

ORIGINAL RESEARCH

Vein preservation strategies to improve the survival rate of the infrahyoid musculocutaneous flap

Khoi Anh Nguyen MD, PhD^{1,2}  | Tham Xuan Ngo MD² | Can Quoc Nguyen MD² | Richard O. Wein MD³

¹Department of Oncology, Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Vietnam

²Department of Head & Neck Surgery, Oncology Hospital, Ho Chi Minh City, Vietnam

³Division of Head and Neck Surgery, Tufts Medical Center, Boston, Massachusetts, USA

Correspondence

Khoi Anh Nguyen, Department of Oncology, Pham Ngoc Thach University of Medicine, 2 Duong Quang Trung, Ward 12, District 10, Ho Chi Minh City, Vietnam.
Email: khoinguyenmd@gmail.com

Abstract

The infrahyoid musculocutaneous flap (IHMCF) is a good alternative in the reconstruction of moderate-sized oral cavity surgical defects. Insufficient venous drainage can significantly affect the survival rate of this flap.

Objectives: Identify the survival rates of the IHMCF and evaluate the functional capacity of reconstructed patients.

Design: We report a case series.

Setting: This study took place at the Department of Head and Neck Surgery of Oncology Hospital Ho Chi Minh City, the largest oncology center in South Vietnam.

Participants: One hundred and twelve patients with surgical defects after oral cavity resection for cancer underwent IHMCF reconstruction from November 2013 to November 2018. During the harvest of the flap, our modification of the surgical technique specifically attempted to preserve more secondary veins for IHMCF.

Main Outcome Measures: Postoperative viability of the flap was checked by clinical observation. The last examination was performed at 3-months after reconstructive operation or after the completion of adjuvant radiotherapy. The functional capacity of our patients was evaluated by three physicians (Head and Neck Surgeon, Radiation Oncologist, and Physiatrist) with understandability of speech scale and the functional oral intake score items assessed.

Results: Two cases of partial skin necrosis (1.8%) were experienced. The majority of patients demonstrated favorable functional rehabilitation at long-term follow up.

Conclusions: The IHMCF is a reliable flap suitable for moderate-sized defects of the oral cavity. Altering the surgical approach to specifically preserve more venous out-flow can improve the survival rate of the flap.

Level of Evidence: 4.

KEYWORDS

infrahyoid musculocutaneous flap, oral cavity defect

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1 | INTRODUCTION

In 1980, Wang and Shen first reported the infrahyoid musculocutaneous flap (IHMCF).¹ This flap has proven to be useful in the reconstruction of moderate-sized (T2-T3) intraoral defects. The main blood supply of the IHMCF is from the superior thyroid artery, the first branch of the external carotid artery.

Within the surgical literature, the complication rate is extremely variable with partial flap necrosis rates ranging from 9% to 26.7% and complete flap failure seen in 3% to 20%.² Insufficient venous drainage is the major factor related to the survival of the skin paddle.³ We report on our variation in the surgical technique of raising the flap with the intent to improve the postoperative survival rate.

2 | MATERIALS AND METHODS

From November 2013 to November 2018, 112 patients with oral cavity squamous cell carcinoma (SCC), 79 men and 33 women, underwent infrahyoid flap reconstruction after tumor resection. The age of patients ranged from 29 to 76 years, with median of 58 years. The primary sites of patients in the series were oral tongue (68), floor of mouth (31), and alveolar ridge (13) (Table 1).

The functional capacity of reconstructed patients was subsequently evaluated by three doctors (Head and Neck Surgeon, Radiation Oncologist, and Physiatrist) with the scores averaged. The speech function was evaluated based on Performance Status Scale for Head and Neck Cancer Patients,⁴ the range of the scores

from 0 (worst) to 4 (best). The Speech Intelligibility Test (SIT) was used for objective evaluation of speech function. The 7-point ordinal scale Functional Oral Intake Score (FOIS) was used to estimate the swallowing function.⁵ This assessment was conducted at 3 months after reconstruction (28 patients did not require adjuvant radiotherapy) or after radiotherapy (84 patients).

3 | MODIFIED SURGICAL TECHNIQUES

In this series, the techniques suggested by Dolivet et al⁶ and Deganello et al² were used in all patients (Figure 1). Dolivet et al⁶ tried to preserve venous drainage towards digastric triangle network and mylohyoid muscle. Deganello et al² left fascial connections between the superficial and median cervical fascia intact because of microvascular venous return. In addition to these techniques, we also preserve a minor venous tributary to internal jugular vein, below the superior thyroid vein, and the communicating vein to external jugular vein when possible. While performing the incision for the lateral border of the skin flap, we dissect through the platysma meticulously while preserving the communicating vein to external jugular vein that is immediately below this muscle. In the line with the hyoid bone (or 0.5-1 cm lower), we typically identify a vein which crosses over the anterior border of sternocleidomastoid and drains to external jugular vein. The IHMCF is usually raised from the bottom-up. During the dissection along the internal jugular vein a minor venous tributary at the level of upper thyroid pole, or higher 0.5-1.5 cm, is also identified and preserved (Figure 2).

TABLE 1 Overview of clinical series

Subsite	pTNM	N ^o of cases	Speech score (N ^o of cases)			Oral intake score (N ^o of cases)		
			4	3	2	7	6	5
Tongue	pT2N0	21	21	0	0	21	0	0
	pT2N1	18	18	0	0	17	1	0
	pT3N0	8	4	4	0	8	0	0
	pT3N1	12	8	4	0	11	1	0
	pT3N2	2	0	2	0	0	2	0
	pT4N1	4	0	3	1	0	3	1
	pT4N2	3	0	2	1	0	3	0
Floor of mouth	pT2N0	7	7	0	0	7	0	0
	pT2N1	4	4	0	0	4	0	0
	pT3N0	7	6	1	0	7	0	0
	pT3N1	5	2	3	0	5	0	0
	pT4N1	4	3	1	0	1	3	0
	pT4N2	4	3	1	0	3	1	0
Alveolar ridge	pT3N0	4	4	0	0	4	0	0
	pT3N1	2	2	0	0	2	0	0
	pT4N1	5	5	0	0	5	0	0
	pT4N2	2	2	0	0	0	2	0

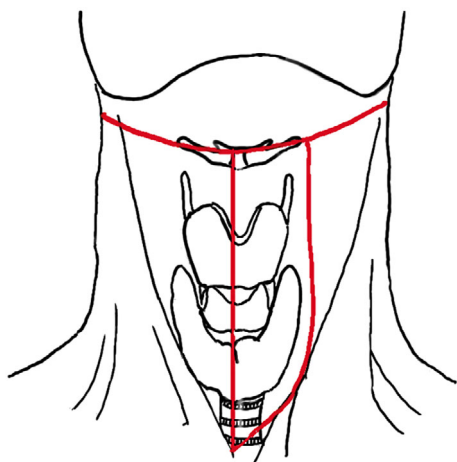


FIGURE 1 Neck incision: vertically oriented ILMCF at the left side

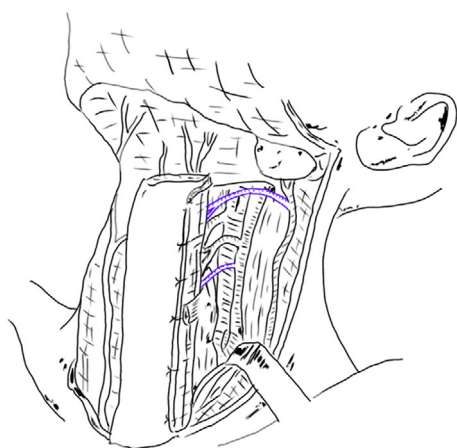


FIGURE 2 The pedicle of ILMCF, the upper purple vein is the communicating vein to the external jugular vein and the lower one is the minor venous tributary to internal jugular vein

4 | RESULTS

There were only two cases of partial skin necrosis (1.8%) and no cases of complete flap loss (Table 2). The average dimension of the flaps in our series was 8×3.5 cm. The average length of hospital stay was 7.6 ± 1.2 days. All patients that were considered to have evidence of a potential neck infection or developed a salivary fistula were treated by antibiotics and local wound care. Postoperatively, the majority of patients could communicate on the phone (understandability of speech score 3-4), with only two patients, that underwent primary tongue resection, receiving a score of 2. All of patients had the capacity for oral diet (swallowing function score 6-7). One patient, with T4 oral tongue carcinoma, had a score 5 (Table 1).

We detected and preserved the minor vein below the superior thyroid in 87 cases (78%). The range in diameter of this minor vein was 0.8-1.5 mm, mean 1.2 mm (0.17). Evidence of the communicating vein to external jugular vein was recorded in 28 cases (25%). The

TABLE 2 Complications of reconstructive operations

Complications	No. of (%) patients
Severe complications	
Total flap loss	0 (0)
Minor complications	
Partial skin necrosis	2 (1,8)
Cervical infection	7 (6,3)
Salivary fistula	6 (5,4)
Cervical seroma	9 (8)
Hypertrophic scar	11 (9,8)

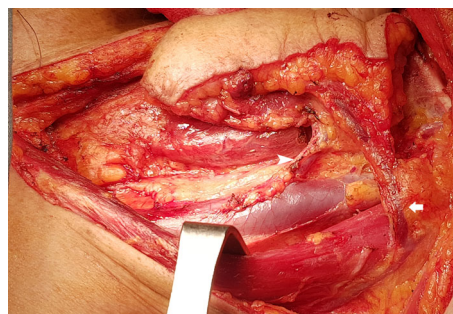


FIGURE 3 The ILMCF has both the minor venous tributary to internal jugular vein (arrow head) and the communicating vein to external jugular (arrow)



FIGURE 4 Patient with right oral tongue reconstruction with ILMCF at 3 months postop

range of diameter of this minor vein was 1.1-2.3 mm, mean 1.6 mm (0.21). We were able to preserve both veins in 12 cases (Figure 3). In 9 of our cases (8%), neither of these veins were capable of preservation. In the two cases of partial flap necrosis, one had only a minor venous tributary and the other had neither (minor venous tributary nor communicating) venous drainage pattern.

5 | DISCUSSION

In comparison with the other flaps used for oral reconstruction, there are only a limited number of original articles concerning the IHMCF. This flap is a robust, predominantly hairless and is adequate option for moderate-sized oral cavity defects. Raising IHMCF does not carry the same risk of violating the principles of an oncologic dissection as may occur with the dissection required for a pedicled submental island flap.⁷

Flap failure with the IHMCF is typically a result of venous insufficiency. Many authors have modified surgical techniques to improve the survival of the skin paddle.^{2,3,6} The importance of avoiding partial skin flap necrosis cannot be underestimated. Postoperative salivary fistulas as a result wound dehiscence can result in an increase in the length of hospital stay.

With our modified surgical techniques, the overall survival rate of IHMCF is 100% (Figure 4). None of patients in our series developed a salivary fistula. The main disadvantage of our technique is the resultant shortening of the flap arc rotation for the flap because of a wider vasculature pedicle. With our technique, our flaps were able to easily reach the floor of mouth and alveolar ridge defects, however reconstruction of the anterior tongue at the tip can be challenging.

6 | CONCLUSION

The IHMCF can be a reliable alternative for the reconstruction of specific moderate-sized oral cavity defects. Modifications to the technique of raising the flap, with attention to more aggressively preserving venous drainage pathways (potentially at the expense of limiting the arc of rotation for inset) can improve the viability rate of the flap.

CONFLICT OF INTEREST

No conflict of interest.

ETHICAL CONSIDERATIONS

INFORMED CONSENT

All patients participating in this series were fully informed about the evaluation being conducted. Participants were aware of the purpose of the project and how the findings would be potentially used. All patients made an informed decision as to whether they would participate in the research. Additionally, if participation resulted in any patient distress or concerns, patients were allowed to withdraw from the study or receive additional counseling as needed.

VOLUNTARY PARTICIPATION

The patients participated in this series free from coercion. Participants were free to withdraw their participation at any time without negatively impacting their involvement in future services or the current relationships with any of the researchers or research bodies involved.

DO NO HARM

All patients were scheduled to undergo ablative surgery similar to treatment standards used for non-study patients with oral carcinoma.

The modified surgical techniques focused on the harvest of the reconstructive flap. A technique attempting to preserve more veins for the infrahyoid musculocutaneous flap drainage was employed. The procedure utilized the standard approach for the neck dissection portion of the operation and did not affect the anticipated oncologic results of the surgery. The duration of operation with modified flap harvest required an additional 15-30 minutes of overall procedure time.

CONFIDENTIALITY

All identifying information was blinded and inaccessible to the researchers. The identifying information is excluded from any reports or published documents.

ANONYMITY

The identity of the participants remained unknown to the research team.

ONLY ASSESS RELEVANT COMPONENTS

We will assess the survival rates (partial vs total loss) of the flaps and the functional capacity of reconstructed patients. The evaluations were simple and could be easily replicated.

ORCID

Khoi Anh Nguyen  <https://orcid.org/0000-0002-4102-2519>

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