

## Complications of the Submental Flap when used for Post-Oncological Oral Cavity Reconstruction

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### ABSTRACT

**Background:** The oral cavity consists of the oral vestibule and oral cavity proper. Its primary function is to serve as the alimentary tract entrance and initiate the digestive process. It also serves as a secondary respiratory conduit, a site of sound modification to produce speech, and a chemosensory organ. The development of a primary malignancy within the oral cavity and subsequent cancer treatment and next cancer treatment can affect these standard functions.

**Aim of study:** This work aims to discuss the complications of the submental island flap when used instead of the microvascular free flap in post- oncological oral cavity reconstruction.

**Subjects and Methods:** An interventional study involved patients with carcinoma of the oral cavity doing submental island flap during the study period. Evaluation of the patient pre operatively by assessment of intraoral cancer stage (TNM), type of pathology degree of differentiation (grade), the neck flaps, and the submental flap dimensions by pinch test and using a ruler and comparing it with defect that will created after resection of intra oral tumor. All patients underwent one-stage procedure for tumor resection, neck lymph node dissection and reconstruction with orthograde contralateral or ipsilateral submental island flap.

**Results:** 79.16 % of the participants were intact regarding flap vascularity, 3.8% were congested and conservatively managed, while 12.5% were dead. Concerning the fate of totally dead, 33.33% were primary closed, 33.33% pectoralis major flap done to them, and 33.33% Thoracodorsal artery perforator flap (TDAP) was used. The Mean  $\pm$  SD of hospital stay was  $8.16 \pm 3.17$  days. 91.7 % of the patients did not need a tracheostomy, and 4.2% needed tracheostomy; only 8.3 % of them had infected wounds, and all of them preserved. Marginal Mandibular Nerve (MMN). 16.7 % of the participants had local recurrence, 8.3% of them had a nodular recurrence. 58.3% of the patients didn't need adjuvant therapy.

**Conclusion:** Submental artery flap is a valid option for the reconstruction of oral cavity defects. It represents an excellent alternative to free flaps, particularly in elderly patients or in high-ASA risk in spite there are many complications, like flap vascularity impairment and the need for tracheostomy wound infection and early recurrence.

**Keywords:** Intraoral cancer stage; Submental island flap; in post- oncological oral cavity reconstruction.

### 1. Introduction

The oral cavity consists of the oral vestibule and oral cavity proper. Its primary function is to serve as the alimentary tract entrance and initiate the digestive process. It also serves as a

secondary respiratory conduit, a site of sound modification for the production of speech, and a chemosensory organ. The development of a primary malignancy within the oral cavity, as well as subsequent cancer treatment, can affect these normal functions. Oral cavity cancer is one of the most common types of cancer; oral and oropharyngeal squamous cell carcinoma (SCC) represents the sixth most common cancer worldwide and occurs most commonly in middle-aged and elderly individuals [1]. While cancers of the oral cavity only account for approximately 2% of all new cancer diagnoses in the United States, it is the most common site of all head and neck cancers [2]. In India, oral cavity cancer is among the three most common malignancies, accounting for over 30% of all reported malignancies due to the high prevalence of chewing and smoking various carcinogens [3]. Surveillance Epidemiology and End Results (SEER) program data estimate 32,670 cases of cancer of the oral tongue, mouth, and oral cavity for 2017 in the United States [2]. An estimated 300,400 new cases and 145,400 deaths from cancer of the oral cavity and lip occurred worldwide in 2012 [4]. This tumor may affect the mucosa of the floor of the mouth, cheek, tongue, and inner lip surface, with the tongue being the most common oral site [5].

Surgery is the primary method of managing oral cavity cancer. The excision entails the removal of the tumor with a margin of at least 1 to 1.5 cm. Simultaneously neck dissection is performed for clinically evident nodal disease, for large primary tumors or for tumors with a depth of invasion greater than 4 mm [6].

Free flaps are commonly used for the reconstruction of extensive tumor resection defects in the oral cavity [7]. The radial forearm free flap is the most frequent reconstructive technique. Free tissue transfer is nowadays more often performed in the elderly with the increase in the geriatric patient population compared to the past [8]. Age alone is not an independent variable for increased risk in microvascular reconstruction; however, operative time and ASA risk score correlated with medical complications but not with surgical complications [9]. Pedicled flaps have a vital role in reconstructing medium to significant sized defects of oral cavity [10-11].

Over the last few years, the submental island flap has proven to be a reliable reconstructive option in head and neck surgery [12]. Moreover, the operative time and hospital stay are shorter than the gold standard radial forearm free flap [13].

The purpose of this study was to discuss the complications of a series of 24 patients, affected by carcinoma of the oral cavity in whom reconstruction have been performed using ipsilateral or contralateral submental flap.

## **2. Subjects and Methods**

### **2.1 Research Design and Ethical consideration:**

An interventional study was used in carrying out the study conducted in Zagazig University hospitals and national cancer institute, as they are of the major curative facilities in Egypt.

Permission was obtained from the Institutional Review Board (IRB) and Ethical Committee of Zagazig University's faculty of medicine before starting the study. In addition, informed consent was received from all patients who participated in the study

### **2.2 Patients:**

Cancer patients with intraoral malignancy. The sample size was 24 patients as the expected number of cases with intraoral cancer doing immediate reconstruction with submental island flap and fulfilling the inclusion criteria is two patients per month (24/ year), and all of them have been included in the study as the comprehensive sample.

## **2.3 Experimental protocol**

### **Inclusion criteria:**

Any patient with carcinoma of the oral cavity doing island submental flap during the study period.

### **Exclusion criteria:**

Presence of distant metastasis, locally advanced tumor of the oral cavity, Small sized lesions whose defect can be closed primarily and Previous neck irradiation, extensive scarring.

## **2.4. Operational Design:**

### **2.4.1. Data collection tools:**

Laboratory investigations, neck ultrasound and CT, tissue diagnosis, TNM stage, grade of the tumor, and metastatic workup.

### **2.4.2. Process:**

Evaluation of the patient pre operatively by assessment of intraoral cancer stage (TNM), type of pathology degree of differentiation (grade), assessment of the neck flaps.

Assessment of the submental flap dimensions by pinch test and using a ruler and comparing it with defect that will created after resection of intra oral tumor.

All patients underwent one-stage procedure for tumor resection, neck lymph node dissection and reconstruction with orthograde contralateral or ipsilateral submental island flap. Early and late complications of this technique were discussed.

An elliptical island was designed in the submental triangle. The upper incision was made 1.5 cm below the mandible at the midline and 3.5 cm below the angles of the mandible bilaterally. The length of the ellipse was outlined related to the expected size of the defect and to accommodate unilateral or bilateral neck dissection. Hence the dissection of the neck started, taking care to preserve both the facial artery and vein on that side. The vascular tributaries to the submandibular gland were ligated as close as possible to the gland and dissected away from it, preserving the submental vessels. In case bilateral neck dissection was needed, the flap was harvested on the less involved side of the neck.

Flap dissection began from the contralateral side of the pedicle, in the subplatysmal plane. On the side of the pedicle, the anterior belly of the ipsilateral digastric muscle was sectioned from its mandibular insertion and the common tendon to be elevated with the skin paddle so that the submental artery and vein can be sandwiched between the digastric muscle and superficial cuff of the mylohyoid muscle.

The flap was always moved toward the oral cavity passing medially to the mandible to cover the defect of the floor of the mouth, the base of the tongue, the tonsillar fossa, or the buccal mucosa. Lastly, the flap was inset and sutured in place and neck bi-limbed suction drain was placed. If the oral cavity dissection crosses the midline or suspect post-operative edema tracheotomy should be done.

Follow up of the patients to record early complications in hospital admission flap vascularity, marginal mandibular nerve injury, oro-cutaneous fistula, wound infection, swallowing

difficulty, speech articulation hair growth in the flap for a male patient, confirmation of the pathology, and grade after resection, confirmation of the safety margin, assessment of the nodal spread of the tumor.

Follow up tumor recurrence either locally or neck nodes or distant recurrence and assessment of patient satisfaction with the flap. We were withdrawn from the study by detecting the morbidity, functional and cosmetic outcome of immediate reconstruction of the oral cavity and tongue, of course, plus tissue margins clearance of malignancy.

## 2.5. Data management:

Data collected throughout history, basic clinical examination, laboratory and radiological investigations, and outcome measures coded, entered, and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data, qualitative represent as number and percentage, and quantitative continues group represented by mean  $\pm$  SD. The results were assessed and statistically analyzed to evaluate the post-operative outcome of immediate reconstruction of the intraoral malignancy by ipsilateral or contralateral submental island flap.

## 3. Results

The Mean  $\pm$  SD of the age of the studied group was  $52.75 \pm 9.24$ , 62.5% of them were females, 37.5% of them were males, half of them were smokers, and 4.2% of them were drinking alcohol (Table 1) (Figure 1). More than half of them (58.3%) had the lesion in the tongue, and 25% of them had the lesion in cheek (Table 2) (Figure 2). 83.3% of them had SCC, and 12.5 % had adenoid cystic C as a lesion pathology (Table 3) (Figure 3).

Regarding TNM of lesion, 40.9% of the participants were T2N0M0G2 and 18.2% of them were T3N1M0G3 (Table 4) (Figure 4).

Concerning flap vascularity, 79.16 % of the participants were totally intact, 12.5% of them were totally dead 3.8% of them were congested and conservatively managed (Table 5).

About fate of totally dead, 33.33% of them were primary closed, 33.33% pectoralis major flap done to them and 33.33% of them were TDAP, died, and major pectoralis flap done to it (Table 6).

The Mean  $\pm$  SD of hospital stay was  $8.16 \pm 3.17$  days (Table 7). 91.7 % of the participants didn't need trichotomy, 4.2% of them need trichotomy for post-operative stridor, and 4.2% of them need trichotomy for dissection crossed midline (Table 8). Only 8.3 % of them had infected wounds, and all of them preserved MMN (Table 9). Concerning pathological node assessment, 12.5% of them were N(0/30), and 8.3% of them were both N(1/30) and N(10/40) (Table 10).

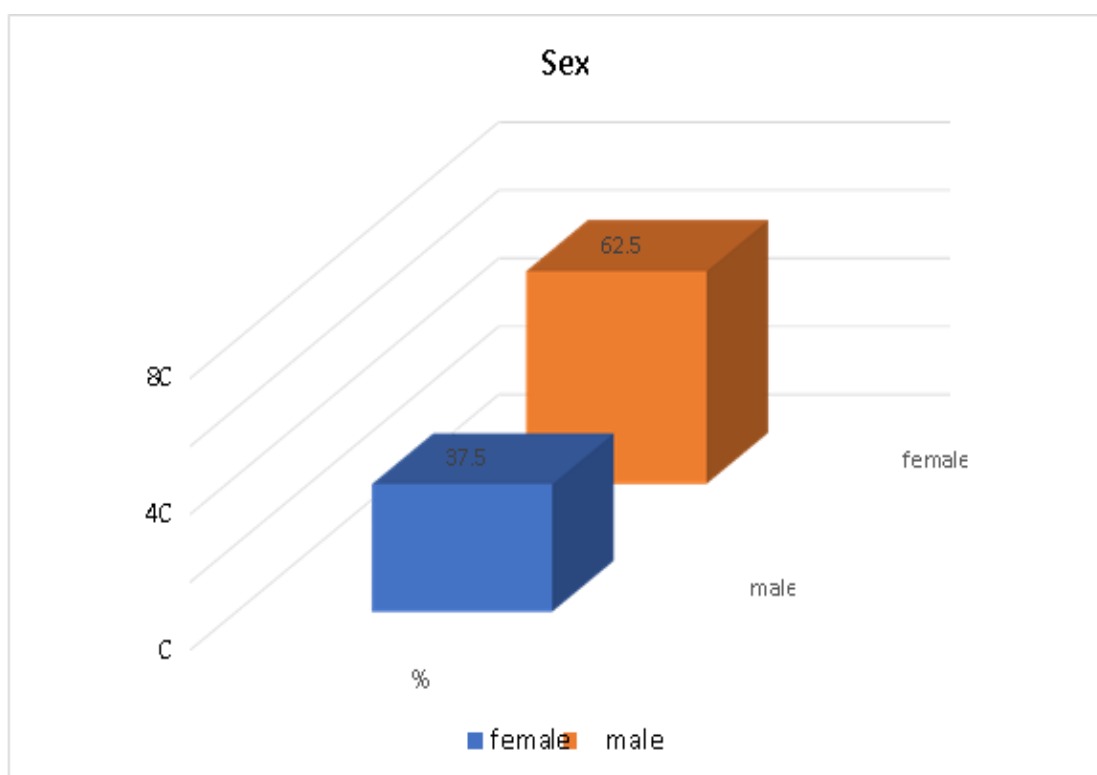
16.7 % of the included patients had local recurrence, 8.3% of them had a nodular recurrence, and as regards distant recurrence, 83.3 % of them didn't had a distant recurrence, 8.3% of them had a distant recurrence in the lung, 4.2% of them had a distant recurrence in lung & liver, and 4.2% of them had distant recurrence in brain (Table 11). More than half of them (58.3%) didn't need adjuvant therapy, 37.5 % of them received radiotherapy, and 4.2 % of them received chemoradiotherapy therapy (Table 12) (Figure 5).

33.33% of the participants didn't have hair growth, the remaining who had hair growth 33.33% of them had hair growth spontaneously (mucosalized) ,33.33% of them had hair growth

(improved by laser), and 33.33% of them had hair growth (Radiotherapy improved it) (Table 13).

**Table 1: Sociodemographic data among studied groups**

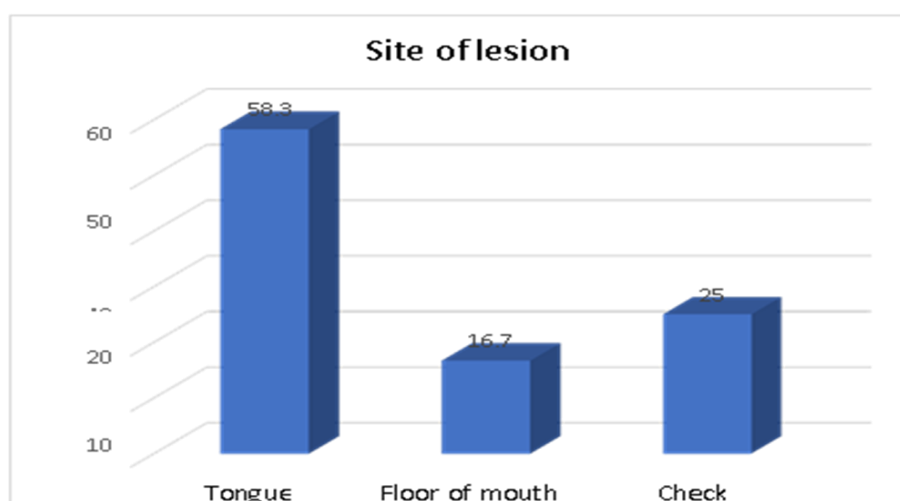
Item	No=24	%=100
Age (Yrs)	Mean $\pm$ SD:	52.75 $\pm$ 9.24
	Range:	32-69
<b>Sex:</b>		
Males	9	37.5
Females	15	62.5
<b>Smoking</b>		
Yes	12	50
NO	12	50
<b>Alchol Drinking</b>		
Yes	1	4.2
NO	23	95.8



**Fig 1: Sex distribution among the studied group**

**Table 2: Site of lesion among the studied group**

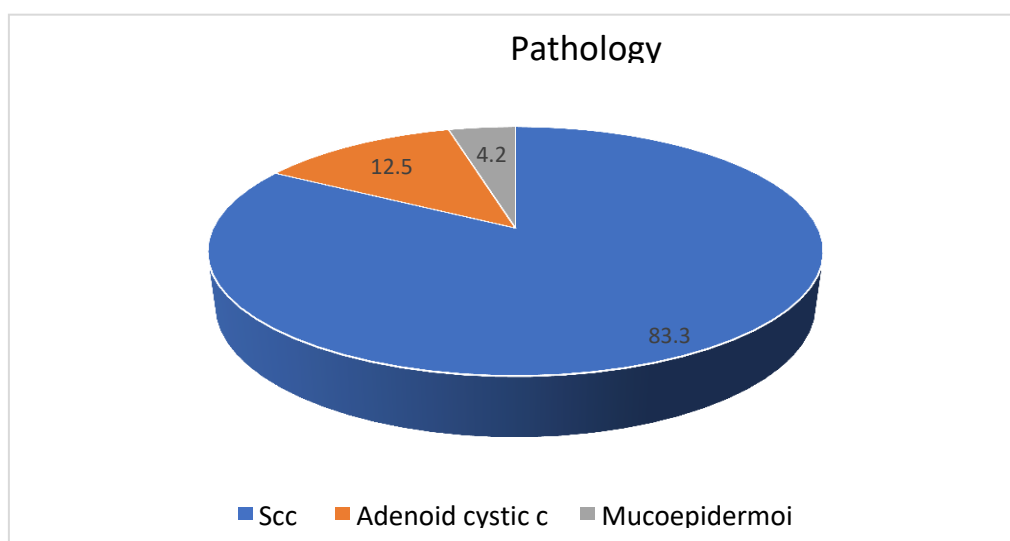
Item	No=24	%=100
<b>Site:</b>		
• Tongue	14	58.3
• Floor of mouth	4	16.7
• Cheek	6	25



**Fig 2:site of lesion among studied group**

**Table 3: Pathology of lesion among the studied group**

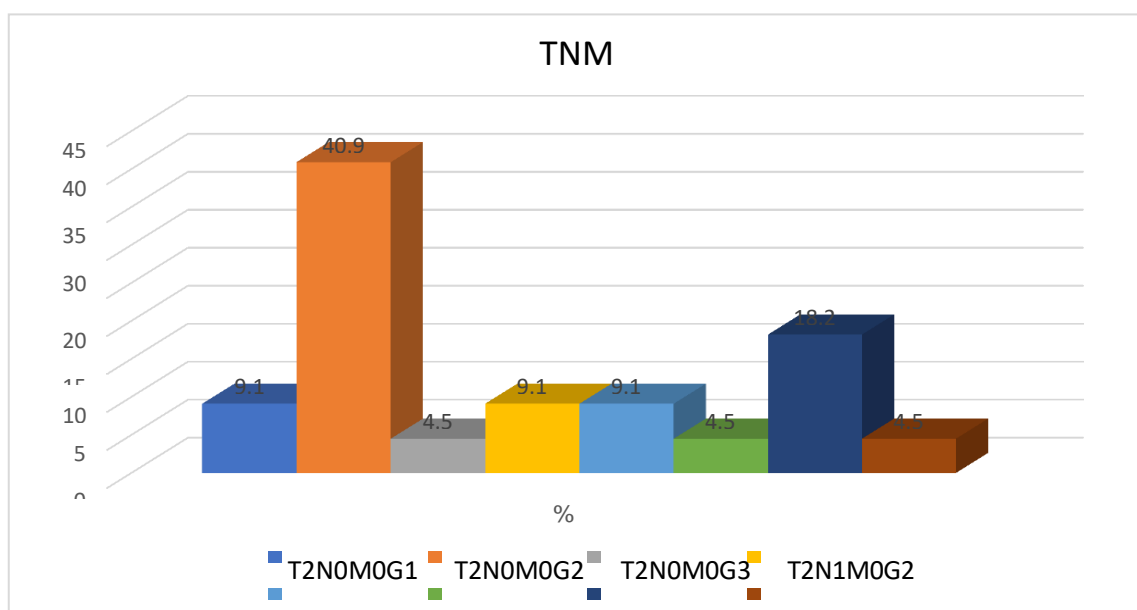
Item	No=24	%=100
<b>Pathology:</b>		
• SCC	20	83.3
• ADENIOD CYSTIC C	3	12.5
• MUCOEPIDEMIOD C	1	4.2



**Fig 3: Pathology of lesion among the studied group**

**Table 4: TNM of lesion among the studied group**

Item	No	%
T2N0M0G1	2	9.1
T2N0M0G2	9	40.9
T2N0M0G3	1	4.5
T2N1M0G2	2	9.1
T3N0M0G2	2	9.1
T3N1M0G2	1	4.5
T3N1M0G3	4	18.2
T3N2M0G2	1	4.5



**Fig 4: TNM of lesion among the studied group**

**Table 5: Flap vascularity and fate among the studied group**

Item	No=24	%=100
<b>Flap vascularity</b>		
• Totally intact	19	79.16
• Congested	2	8.3
• Totally dead	3	12.5

**Table 6: Fate of totally dead flap among the studied group**

Item	No=3	%=100
<b>Fate of totally dead flap:</b>		
<input type="checkbox"/> Primary closure	1	33.33
<input type="checkbox"/> Pectoralis major flap	1	33.33
<input type="checkbox"/> TDAP	1	33.33

**Table 7: Time needed for hospital stay among the studied group**

Item	Mean $\pm$ SD	Range
Hospital stay(days)	8.16 $\pm$ 3.17	5-20

**Table 8: Need for trichotomy among the studied group**

Item	No=24	%=100
<b>Need for trichotomy:</b>		
• No	22	91.7
• Yes (Post-operative stridor)	1	4.2
	1	4.2
• Yes (dissection crossed midline)		

**Table 9: Wound infection and MMN injury among the studied group**

Item	No=24	%=100
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<b>Wound infection</b>		
• No	22	91.7
• Yes	2	8.3
<b>MMN injury</b>		
• Preserved	24	100

**Table 10: Pathological nodes assessments among the studied group**

<b>Item</b>	<b>No=24</b>	<b>%=100</b>
N(0/20),G1	1	4.2
N(0/14),G1	1	4.2
N(2/19),G2	1	4.2
N(0/32),G2	1	4.2
N(0/18),PERINEU RAL INVSTION	1	4.2
N(0/30)	3	12.5
N(0/33)	1	4.2
N(3/20)	1	4.2
N(1/30)	2	8.3
N(4/17)	1	4.2
N(0/16),PERINEU RAL INVSTION	1	4.2
N(3/30)	1	4.2
N(6/23)	1	4.2
N(5/22)	1	4.2
N(3/22)	2	8.3
N(10/40)	1	4.2
N(0/20),PERINEU RAL INVSTION	1	4.2
N(9/24)	1	4.2
N((2/22)	1	4.2
N(0/22)	1	4.2

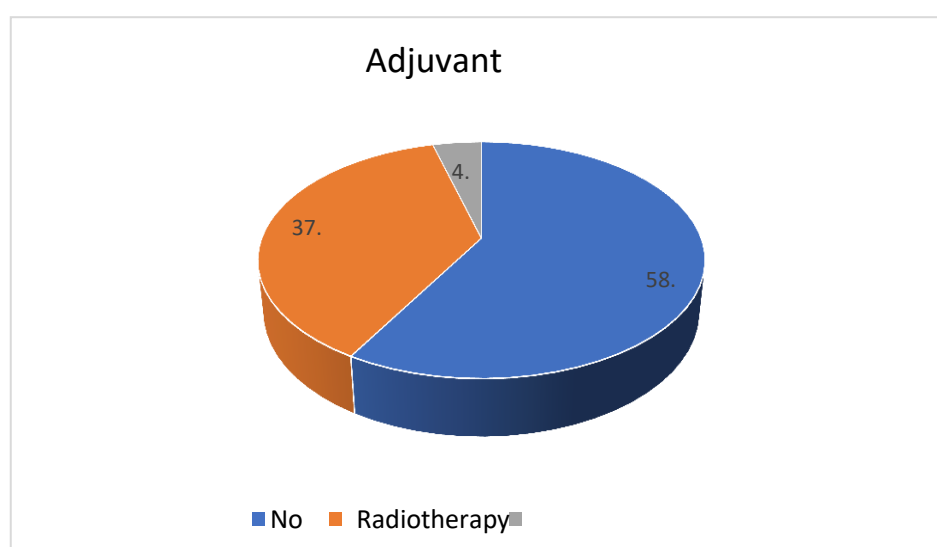
**Table 11: Recurrence among the studied group**

<b>Item</b>	<b>No=24</b>	<b>%=100</b>
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<b>Local recurrence</b>		
• No	20	83.3
• Yes	4	16.7
<b>Nodular recurrence</b>		
• No	22	91.7
• Yes	2	8.3
<b>Distant recurrence</b>		
• No	20	83.3
• Lung	2	8.3
• Lung& Liver	1	4.2
• Brain	1	4.2

**Table 12: Adjuvant therapy among the studied group**

<b>Item</b>	<b>No=24</b>	<b>%=100</b>
<b>Adjuvant therapy:</b>		
• No	14	58.3
• Radiotherapy	9	37.5
• Chemo radiotherapy therapy	1	4.2



**Fig 5: Adjuvant therapy among the studied group**

**Table 13: Hair growth among studied male group**

Item	No=9	%=100
<b>Hair growth:</b>		
• No	3	33.33
• Yes (spontaneously mucosalized)	2	33.33
• Yes (Laser)	2	33.33
• Yes (Radiotherapy improved it)	2	33.33

#### 4.Discussion

It is occurring most commonly in elderly individuals. In India, it accounts for approximately 30% of all cancers involving the head-neck region [14].

Surgery is the main method of managing oral cavity cancer. The excision entails the removal of the tumor with a margin of at least 1e1.5 cm. Simultaneously neck dissection is performed for clinically evident nodal disease, for large primary tumors, or for tumors with a depth of invasion greater than 4 mm [6].

Reconstruction of oral defects after oncological resections represents one of the greatest challenges in head and neck surgery. Several techniques have been proposed in order to achieve adequate functional and aesthetic results. In this regard, a sub-mental flap might constitute a useful resource [15].

Microvascular-free flaps have become popular in reconstructing complex post resection defects in the Head and neck, but factors such as cost, expertise, and logistics (e.g. operating time) are serious concerns in the public healthcare delivery system. Simple and technically reproducible alternatives are urgently needed to tackle these issues. The submental artery flap is a -described axial pattern flap is increasingly used in head and neck reconstruction because of its obvious advantages [16].

The two most common applications of the submental island flap repair cutaneous facial defects and intraoral reconstruction. Submental island flap offers excellent color and texture. Moreover, donor site incisions could be closed primarily with minimum morbidity. It may be employed in a number of ways, such as myocutaneous, fasciocutaneous, osteocutaneous or cutaneous flap. Flap elevation is simple and rapid when in expert hands [17].

The submental island flap, first described by Martin et al. in 1994, has several known advantages in head and neck reconstruction. From a cosmetic standpoint, the thin pliable tissue that is harvested has unparalleled color and texture match for head and neck defects, while also having minimal donor site morbidity. The submental flap is also a very versatile flap for reconstruction in the, Head and neck. The proximity to the Head and neck allows it to be used as a pedicled island flap in many situations without the need for microvascular expertise. It has also been described as a 'hybrid 'flap' with venous-only anastomoses as a way of increasing reach. Finally, it can easily be harvested as a free flap without difficulty [18].

The submental flap has been used for lower and midfacial defects. The use of pedicled and

hybridized submental flaps for lateral skull base defects has also been described, demonstrating its potential utility for higher defects [19].

The main objective of this study was to discuss the early and late complications of the submental island flap which had steadily replaced the microsurgical free flap in intraoral post oncological reconstruction in medium sized defects.

An intervention study was carried out on 24 Cancer patients with intraoral malignancy with carcinoma of the oral cavity doing submental island flap during the study period at Zagazig University Hospitals and national cancer institute. The duration of the study ranges from 6 to 12 months.

### **The main results of the study were as following:**

Oral cancer is the sixth most common cancer worldwide, occurring most commonly in elderly individuals. It is more common in males between the sixth to eighth decades of life [20]. Our results show that Mean  $\pm$  SD of the age of the studied group was  $52.75 \pm 9.24$ , 62.5% of the participants were females, 37.5% of them were males, half of them were smokers, and 4.2% of them were drinking.

Our results are supported by findings reported by **Cariati, et al., 2018 [15]**, as they found that the mean age of the patients was 59.6 years (range, 42–75). But in contrast to our results, they reported that nine patients were included in this study, of which 8 were males and one was female.

Regarding the study of **Pradhan et al., 2019 [14]**, they found that the age of the patients ranged from 30 to 63 years old, and the mean age was (45 to 10) years old. A history of smoking was found in 18 patients (60.00%), and 16 (53.33%) were tobacco chewer.

The common subsites of oral carcinoma are the cheek, floor of the mouth, the tongue and the inner surface of the lip. Amongst all, the tongue is the most standard site to be affected by the malignancy. The common etiology could be due to chewing tobacco in the form of pan/gutkha, particularly in the Indian subcontinent [5].

The study in our hands shows that more than half of them (58.3%) had the lesion in tongue, and 25% of them had the lesion in cheek. 83.3% of them had SCC, and 12.5 % had adenoid cystic C as a lesion pathology.

These results are supported by the study of **Sittitrai et al., 2017 [21]**, as they reported that primary tumor sites included tongue (16), the floor of mouth (11), buccal mucosa (5), and alveolar margin (3).

Also, **Cariati, et al., 2018 [15]** reported that tumor locations were base of the tongue extended to the lateral pharynx wall and tongue base (n2), the lateral edge of the tongue (n4), the floor of the mouth (n2) and buccal mucosa (n1). In all patients, histology showed infiltrating squamous cell carcinoma: in 11 of them, SCCs were well-differentiated (G1-G2); in one patient, it presented a warty appearance.

Our results are contrary to the study of **Amin et al., 2011 [6]** as they found that the primary tumor sites included buccal mucosa (7), tongue (4), alveolar margin (3), the floor of mouth (5), and lip (2).

According to **Schonauer et al., 2016 [22]**, Primary sites involved the floor of the mouth in 4 patients, the floor of the mouth and the right inferior alveolar crease in 1 patient, the buccal mucosa in 3 patients, the tongue in 3 patients (in 2 of them was involved the right portion of the tongue and in 1 the left part of it) and the anterior portion of the floor of the mouth and the base of the tongue in 1 patient.

Furthermore, **Pradhan et al., 2019 [14]** reported that buccal mucosa was found to be involved in 12 patients, followed by the tongue (10 patients), and floor of the mouth was found to be involved in 8 patients. In all 30 cases, final histopathology was confirmed to be squamous cell carcinoma.

Regarding **Chang et al.,2019 [23]**, They found various pathologies, such as melanoma, clear cell carcinoma, squamous cell carcinoma, and Merkle cell carcinoma.

In the present study, all of the patients were preoperative imaging Y. Regarding TNM of the lesion, 40.9% of them were T2N0M0G2, and 18.2% of them were T3N1M0G3.

Our results are supported by the study of **Amin et al.,2011 [6]** as they reported that regarding TNM of the lesion, 2 cases were T2N0M0G2, and 2 of them were T4N0M0.

Also, **Cariati et al., 2018[15]**, reported that 7 patients were staged T3N0M0 and 5 T2N0M0.

Furthermore, **Pradhan et al.,2019 [14]** reported that Patients with clinical staging I/II/III (T1/T2/T3, N0) oral malignancy were included in the study.

**Sittitrai et al.,2017 [21]** reported that five patients presented a T2N0M0 tumor, and four patients presented a T2N1M0 tumor.

The submental island flap was first reported in 1993 by Martin et al. for soft-tissue Head and neck reconstruction. It is based on the submental artery, a constant branch of the facial artery, which originates 27.5 mm distal from the origin of the facial artery from the external carotid artery. This artery has five main branches along its course toward the midline and anastomoses in 92% of cases with contralateral artery. It is located medially to the inferior mandibular border and represents the main blood supply of the floor of the mouth in 60% of cases [24].

The submental artery island flap could be classified according to the blood supply, as a pedicled flap, free flap, or perforator flap, and according to the flap paddle's composition myocutaneous or osteocutaneous flap. It can be an inferior pedicled flap or orthograde or superior pedicled flap or reverse flow type according to the vascular anastomosis and the reconstruction site in the oral cavity. An orthograde flap is meant to repair the oral cavity, including the buccal mucosa, the floor of the mouth, and the tongue [25].

The study in our hands shows that all patients had blood flow inside flap orthograde. Regarding the side of donation, 91.7 % of them from the contralateral side and 8.3 % of them from the ipsilateral side. As regard neck dissection, 91.7 % of them were unilateral and 8.3% of them were bilateral.

Our results are contrary to findings reported by **Cariati et al., 2018 [15]**, as they found that Neck dissection was bilateral in 8 patients, unilateral right in 3 patients, and unilateral left in 1 patient.

**Schonauer et al.,2016[22]**, Neck dissection was bilateral in 8 patients, unilateral right in 3 patients, and unilateral left in 1 patient. In all the patient's reconstruction was performed with orthograde submental island flap, with left pedicle in 7 patients and right pedicle in the remaining 5.

**Chang et al.,2019 [23]** reported that five patients (55.5%) underwent successful reconstruction with a pedicled flap. Of the remaining four patients, only one had viable retrograde flow through the venous system. Two patients (22.2%) had obviously visible valves within the venous facial system. Subsequently, two patients underwent hybridization with a venous anastomosis. One patient underwent anastomosis to the common facial vein; the other was anastomosed to the external jugular vein. The remaining two patients (22.2%) required microvascular anastomoses of the artery and vein as a free flap due to inadequate reach with hybridization. The microvascular anastomosis was performed to the internal maxillary artery and retromandibular vein in one patient and to the superficial temporal artery and common facial vein in the other patient.

As stated previously, the submental flap was first described in 1993. It is relatively simple to harvest and offers great tissue thickness with the less surgical time required in comparison with other techniques [26].

The present study shows that the Mean  $\pm$  SD of time needed for surgery was  $138.45 \pm 19.72$  minutes. 79.16 % of them were totally intact regarding flap vascularity, 12.5% of them were dead 3.8% of them were congested and conservative. Regarding the fate of totally dead, 33.33% of them were primary closed, 33.33% pectoralis major flap done to them and 33.33% of them were

TDAP which were died and major pectoralis flap done to it.

Our results are supported by the study of **Amin et al.,2011 [6]**, as they reported that the mean operative time, including resection and reconstruction, was 3 hours. Complete flap loss occurred in 2 patients; one of them died postoperatively from pneumonia after salvage surgery with major pectoralis flap, while the other patient's raw area was left to heal by secondary intention, resulting in mild trismus, which has improved with physiotherapy. Partial flap loss occurred in 3 patients, and wounds healed spontaneously. Another patient developed an oro- cutaneous fistula which closed spontaneously with conservative measures.

According to **Pradhan et al.,2019 [14]**, The average operative time for the tumor resection, neck dissection, and flap reconstruction was four h and 10 min (range 3.5e5.5 h). Of the 30 flaps, partial necrosis of the skin was noticed in 4 patients, and in 2 patients, there was complete skin loss. Only 2 cases required revision surgery, one patient was repaired with a nasolabial flap and the other with a rotational tongue flap.

**Schonauer et al.,2016[22]** reported that Venous congestion was observed in 2 patients, and it spontaneously solved. Superficial necrosis was observed in one patient, but the flap recovered gradually. One patient experienced neck hematoma, which was subsequently drained in the theatre. No patients developed a total flap loss nor infection.

In this regard, it is important to highlight that submental flap was also shown to have a high success rate and minimum morbidity in the series conducted by **Cariati et al., 2018 [15]**. No cases of flap failure were found, and only one patient experienced partial epithelial loss, which responded well to local wound care. Moreover, severe complications such as massive bleeding or systemic infection were not observed during the immediate post-operative period in those patients.

**Chang et al.,2019 [23]** reported that one patient had congestion in the early postoperative period and required hirudotherapy for 4 days. The flap survived after this, and there was no permanent ischemia or flap loss. There were no donor site complications

Our results show that the Mean  $\pm$  SD of hospital stay was  $8.16 \pm 3.17$  days. 91.7 % of them 'didn't need trichotomy,4.2% needed trichotomy for post-operative stridor, and 4.2% of them needed tracheostomy for dissection crossed midline. Only 8.3 % of them had infected wound and all of them preserved MMN.

Our results are in agreement with the study of **Schonauer et al.,2016[22]** as they reported that the duration of hospital stay range from 3 to 12 days.

Furthermore, **Pradhan et al.,2019 [14]** reported that the hospital stays ranged from 2 to 15 days and the average duration of stay was 72 hrs. Marginal mandibular palsy with the deviation of angle of mouth was detected in 5 patients immediately after the surgery, of which two patients recovered completely after six weeks and three patients had residual palsy till six months of follow-ups.

**Sittitrai et al.,2017[21]** reported no oro-cutaneous fistulas, although two patients developed minor wound infections that responded well to local wound care. No other complications such as marginal mandibular branch paralysis or hematoma were detected.

**Pistre et al., 2001 [27]** reported one case of temporary, marginal mandibular nerve palsy in 31 cases in which the submental flap was used for a variety of defects. Although the latter authors exposed the nerve early in their series, they found that avoidance may be a better approach. Other reports echo similar results **Multinu et al.,2007 [28]** and highlight the possibility of nerve injury if dissection is not performed carefully.

The present study shows that regarding pathological node assessment,12.5% of them were N(0/30), and 8.3% of them were both N(1/30) and N(10/40). The mean  $\pm$  SD of follow-up period was  $11.33 \pm 3.50$  months. **Amin et al.,2011 [6]** reported that follow-up ranged from 7 to 44

months.

**Cariati et al., 2018 [15]** found that two patients with negative post-operative histopathological examination of the neck (level I-IV) presented a recurrence of the disease. Specifically, one of those (classified as stage III before surgery) experienced a cervical relapse (at level IIa) 9 months after surgery. Submental flap oncological safety is controversial, and the relationship between the flap and lymph nodes of the Ib region might increase the risk of recurrence [29].

The study in our hands found that 16.7 % of them had local recurrence, 8.3% of them had nodular recurrence and as regard distant recurrence, 83.3 % of them 'didn't had a distant recurrence, 8.3% of them had a distant recurrence in the lung, 4.2% of them had a distant recurrence in lung & liver and 4.2% of them had distant recurrence in brain. More than half of them (58.3%) 'didn't need adjuvant therapy, 37.5 % received radiotherapy, and 4.2 % received chemoradiotherapy therapy.

Our results are supported by the study of **Amin et al., 2011 [6]**, as they reported that one patient died from the metastatic disease after palliative chemotherapy and another four patients developed ipsilateral nodal neck recurrence. All of those recurrences were in the submandibular triangle at the site of the flap tunnel. Three 3 out of those nodal recurrences had an initial simultaneous neck dissection in whom the flap was harvested first. Nodal recurrence was managed by salvage neck dissection. After adopting the refined technique, we had 0% neck recurrence.

**Merten et al. 2002 [30]** reported the loss of one flap in 11 non-irradiated patients. The latter authors mentioned they avoided this flap if the neck had been previously irradiated. In our series, two total and three partial flap losses were recorded. Most reports did not assess the influence of irradiation on flap viability. However, in the experience of **Taghinia, and his colleagues**, preoperative radiotherapy was the most consistent finding in those who suffered flap loss [31].

In the study conducted by **Amin et al., 2011 [6]**, no flap loss occurred in the two patients who had received preoperative radiotherapy. Interestingly, those patients in this study who had post-operative radiation therapy also experienced complications of scar contractures requiring multiple procedures. Thus, irradiation significantly predisposes the patient to complications of ischemia and scar contractures.

**Cariati et al., 2018 [15]** reported that swallowing function was reestablished in approximately seven days. This is particularly significant in order to avoid any delay in starting complementary treatment (radio and chemotherapy). However, the relapse rate was high in our series (44.4%). We observed three cervical recurrences (33.3%) and 1 local failure (11.3%). Two of the 3 cervical relapses (22.2%) involved the submandibular space and might be related to the flap. This contrasts with the outcomes evidenced by other studies in the field [21].

Furthermore, **Pradhan et al., 2019 [14]** reported that although no cervical metastasis had been detected in clinical and radiological examinations, still two patients presented with nodal metastasis (level Ia) with extracapsular invasion as shown in the histo-pathological report. Lymphovascular infiltration of the tumor was observed in 3 patients. Adjuvant chemoradiation was required in the above 5 cases for the regional metastasis. There was no recurrence of the tumor in the primary site till six months of follow-ups, although one patient had cervical lymphadenopathy (right level II) after four months of surgery, which was managed with salvage neck dissection.

The present study shows that 33.33% of them 'didn't have hair growth. Of the remaining who had hair growth, 33.33% of them had hair growth spontaneously (mucosalized) ,33.33% of them had hair growth.

## 5. Conclusion

The submental artery flap is a valid option for the reconstruction of oral cavity defects. It represents an excellent alternative to free flaps, particularly in elderly patients or in high-ASA risk patients where the reduced operative time and the easily concealable donor-site incision

make it a really neat solution despite the presence of many complications, like flap vascularity impairment, the need for tracheostomy infected wounds, wound infection and early recurrence.

**6.Declaration ofInterest Statement:** No conflict of interest for any of the authors.

There is no conflict of interests regarding the publication of this research

## 7. References

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