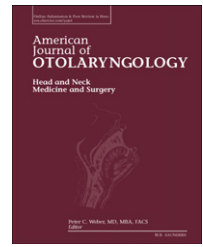


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# Sternocleidomastoid contour restoration: an added benefit of the anterolateral thigh free flap during facial reconstruction<sup>☆</sup>

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## ABSTRACT

**Purpose:** To demonstrate the potential of the anterolateral thigh free flap for neck contour restoration.

**Study design:** Retrospective chart review at a tertiary care medical center of patients who underwent radical parotidectomy with sternocleidomastoid sacrifice, with or without temporal bone resection, and reconstruction of both facial and cervical contour with the anterolateral thigh free flap between November 2011 and March 2015. Seven patients were included and demographics, flap viability, pathology and tumor staging, surgical intervention, adjunctive reanimation procedures, ischemia time, and pre-operative and post-operative photos were recorded and analyzed.

**Results:** There were no flap failures and the mean ischemia time was 82 minutes. There were 2 recipient site complications. Post-operative neck symmetry was improved for all 7 patients.

**Conclusions:** The adipofascial anterolateral thigh flap is useful for improving the aesthetic contour of the neck among patients undergoing sternocleidomastoid muscle resection/disinsertion following total parotidectomy with/without temporal bone resection. Contour restoration may be performed with minimal added morbidity and with relatively little additional operative time. This technique may be adapted for other complex facial and neck defects caused by ablative surgery.

*Level of Evidence:* 4

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## 1. Introduction

Extirpative head and neck surgery, particularly when combined with facial nerve sacrifice, may confer tremendous functional and aesthetic impairments on patients. In the case of high-grade

parotid malignancy, radical surgery performed with or without temporal bone resection and neck dissection is associated with even greater morbidity. In these cases, static and dynamic facial asymmetry due to loss of cranial nerve function coincides with a significant contour deformity at the angle of the mandible and at

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the neck, causing a “sunken in” appearance. The contour defect is further accentuated when the sternocleidomastoid (SCM) muscle is resected for complete tumor extirpation or is disinserted, and often ultimately removed, following temporal bone resection. This causes a significant soft tissue defect in the neck, adding to the inherent morbidity the primary procedure.

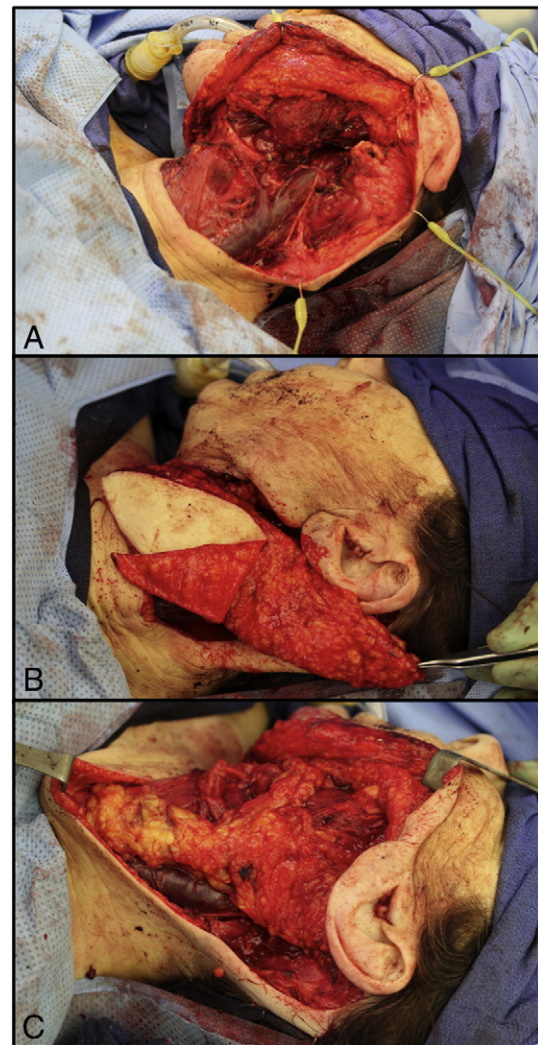
Given the potential psychological and social impact head and neck asymmetry may cause, recent emphasis has been placed upon using free tissue transfer to achieve satisfactory cosmetic results following complete tumor extirpation, and following adjuvant and neoadjuvant radiation therapy [1-4]. The anterolateral thigh (ALT) flap in particular has been shown to be an effective method for facial defect reconstruction following total parotidectomy [4-6]. Some benefits include minimal donor site morbidity, the possibility of a two-team approach, and access to the tensor fascia lata and the motor nerve to the vastus lateralis (MNVL) for facial reanimation. The long-term improvement in facial symmetry restoration is certainly one of its greatest attributes.

Relatively little consideration has been given to the neck asymmetry that may also accompany a facial contour defect. Given the ample tissue afforded by the ALT, we suggest that this flap may provide the additional benefit of resolving neck asymmetry following radical parotidectomy with temporal bone resection and SCM-sacrificing neck dissection. We describe a series of patients with parotid and temporal bone defects for which a standard adipofascial ALT flap was extended to re-establish normal SCM contour.

## 2. Methods

We obtained institutional review board (IRB) approval for this retrospective consecutive case series from the University of California San Francisco Medical Center, with a waiver of informed consent (IRB #14-14144). We identified 7 patients who underwent soft tissue reconstruction with an adipofascial ALT free tissue transfer between November 2011 and March 2015. All patients underwent radical parotidectomy with or without temporal bone resection and modified radical neck dissection including sacrifice of the SCM in the treatment of primary or recurrent cutaneous or salivary malignancy. Recorded information included patient demographics, flap viability, pathology and tumor staging, surgical intervention, adjunctive reanimation procedures, post-operative complications and adjuvant and neoadjuvant therapy.

Intraoperatively, the ALT flap was raised in the normal fashion and anastomosed to previously dissected vessels in the neck. After completion of the facial reanimation procedures, the flap was sutured into the defect site. Given that the soft tissue defect was greatest in the parotid bed/temporal bone area, the proximal aspect of the ALT flap was suspended superiorly, and even was occasionally turned over on itself to provide sufficient bulk. The distal, thinner part of the ALT was sutured either to the remnant SCM muscle inferiorly, or it was fixated to the sternal head of the clavicle. The flap was then de-epithelialized and carefully sculpted to faithfully recontour each patient's soft tissue defect (Fig. 1). When appropriate, a small crescent shaped skin paddle was placed in the retroauricular sulcus to permit easy flap monitoring.



**Fig. 1 – Intraoperative details. (A) Resection bed. (B) ALT flap during de-epithelialization, demonstrating adipofascial tissue for defect recontouring. (C) Trimmed ALT flap after inset, with anatomic volume restoration of the defect.**

## 3. Results

All 7 patients underwent radical parotidectomy and neck dissection with SCM sacrifice for treatment of malignancy; three patients had primary parotid malignancies and 4 patients had primary squamous cell carcinoma that either directly invaded or metastasized to the ipsilateral parotid gland (Table 1). Every patient received radiation therapy, either pre-operatively or post-operatively.

Four of the SCM contour reconstructions were completed immediately and the other 3 patients were reconstructed secondarily (dates from primary resection to definitive reconstruction ranged between 237 and 988 days). Four patients underwent simultaneous temporal bone resection. All patients had some degree of facial paralysis due to the burden of disease or previous resection, and 5 of the 7 patients underwent simultaneous facial reanimation procedures. There were no flap losses with an average ischemia time of 82 minutes. There was 1 donor site seroma.

**Table 1 – Patient demographics and outcomes. SCC: Squamous Cell Carcinoma.**

Patient	Gender	Age	Pathology	Stage	Pre-operative chemoradiation	Post-operative radiation	Post-operative chemotherapy	Survival (months)
1	M	71	Squamous Cell Carcinoma	pT4aN2b	N	Y	Y	21
2	M	46	Adenocarcinoma	pT2N2b	Y	N	N	25
3	M	76	Squamous Cell Carcinoma	pTxN2b	Y	N	Y	17
4	M	82	Mucoepidermoid Carcinoma	pT4aN2b	Y	N	N	26
5	M	57	Adenocarcinoma	pT4aN3	N	N	Y	17
6	F	64	Acinic Cell Carcinoma	pT4aN2b	N	Y	N	19
7	M	67	Squamous Cell Carcinoma	pT2N0	Y	N	N	5

There were 2 recipient site complications. One patient returned to the operating room for an awake tracheotomy and hemorrhage control for a wound hematoma unrelated to the flap. Another patient suffered a facial abscess at the temporalis tendon transfer site post-operatively requiring incision and drainage. Both patients recovered well from their complications.

Both face and neck symmetry were improved in all 7 patients. Photographs demonstrate the pre-operative tissue loss notable in the neck following a neck dissection, as well as the reconstructed SCM contour post-operatively in 2 of our patients (Figs. 2 and 3).

#### 4. Discussion

Neck contour defects are a common, yet underappreciated and usually unreconstructed component of the morbidity following radical head and neck cancer ablation. It is well known that cosmetic asymmetry and post-operative defects can negatively impact the social and emotional health of patients [7-9]. While there has been a dramatic increase in the use of SCM-sparing selective neck dissection techniques, the SCM still undergoes sacrifice in patients with advanced neck disease and among select patients undergoing temporal bone resection. Although the morbidity of SCM resection during radical or modified radical neck dissection is well known,

there is virtually no literature describing techniques for SCM contour restoration.

There is extensive literature describing a variety of techniques for reshaping facial contour following parotidectomy, though each method has its shortcomings. Local regional flaps, such as SCM [10], anterior cervical flaps [11], and platysmal flaps [12], are a convenient option for reconstruction, but these techniques may cause further donor site contour defects, particularly when used to repair large volume deficits. Acellular human dermal matrix (Alloderm; Lifecell Corporation, Bridgewater, NJ) [13], TPF flaps [14], and SMAS transposition have all been used successfully [15,16]. Though these methods may be adequate for superficial parotidectomy reconstruction, they may not provide enough volume for the defect resulting from a radical parotidectomy. Additionally, TPF flaps require superior extension of the incision and expose the patient to additional risks including alopecia, zygomatic arch fullness, and injury to the frontal branch of the facial nerve [17]. Non-vascularized fat transfer has a long history of use for parotid reconstruction [17,18], however long-term results vary. Free fat is avascular, and therefore is at risk for liquefaction and resorption, limiting aesthetic reliability; studies suggest resorption rates vary between 25% and 80% [19-22].

Previously, given the potential morbidity, added operative time, and failure rates, microvascular reconstruction was only employed when considered absolutely essential. As techniques



**Fig. 2 – (A) Pre-operative photo of patient at rest following right radical parotidectomy and SCM sacrifice. (B) Post-operative photo demonstrating improved symmetry following reconstruction of soft tissue defect with ALT adipofascial flap and facial reanimation procedures.**



**Fig. 3 – (A) Pre-operative photo of patient puckering following radical parotidectomy, SCM sacrifice and temporal bone resection. (B) Post-operative photo demonstrating improved symmetry following reconstruction with ALT flap and facial reanimation. This patient underwent subsequent ear setback.**

have improved, morbidity has been minimized and success rates have approached 99%, surgeons are increasingly utilizing free tissue transfer for aesthetic indications following head and neck extirpative surgery [2-4]. This shift in the paradigm of reconstructive head and neck surgery is most evident in radical parotidectomy reconstruction. Adipofascial ALT free tissue transfer has become a minimally morbid advanced technique for large volume parotid contour reconstruction for patients being treated with adjuvant or neoadjuvant radiation therapy [4,6].

There are several benefits to free tissue transfer. Using the two-team approach, the surgical team may simultaneously harvest the flap while the ablation and neck dissection is underway. During the neck dissection, potential vessels for microvascular anastomosis are already identified; therefore very little additional operative time is required, with only an average of 82 additional minutes being added to the cases in this series (the mean flap ischemia time). Minimal additional time is needed for flap inset and contouring, time which would be similar to other reconstructive techniques. Depending on donor site of the free flap, the tissue for reconstruction may also be used for facial reanimation (i.e. the fascia lata harvested with an ALT and the motor nerve to the vastus lateralis used for cable grafting) [4,6]. As vascularized fat likely undergoes little to no atrophy, long-term aesthetic outcomes are oftentimes favorable using free tissue transfer.

The ALT flap in particular has been used with great success for facial contour reconstruction [4-6,23]. The donor site provides abundant soft tissue [24]. The ALT is a fasciocutaneous flap, which can easily be sculpted (even among patients with high BMI) to conform to a defect (it can be folded on itself among patients with low BMI) and can be de-epithelialized and buried in order to add bulk [25]. There is very little donor site morbidity [26,27], with the most common sequela being lateral thigh numbness. Finally, cosmetic outcomes with the ALT are very favorable [4,6].

In addition to an unsatisfactory aesthetic result, SCM sacrifice may leave the great vessels more vulnerable; many of the patients who undergo this procedure will require post-operative radiation. Since the great vessels are left covered only by a thin layer of soft tissue and skin, they are at greater risk for potential complications such as carotid blowout syndrome [24,28]. Cordova et al. described a retrospective cohort of patients with head and neck cancer that underwent SCM-sacrificing neck surgery without reconstruction and had a 4.1% of carotid blow syndrome, while the cohort that had reconstructions which covered the great vessels had a 0% rate of carotid blowout. All of these patients underwent radiation therapy during the study period. Furthermore, there is some evidence that in addition to providing a well-vascularized barrier to the great vessels, free tissue transfer also induces recipient site angiogenesis [29]. Increasing vascularity in this tissue bed, often irradiated, may improve wound healing.

## 5. Conclusions

We propose that the ALT flap should be considered for SCM contour restoration in patients undergoing radical parotidectomy and SCM-sacrificing neck dissection. This technique causes minimal morbidity and requires little additional operative time,

but affords the surgeon a chance to create a more optimal reconstruction. Cosmetically, this novel use of the ALT flap rebuilds the bulk of the resected SCM, providing symmetry to the neck. Functionally, the free tissue provides a vascularized soft tissue barrier between the great vessels and the skin, a prospective advantage for the patients who will require radiation therapy post-operatively. This technique may be adapted for other complex facial and neck defects caused by ablative surgery.

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