions have high movement make reconstructive proce-

dures in this area a challenge.² In the face, surgical reconstruction has to take account of the aesthetic units and provide a thin flap to enable mimic function.³ Again, the texture of the transferred skin has to be considered. Head and neck soft-tissue oncologic resections often result in complex reconstructive problems that require a dependable local, regional, or free flap to restore both form and function. With recent advances in microsurgical free-tissue transfers, the reconstructive bar has been elevated. Significant donor-site morbidity is neither acceptable nor necessary. As a basic concept, first formulated by Gillies⁴ in 1920, the more adjacent the donor site is, the better the skin will match the recipient site.^{4–6} To achieve these goals, a thin reliable flap, harvested close to the face/neck region with good skin texture match, and a smooth hairless skin surface—one that provides sensitivity—are needed. Everyday clothing should conceal the donor site. For resurfacing of defects in the head and neck, fasciocutaneous flaps should be used. In 1842, Mutter⁷ was first in describing a random patterned flap of the supraclavicular region extending toward the shoulder. In 1949, the first clinical application of a flap from the shoulder (“charretera” or acromial flap) was performed by Kazanjian and Converse.⁸ Charretera, in Spanish, means the shoulder area where honors are bestowed on military personnel. After further modification⁹ and closer examination of the vascularization, the flap was described as the supraclavicular axial patterned flap.¹⁰ Anatomically, the neck/shoulder flap was based on the supraclavicular artery. Since it has been used, the flap has been controversial because of the reported incidence of distal flap necrosis.¹¹ Beginning in the 1990s, Pallua et al^{12,13} “rediscovered” this flap and popularized its use by performing detailed anatomic studies examining the vascularity of what is known today as the supraclavicular island flap.^{12–14} We reduced the donor-site defect by limiting preparation to the size of the flap actually required. Thus, the pedicle was tunneled subcutaneously, and the scar around the shoulder was prevented from crossing the clavicle.

In this case, we present the application of bilateral tunneled supraclavicular island flaps for simultaneous reconstruction of massive facial defect and intraoral lining in massively progressed invasive SCC of the lower lip with severe intraoral extension.

CLINICAL REPORT

A 54-year-old man was presented with recurrent lower lip invasive SCC after lower lip wedge resection with safe margins 1 year ago. In his medical history, surprisingly, the patient had previous lower lip excisional biopsy, which had resulted as “keratoacanthoma.” Unfortunately, the patient refused a second operation and delayed his treatment for 9 months. Thereafter, his tumor extensively enlarged and invaded the intraoral lining and inferior oral sulcus. The patient was referred to an oncologist for adjuvant chemoradiation therapy. He came back to our department after 6 courses of chemotherapy and a second radiation because of severe tumor necrosis (Fig. 1).

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FIGURE 1. Severe tumor necrosis after chemoradiation therapy.

Complete resection of the lower lip and resection of the lateral portions of the upper lip (more than 1 cm from the right commissure and at least 2 cm from the left commissure) and mandible (from 2 cm above the right angle to the same region of the left angle) were done. Inferior oral sulcus and perioral soft tissue were excised. Thereafter, cervical central node dissection was performed. Bilateral parotid ducts and orifices were maintained. For maintaining the anatomic continuity, mandibular reconstructive plate (2/7 mm, AO system, Synthes, West Chester, PA) was applied. After wide resection of the tumor, because of the uncertain histology, complete removal was confirmed by pathology. Also, defects' coverage was performed after frozen section answers the safety margins (Fig. 2). Outlining of the flaps was drawn bilaterally. The cross in the supraclavicular region indicates the pedicle confirmed with Doppler sonography (Fig. 3). Afterward, the following steps were undertaken: (1) dissection of the flaps and preparation of the tunnels in both sides; (2) flap elevation and subcutaneous preparation; (3) transfer of the flap subcutaneously; (4) inseting of the tunneled flap from left side for intraoral lining (12 × 30 cm) and inseting of the tunneled flap from right side into the lower cheek, mandibular reconstructive plate, and upper neck (14 × 35 cm); and (5) closure of the donor sites was done with skin graft (Fig. 4).

Figures 5A and B show 6-day and 2-month postoperative photographs, respectively.

DISCUSSION

Over the past 30 years, our growing knowledge of skin vascular anatomy and physiology has led to significant advancements in



FIGURE 3. Outlining of the flap in the right side.

skin flap-harvesting techniques and technical refinements, making “forgotten” flaps more reliable and predictable.¹⁴ The supraclavicular artery island flap has been rediscovered by several groups after an extended period of absence from the literature.^{12,13,15–18} The goals of most head and neck oncologic reconstructive cases are to resurface ablative tumor tissue, restore tissue volume, and provide tissue lining. Reconstructive procedures in the head and neck region have to take account of anatomic, aesthetic, and functional aspects.^{2,5,6,19–21} First, normal contours have to be achieved; in the neck, the cervicomandibular angle has to be reformed. Second, the aesthetic units have to be taken into account. Third, the functional outcome has to ensure full range of movement, both of the lower face and of the neck. Finally, additional scarring of the upper chest should be avoided. To cover defects of the neck and head, thin flaps with good color-and-texture match should be used. The best color-and-texture match is achieved with local and regional flaps.^{4,22–24} Usability of the local flaps may be restricted because of radiation or destruction of vascularization.²⁵ For simultaneous extraoral and lining defect, the classic combination is of a prelaminate superficial temporal fascia flap and a skin graft²⁶ for the inner lining and the deltopectoral flap²⁷ for the outer lining. A second approach is to reconstruct the disfigured face by pedicled latissimus dorsi flaps in combination with an enoral skin graft for the inner lining.²⁸ Severe defects can also be reconstructed by free flaps, especially the free parascapular or scapular flap.²⁹ Microsurgical transplantation of free flaps enables coverage by vascularized tissue to fill larger defects. The preferred free flaps are the radial forearm flap and the latissimus dorsi and scapular flaps.^{20–22} The level of complications with free-tissue transfer ranges between 5% and 10%. In addition to technical problems, the aesthetic outcome largely depends on the donor site. Flaps from the trunk do not provide homogeneity of texture or color and thickness to the neck and head region.²³ The use

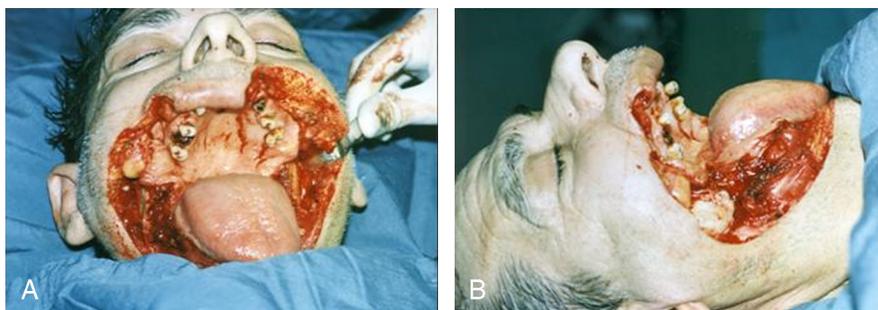


FIGURE 2. Complete resection of the lower lip and resection of lateral portions of the upper lip and mandible and resection of intraoral extension of the tumor.

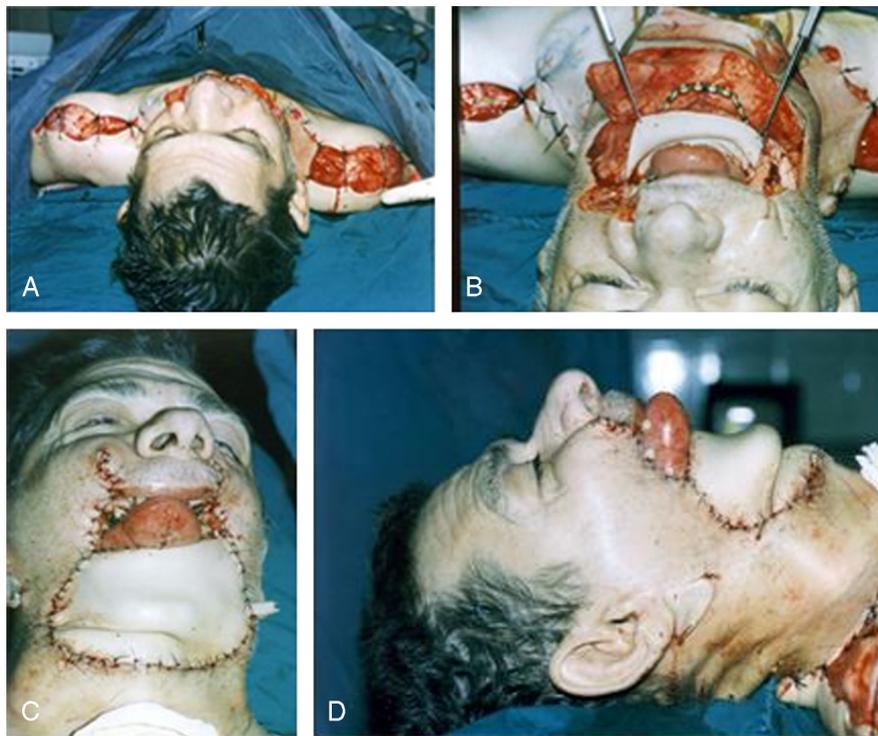


FIGURE 4. A, Dissection of the flaps and preparation of the tunnels in both sides, flap elevation and subcutaneous preparation. B, Transfer of the flap subcutaneously. C and D, Insetting of the tunneled flap from the left side for intraoral lining (12 × 30 cm) and inseting of the tunneled flap from the right side into the lower cheek, mandibular reconstructive plate, and upper neck (14 × 35 cm).

of regional flaps in reconstructive surgery gives high reliability when covering large defects and reduces the risk of complications to a level lower than found for free flaps. Aesthetic restoration of the head and neck is restricted by limited availability of local tissue. The shoulder is a region much easier to conceal and should therefore be used in reconstruction procedures if fasciocutaneous regional flaps are needed. The supraclavicular artery island flap was used to re-

construct oncologic ablative defects in critical locations, such as the pharyngeal wall, radiated neck, tracheal-stomal junction, mandible, parotid gland, and, in our case, for simultaneous intraoral lining. High-risk patients (those with advanced age, advanced tumors, poor nutrition, or multiple medical issues) are not always acceptable surgical candidates for potentially prolonged microsurgery; therefore, regional flaps remain the preferred technique in these more difficult cases.

The supraclavicular artery island flap is our flap of choice for most defects of the lower third of the face and neck oncologic defects. Flaps have been harvested successfully in patients with various comorbidities, including obesity, poor nutrition, diabetes, and smoking history. Flap survival is no different from that for any traditional flap. Contraindications have been limited to patients who have had previous bilateral neck dissections and/or radiated necks. The surgeon must adapt his/her choice of therapy to the patient and, especially in the third world, to local healthcare environments. In the current clinical case, the distal two thirds of the flaps was used for coverage in the lower third of the face from the right side and for intraoral lining from left side. Especially for intraoral lining where thin flaps are required, a nearly perfect tissue match of the flap is observed. By leaving a small rim of connective tissue around the pedicle, lymphostasis can be prevented, and versatility is ensured. The tunneling technique optimizes the surgical outcome by reducing the scar at the donor site. If thin flexible fasciocutaneous flaps are needed, the shoulder provides an easy-to-conceal donor site, which can be closed primarily. By clearly identifying the vascular pedicle of the supraclavicular island flap, this flap can be used by tunneling into defects in the face, neck, and anterior chest. As experience with the supraclavicular artery flap in head and neck reconstructive surgery expands, proper patient selection and improved technical refinements



FIGURE 5. A, Postoperative oblique view 6 days after operation with near-optimal color match and restoration of the submandibular angle appearance with good range of motion and continuity to intraoral lining. B, Postoperative result, 2 months after surgery. Scar redness still remaining.

will continue to be paramount. Preoperative computed tomography angiography may also become a critical part of preoperative flap planning for head and neck oncologic reconstruction. Perhaps in the future, flap variations could include composite flaps using both the supraclavicular island skin and an osteomusculocutaneous trapezius flap for selected head and neck oncologic defects such as in our case.

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