Original Research Article

Submental Island Flap: An Alternative to Free Flap In Head And Neck Cancer

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Abstract

Introduction: Submental flap is locoregional flap for head and neck tumor defects. It is based on submental vessels branch of facial vessels.

Aims and Objectives: Aim of the study was to know the effectiveness and feasibility of submental flap in head and neck cancer reconstruction in a resource-constrained rural set up.

Materials and Methods: A total of five patients were reviewed in the Department of Surgical Oncology, which were reconstructed with submental flap after head and neck tumor resection.

Result: Three patients were having primary site as buccal mucosa, one as tongue and one as floor of mouth. All the patients underwent supra-omohyoid neck dissection. Data included age, sex, biopsy of primary site, clinical and pathological stage, adjuvant treatment and follow up.

Conclusion: It is concluded that submental flap is a simple flap, rapid to harvest flap, having wide arc of rotation with minimum donor side morbidity. The flap does not provide bulk to the defects and better used for mobile organ like tongue reconstruction. Various other advantages include reduce hospital stay, shorter operative time, same incision for neck dissection, hide the donor scar and lower cost as compared to free flap reconstruction of similar head and neck defects. Low ASA risk score could predict for favorable surgical outcome in SIF.

Keywords: digastric, mylohyoid, supra-omohyoid dissection, submental island flap, head and neck cancer, rural, resource-constrained, ASA

INTRODUCTION:

Head and neck cancers are the major cancers among Indian population.[1] It includes carcinoma of the anterior tongue, buccal mucosa, floor of mouth and inner lip with tongue being the most common oral cancer site.[2]
Surgery is the main-stay of treatment in oral cavity cancers. Which encompasses removal of tumor with margin of at least 1.5 cm and simultaneous neck dissection for clinically visible neck nodes.[2,3] After cancer surgery, reconstruction remains a challenge because of complex anatomy. The pectoralis major myocutaneous flap and other regional flaps were used for reconstruction previously but nowadays microvascular free flaps are the gold standard for head and neck cancers after surgery.[3,4] Although there are several advantages of free flaps like good cosmetic outcome, minimum donor site morbidity, wide range of skin characteristics and wide variety of available tissue types but free flap needs high degree of expertise, more cost, long duration of surgery and increase hospital stay for patients.[1,5]

In high volume and low resource centers, various pedicled flap play a major role and one such flap is submental island flap (SIF). Submental artery island flap was first described by Martin et al. in 1993.[5] It is an axial pattern skin flap based on the submental artery. The flap has an excellent skin color match and wide arc of rotation and used for tongue, floor of mouth and oral cavity cancers.[6]

Though age is not an independent risk factor for reconstruction surgery, however, ASA risk score may correlate with medical events and not correlate with surgical complications.[7]
This study presents a series of five patients affected by early-stage oral squamous cell carcinoma in whom reconstruction has been performed with submental flap. Its advantages, complications and outcome are discussed.

SURGICAL ANATOMY

The submental artery island flap is an axial fasciocutaneous flap that includes skin, subcutaneous tissue, platysma, and submental fat along with surrounding lymph nodes.[5] The anterior belly of digastric and mylohyoid muscle may be included. Entire flap is based on submental vessels. Submental artery is a well-defined and consistent branch of facial artery. It arises deep to the submandibular gland and passes forward and crosses the mylohyoid muscle.[6] It gives branches to submandibular gland, platysma and mylohyoid muscle and terminal branches cross the anterior belly of digastric muscle either superficial (44%) or deep (56%) to it. The external diameter of the artery is 1-2 mm. The corresponding submental vein drain into facial vein, communicating with both the internal and external jugular veins.[6-9]

Fig 1 showing flap design with pedicle

Fig 2 showing tunneling of flap

Fig 3 showing tumor along with ipsilateral supraomohyoid neck dissection

Fig 4 showing insetting of flap

Fig 5 showing final closure.

MATERIALS AND METHODS:

A total of five patients were operated in the Department of Surgical Oncology at Uttar Pradesh University of Medical Sciences (UPUMS), Uttar Pradesh, over a period of one year from 2019-2020. All patients underwent one stage procedure for tumor resection, selective neck dissection and reconstruction with submental island flap. ASA risk score of patients were assessed and correlated with surgical complications.

The patients were reviewed by Radiation Oncology Department, UPUMS, for indication of adjuvant radiotherapy. Data included age, sex, ASA risk score, biopsy of primary site, clinical and pathological stage, adjuvant treatment and follow up.

Surgical Technique:

Standard surgical technique was used as described. Skin pedicle of the flap was on an average 7*15 cm and depended on skin laxity and age. Shape of the flap was D shaped, crescent shape or ellipse shaped as shown in Figure 1. The anteroposterior diameter of the skin island was limited by the ability to achieve primary closure which was checked by Pinch test based on laxity.[6] The upper incision started at submental triangle while the lower incision was the limit of pinch test allowing primary closure adequately according to need of the flap required. Lower flap was raised first up to the clavicle while upper flap was harvested later. Proper precautions of marginal mandibular nerve were taken while raising the upper flap. Now, the flap was raised on contralateral site in the subplatysmal plane.[7-9]

After the flap elevation ipsilateral neck dissection was done while preserving the submental vessels. On approaching the submandibular triangle, the facial vessels were carefully dissected away from the submandibular gland by ligating the branches going to the gland and preserving the submental vessels. In some a strip of mylohyoid muscle and anterior belly of digastric muscle were incorporated within the flap.[10]

The flap was tunneled (Figure 2) medial to the mandible when the defect involved the floor of mouth, base of tongue and tonsillar fossa and lateral to the mandible for the defects that involved the buccal mucosa.
The following precautions were taken for preservation of flap.[11, 12]

1 There should not be any injury to the correspondent vessels while raising the flap.
2 Small tributaries of facial artery and vein were properly ligated and clipped both.
3 Vessels should be dissected off from the submandibular gland with the help of vessel retractor and without much pressure on the vessels.
4 Bipolar cautery should be used rather than monopolar cautery.
5 If possible, flow should be checked with the doppler.
6 For additional pedicle length, the facial vessels were either divided above the origin of submental vessels or cut the posterior belly but the flap should not be under tension at any cost.
7 All the branches of facial artery from the gland were divided to free the facial artery.

Figure 3 shows the tumor resected along with supraomohyoid lymph node dissection. Figure 4 shows the flap insetting. The final closure is shown in figure 5.

RESULTS:

The study included five male patients of age group between 45 to 55 years with mean age of 48.2 years. ASA risk score for patients ranged from 1 to 2. Table 1 shows the patient disease characteristics. The biopsy of the primary site was squamous cell carcinoma. It was moderately differentiated carcinoma in three patients and well differentiated in the other two patients. Three patients were having primary site as buccal mucosa, one had tongue and one had floor of mouth. Size of tumor was less than 2 cm and node were not palpable clinically and radiologically.

All the patients underwent one-stage surgical resection, supraomohyoid neck dissection while the patient with floor of mouth primary underwent bilateral supraomohyoid neck dissection. All the patients tolerated the procedure well under general anesthesia. The average operative time for resection, neck dissection and reconstruction was 3 hour and 50 minutes. Post-operative hospital stay was 4-12 days.

The flaps were successful in all patients except one patient (ASA risk score 1) who got partial flap necrosis in the form of skin necrosis which was settled after debridement. No other surgical or medical complications were encountered. Two patients were given Radiotherapy as adjuvant treatment. All patients were followed for a period of 6 months and none of them got recurrence.

Table 1. Patient Disease characteristics.

S. No.	Age	Sex	ASA risk score	Biopsy	Site	Clinical Stage
1	46	M	1	SCCMD	Buccal Mucosa	cT1No
2	45	M	1	SCCMD	Tongue Antero-lateral	cT1No
3	50	M	1	SCCWD	Buccal Mucosa	cT1No
4	55	M	2	SCCMD	Buccal Mucosa	cT1No
5	45	M	1	SCCWD	Floor of Mouth	cT1No

(M=Male, SCCWD&MD=Squamous cell carcinoma well differentiated and moderate differentiated, c=clinical, ASA= American society of Anaesthesiology)

Clinico-pathological outcome:

All the patients were clinically T1N0 as assessed pre-operatively. Of those two patients (2/5) were upstaged as T2N0 on histo-pathological examination, whilst three patients (3/5) turned out to be T1N0 and correlated with initial preoperative staging.

The flaps were successful in all patients except one patient (ASA risk score 1) who got partial flap necrosis in the form of skin necrosis which was settled after debridement. No other surgical or medical complications were encountered. Thus,

low ASA risk score was predictive of a favorable surgical outcome and low or nil medical complications in our patients. Two patients were given Radiotherapy as adjuvant treatment. All patients were followed for a period of 6 months and none of them got recurrence in the follow up period.
Clinico-pathological outcomes are shown in Table 2.

Table 2. Clinico-pathological outcomes

S.No	Neck dissection	Complication	Pathological Stage	Adjuvant Treatment	Recurrence
1	I/L SOHND	-	pT2N0	RT	-
2	I/L SOHND	-	pT1N0	-	-
3	I/L SOHND	Partial skin necrosis	pT1N0	-	-
4	I/L SOHND	-	pT2N0	RT	-
5	B/L SOHND	-	pT1N0	-	-

(I/L & B/L= Ipsilateral and bilateral, SOHND= Supraomohyoid Neck Dissection, p=Pathological, RT=Radiotherapy)

DISCUSSION:

Head and neck defects possess a challenge to reconstruction after tumor excision. Various locoregional and free flaps are used for this purpose.[1,7,10] One such flap is submental flap which is used widely now a days for head and neck defects. The submental fap which was first described by Martin et al. has been widely used in head and neck reconstruction.[5] It is a simple flap, rapid to harvest flap, having wide arc of rotation with minimum donor side morbidity. It provides a thin, well vascularized tissue with same color to that of skin at defect site and obviate the need of microsurgical techniques. Other advantages of the flap are easy availability, good mobility, and excellent reach because of wide arc of rotation.[6-9] The flap does not provide bulk to the defects and better used for mobile organ like tongue reconstruction. Various other advantages include reduce hospital stay, shorter operative time, same incision for neck dissection, hide the donor scar and lower cost as compared to free flap reconstruction of similar head and neck defects.[11] Microvascular reconstruction techniques increase the surgical time and complexity of the process and carry an inherent risk of vascular failure.[10,11]

Despite these advantages, there are some disadvantages of flap like long learning curve because of complex anatomy, chances of early venous congestion and partial flap necrosis. Meticulous dissection and preservation of vascular supply is essential for flap viability. Use of anterior belly of digastric and mylohyoid muscle improved the viability of flap but the role remains controversial.[12] Rahpeyma et al. introduced the orthograde submental fap (Pattel modifcation).[10,11] The anterior belly of the digastric muscle and mylohyoid muscle in the pedicle half were included. In the nonpedicle part of the fap, the paddle was composed of platysma, subcutaneous fat tissue, and skin. Secondary epithelialization on the raw surface of subcutaneous fat exposed to the oral cavity was completed post-operatively at 3 weeks.[13]

Gao et al. in a study did an analysis on the cost-effectiveness of microvascular surgical reconstruction for head and neck defects and they concluded that the cost of head and neck microvascular surgical reconstruction is higher than locoregional methods.[14] Other disadvantage being the hair growth in the flap in male patients.[12] Katre et al. reported their previous experience with submental fap, in which they experienced similar issue of hair-bearing skin in oral cavity in males, who did not receive adjuvant RT.[6] These patients then had to undergo a second procedure of skin de-epithelialization or laser epilation later.

In clinically advance nodal disease flap should be avoided because of compromise of oncology safety.[5-7] Although frozen section of node can be done and if positive, flap should be abandoned. When facial artery is already being ligated or there is previous neck surgery then this flap should be avoided. [11,12]

Complications include partial or complete flap necrosis. Major hematoma or localized hematoma act as source of infection and prone to flap necrosis. Reversible or transient marginal mandibular nerve palsy may occur in some cases. Infection and seroma may lead to orocutaneous fistula, but this is very uncommon complication. In our study we encountered partial flap necrosis in one out of five cases. Chow et al. reported partial loss of two out of ten flap.[15]

Merten et al. reported loss of one flap in 11 nonirradiated patients.[16] However, no flap loss was seen in out study till last follow up though two patients got adjuvant RT.
The submental island is a pedicled myocutaneous flap. It has a wide arc of rotation, a constant axial vessel, appropriate pedicle length, large skin paddle and wide pivotal movement.[15] It is mainly used for reconstruction of oral cavity defects after cancer surgery, particularly after Squamous Cell Carcinoma resection. The use of this flap is contraindicated in patients with metastasis and in patients with a history of neck dissection, because for the success of this technique the integrity of the facial artery/vein is necessary.[17] In our study, all the patients were early stage (T1, T2) and none of the patients had clinically or radiologically palpable disease in the neck nodes.

American Society of Anaesthesiologists (ASA) proposed the physical status classification of preoperative patients (ASA risk score 1-5) for anaesthetic risk assessment in 1963.[18] Associations between ASA scores and specific surgical complications and outcomes have been reported in the literature. This free flap technique is not recommended in patients

with vessel-depleted irradiated neck and in patients with a high ASA risk score.[7,19] However in our study all the patients were younger than 60 years age and had ASA risk score 1 to 2. There were not significant medical or surgical complications.

Forner et al. in his study of cost analysis has found that Submental Island Flap incurred significantly less cost and less duration of hospital stay as compared to other Flap surgeries.[20] SIF may be advantageous in resource-constrained set like in rural India, where more patients can be benefitted and hospital facilities efficiently utilized.[14]

CONCLUSION:

Submental flap is a simple flap, rapid to harvest flap, having wide arc of rotation with minimum donor side morbidity. The flap does not provide bulk to the defects and better used for mobile organ like tongue reconstruction. Various other advantages include reduce hospital stay, shorter operative time, same incision for neck dissection, hide the donor scar and lower cost as compared to free flap reconstruction of similar head and neck defects. The flap should not be used for advance nodal disease or prior dissection of facial vessels has done. ASA risk score (low risk 1-2) can be used for preoperative assessment and can predict for low probability of medical and surgical complications in patients undergoing SIF reconstruction in head and neck cancer patients.

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Nil

CONFLICT OF INTEREST:

None

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