Submental island flap reconstruction of large and complex oral commissure defects

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Background
Oral commissure squamous cell carcinoma frequently presents at advanced stage and surgical treatment will eventually result in large and complex lip, buccal, and facial skin defects. Reconstruction of such defects is a challenge. The authors hereby present the experience with the reconstruction of large and complex postexcisional defects of the oral commissure with submental island flap.

Patients and methods
Eighteen patients with stage IVA squamous cell carcinoma of the oral commissure were enrolled. For all patients wide surgical excision of the primary tumor with supraomohyoid neck dissection followed by immediate reconstruction of the resultant defect with submental island flap was done. During the follow-up period, surgical and oncologic outcomes were reported; and functional and aesthetic outcomes were evaluated using the Functional Lip Glasgow Scale score.

Results
Male predominates and the mean operative time was about 197 min. Surgical complications were unremarkable. Functional Lip Glasgow Scale score ranged from 18 to 25. Recurrence occurred in three cases.

Conclusion
Submental flap is a feasible reproducible reconstructive technique for oral commissure tumors surgery with satisfactory functional and aesthetic outcomes.

Keywords:
lip cancer, oral commissure, oral malignancy, reconstruction, submental flap

Background

Squamous cell carcinoma (SCC) of the lip represents up to 30% of all oral cancers, and it is well known by its excellent prognosis having 90% 5-year survival rate owing to early detection of these visible and symptomatic lesions [1–3]. However, involvement of oral commissure is considered a high-risk factor and tends to have lower survival rates, which may be due to advanced stage at presentation (about 20% of patients are presented at stage IV) and frequent regional lymph node involvement including not only the submandibular and upper deep cervical nodes, but also the preauricular and periparotid lymph nodes [2,4,5].

The mainstay treatment of oral commissure SCC is wide surgical excision with a 1 cm safety margin, which usually results in large and complex buccal, lip, and facial skin defects [6,7]. Primary closure of such defects is usually impossible, requiring local, regional, or distant flap reconstruction in order to secure oral competence with good commissure contour and cosmesis [5,8,9].

Microvascular free flaps are considered the state-of-the art reconstructive method for these large and complex oral commissure defects [9,10]. However, most of patients with oral commissure SCC are old, frail, and frequently having multiple co-morbidities for whom microvascular free flaps are not suitable, due to long operative time besides the need for much expertise and facilities.

Submental island flap reconstruction of oral and perioral defects has been extensively studied with excellent results due to its axial, secure blood supply, excellent skin color, thickness and matching texture, with cosmetically acceptable scars [11,12].

We hereby present our experience with the reconstruction of large and complex post-excisional defects of the oral commissure with submental island flap.

Patients and methods

This is a prospective single-institution study including 18 patients with stage IVA oral commissure SCC presented to the authors' service at the Surgical Oncology Unit at Mansoura University from September 2016 to March 2018. All clinical procedures were conducted after obtaining written informed consent from all patients and were approved by the institutional review board (IRB) of the Oncology center of Mnasoura University. Patients with extensive mandibular invasion, with distant metastases or with clinical nodal status beyond N1 were excluded. Preoperative investigations included histopathological diagnosis and computed tomography staging of the tumor extent. Neoadjuvant therapy was not used in this study.

Written consent was obtained from all patients after detailed discussion of the planned procedure and its potential sequalae.

All patients were operated for simultaneous tumor resection and reconstruction of the resultant defect with orthograde submental island flap (Figs 1 and 2). Frozen section examination of safety margins were performed in all cases. In all cases, the submental skin island extended from one angle of the mandible to the other with inclusion of ipsilateral anterior belly of digastric and a small cuff of ipsilateral mylohyoid muscle. Doppler localization or angiographic mapping of the pedicle was not performed in any of the cases. During its inset, the submental flap was folded inwards in order to form the commissure and reconstruct the buccal mucosal defect. Additional full thickness lip advancement flap from either or both lips is performed in all cases with concomitant significant upper and/or lower lip defect. Primary closure of the neck donor site was performed with undermining of the lower neck flap in a supraplatysmal plane. All cases had selective supraomohyoid (level 1–3) nodal neck dissection which was performed after flap elevation. Ryle

Figure 1
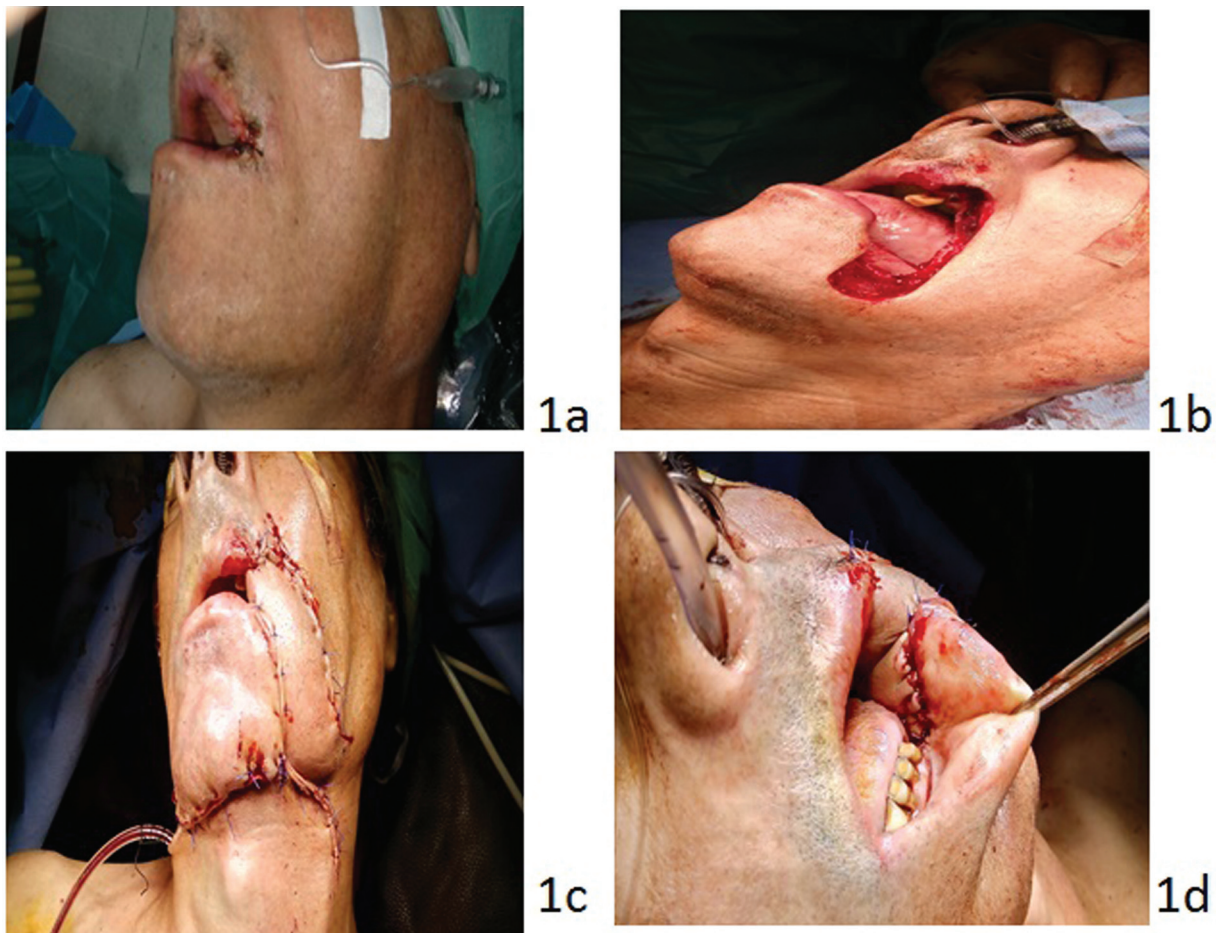
Operative views of patient 1 of the study group. (a) Shows a left oral commissure ulcerating lesion; (b) the defect after resection; (c) submental island flap inset into the defect; and (d) intraoral view of the submental flap after inset.

Figure 2
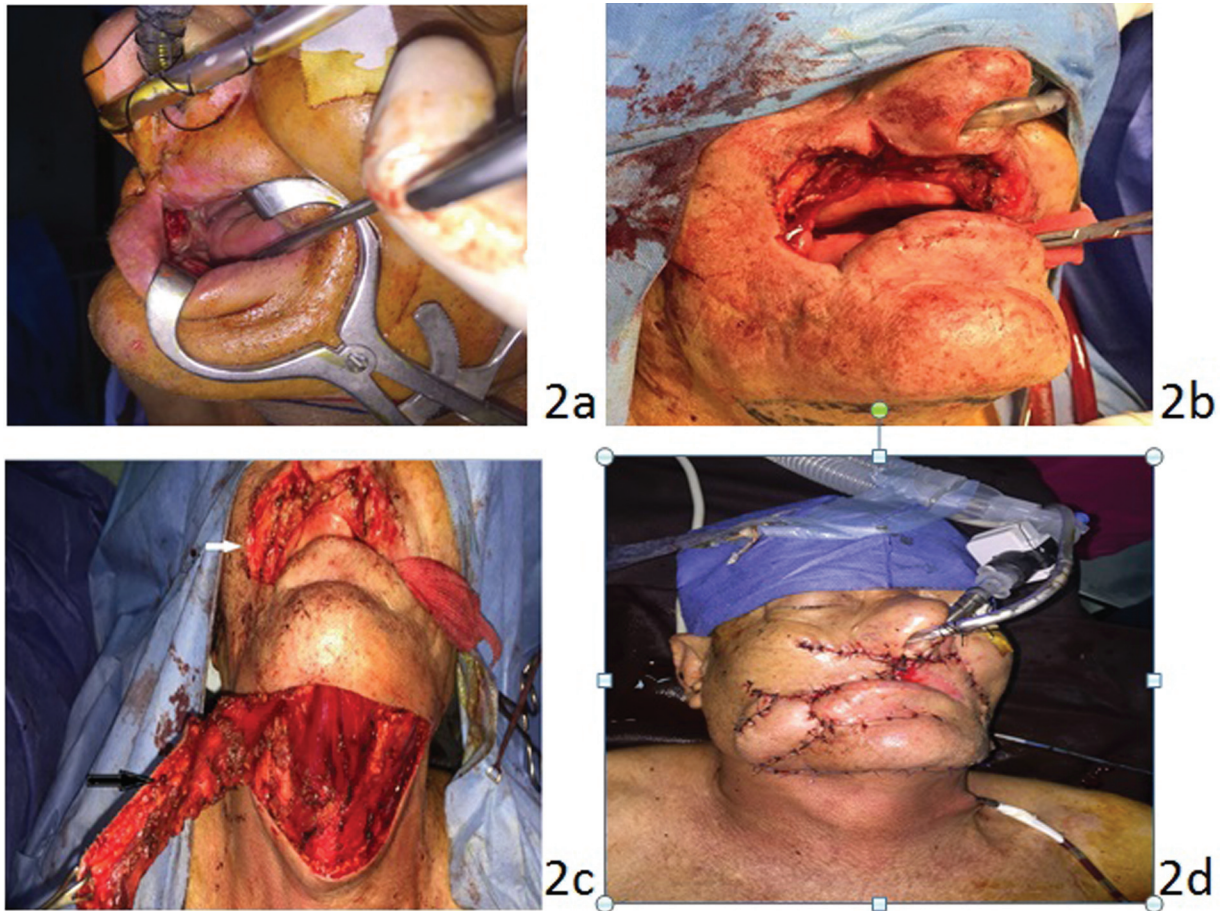
Operative views of patient 2 of the study group. (a) Recurrent right oral commissure SCC; (b) the defect after resection; (c) submental island flap raising (black arrow) and the defect (white arrow); and (d) final view after submental flap inset with upper and lower lip advancement.

Table 1 Functional Lip Glasgow Scale score: a new method of outcome assessment for lip carcinoma-treated patients (proposed by Di Fede and, Veronica *et al.*)

FLiGS score	Speaking	Chewing	Swallowing	Drooling	Physical (cosmetic) appearance
5	Clearly understood always	Any food, no difficulty	Any food, no difficulty	Absent	Very good result
4	Requires repetition sometimes	Semisolid food only	Semisolid food only	Present occasionally during the day	Good results
3	Requires repetition many times	Any food with difficulty	Any food with difficulty	Present during chewing	Acceptable result
2	Understood by relatives only	Liquids only	Liquids only	Present also during speaking	Bad result
1	Unintelligible	Cannot chew at all	Cannot swallow at all	Constant drooling with maceration of the mandibular cutaneous region	Very bad result

FLiGS, Functional Lip Glasgow Scale.

feeding was maintained in all patients for 10 days postoperatively after which oral feeds are initiated gradually. Surgical outcomes including operative time, blood loss, flap loss and wound complications were reported. Oncological outcomes in terms of recurrence and survival were evaluated.

Functional and cosmetic outcomes were evaluated using Functional Lip Glasgow Scale (FLiGS) score (Table 1) [13]. FLiGS is a simple five-point scale questionnaire used for lip cancer patients who had surgical excision with or without reconstruction analyzing the following postoperative parameters: speaking, chewing, swallowing, drooling, and physical (cosmetic) appearance.

All patients were referred to the Medical Oncology Unit for receiving their adjuvant therapy as needed.

Table 2 Baseline criteria of the patients of the study

Parameters	N (%)
Sex	
Male/female	15/3 (83.3/16.7)
Comorbidities	
DM	8 (44.5)
HTN	12 (66.7)
COPD	9 (50)
Bronchial asthma	1 (5)
Chronic liver disease	4 (22)
Ischemic heart disease	3 (16)
Two or more co/morbidities	15 (83)
Clinical stage	
T4aN0/T4aN1	12/6 (66.7/33.3)
De novo/recurrent	16/2 (88.9/11.1)
Grade I/II	5/13 (27.8/72.2)
Extracapsular nodal extension	0
Flap necrosis	
No/partial	16/2 (88.9/11.1)
Wound infection and gapping	
No/yes	16/2 (88.9/11.1)
Recurrence	
No/yes	15/3 (83.3/16.7)
Pathological stage	
T4aN0/T4bN1	14/4 (77.8/22.2)
Adjuvant radiotherapy	
No/yes	0/18 (0/100)

COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; HTN, hypertension; IHD, ischemic heart disease

Data of these patients were analyzed and statistical values were obtained using SPSS version 22 (SPSS Inc., Chicago, Illinois, USA). Continuous variables are presented as mean when symmetrical or median and range when asymmetrical. Categorical variables are presented as proportions. Bivariate analysis was done using χ^2-test and Student's t-test. P value less than 0.05 was considered significant.

Results

This study included 18 patients with stage IVa oral commissure SCC; the baseline criteria of the patients are shown in Table 2. Follow-up period ranged from 9 to 18 months.

The mean age of the study group was 59±7.4 years. The greatest diameter of the lesion was 8±2 cm. As for the comorbidities in this series, there were: Diabetes mellitus in eight, hypertension in 12, chronic obstructive pulmonary disease in nine, bronchial asthma in one, chronic liver disease in four, ischemic heart disease in three patients, and 15 (83%) patients were having two or more simultaneous comorbidities. Tumor site distribution is displayed in Fig. 3. The mean intraoperative blood loss was 136.1±40.5 ml, and the mean operative time

Figure 3
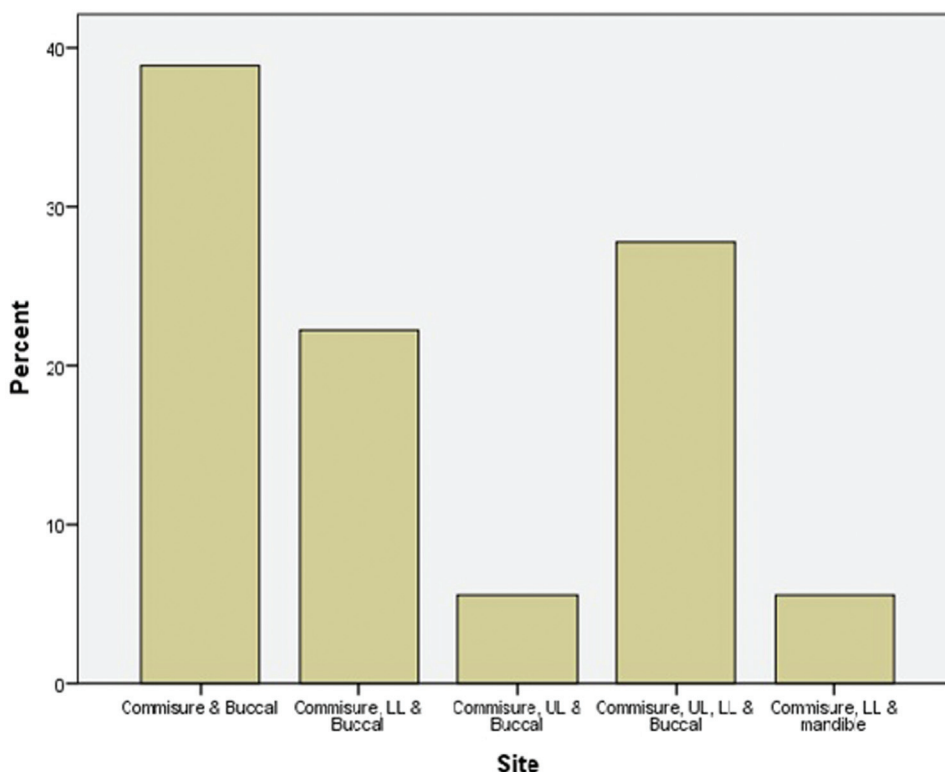
Bar chart showing site distribution of the tumor among the study group.

Table 3 Functional Lip Glasgow Scale scores among patients of the study

	Speaking					Chewing					Swallowing					Drooling					Physical (cosmetic) appearance				
Parameter/FLiGS Score	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1
Number of patients	14	**2**	**2**	0	0	**18**	0	0	0	0	**18**	0	0	0	0	**10**	**4**	**3**	**1**	0	**9**	**3**	**6**	0	0

FLiGS, Functional Lip Glasgow Scale.

Figure 4

Dropping of the reconstructed angle of the mouth with subsequent drooling (arrow). (a) Patient 1; and (b) patient 2.

was 196.9±18.4 min. Negative safety margins were achieved in all cases and confirmed in the postoperative pathological examination. All patients received adjuvant radiotherapy (one of them was delayed for about 6 months). Scar complications occurred in four patients (22% of cases); two of them were having hypertrophic; and the other two were having stretched scars.

Locoregional recurrence occurred in three cases (16.66% of all cases); the time period to recurrence ranged from 3 to 10 months during the follow-up period. The significant factor correlated with recurrence was the pathologic node positive disease ($P=0.045$), young age [$P=0.036$, mean difference: 7.58, 95% confidence interval (CI)0.568–14.599], and increased intraoperative blood loss ($P=0.001$, mean difference: –58.33, 95% CI=–89.93 to 26.74). Those patients who developed locoregional recurrence were referred to the medical oncology unit for receiving chemoradiotherapy. No mortality reported

in any of the cases of the study during the follow-up period.

Intraoral hair growth was seen in the buccal part of the submental flap which decreased after 6 months especially after receiving adjuvant radiotherapy.

In all cases, the mouth opening was adequate allowing more than two fingers between incisors. There was no significant donor site morbidities apart from hypertrophic scar in two patients and stretched scar in two other patients; nevertheless, these scars were concealed being situated in the submental region.

FLiGS score ranged from 18 to 25 (Table 3). No patients showed chewing or swallowing problems. Speaking was easily and clearly intelligible in 14 patients and required repetition sometimes in two patients and repetition many times in two other patients. Adequate oral competence with no

Figure 5

Final view of patient 1 after secondary corrective surgery to raise the dropped left commissure and complete resolution of drooling.

drooling was achieved in 12 patients; nevertheless, eight patients showed variable degrees of drooling. In the latter eight patients, significant improvement of drooling was achieved by a secondary corrective surgery to raise the reconstructed commissure after being bottomed out with gravity. (Figs. 4 and 5). The cosmetic appearance was evaluated in 3 months postoperatively and was very good in nine (50%) patients, good in three (16%) patients, and acceptable in six (33%) patients.

Discussion

The estimated global incidence of lip cancer in 2012 was 0.3 per 100 000 (0.4 in men and 0.2 in women). This incidence varies significantly based on age, sex, and geographical distribution [14]. The overall prognosis of lip SCC is excellent; however, once spread regionally to the lymph nodes, survival drops significantly to about 50% [15]. Several studies have reported poorer prognosis in patients with oral commissure SCC owing to frequent lymph node involvement, not only to the submandibular nodes but also to the preauricular and periparotid nodes [2,4,16]. The definitive treatment of oral commissure SCC is curative surgical resection with 1 cm safety margin with or without cervical lymph node dissection as indicated [6]. Oral commissure SCC patients frequently present late with large primary tumor infiltrating large areas of buccal mucosa, adjacent upper, lower lips, and facial skin with or without lower alveolar margin involvement [4]. Adequate surgical resection of such large lesions will result in large and composite defects for which adequate reconstruction is much difficult and challenging.

Reconstruction of large oral commissure defects is a real reconstructive challenge and the reconstructive

surgeon should keep in mind the potential problems of reconstructing such defects, such as speaking affection, inadequate oral opening, oral incompetence, and unacceptable appearance which can negatively impact the quality of life and social interaction; therefore, such issues must be addressed and discussed with the patient preoperatively [17].

The principal goals of reconstruction of oral commissure defects include maintaining a dynamic oral sphincter, a sufficiently sized stoma, and an acceptable active (smile) and passive (form) cosmetic result. To achieve these three goals, various reconstructive procedures have been developed for lip and oral commissure defects like mucosal advancement flap [18], Karapandzic flap [19,20], Abbe-Estlander flap [17], Gilles fan flap (nasolabial) [21,22], Webster flap, mobilization of cervical skin, submental island flap [23], pectoralis major flaps [24], and radial forearm or anterolateral thigh free flap [25].

The reconstruction should be tailored to the individual needs of the patient; and selection of the most suitable reconstructive method depends on the size and extent of the defect, patient's general health condition, surgical skill of the operating surgeon, and available facilities [17]. For small oral commissure defects, lip advancement neurovascular local flaps such as Karapandzic or Abb-Estlander flaps are enough; however, for large complex oral commissure defects regional or distant flaps are required to restore the resultant extensive soft tissue loss [26]. Microvascular free flaps (as radial forearm and anterolateral thigh flaps) are the state-of-the art reconstructive method for such large and complex defects; nevertheless, not all patients and centers are potential candidates for these lengthy, costly, and complex surgeries.

Submental island flap had emerged as an easy, secure, versatile regional flap for most oral and/or perioral defects especially for patients who are not potential candidates for microvascular free flaps [23]. The major concern when using submental island flap for oral and/ or perioral reconstruction is its potential interference with sound cervical lymph node dissection; nevertheless, Elzahaby *et al.* [27] reported the oncological safety of submental island flap use in oral SCC patients with N0 or N1 neck.

In this study, we discussed the surgical, oncological, functional, and aesthetic outcomes of submental island flap reconstruction of 18 patients with locally

advanced oral commissure SCC. All patients were above 50 years old (the mean age was 59±7.4 years.). All patients were having one or more co-morbidities such as diabetes, chronic obstructive pulmonary disease, and chronic liver disease. In all cases, the lesion size was large (the greatest diameter of the lesion was 8±2 cm.). In all patients of the study, the orthograde submental island flap was raised as described in the literature with incorporation of the ipsilateral anterior belly of diagastric and part of the ipsilateral mylohyoid muscle in order to preserve the very delicate submental artery perforators passing close or through these muscles to supply the overlying skin island, thus increasing the flap viability. Therefore in this study, we did not observe any case of total flap necrosis even in old diabetic patients. In all patients, the donor site was closed primarily without difficulty provided that adequate undermining of the lower neck flap is done in the supraplatysmal plane. Four patients only showed hypertrophic or stretched scars; nevertheless, these scars were almost concealed being situated beneath the lower mandibular border. Only two patients suffered from wound infection which was managed conservatively with antibiotics and frequent dressing.

Regarding the functional outcomes, no negative impact on the swallowing or chewing was observed in any patient of the study. The oral incompetence (drooling) is one of the common problems of oral commissure reconstruction which is usually proportionate to the defect size and commonly observed when regional or distant non-innervated (static nondynamic) flaps are utilized for reconstruction. With these static reconstructive methods, eventual drooping of the reconstructed angle of the mouth gradually occurs leading to progressive drooling which was observed in eight patients of this study; nevertheless, this drooling was markedly improved with secondary corrective surgery for raising the reconstructed angle of the mouth.

Mild affection of speaking was observed in only four patients who needed to repeat their words sometimes or many times to be understood. This may be attributed to the inadequate oral competence; therefore, this speaking affection also improved with secondary corrective surgery. Three months postoperative evaluation of the cosmetic outcome was encouraging with nine patients (50% of the cases) being reported as very good, three patients (16%) as good, and six patients (33%) as satisfactory with no bad or very bad results.

Regarding the oncologic outcome, no mortality reported during the period of follow-up. Locoregional recurrence occurred in three cases representing 16.66%; the time period to recurrence ranged from 3 to 10 months during the follow-up period. This recurrence might be related to the advanced stage at presentation, pathological lymph node infiltration ($P=0.045$), and younger age ($P=0.036$, mean difference: 7.58, 95% CI=0.568–14.599). The impact of the method of reconstruction on the oncologic outcome had been reported in several studies, with no significant difference in locoregional recurrence between pedicled and free flaps, provided that adequate surgical resection has been accomplished [28,29].

Conclusion
Submental flap is an available option for reconstructing large complex lesions at oral commissure with satisfactory functional and cosmetic outcomes. Tumor recurrence is however high among these patients, which was mainly attributed to advanced stage presentation, node positive disease, and young age.

Conflicts of interest
There are no conflicts of interest.

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