Turkish Archives of Otorhinolaryngology
Türk Otorinolarengoloji Arşivi

Turk Arch Otorhinolaryngol 2018; 56(2): 85-8

Infrahyoid Flap, a Convenient Alternative for Reconstruction of Tongue and Floor of Mouth Defects: Case Series

Original Investigation

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Abstract

Objective: The aim of this study was to share our clinical experience with the neurovascular myofasiocutan infrahyoid flap (NMIHF), which was used for the reconstruction of the defects after oral cavity cancer surgery.

Methods: Records of five patients who were diagnosed with oral cavity cancer and underwent tumor resection, neck dissection, and defect reconstruction with NMIHF between 2012 and 2017 were analyzed retrospectively.

Results: The infrahyoid flap was used in five patients: four males and one female. The mean age of patients was 61.8 years. Four patients underwent tumor resection and bilateral level I-III neck dissection, whereas one patient underwent tumor resection and unilateral level I-III neck dissection. NMIHF was used for the reconstruction of the defects during the same procedure in all the patients. Mean post-operative follow-up was 30.6 months. Partial skin necrosis was observed in two patients, but none of the patients showed total necrosis of the flap. Postoperatively, oral intake was initiated after an average of 12 days in all patients. For two patients who required post-operative radiotherapy (RT), the treatment was started after an average of 50 days.

Conclusion: NMIHF does not prolong operation time and does not cause additional scar in the neck, and the defect in the donor field can be closed without the use of a graft or flap. This is considered to be a reliable and successful alternative to free flaps for the reconstruction of oral cavity defects.

Keywords: Oral cavity, carcinoma, reconstructive surgical procedure, pedicled flap

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Cite this article as: *İşlek A, Balcı MK, Yüksel Ö, Önal K, Arslanoğlu S, Eren E. Infrahyoid Flap, a Convenient Alternative for Reconstruction of Tongue and Floor of Mouth Defects: Case Series. Turk Arch Otorhinolaryngol 2018; 56(2): 85-8.*

This study was presented at the 39th Turkish National Congress of Otorhinolaryngology and Head & Neck Surgery, November 8-12, 2017, Antalya, Turkey.

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Received Date: 20.12.2017
Accepted Date: 25.03.2018

DOI: 10.5152/tao.2018.3114

Introduction

The infrahyoid flap or the neurovascular myocutaneous infrahyoid flap (NMIHF) was first used by Wang and Shen (1) in 1980 for defect reconstruction after the surgical treatment of tongue cancer. NMIHF is described as a convenient, reliable and simple technique for the reconstruction of defects involving less than half of the tongue, as well as of those involving the oral cavity, the oropharynx, the hypopharynx, the parotid gland, and 1/3 of the lower face (2-4). Surgical modifications have been introduced after the first applications for venous return problems and aesthetic issues regarding donor site closure (5, 6). NMIHF has a composite structure that is vascularized by the superior thyroid artery and vein pedicle, is innervated by the deep branches of ansa cervicalis, and includes the upper parts of the sternohyoid, sternothyroid and omohyoid muscles (7, 8). While the size of the skin island on the flap can be adjusted according to the dimensions of the defect, a maximum of 9 cm length and 5 cm width is reported in published studies (8).

Neurovascular myocutaneous infrahyoid flap can be prepared prior to neck dissection, does not inhibit the dissection procedure, does not require additional incision, and can be primarily closed (7). It can be used bilaterally when necessary. Complication rates after reconstruction are reported to range from 3% to 47% and to mostly be due to insufficient venous return (4, 9). Small- to medium-sized oropharyngeal defects can be sufficiently and functionally reconstructed with successful outcomes comparable to free flaps, and can be preferred in elderly patients where microanastomoses are most likely to fail (8). In large-sized defects,

however, NMIHFs are reported to be likely insufficient (8, 9). While previous thyroid surgery, neck dissection, and presence of metastatic disease localized to level III or IV of the neck restrict the use of the NMIHF technique, it should not be used in patients diagnosed with N3 neck metastasis according to the TNM staging system (3). When used with regard of its restrictions and contraindications, NMIHF is a simple reconstruction technique that preserves swallowing and speech functions and brings high patient satisfaction in oropharyngeal defects (3, 10).

The neurovascular myocutaneous infrahyoid flap comes forth as a technique that can be performed in the same session to repair the defects that occur due to the surgical treatment of tongue and mouth cancers, without requiring additional incisions and donor site reconstruction. This study aims to present the benefits, viability and the results of the technique.

Methods

Records of five patients who were operated in the Department of Otorhinolaryngology & Head and neck Surgery of a tertiary university hospital between January 2012 and January 2017 for tongue and floor of mouth cancer were retrospectively reviewed. All five patients were operated on by the same surgeon using NMIHF for oral cavity reconstruction and histopathologically all surgical margins were tumor negative. All patients were followed-up regularly for at least one year after surgery. In all cases, NMIHF was prepared during neck dissection as a superior thyroid artero-venous pedicled flap and adapted to the recipient site after tumor resection and neck dissection. Tumor resection was performed using the pull-through technique and the flap was rotated to the recipient site through the opening in the floor of the mouth. Donor site defect was primarily closed in all patients. All patients were fed through nasogastric tubes in the postoperative period and were given the same feeding formula in the quantities prescribed by the Nutritional Support Unit. Additionally, all patients were intravenously administered metronidazole 500 mg and ceftriaxone 1 g every 12 hours for the first seven days after the surgery. Daily examination and dressing of wound site was performed by the operating surgeon in the company of two alternating surgeons. The study was conducted in line with the Declaration of Helsinki and with the approval dated 22.06.2017 and number 103 of the Ethics Committee of İzmir Katip Çelebi University.

Surgical Technique

The neurovascular myocutaneous infrahyoid flap was planned so that its medial edge fell along the midline, its lateral edge 3- to 5-cm distal to the midline, its upper margin leveled with the hyoid bone, and its lower margin fell on the suprasternal notch. Flap elevation began at the midline and the infrahyoid muscle group was dissected up to the fascia of the thyroid gland. An incision was made up to the lateral margin and the deep branches of the ansa cervicalis were identified and preserved. The flap was elevated up to the hyoid bone on the fascia of the thyroid gland and the laryngeal perichondrium, infrahyoid muscles were cut from the body of the hyoid bone and dissection was advanced laterally to expose the pedicle. The flap was adapted to the recipient site through the defect on the floor of the mouth. In cases where the defect on the floor of mouth was not full-thickness, NMIHF was brought to the recipient site through an artificially created channel. To ensure sufficient pedicle length, the branches of the superior thyroid artery that extend into the trachea, the larynx and the thyroid gland were ligated and divided. The incision for neck dissection was planned, depending on the purpose of the dissection, either from the upper or from the lower end of the lateral flap incision up to the mastoid apex (Figure 1). Flap preparation was found to take approximately 30 to 60 minutes.

Results

In this study, records of five tongue and floor of mouth cancer patients who underwent tumor resection and neck dissection followed by defect reconstruction using NMIHF from 2012 to 2017 were reviewed. Of the five patients, one was female and four were male. Their mean age was 61.8 years (range: 27-74). Mean follow-up time was 30.6 months. One patient underwent a surgery for recurrent tongue cancer after primary excision and four patients for primary tongue-floor of mouth cancer. Incisional biopsy was performed on all patients prior to the surgery. Pathologic diagnosis of squamous cell carcinoma reported after surgery was found consistent with the results of the biopsies. Neck metastasis was identified in three patients after histopathologic examination and two were indicated for radiotherapy (RT). Adjuvant RT was started at approximately the 50th day after the surgery and completed uneventfully. While the overall mean hospitalization time was 32.2 days; this time was 25.3 days in patients who did not experience any complications related to the flap. Mean time to oral food intake was 12 days.

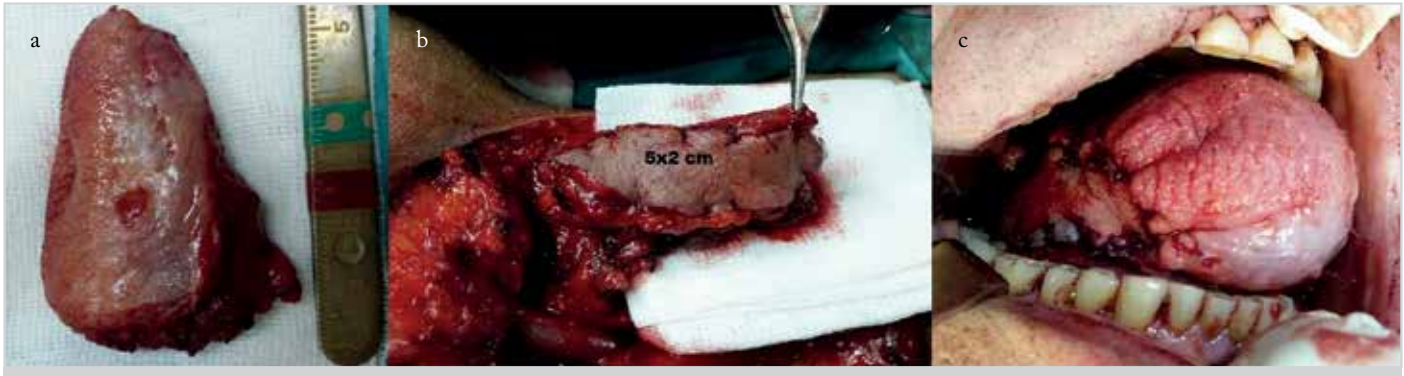

Figure 1. a-c. Infrahyoid flap. Surgical specimen (a), Infrahyoid flap of 5x2 cm ready to be transferred (b), Remaining tongue and flap after defect reconstruction (c)

Histopathologically surgical margins were tumor negative in all patients. In two patients partial skin necrosis developed on the flap in the early postoperative period. One was started on radiotherapy after wound healing was achieved through debridement and dressing. The other patient underwent a partial-thickness skin graft (PTSG) procedure for defect revision 34 days after the primary surgery and started on radiotherapy at the 65th postoperative day. Total flap loss was not seen in any of the patients (Figure 2). Tumor recurrence was seen in one patient and local recurrence was histopathologically confirmed during the follow-up period in the sixth month after surgery and postoperative RT. Chemotherapy was started as salvage therapy, but the patient died in the 31st month during follow-up. This patient was diagnosed at a late stage due to mental retardation and all procedures, including biopsy and all examinations, could be performed only under general anesthesia. TNM stages, metastatic neck levels and clinical findings of patients are summarized in Table 1.

Discussion

Wang et al. (2) in 1986 and Dolivet et al. (6) in 2005 reported that NMIHF could also be used in the reconstruction of parotid, oropharyngeal and laryngopharyngeal defects. All patients included in our study were diagnosed with squamous cell carcinoma of the tongue and the floor of mouth and had a mean age of 61.8 years. Authors who reported their large case series in the literature did not indicate a specific age range for infrahyoid flap, however, recommended that this flap was used in suitable elderly patients given the difficulties presented by free flaps in this age group (2, 6, 8). While the dimensions of NMIHF can be adjusted according to the size of the defect, in their 2014 review Daganello et al. (8) reported an ideal size of 7x4cm. Wang et al. (2) who first described this surgical technique, on the other hand, indicated that its length could be up to 14 cm in defects of the buccal region, but primary closing of the donor site could be difficult when the width exceeds 4.5 cm. In our study, mean length and width of the flaps used for defect reconstruction were 6.6 cm and 3.2 cm, respectively. In all patients, donor site defects were closed primarily and within the incision for neck dissection.

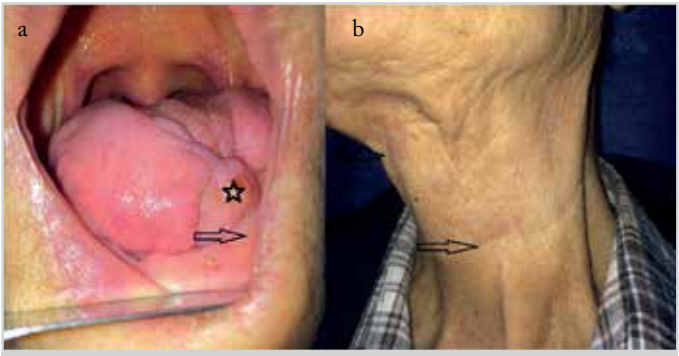

Figure 2. a, b. Remaining tongue and adapted infrahyoid flap; star: flap, black arrow: mandible (a), neck scar, black arrows: incision line (b)

In their 1986 series including 112 patients Wang et al. (2) reported no total flap losses; only partial skin necrosis in 11 patients, in whose cases defects had healed by secondary intention within one to two months. While a flap success rate of 90% was reported in this series, failure rate was reported to be higher in cases which internal and external jugular veins were resected together compared to those in which internal and external jugular veins were preserved. Another study published in 2001 reported to have found partial skin necrosis in two, total skin necrosis in two, and flap necrosis in one patient of the total 53 patients who underwent oral cavity defect reconstruction. Second surgery was not required in any of the cases (9). In our study, partial skin necrosis developed in two patients; one was left to heal by secondary intention, and the other was treated with revision surgery using PTSG on the 34th day after the primary surgery. In the latter patient decision for defect revision with PTSG was taken to avoid the risk of delaying radiotherapy.

While in the literature contraindications for using the NMIHF technique are defined as N3 stage and presence of level III-IV lymph node metastasis, the main concern in the presence of a level III-IV metastasis is indicated to be the risk of compromising the principles of oncologic surgery in favor of the flap (3, 4). In our study, there was one patient in whom pathologic specimen revealed level III metastasis which was not interpreted as metastatic in radiologic or clinic examinations, and no local or neck recurrence was observed during the follow-up period. The NMIHF technique can be used in cases except for those presenting with N3 neck metastasis where the same sided pedicle can be preserved together with the strap muscles and the overlying skin (3). Moreover, factors that are general contraindications for flap surgeries, namely previous surgery and prior

Table 1. Demographic data of patients; tumor size, T-N stage, postoperative complications and follow-up results

Age / Gender	T-stage	N-stage	Recurrence	Tumor size (cm)	Flap size (cm)	Partial flap necrosis	Revision surgery	Hospitalization (days)	Time to oral intake (days)
67, M	4	2B	-	4.5x3	8x3	+	+	60	13
74, M	1	0	-	1x1	5x2	-	-	22	8
70, F	1	1	-	1.5x1	6x3	-	-	35	12
27, M	4	2C	+ *	4.5x3	7x3	+	-	25	20
71, M	2	0	-	2.5x1	7x5	-	-	19	7

*Local recurrence
M: Male; F: Female; T: Tumoral stage; N: Lymph node stage

radiotherapy to the donor site, are also contraindications for the NMIHF technique (2, 3, 8). None of the patients analyzed in our study had undergone a surgery that involved the donor site or had received radiotherapy to the donor site.

In the literature, NMIHF was reported and recommended to be used for the reconstruction of small- to medium-sized defects of the tongue and the floor of mouth, and in addition to free flaps for the reconstruction of large-sized defects (2, 3, 7). All of the defects in our study were small- to medium-sized; the largest defect was measured 7x5 cm.

Reconstruction with NMIHF increases the volume of the mobile parts of the tongue, and thereby, favorably affects speech and swallowing functions (1, 2, 9, 10). In our study, similar to that reported in the literature, feeding tubes were typically removed and oral intake was started on the 12th day after surgery (9). No complaints were identified regarding speech functions in any of the patients, however an objective test was not performed for articulation assessment. The NMIHF technique allowed primary closure by concealing the donor site within the incision of the neck dissection, thus enabled aesthetically successful outcomes (2, 3, 7, 8).

Conclusion

Neurovascular myocutaneous infrahyoid flap is a technique that can be quickly performed in the same session to repair the defects that occur due to the surgical treatment of tongue and mouth cancers, without requiring additional incisions and donor site reconstruction. It can be considered as a suitable alternative to free flap in suitable cases for its ease of application and flap success.

Ethics Committee Approval: Ethics committee approval was received for this study from İzmir Katip Çelebi University School of Medicine (Date: 22/06/2017 Number: 103).

Informed Consent: Informed consent was not received due to the retrospective nature of the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.İ., M.K.B., E.E., Ö.Y.; Design - A.İ., M.K.B., E.E., Ö.Y.; Supervision - A.İ., M.K.B., K.Ö., Ö.Y.; Resource - A.İ., M.K.B.; Materials - A.İ.; Data Collection and/or Processing - A.İ., M.K.B.; Analysis and/or Interpretation - A.İ., E.E.; Literature Search - A.İ., E.E.; Writing - A.İ.; Critical Reviews - S.A., K.Ö.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

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