

# The Hybrid Submental Flap for Tongue Reconstruction

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**Purpose:** To describe a hybrid submental flap using pedicled and microvascular techniques to circumvent a restricting vascular anatomy and increase the rotational arc of the skin paddle.

**Methods and Materials:** This case report and literature review describes a hybrid submental flap. A standard submental island flap was planned and elevated for reconstruction of an acquired lateral tongue defect secondary to oncologic ablation. Aberrant venous anatomy was encountered in which the submental vein drained directly into the internal jugular vein, thus limiting the arc of rotation. The facial vein was ligated at its branch point from the internal jugular vein and anastomosed to the external jugular vein. Medical records were reviewed, including clinical and operative notes. A standard free flap postoperative protocol was adhered to, including aspirin, enoxaparin sodium, flap checks, and internal monitoring using a venous Flow Coupler (Synovis Micro Companies Alliance, Inc, Birmingham, AL).

**Results:** The hybrid submental flap was used effectively for lateral tongue reconstruction. Hybridization of the flap allowed for increased pedicle length and mobilization of the skin paddle. The flap remained well perfused postoperatively, with excellent speech and swallow function after adjuvant chemoradiotherapy.

**Conclusion:** The hybrid submental flap is technically feasible and can be a valuable bailout procedure when aberrant vascular anatomy limits the arc of rotation. Ligation and anastomosis of the vein, versus the artery, is more likely to be required because of the more variable drainage patterns and potential valves that would prevent retrograde flow in a Y-V procedure. Retrograde arterial perfusion through the angular branch of the facial artery, by ligation of the submental artery at its proximal takeoff from the facial artery, is a well-documented method to gain cephalad arc of rotation in cases of restrictive arterial anatomy.

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Submental tissue can be recruited for head and neck reconstruction as a pedicled submental island flap (SMIF) and a submental artery perforator (SMAP) flap requiring anastomosis. An island flap is considered simpler and does not require microvascular anastomosis but might not have a sufficient rotational arc, because of a limiting vascular anatomy or a defect site that is too distal.<sup>1,2</sup> One technique to increase the arc of rotation or circumvent a limiting vascular anatomy is to divide the vessel in a Y-V procedure harnessing retrograde flow.<sup>3,4</sup> In this technique, the facial vessels are ligated just proximal to the submental vessel branch point, eliminating anterograde inflow from

the external carotid artery and anterograde drainage into the internal jugular vein. This can be problematic when performed on the vein because of unpredictable drainage patterns and potential valves that would prohibit reverse blood flow. Although this is a reliable technique when performed on the artery (through retrograde flow from the angular branch), the consistent facial and submental artery length and pattern rarely require this adaptation.<sup>3-5</sup>

Usually, the submental vein drains into the common facial vein, which then drains into the internal jugular vein. Notable variations include the submental vein draining directly into the internal jugular vein

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separately from the common facial vein or directly into the external jugular vein. If the former variation is found, it likely enters the internal jugular vein at a more caudal position and can limit cephalad mobilization of the skin paddle.<sup>5,7</sup>

In such cases, a hybrid submental flap can be performed, as described by Hayden et al<sup>5</sup> using the technique of Sterne et al.<sup>6</sup> Here the submental vein is ligated and anastomosed to a more cephalad recipient vein such as the external jugular or the common facial vein. This type of flap can be considered a pedicled and a vascularized free flap.

### Report of Case

A 28-year-old woman presented with a clinically T4aNOMO biopsy-proved squamous cell carcinoma of the left lateral tongue. Computed tomography and magnetic resonance imaging supported the physical examination with no evidence of nodal involvement (Figs 1, 2). The tumor was noted to be deeply infiltrative and recommendation for hemiglossectomy with selective neck dissection of

levels I to III and reconstruction using a radial forearm free flap or a SMIF was discussed. Sufficient submental laxity was confirmed with a pinch test and the patient opted for the SMIF.

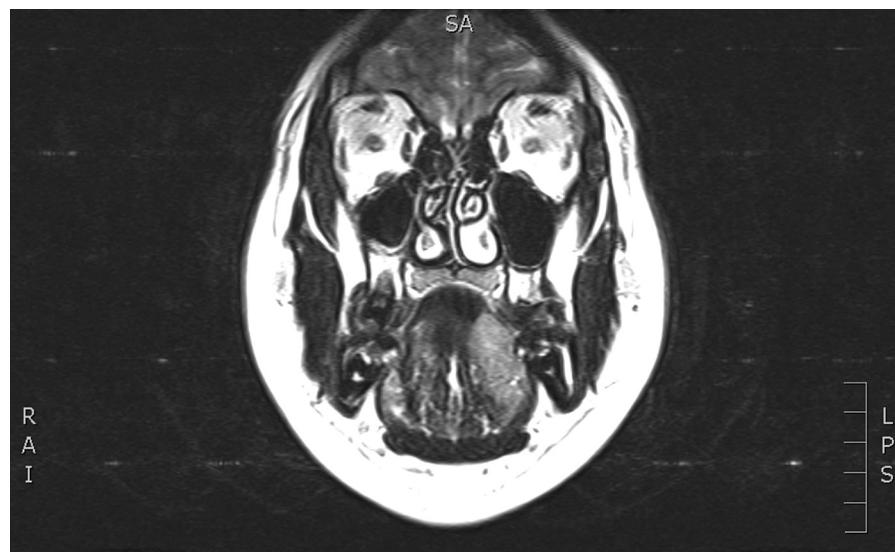
The hemiglossectomy was performed first so that the appropriate skin paddle dimensions could be calculated. Then, elevation of the flap commenced. A 3 × 6-cm skin paddle was designed in the submental region, which was continued into an apron-type incision for a left cervical lymphadenectomy (Fig 3).

Beginning on the contralateral side, the flap was elevated in a subplatysmal plane until the ipsilateral anterior digastric belly was encountered. At this point, dissection was carried deep to the anterior digastric muscle, which was incised at the mentum and hyoid as it was elevated with the flap. Then, the submental vessels were identified superficial to the mylohyoid muscle. Although not required in this case, the mylohyoid muscle can be elevated with the flap for added volume.<sup>5</sup>

The facial vessels were dissected free of the submandibular gland and traced farther proximally. The posterior digastric muscle was incised for additional



**FIGURE 1.** Axial magnetic resonance image through the oral cavity. Note deep muscular invasion of the tumor in the left oral tongue.  
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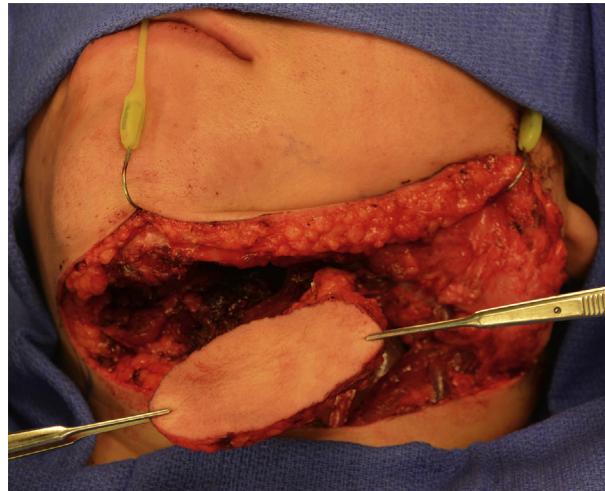
**FIGURE 2.** Coronal magnetic resonance image through the oral cavity. Note deep muscular invasion of the tumor in the left oral tongue.  
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exposure of the facial artery and increased pedicle length. While elevating the submental vein, it was apparent that it drained directly into the internal jugular system at a caudal position and did not communicate with the common facial vein or external system. This limited mobilization of the skin paddle. The facial artery had a typical pattern branching directly off of the external carotid and giving rise to the submental branch.

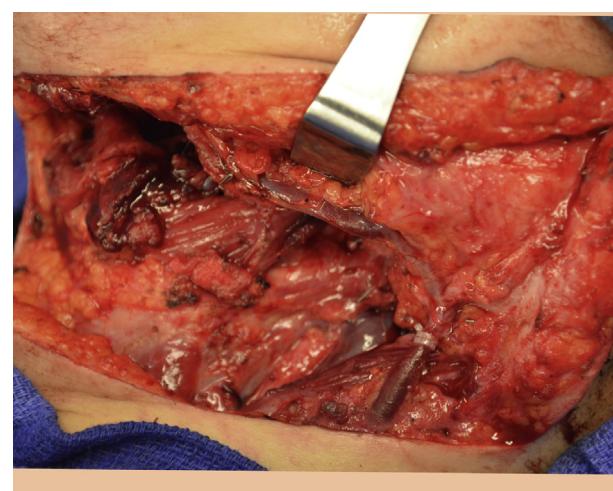
At this point, the flap was secured and standard selective neck dissection of levels I to III was performed while taking care to avoid injury to the vascular pedicle or its tributaries. Once completed, attention was returned to the submental flap. The mylohyoid

was incised and a tunnel of at least 3 fingerbreadths was created into the floor of the mouth to allow passage of the flap without pedicle compression. It was confirmed that the rotational arc was insufficient, limited by the venous anatomy.

At this point, it was decided to transition to a hybrid SMIF. The external jugular vein was dissected for length and ligated, and the adventitia was removed. Then, the submental vein was ligated at its branch point from the internal jugular vein. The vein was anastomosed using a surgical microscope and a 3.0-mm Synovis Vein Flow Coupler (Synovis Micro Companies Alliance, Inc, Birmingham, AL; **Fig 4**). The flap was transferred passively into the defect site.



**FIGURE 3.** Submental flap harvest before division and anastomosis of the outflow vein.  
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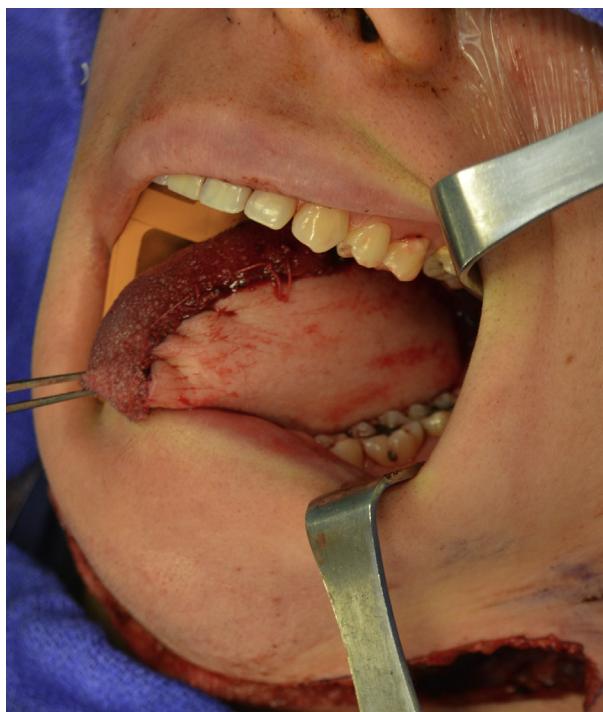


**FIGURE 4.** Anastomosis of the submental outflow vein to the external jugular vein with a venous coupler.  
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The skin paddle was inset into the tongue defect and the neck wound was closed in a standard layered fashion with a Penrose drain (Fig 5). Standing cone deformities were removed from the lateral aspect of the submental donor site while keeping the wounds within the submandibular region and not crossing the inferior border.

The standard free flap postoperative protocol included aspirin, enoxaparin sodium (Lovenox, Sanofi-Aventis US LLC, Bridgewater, NJ), routine flap checks, and a temporary nasogastric feeding tube. Flap assessment was performed using the Flow Coupler signal and clinical assessment of the new tongue skin paddle. The flap remained viable throughout the patient's hospital course. An oral diet was started on postoperative day 5. Minor debridement of the contralateral native tongue tip was performed at bedside on hospital day 7. The patient was discharged on postoperative day 8 after tolerating an oral diet and decannulation of her tracheostomy.

The patient was recommended for adjuvant chemo-radiotherapy for deep muscular tongue invasion (pT4 staging), perineural invasion, and 1 involved lymph node at level III (Fig 6). At the 9-month follow-up visit, the patient showed no evidence of disease, a well-integrated flap with excellent tongue mobility and function, and satisfactory cosmesis at the submental donor site within the neck (Figs 7, 8).



**FIGURE 5.** Hybrid submental flap reconstruction of hemiglossectomy defect.

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**FIGURE 6.** Left oral tongue specimen fixed and stained for pathologic analysis.

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## Discussion

As the current popularity for local and regional flaps in head and neck reconstruction has increased, the SMIF has gained popularity.<sup>1-3</sup> It was originally described by Martin et al in 1993 and derived from knowledge of the platysma and infrahyoid flaps.<sup>1,3,8,9</sup> Currently, some controversy remains over its safety in oncologic reconstruction of the head and neck.

Supporters have found this flap to be a reliable method for reconstructing defects as distal as the temporal region.<sup>1,3,10,11</sup> It offers a relatively expeditious harvest and no requirement for microvascular anastomosis unless converted to a



**FIGURE 7.** Hybrid submental flap tongue reconstruction (1 month postoperatively).

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**FIGURE 8.** Donor-site esthetics (1 month after completion of adjuvant chemoradiotherapy).

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hybrid or SMAP flap. This offers shorter operative time and hospitalizations with equal success compared with the radial forearm free flap.<sup>12</sup> In addition, the donor site can be contiguous with the cervical incision for lymphadenectomy, thus avoiding an additional donor site. Up to 9 × 17 cm of soft tissue can be taken in some cases with unproblematic closure.<sup>5,8,9</sup> Osteocutaneous variations of this flap have been described using the inferior mandibular symphysis.<sup>4</sup>

Arguments against the SMIF include the theoretic risk of involved occult metastatic submental level I nodes transferred with the flap into the reconstructed defect. The current literature has disproved this risk even in cases of ipsilateral neck disease and occult disease in level Ia.<sup>5,10,12,13</sup> Nevertheless, the authors reserve this flap for clinically or radiographically N0 disease. The authors also routinely send submental nodes identified for frozen-section analysis. In the event of an intraoperative positive level I node, the submental flap will be abandoned for another reconstructive option, such as a radial forearm flap. Dissection can be difficult in the area of the submandibular gland, and care must be taken to avoid injury to the submental vessels and facial vessels, potentially leading to vascular injury and flap compromise.<sup>14</sup>

Assessment of donor-site cosmesis is somewhat subjective and variable depending on the degree of soft tissue laxity and the skin paddle dimensions. Some have described it as a bonus “neck lift,” whereas others have described an unfavorable augmentation of the jaw line.<sup>5,8-12,15</sup>

If it is accepted that the SMIF is oncologically sound, then its main advantages over a free flap include avoiding a distant donor site, the potential for improved

cosmesis, and decreased operative time with shorter hospitalizations.<sup>12</sup> In cases in which limiting vascular anatomy is encountered or when the defect is too distal, it can be transitioned into a retrograde, hybrid, or SMAP flap.

Harnessing retrograde flow is the simplest method for increasing pedicle mobility. This is performed by ligating the vessels just proximal to the submental branch takeoff in a “Y-V” fashion.<sup>1,3-5</sup> This is reliable when performed on the artery; however, the potential for valves in the veins could prohibit retrograde venous drainage. For this reason, it is preferable to ligate and anastomose the vein distally, hybridizing the flap. Veins also are more likely than arteries to have variable anatomy. In a series by Hayden et al,<sup>5</sup> hybridization of the flap added at least 5 cm of pedicle length, allowing it to reach the frontal, parietal, and occipital scalp.

The hybrid submental flap is technically feasible and can be a valuable bailout procedure when aberrant vascular anatomy limits the arc of rotation. In the present case, hybridization of a submental flap allowed for an increased arc of rotation and successful reconstruction of a hemiglossectomy defect. This technique is most useful for an aberrant venous anatomy that limits pedicle length, as described in this report, or with more distant and cephalad defect sites.

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