

Successful management of the supraclavicular artery island flap combined with a sternohyoid muscle flap for hypopharyngeal and laryngeal reconstruction

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Abstract

This retrospective study evaluated operative outcomes when using a supraclavicular artery island flap (SAIF) combined with a sternohyoid muscle flap (SHMF) to reconstruct defects after hypopharyngeal carcinoma resection. Reconstructive surgery for hypopharyngeal and laryngeal defects was performed with the SAIF + SHMF combination in 6 patients during 2016 to 2018. Within 14 to 16 days after the surgery, all 6 patients could ingest food and block the tube (avoiding aspiration), with no pharyngeal fistulas. They then underwent irradiation up to a total of 60.5 Gy during the 4 weeks postoperatively. All 6 flaps survived, and there were no donor-site complications except minor dehiscence in 1 patient. Thus, the SAIF + SHMF combination can be used to reconstruct hypopharyngeal and laryngeal defects after hemi-laryngectomy in patients with hypopharyngeal carcinoma involving the unilateral larynx. This technique effectively preserved the swallowing function and phonation of the patients, thereby improving their quality of life.

Abbreviations: CT = computed tomography, MRI = magnetic resonance imaging, SAIF = supraclavicular artery island flap, SCC = squamous cell carcinoma, SHMF = sternohyoid muscle flap.

Keywords: cancer, hypopharynx, supraclavicular artery island flap

1. Introduction

Squamous cell carcinoma of the hypopharynx accounts for about 5% of all head and neck cancers and includes primary hypopharyngeal tumors and advanced tumors from other sites, most notably the larynx.^[1,2] The surgical treatment of malignant neoplasms involving the hypopharynx (either at the primary tumor site or as advanced disease from other sites) continues to be difficult for the head and neck surgeon. Many patients present with advanced T-stage disease that requires radical resection, such as total laryngectomy in combination with total or partial pharyngectomy and cervical esophagectomy via a cervical approach. Bilateral neck dissection is generally also performed.

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The resulting postoperative defect presents a further challenge for the surgeon as an adequate reconstructive procedure should guarantee early restoration of speech (phonation) and the swallowing function. The ideal reconstruction would restore normal anatomy, allow normal deglutition without aspiration, and allow the development of normal speech and normal breathing.^[3,4]

Patients with advanced hypopharyngeal cancer have a poor prognosis. Consequently, surgery for these patients should be considered primarily palliative, with the optimal reconstruction preserving the patient's quality of life for the duration of his or her survival.

The aim of the present study was to evaluate the results of using the supraclavicular artery island flap (SAIF) combined with a sternohyoid muscle flap (SHMF) to reconstruct hypopharyngeal and laryngeal defects after hemi-laryngectomy in patients with hypopharyngeal carcinoma involving the unilateral larynx.

2. Methods

2.1. Study subjects and design

Between January 2016 and May 2018, 6 patients (all men) with advanced hypopharyngeal carcinoma underwent surgery. The demographic characteristics of patients are shown in Table 1. Postoperative radiotherapy was administered in all patients, followed by computed tomography (CT) or magnetic resonance imaging of the neck and direct suspension endoscopy. Ultrasonography, chest and abdominal CT scans, and positron emission tomographic imaging were performed in all patients who experienced recurrence/persistence of their disease. The histological diagnosis was squamous cell carcinoma in all cases.

Table 1
Demographic characteristics of patients with SCC (N=6).

Patient	Age, yr	Sex	Smoking, yr	Alcohol use, yr	Chief complaint	Chain complication
1	57	M	Ever (35)	Ever (35)	Hoarseness and pharyngalgia for 3 mo	No
2	64	M	Ever (44)	Ever (30)	Foreign-body sensation for 6 mo	No
3	63	M	Ever (40)	Ever (40)	Hoarseness and pharyngalgia for 2 mo	No
4	74	M	Ever (54)	Ever (52)	Pharyngalgia for 3 mo	Dehiscence
5	65	M	Nerve	Ever (45)	Dysphagia for 1 yr, pharyngalgia for 7 d	No
6	69	M	Ever (47)	Ever (47)	Pharyngalgia for 1 mo	No

SCC=squamous cell carcinoma.

2.2. Patient population and evaluation

A retrospective chart review was performed to identify all patients who had undergone resection of their laryngeal/hypopharyngeal cancer with reconstruction of the laryngeal/pharyngeal defect using a combination of SAIF and SHMF. All operations were performed in the Otolaryngology Department, The First Affiliated Hospital, College of Medicine, Zhejiang University, China from January 2016 to May 2018. In addition to demographic data, patient's records were reviewed to determine the indications for radical resection, the site and stage of the primary tumor, gross and pathological surgical resection margins, postoperative complications, morbidity, mortality, and survival. Functional results, particularly the ability to resume oral intake, were also evaluated. Data were obtained from outpatient medical records, surgical reports, and telephone surveys. The study was reviewed and approved by The First Affiliated Hospital, College of Medicine, Zhejiang University (no. 2016-01-015).

2.3. Surgical technique

Each tumor ablation and bilateral neck dissection from level II to level V was performed by a head and neck surgeon. Additional resections, including partial thyroidectomy, tonsillectomy, and level VII lymph node dissection, were performed if positive margins were found by intraoperative frozen-section analysis. SAIF was used to reconstruct the hypopharynx and SHMF to reconstruct the larynx after resection of hypopharyngeal carcinoma involving the unilateral larynx (Figs. 1 and 2).

Postoperatively, the patients were monitored by laryngoscopy for early detection of flap failure. Other postoperative care included administration of antibiotics and analgesics and inspection of the neck at least daily. Before patients began to take food or liquids orally, gastric radiography was performed to detect leakage and assess swallowing function. If the test showed no evidence of a fistula, the nasogastric tube was removed, and the patients began to receive adjuvant cancer treatment. Patients were monitored throughout their treatment and afterward at 1-month intervals during the first year and then at 3-month intervals. The follow-up examinations included a complete clinical examination, endoscopy (Fig. 3), CT/magnetic resonance imaging scans of the neck (Fig. 4), cervical ultrasonography, and chest radiography. Additional examinations, such as positron emission tomography scans, were conducted when indicated.

3. Results

3.1. Patients' characteristics

The characteristics of the patients before the radical surgery are shown in Table 1. This study included 6 patients (mean age 64.5 years, range 57–74 years) with carcinoma of the hypopharynx involving the unilateral larynx. The most common complaint was dysphagia, with the other symptoms being weight loss, hoarseness, and pain. All 6 patients underwent postoperative radiotherapy.

No anastomotic leakage or graft necrosis was observed in any of the patients. Normal swallowing function and phonation were achieved in all 6 patients. No overall pulmonary complications

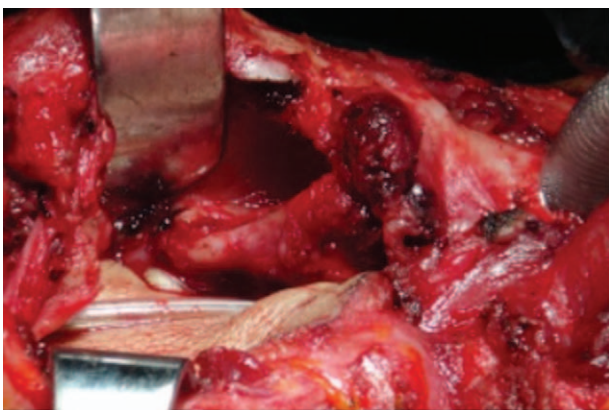


Figure 1. The SAIF was used to reconstruct hypopharyngeal defects after resection of hypopharyngeal carcinoma. SAIF=supraclavicular artery island flap.

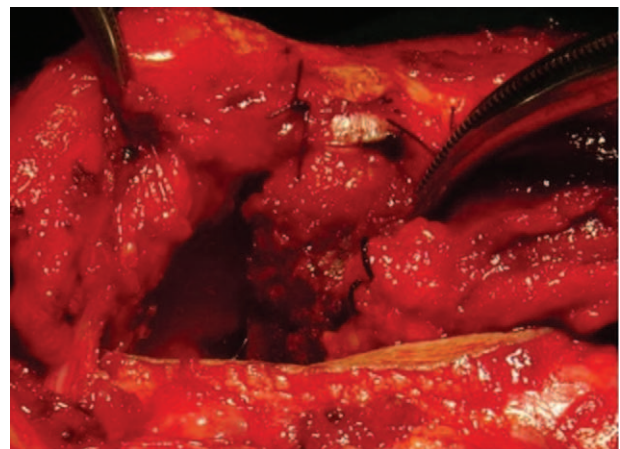


Figure 2. The SHMF was used to reconstruct laryngeal defects after resection of hypopharyngeal carcinoma. SHMF=sternohyoid muscle flap.

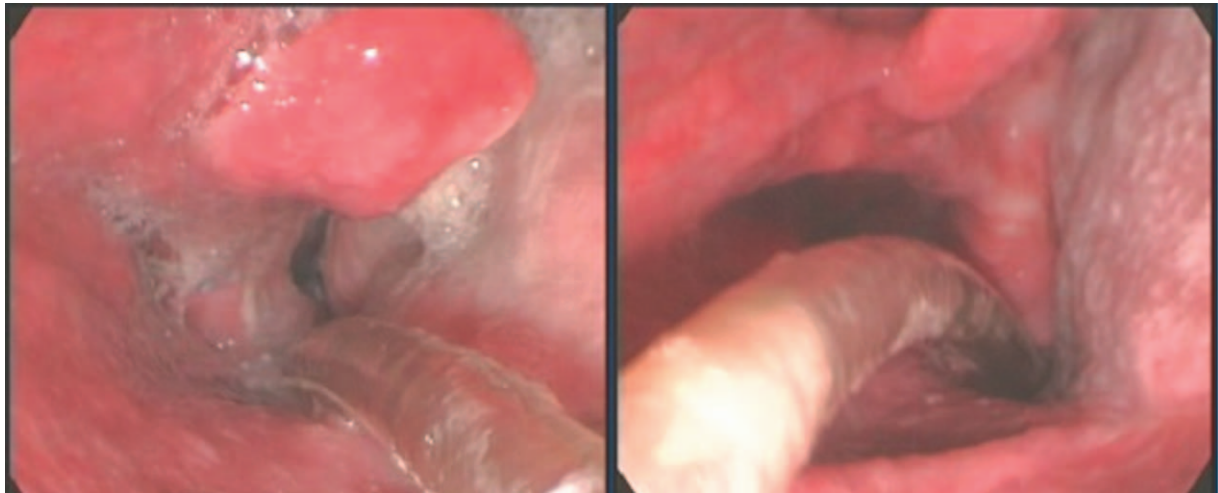


Figure 3. Laryngoscopy shows the condition of the SAIF and SHMF postoperatively. SAIF=supraclavicular artery island flap, SHMF=sternohyoid muscle flap.

were observed in the study, and no patients died during the postoperative period.

3.2. Resumption of feeding and hospital stay

The overall average time to resumption of feeding was 15 days following the operation (range 14–16 days). The overall average postoperative hospital stay was 17.5 days (range 16–19 days).

3.3. Tumor classification and pathological stage

For the 6 hypopharyngeal tumors, the clinical preoperative clinical stage and postoperative pathological stage were assigned according to the 7th edition of the American Joint Committee on Cancer classification. The tumors were staged as T3 (n=4), T4 (n=2), N0 (n=1), N1 (n=3), N2 (n=2).

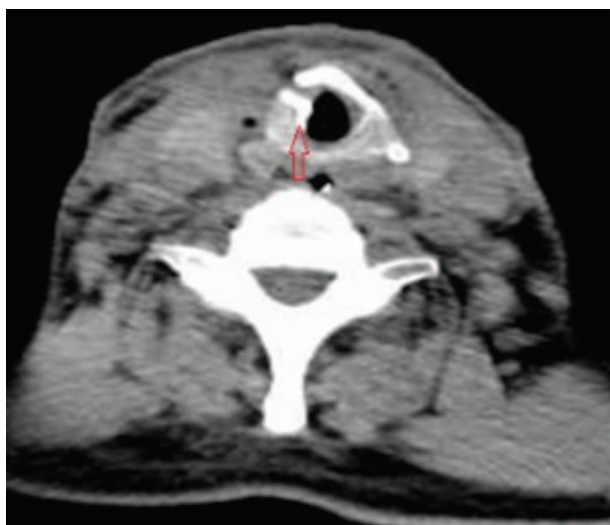


Figure 4. Computed tomography shows the postoperative condition of the SAIF and SHMF (arrow). SAIF=supraclavicular artery island flap, SHMF=sternohyoid muscle flap.

4. Discussion

Patients with hypopharyngeal carcinoma are often diagnosed late, as early symptoms are vague and nonspecific. Hypopharyngeal cancers have a noticeable male preponderance with a male/female ratio of 4–5:1.^[5] All patients in our series were men.

Many reconstructive options have been recommended for repairing the massive defects resulting from radical resection.^[6–8] The advantages and disadvantages of each method have been comprehensively discussed in the literature.^[3] Reconstruction of a defect after resection of the hypopharynx and cervical esophagus remains one of the greatest challenges to the head and neck surgeon because, in most cases, it occurs after chemoradiotherapy and in patients with poor health status. The goal of reconstruction is a safe, 1-stage procedure that allows early functional recovery and adequate ability to tolerate postoperative irradiation. The choice of reconstructive technique depends on tumor-related characteristics, the patient's medical condition, availability of microvascular experience, and the cost. The surgical procedure must aim at both an adequate resection and a short postoperative course. Even minor complications are a common factor of prolonged hospitalization, which may delay postoperative complementary chemoradiotherapy in advanced cases. For these reasons, we adopted the SAIF to reconstruct the hypopharyngeal defect and the SHMF to reconstruct the laryngeal defect after tumor removal.

The supernumerary muscles, such as the double sternohyoid muscle, can be used for muscle reconstruction. Deganello^[9] and Cristalli et al^[10] reported that infrahyoid myocutaneous flaps were used to reconstruct defects after resection of carcinoma of the neck, and they considered the flap reliable, easy to harvest during neck dissection, and with negligible donor-site morbidity.^[9,10] The infrahyoid flap represents an excellent reconstructive solution in selected patients at head and neck sites.^[11,12]

More recently, the use of the supraclavicular fasciocutaneous flap has been described for reconstructing a variety of head and neck defects, including pharyngeal, oral cavity, parotid, lateral skull base, and cutaneous defects.^[13–15] This flap has been shown to be well tolerated by the patient, with minimal donor-site morbidity and good viability at the recipient site.^[16]

In this study, we used the SAIF to reconstruct the hypopharyngeal defect and SHMF to reconstruct the laryngeal defect after tumor removal. The overall average time of feeding resumption was 15 days postoperatively (range 14–16 days). The overall average postoperative hospital stay was 17.5 days (range 16–19 days). SAIF and SHMF were technically easier and much faster to harvest than at other donor sites and did not require microvascular experience. Compared with a pectoralis major myocutaneous flaps, SAIF and SHMF caused minimal pain at the donor sites and exhibited good viability at the recipient sites.

The rate of flap-related complications in this study was more favorable than those in the literature for the same flap procedure and fasciocutaneous free flap procedures. In our series, using the SAIF and SHMF for the respective reconstructions, no perioperative or postoperative morbidities or mortalities were observed. Thus, both SAIF and SHMF are safe 1-step procedures with low morbidity that are particularly useful for reconstruction following hypopharyngeal carcinoma removal involving the unilateral larynx. In this study, all 6 patients could ingest food, block the tube (avoiding aspiration), and had no pharyngeal fistulas. Hence, the procedures not only effectively preserved the swallowing function and phonation of the patients, it improved their quality of life.

In the present study, we confirmed that the combined use of SAIF and SHMF to reconstruct hypopharyngeal and laryngeal defects after hemi-laryngectomy in patients with hypopharyngeal carcinoma involving the unilateral larynx was both safe and effective. It effectively preserved the swallowing function and phonation of the patients and improved their quality of life.

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