Submental Flap as a Reconstructive Option for Reconstruction in Oral Cancer

Tahir Masood Ahmed, Muhammad Umar Qayyum*, Umamah Tahir, Yumna Tahir**, Rubbab Zahra***, Maliha Tahir***

Combined Military Hospital Peshawar/National University of Medical Science (NUMS) Pakistan, *Combined Military Hospital Lahore/National University of Medical Science (NUMS) Pakistan, **Rawalpindi Medical College, Rawalpindi Pakistan, ***Avicenna Dental College, Lahore Pakistan

ABSTRACT

Objective: To demonstrate the advantages and oncological safety of the submental flap.
Study Design: Case series.
Place and Duration of Study: Department of Plastic and Reconstructive Study, Combined Military Hospital Rawalpindi, Multan and Peshawar Pakistan, from Jul 2014 to May 2020.
Methodology: Twenty patients underwent flap reconstruction with a submental flap. The patients were diagnosed with squamous cell carcinoma, basal cell carcinoma and verrucous carcinoma at different sites of the head and neck. Only patients with no cervical lymph node metastasis were included.
Results: We operated a total of 20 patients, out of which 11 (55%) were male and 9 (45%) were female. The mean age was 62.75 years (range: 47-80 years). Thirteen (65%) patients were diagnosed with Squamous cell carcinoma, 5 (25%) with Basal cell carcinoma and 2 (10%) were diagnosed with Verrucous carcinoma on histopathology. Two (10%) patients reported back with regional recurrence and were given postoperative radiotherapy. One (5%) patient had complete flap loss while 2 (10%) had distal tip necrosis.
Conclusion: In carefully selected cases submental flap is a viable option, without the risk of occult metastasis.

Keywords: Basal Cell Carcinoma, Myocutaneous Flap, Pedicled Flap, Squamous Cell Carcinoma, Verrucous Carcinoma.

How to Cite This Article: *Ahmed MT, Qayyum UM, Tahir U, Tahir Y, Zahra R, Tahir M. Submental Flap as a Reconstructive Option for Reconstruction in Oral Cancer. Pak Armed Forces Med J 2022; 72(Suppl-2): S350-354. DOI: https://10.51253/pafmj.v72iSUPPL-2.4527*

INTRODUCTION

Several different options have been used in the past, to reconstruct defects of the orofacial region. The early years of reconstruction after tumour ablative surgery saw the extensive utilization of pedicled flaps such as the pectoralis major myocutaneous flap, the latissimus dorsi flap and temporalis muscle flap to name a few. These flaps resulted in excessive bulk and less than ideal colour matches. With the advent of free flap surgery, it became possible to have the desired volume of the tissue including skin, muscle and bone predictably. Microvascular surgery had the disadvantages of increased cost, the requirement of a highly trained microvascular team, greater effort in postoperative hospital care and increased time under general anaesthesia. One of the recent addition to pedicled flaps is the submental artery flap which was first described by Martin *et al*.[1] It was not until 1996 that this flap was used by Sterne and Hall,[2] for the reconstruction of oral cancer. The submental flap is based on a constant branch of the facial artery having the largest diameter of branches of the facial artery.[3] It originates from the facial artery at a distance of 27.5mm from the external carotid artery. In 92% of the cases, it is anastomosis with the contralateral facial artery.[4] Studies have demonstrated that a large skin paddle measuring 10 x 16 cm is supplied by the submental artery reaching from one angle to the contralateral angle of the mandible. The submental artery gives up about 5 branches,[5,6] and has 2-4 skin perforators.[7] The venous drainage is based on venae comitantes that drain into the facial vein and the submental vein. The dimensions of the flap are limited by the amount of skin laxity which is determined by a pinch test. It is a versatile flap which can be employed for the reconstruction of defects of the cheek, the floor of the mouth, alveolus, palate, tongue and nose. The rationale of the study is to demonstrate the advantages and oncological safety of the submental flap.

METHODOLOGY

This case series of 20 patients was conducted at the department of plastic and reconstructive surgery of Combined Military Hospital Multan from June 2014 to May 2020. All the data was taken from the medical records. The study was approved by the Hospital Review Board. Informed consent was taken from the patients for the use of clinical pictures in the study.

Correspondence: Dr Muhammad Umar Qayyum, Classified Oral and Plastic Surgeon, CMH Lahore-Pakistan
Received: 16 Jun 2020; revision received: 09 Dec 2020; accepted: 23 Dec 2020

Inclusion Criteria: Those patients who were node-negative for the metastasis were included in the study.

Exclusion Criteria: None

All patients were included through consecutive sampling. The patient was positioned supine with the extended head as done in procedures for standard resection of head and neck tumours with neck dissection. The patient was draped keeping him/her exposed from the eyebrow to the clavicles inferiorly. The incision was marked in the submandibular crease and was extended anteriorly to the lower border of the mandible in the region of the submental flap. The lower border was marked with the help of a pinch test to estimate and mark the skin that can be included in the flap to facilitate a primary closure at the donor site. Depending on the size of the defect, the flap can be extended from one angle of the mandible to the contralateral side. The submandibular incision was marked and the incision was made through platysma (Figure-1).

Figure-1: A 55 year old female presented to us with an exophytic growth of the left lower lip, involving the labial vestibule and abutting the alveolar bone. Her neck was N0 on clinical and radiological exam. She had no co-morbid medical condition. She underwent selective neck dissection I-III. Submental artery flap was harvested through the same incision and was folded to provide coverage intraorally and extraorally.

Gentle dissection around the superior border of the submandibular gland exposed the submental and facial vessels. The ipsilateral anterior belly of the digastric muscle was included in the flap to protect the perforators. The flap was extended towards the contralateral side in a subplatysmal plane taking care to avoid injury to the marginal mandibular nerve. Now that the submandibular gland was dissected, intraglandular vessels were cauterized with bipolar diathermy. The main trunk of the facial artery was followed and the submental branch was identified. The submental artery was followed until the midline and the facial artery was ligated above the origin of the submental artery. At this stage, the arc of rotation of the flap was verified. A subcutaneous tunnel was made to transport the flap intraorall, the tunnel was wide enough to accommodate the pedicle without causing pressure on it. Hemostasis was achieved before flap inset. A suction drain was placed and the donor defect was closed primarily along with the neck dissection incision in cases of SCC (Figure-2).

Figure-2: Histopathologically diagnosed poorly differentiated squamous cell carcinoma. Resection marks and the marks for nasolabial flap and a submental artery flap are shown. Resection of the tumor with clear margins. The neck was accessed for selective neck dissection I-III. Submental flap was harvested. The defect was closed by a combination of nasolabial and submental artery flap.

The statistical analysis was done using the Statistical Package for Social Sciences version 23.0 Continuous variables were expressed as means and standard deviations, whereas frequencies and percentages were shown for categorical variables.

RESULTS

Eleven male (55%) and nine female patients (45%) were operated on for different types of tumours of the head and neck region (Table). The operations were carried out at Combined Military Hospital Multan. Their ages ranged from 47-80 years with a mean age of 62.75 years. Thirteen (65%) patients were diagnosed with Squamous cell carcinoma, 5 (25%) with Basal cell carcinoma and 2 (10%) were diagnosed with Verrucous carcinoma on histopathology. The T stage ranged from T2 to T4 for SCC and VC. Selective neck dissection levels 1-3 were done in all the cases of SCC and VC. All the patients had a clinically negative neck. The different sites involved were buccal mucosa, lip, chin, anterolateral neck, alveolus and labial mucosa in different combinations. The TNM staging was stage 1 or 2. The patients who were operated on for Squamous cell

Table: Demographic variables and patients characteristics.

S. No	Gender	Age	Site	Tumour Stage	Histopatho-logical Diagnosis	Neck lymph Node Metastasis	Neck Dissection	Flap Survival	Follow up	Complications/Post Operative Sequelae
1	M	70	Buccal Mucosa and Skin	T4	SCC	No	SND I-III	Complete	>5 years	Recurrence; was Reoperated and Post RT Given
2	F	65	Buccal Mucosa	T2	SCC	No	SND I-III	Complete	>5 years	Intraoral Hair Growth
3	F	68	Buccal Mucosa	T2	SCC	No	SND I-III	Complete	>5 years	Nil
4	F	70	Chin Skin	--	BCC	No	Nil	Complete	<5 years	Nil
5	M	65	Anterolateral Neck	--	BCC	No	Nil	Complete Necrosis		Complete flap necrosis
6	F	58	Anterolateral neck	T2	BCC	No	Nil	Complete	4 years	Nil
7	M	76	Lower Cheek/chin	T4	SCC	No	SND I-III	Complete	2 yeas	Intraoral hair growth
8	F	55	Buccal Mucosa, Alveolus	T3	SCC	No	SND I-III	Complete	6 months	Neck Metastasis; Recuurence was Noted and was Reoperated Alongwith Post RT for Neck and Primary Tumour
9	F	80	Lateral Lip, alveolar mucosa	T3	SCC	No	SND I-III	Complete	1 year	Wound dehisence
10	M	68	Buccal mucosa	T2	Verrucous carcinoma	No	Nil	Complete	2 years	Intraoral hair growth
11	M	65	Alveolus	T2	SCC	No	SND I-III	COMPLETE	2 years	Nil
12	F	52	Buccal and labial mucosa	T3	SCC	No	SND I-III	Complete	18 months	Nil
13	M	54	Lateral lip and cheek	--	BCC	No	Nil	Complete	1 year	Nil
14	M	59	Lower cheek/chin	T3	SCC	No	SND I-III	Complete	4 years	Distal Tip Necrosis
15	M	62	Buccal mucosa	T2	SCC	No	SND I-III	Complete	2 years	Nil
16	M	47	Buccal mucosa	T2	Verrucous carcinoma	No	Nil	Complete	6 months	Wound Dehiscence
17	F	76	Buccal mucosa	T2	SCC	No	SND I-III	Complete	18 months	Nil
18	M	49	Lateral lip and chin skin	-	BCC	No	Nil	Tip Necrosis	3 years	Distal Tip Necrosis
19	M	56	Lateral lip and cheek skin	T2	SCC	No	Nil	Complete	2 years	Nil
20	F	60	Buccal Mucosa	T3	SCC	No	SND I-III	Complete	2.5 years	Nil

carcinoma and Verrucous carcinoma were discussed in Tumour Board before the surgery. Two (10%) patients reported back with regional recurrence, they have discussed in Tumour board again and were given post-operative radiotherapy. One (5%) patient had complete flap loss while two (10%) had distal tip necrosis. Three patients with intraoral hair growth were advised laser but they declined (Figure-3).

DISCUSSION

The submental is a relatively new flap. Incorrectly selected cases this flap has the advantage of being in the vicinity of the surgical process, having a good arc of rotation and a good colour match. The submental flap has also been described according to the composition of the tissues; as myocutaneous or osteocutaneous flap.[8,9] The submental flap can be pedicled as an orthograde or a retrograde variant. The orthograde variety depends on the integrity of the facial artery while the retrograde or the reverse flow flap relies on

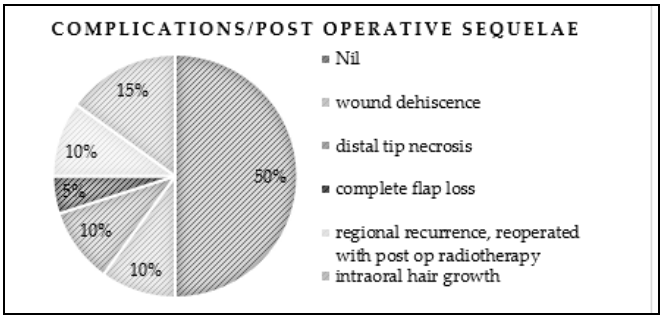

Figure-3: Post-operative complications encountered.

the anastomosis between the terminal branches of the external and internal carotid via the angular artery.[10] The myocutaneous flap is the one which includes the digastric and mylohyoid muscle to increase the bulk and protect the pedicle of the flap.[11-12]

The treatment of oral cancer is primarily surgical. Surgical procedures often produce defects that cannot be closed primarily. An array of flaps have been used starting from the advancement of local tissues to achieve primary closure to pedicled flaps and free flaps. Free flaps require prolonged anaesthesia time, increased intensive unit stay and increased financial burden.[13-14] In such cases, the submental flap offers some advantages. It replaces the tissue with a tissue of similar colour and texture, the skin is thin and pliable. [15-16] In the realm of pedicled flaps, before the advent of the submental flap, pectoralis myocutaneous was the workhorse flap in the reconstruction of head and neck defects.[17] It was a good choice for large defects but small to intermediate defects, it was considered too bulky. For these small defects which did not require muscle bulk submental flap is a good option.

Some of the advantages of the submental flap are constant vascular pedicle, a pedicle which can be lengthened by various means and good pivot movement.[17] The latter is one of the reasons for it being used commonly in squamous cell cancers of the oral cavity. [18] In our series, we used submental flaps in squamous cell carcinoma patients who didn't have nodal disease clinically or radiographically. This is a contraindication to submental flap as an occult disease in the level 1 lymph nodes can lead to tumour seeding in the recipient site.[19] The flap is contraindicated in patients with previous neck dissection, as the integrity of facial vessels is necessary for a successful flap.[20] When compared with other flaps, such as the pectoralis major myocutaneous flap; we recognize the technical simplicity of the flap.[21-22] The drawback of PM flap is its complications especially in female patients, the bulk of the flap and the possible need for revisions.[23-24] The submental flap has been compared to the radial forearm free flap in some aspects such as the thinness of skin, ease of elevation, excellent colour match, versatility and pliability.[1,25] Those patients who have a poor ASA grade and cannot undergo long microsurgical procedures are good candidates for the submental flap, another advantage is the esthetically pleasing result in the elderly due to reduction of mental fullness. Damage to the marginal mandibular branch of the facial nerve is one of the disadvantages, this is rare in expert hands but can occur nevertheless. The incidence ranges from 0-17%. The use of a nerve stimulator and a supraplatysmal dissection can greatly reduce this complication. The hair-bearing skin poses a problem for intraoral reconstruction in male patients, this can be dealt with with the laser ablation of hair. If post-RT is planned then nothing needs to be done for intraoral hair growth removal. Submental Intubation can-not be employed while doing this flap.

There is a consensus that submental flaps should not be used in cases in which there is the metastatic nodal disease. Some authors propose that staying in the correct anatomical plane lessens the chances of tumour seeding in the recipient site. We did not utilize this flap in any patient who had metastatic neck disease in the preoperative workup.

CONCLUSION

The submental flap is a very good option for reconstruction in patients with small to mediumsized defects after cancer ablation surgery. It has a reliable vascular pedicle, good colour match and thin, pliable skin with the added cosmetic advantage in old patients. It also saves precious operation time in patients with reduced physiological reserves. The flap has the disadvantage of hair-bearing skin inside the mouth and a potentially serious complication of seeding nodal disease at level 1 to the recipient site. We conclude by saying that it is a very versatile flap, which in selected patients is a very good option for the reconstruction of oral/ extraoral defects.

Conflict of Interest: None.

Author's Contribution

TMA: Conception and design, acquisition of data, drafting the article for important intellectual content, MUQ: Conception and design, acquisition of data, drafting the article and revising it critically for important intellectual content, final approval of the version to be published, UT:, YT: acquisition of data, analysis and interpretation of data, drafting the article, revising it critically for important intellectual content, RZ: Final approval of the version to be published, ensuring the accuracy of any part of the work that are appropriately investigated and resolved, MT: Data analysis and interpretation of data, final review of the version to be published.

REFERENCES

1. Martin D, Pascal JF, Baudet J, Mondie JM, Farhat JB, Athoum A, et al. The submental island flap: A new donor site. Anatomy and clinical applications as a free or pedicled flap. Plast Reconstr Surg 1993; 92(5): 867-873.
2. Sterne GD, Januszkiewicz JS, Hall PN, Bardsley AF. The submental island flap. Br J Plast Surg 1996; 49(2): 85-89.
3. Jiang GH, Yan JH, Lin CL, Huang Y, Wen H, Li WM. Anatomic study of the facial artery using multislice spiral CT angiography. J Southern Med Uni 2008; 28(3): 457-459.

4. Magden O, Edizer M, Tayfur V, Atabey A. Anatomic study of the vasculature of the submental artery flap. Plast Reconstr Surg 2004; 114(7): 1719-1723.
5. Hwang K, Han JY, Chung RS, Chung IH. Submental perforating artery: a culprit of bleeding during facelift. J Craniofac Surg 2005; 16(1): 3-5.
6. Ishihara T, Igata T, Masuguchi S, Matsushita S, Sakai K, Ihn H. Submental perforator flap: location and number of submental perforating vessels. Scand J Plast Reconstr Surg Hand Surg 2008; 42(3): 127-131.
7. Potter S, De Blacam C, Kosutic D. True submental artery perforator flap for total soft-tissue chin reconstruction. Microsurg 2012; 32(6): 502-504.
8. Magden O, Edizer M, Tayfur V, Atabey A. Anatomic study of the vasculature of the submental artery flap. Plast Reconstr Surg 2004; 114(7): 1719-1723.
9. Rahpeyma A, Khajehahmadi S. Submental artery island flap in intraoral reconstruction: a review. J Craniomaxillofac Surg 2014; 42(6): 983-989.
10. Chen WL, Zhou M, Ye JT, Yang ZH, Zhang DM. Maxillary functional reconstruction using a reverse facial artery-submental artery mandibular osteomuscular flap with dental implants. J Oral Maxillofac Surg 2011; 69(11): 2909-2914.
11. Potter S, De Blacam C, Kosutic D. True submental artery perforator flap for total soft-tissue chin reconstruction. Microsurg 2012; 32(6): 502-504.
12. Matsui A, Lee BT, Winer JH, Laurence RG, Frangioni JV. Submental perforator flap design with a near-infrared fluorescence imaging system: the relationship among number of perforators, flap perfusion, and venous drainage. Plast Reconstr Surg 2009; 124(4): 1098-1104.
13. Sun G, Lu M. Reconstruction of extensive lip and perioral defects after tumor excision. J Craniofac Surg 2013; 24(2): 360-362.
14. Hatef DA, Koshy JC, Sandoval SE, Echo AP, Izaddoost SA, Hollier LH. The submental fat compartment of the neck. Semin Plast Surg 2009; 23(4): 288-291.
15. Tan O, Kiroglu AF, Atik B, Yuca K. Reconstruction of the columella using the prefabricated reverse flow submental flap: A case report. Head Neck 2006; 28(7): 653-657.
16. Amin AA, Sakkary MA, Khalil AA, Rifaat MA, Zayed SB. The submental flap for oral cavity reconstruction: extended indications and technical refinements. Head Neck Oncol 2011; 3(1): 51.
17. McLean JN, Carlson GW, Losken A. The pectoralis major myocutaneous flap revisited: a reliable technique for head and neck reconstruction. Ann Plast Surg 2010; 64(5): 570-573.
18. Chow TL, Chan TT, Chow TK, Fung SC, Lam SH. Reconstruction with submental flap for aggressive orofacial cancer. Plast Reconstr Surg 2007; 120(2): 431-436.
19. Jiang B, Gu Y, Chen W. [Submental island flaps for reconstruction of hypopharyngeal non-circumferential defects after hypopharyngeal carcinoma removal]. Chinese Journ Repar Reconstr Surg 2006; 20(12): 1183-1185.
20. Kadlub N, Shin JH, Ross DA, Della Torre T, Ansari E, Persing JA, et al. Use of the external pectoralis myocutaneous major flap in anterior skull base reconstruction. Int J Oral Maxillofac Surg 2013; 42(4): 453-457.
21. McLean JN, Carlson GW, Losken A. The pectoralis major myocutaneous flap revisited: A reliable technique for head and neck reconstruction. Ann Plast Surg 2010; 64(5): 570-573.
22. Mehrhof AI Jr, Rosenstock A, Neifeld JP, Merritt WH, Theogaraj SD, Cohen IK. The pectoralis major myocutaneous flap in head and neck reconstruction. Analysis of complications. Am J Surg 1983; 146(4): 478-482.
23. El-Marakby HH. The reliability of pectoralis major myocutaneous flap in head and neck reconstruction. J Egypt Natl Canc Inst 2006; 18(1): 41-50.
24. Varghese BT. Optimal design of a submental artery island flap. J Plast Reconstr Aesthet Surg 2011; 64(7): e183-184.
25. Pelissier P, Casoli V, Martin D, Demiri E, Baudet J. Submental island flaps. Surgical technique and possible variations in facial reconstruction. Rev Laryngol Otol Rhinol (Bord) 1997; 118(1): 39-42. .

.....