The incidence of metastases to facial lymph nodes in patients with carcinoma of head and neck

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Background and objective
Supramandibular facial lymph nodes (SFLNs) are one of the unusual sites of lymph nodes metastases. This prospective study investigated the possible involvement of SFLNs in cases of head and neck carcinoma.
Patients and methods
SFLNS were identified and dissected from 30 neck dissections obtained from 30 patients (22 male individuals and eight female individuals) with squamous cell carcinoma (SCC) of the oral cavity without locoregional recurrence or distant metastases.
Result
Histopathological examination of the removed SFLN nodes proved positive for metastases in nine neck dissections, five cases of buccal mucosa SCC (41.7% of the cases) and four cases of alveolar margin SCC (44.4% of the cases).
Conclusion
SFLNs are a probable site of lymph node metastases in SCC of the alveolar margin and buccal mucosa. Careful dissection above the lower margin of the mandible can safely remove these nodes without significant injury to the marginal mandibular branch of the facial nerve.

Keywords:
facial nodes, neck dissection, node metastasis, supramandibular lymph nodes

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Introduction

Tumor lymph drainage is usually a long, well-recognized lymphatic pathway, but rarer lymph node sites can be involved and may be the only site of the disease, particularly in recurrence [1].

Facial lymph nodes are one of the unusual sites of lymph node metastases. They comprise four groups including mandibular, buccinator, infraorbital, and malar. The mandibular lymph nodes are also known as supramandibular facial lymph nodes (SFLNs) [2,3].

These lymph nodes are mobile structures lying within the soft tissues of the cheek between skin and buccinator muscle at the anterior border of the masseter muscle and are closely related to the mandibular branch of the facial nerve and facial vessels. The presence of facial lymph nodes and their significance in the diagnosis and spread of malignant disease has received little attention in the literature [4].

There is no consensus on whether facial lymph nodes should be included in neck dissection for the treatment of head and neck cancer. Facial lymph nodes and their involvement in oral cancer have been discussed in the literature since 1971 by Jeffery Robins, but there are no sufficient data in the literature handling these nodes. Adding to the problem, most of the existing studies are based on retrograde studies that do not clarify the exact figures for these nodes [5].

During neck dissection for head and neck cancer, surgeons do not usually extend their dissection above the inferior border of the mandible, where SFLNs are, but they keep the inferior border of the mandible as the upper limit of their flaps. Thus, although there are many data on metastases in various neck lymph nodes from head and neck squamous cell carcinoma (SCC), yet there are few data on SFLNs. In fact, surgeons hesitate to handle the SFLN because of their close relationship to the marginal mandibular branch of the facial nerve [6].

The mandibular and cervical branches of the facial nerve arise from the cervicofacial division of the facial nerve. Thus, the lower division of the facial nerve

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passes lateral to the retromandibular (posterior facial) vein within the substance of the parotid gland in more than 90% of cases; in others, it passes medial to the vein. Injury to the mandibular branch of the facial nerve results in a very slight drooping of the angle of the mouth. The drooping is not noticeable when the mouth is in response – it is noticeable only when it is in motion (smiling). Depending on the nature of injury, the drooping may be neuropraxia (temporary), or permanent [7].

In this prospective study, we evaluated the frequency of facial lymph node involvement in cases of oral cavity cancer and the incidence of injury to the branches of the facial nerve in case of facial lymph node dissection.

Patients and methods

This prospective study was performed in the Surgical Oncology Department, Faculty of Medicine, Menoufia University, between March 2013 and March 2017, after approval by the hospital's Ethics Committees. Consent statement was taken from all the patients. It involved 30 neck dissections obtained from 30 patients with head and neck cancers.

The patients included had a primary carcinoma in the head and neck. Patients with locoregional recurrence, distant metastases or who received neoadjuvent therapy were excluded from the study.

Resection of the primary tumors of the oral cavity SCC was performed with 1–2 cm safety margins, wide surgical excisions with safety margins, hemiglossectomy (Fig. 1) and/or hemimandibulectomy according to the anatomical location of the primary tumor.

Figure 1

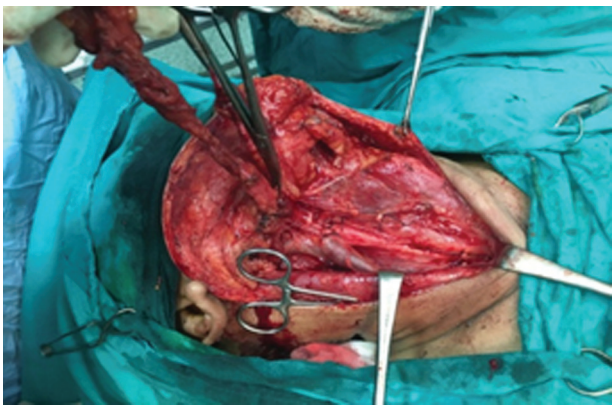
Hemiglossectomy for a case of tongue SCC. SCC, squamous cell carcinoma.

Neck management included modified neck dissection (Fig. 2) and/or supraomohyoid neck dissection (Fig. 3) depending on the primary tumor size, location, clinical presentation, and involvement of cervical lymph nodes.

Postoperatively, patients with unfavorable pathologic features including involved margins, nodal extracapsular extension, more than two positive cervical lymph nodes, perineural invasion, or lymphovascular permeation were scheduled to receive adjuvant concurrent chemoradiation.

During neck dissection, lymph nodes above the inferior border of the mandible were considered the SFLNs (Fig. 4). There were usually one to three nodes lying close to the facial artery and vein. The area was dissected carefully for the conservation of the marginal mandibular branch(es) of the facial nerve. For this purpose, we performed the incision 4 cm below the inferior border of the mandible, followed by careful dissection (with flap retraction) through the superficial layer of the deep cervical fascia; the incision and

Figure 2

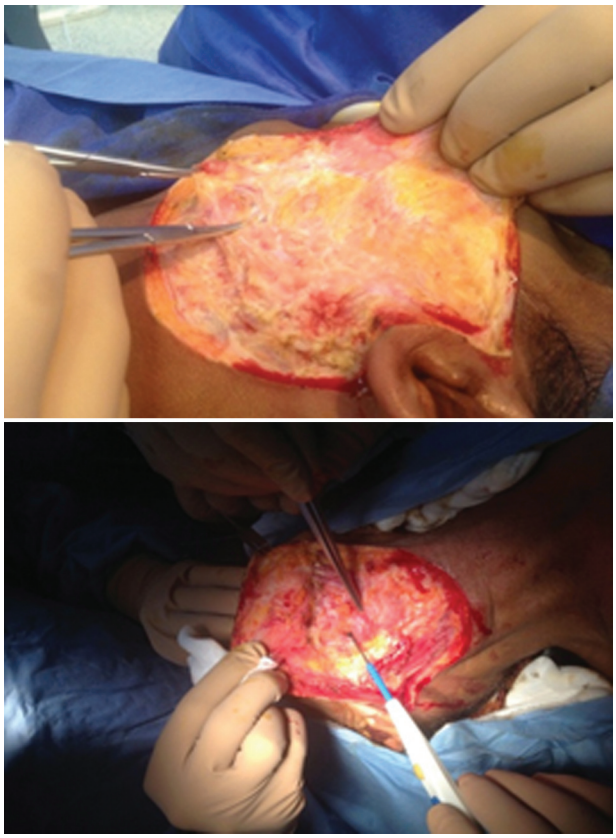


Modified radical neck dissection (MRND) in a case of tongue carcinoma.

Figure 3

MRND in a case of lip SCC. SCC, squamous cell carcinoma.

Figure 4



Facial lymph.

undermining of the fascia extended to 1.5 cm inferior to the mandible to protect the nerve.

Pathological analysis

The histopathological examination of the primary tumor site, the SFLN and the neck lymph nodes was performed separately to verify the differentiation, grade and the nodal micrometastasis. Routine examination of all components of the specimen was carried out using hematoxylin and eosin-stained sections after fixation in neutral buffered formalin. The number, size, and cut sections of SFLNs were recorded separately. SFLNs were examined by multiple step section technique, and the sizes of metastatic deposits were recorded using the micrometer lens.

Results

The mean age among study cases was 54.3±9.16; with about 73% of cases being male individuals (Table 1).

As regards the tumor site, buccal mucosa SCC represented 40% of cases, while tongue SCC and alveolar margin SCC were present among 30% of cases. More than half of cases were grade 2 tumors (53%). T2 and N0 represented 63 and 53% of cases, respectively. Facial lymph nodes were negative in 70% of cases, while neck lymph nodes were negative among 46.7% of cases. The nerve function was intact in 73% of cases (Table 2).

Table 1 Description of personal data among cases

	Mean±SD	Minimum	Maximum
Age	54.33±9.16	39.00	70.00
Sex			
Male	22±73.3		
Female	8±26.7		

Table 2 Description of tumor characteristics among cases

	n (%)
Site	
Buccal mucosa SCC	12 (40.0)
Tongue SCC	9 (30.0)
Alveolar margin SCC	9 (30.0)
Grade	
Grade 1	4 (13.3)
Grade 2	16 (53.3)
Grade 3	10 (33.3)
T	
T1	5 (16.7)
T2	19 (63.3)
T3	4 (13.3)
T4	2 (6.7)
N	
N0	16 (53.3)
N1	12 (40.0)
N2	2 (6.7)
Facial lymph nodes	
Negative	21 (70.0)
Positive	9 (30.0)
Neck lymph nodes	
Negative	14 (46.7)
Positive	16 (53.3)
Nerve function	
Intact	22 (73.3)
Temporary injury	5 (16.7)
Permanent injury	3 (10.0)

SCC, squamous cell carcinoma.

There was no significant difference between negative and positive facial lymph nodes cases as regards personal data (age and sex) (Table 3).

There was a significant difference between cases with tongue SCC and cases with other tumor sites as regards facial lymph nodes, as none of the tongue SCC cases had positive LN cases compared with 42% of other tumor sites (Table 4).

There was no significant relation between tumor characteristics and facial lymph nodes; however, a significant relation was found between nerve

Table 3 Relationship between personal data and Facial lymph nodes

	Facial lymph nodes		*P*	Significance
	Negative (mean±SD)	Positive (mean±SD)		
Age	53.43±9.62	56.44±8.09	0.418	NS
Sex				
Male	15±68.2	7±31.8%	1.000	NS
Female	6±75.0%	2±25.0%		

Table 4 Relationship between tumor site and facial lymph nodes

	Facial lymph nodes (*N*) [*n* (%)]		*P*	Significance
	Negative	Positive		
Tumor site				
Buccal mucosa SCC	7 (58.3)	5 (41.7)	0.062	NS
Tongue SCC	9 (100.0)	0 (0)		
Alveolar margin SCC	5 (55.6)	4 (44.4)		
Buccal mucosa SCC				
No	14 (77.8)	4 (22.2)	0.418	NS
Yes	7 (58.3)	5 (41.7)		
Tongue SCC				
No	12 (57.1)	9 (42.9)	0.029	S
Yes	9 (100.0)	0 (0)		
Alveolar margin SCC				
No	16 (76.2)	5 (23.8)	0.389	NS
Yes	5 (55.6)	4 (44.4)		

S, significant; SCC, squamous cell carcinoma.

functions and facial lymph nodes, as about 63% of cases with impaired nerve functions had positive facial lymph nodes compared with 18% only of intact cases that had positive facial lymph nodes (Table 5).

Statistical package and statistical analysis

The collected data was revised, coded, tabulated, and introduced into a PC using statistical package for the social science (IBM Corp. Released 2011, IBM SPSS Statistics for Windows, Version 20.0; IBM Corp., Armonk, New York, USA). Quantitative variables are expressed as mean and SD. Qualitative variables are expressed as frequencies and percents. Student's *t* test was used to compare a continuous variable between two study groups. Fisher's exact test was used to examine the relationship between categorical variables. *P* value less than 0.05 was considered statistically significant.

Discussion

The existing literature has not yet elucidated the question of what impact metastasis to facial lymph nodes has on treatment of head and neck carcinoma.

Cervical lymph node metastases are the single most important prognostic factors in head and neck cancer patients. Carcinoma of the oral cavity is most often treated by surgical resection and is associated with clinically evident disease in one third of the cases and has a high rate of occult metastatic disease in the N0 neck [8].

The fear that supraomohyoid neck dissection encircling levels I, II, and III, does not satisfy the requirements of a staging dissection in oral cavity SCC has been increasing during the past few years. Many studies investigated whether level IV should be included in the treatment of N0 and even N1 necks of patients with oral cavity carcinoma. It has been evident that each specific site of primary oral cancer should be managed in a specific way in terms of extent of resection, safety margin, extent, and pattern of lymph nodes to be included in surgery [9].

The current study raises the question of fear of micrometastases above level I to the SFLN. By far, there is no consensus on the way of handling facial lymph nodes in cases of oral cavity carcinoma, rather than head and neck carcinoma in general. Moulding *et al.* [10], postulated that the subgroup of SFLNs is the most interesting group of facial lymph nodes during surgical treatment of head and neck carcinoma, because of their close relationship with critical anatomic structures.

Table 5 Relationship between tumor characteristics and facial lymph nodes

	Facial lymph nodes (*N*) [*n* (%)]		*P*	Significance
	Negative	Positive		
Grade				
Grade 1	4 (100.0)	0 (0.0)	0.405	NS
Grade 2	11 (68.8)	5 (31.3)		
Grade 3	6 (60.0)	4 (40.0)		
T				
T1	5 (100.0)	0 (0.0)	0.385	NS
T2	12 (63.2)	7 (36.8)		
T3	3 (75.0)	1 (25.0)		
T4	1 (50.0)	1 (50.0)		
N				
N0	12 (75.0)	4 (25.0)	0.715	NS
N1	8 (66.7)	4 (33.3)		
N2	1 (50.0)	1 (50.0)		
Neck lymph nodes				
Negative	11 (78.6)	3 (21.4)	0.440	NS
Positive	10 (62.5)	6 (37.5)		
Nerve function				
Intact	18 (81.8)	4 (18.2)	0.055	NS
Temporary injury	2 (40.0)	3 (60.0)		
Permanent injury	1 (33.3)	2 (66.7)		
Nerve function				
Intact	18 (81.8)	4 (18.2)	0.032	S
Temporary/Permanent injury	3 (37.5)	5 (62.5)		

S, significant. **Fisher's exact test.

Woltmann *et al*. [11] have said that the SFLN anatomic location poses a serious danger during surgical handling, making the surgical procedures very demanding. Surgical intervention in this region carries a high risk of marginal mandibular nerve injury, resulting in various functional and cosmetic problems, which has a major impact on the patient's quality of life.

Majert and Metzger [12], found that what hinders the correct evaluation of the facial lymph nodes preoperatively is the fact that our capability of representing them with accuracy on the computed tomography (CT) or MRI scans that we carry out before operations is limited. All of the treatment evaluation methods, such as palpation and ultrasound (US), yield results that are significantly different than those yielded from the histopathological results, suggesting that no pretreatment studies can accurately assess the requirement to histopathologically stage the neck.

Ahuja and Ying [13], have stated that US findings are more correlated with the pathological findings than palpation, but CT gives the most effective and reliable results when it is combined with US in neck staging. Up until now, there is no other diagnostic method that is reliable and that shows high accuracy for prediction of lymph node involvement other than the histopathological examination of head and neck lymph nodes.

Sarvanan *et al*. [14] stated that they for now use US and CT combined with clinical palpation to determine their final diagnosis. It is not possible to scan level II by using US; however, ultrasound can be useful in the examination of levels I and IIa wherein it is difficult to use CT. In addition, CT imaging is necessary for detection of deep cervical lymph nodes. Therefore, CT should be the first choice in detecting metastatic nodes, while US could be performed for a more detailed study of suspected nodes. Management of nonpalpable lymph nodes remains controversial, and imaging can influence treatment. Therefore, greater accuracy is required from the imaging techniques.

The results of our study justify the fear of micrometastases including to the SFLN: in cases of buccal mucosa, five (41.7% of the cases) cases, and four (44.4% of the cases) cases of alveolar margin SCC. In contrast, cases of SCC of the tongue had negative SFLN.

Similar to our findings [4], Maruyama [15] observed no lymph node metastases histopathologically in the

superficial fatty tissues containing the mandibular branch of the facial nerve in 26 cases of T2 tongue carcinoma. Chong and Fan studied the records of 1916 patients with a histologically confirmed nasopharyngeal carcinoma. They reported 0.2% affection of facial nodes in their series. Sheahan *et al*. discovered metastases in 17 cases of 29 with various types of oral and oropharyngeal carcinoma. Nodal metastases were more frequent in patients with palpable neck lymph nodes. They concluded that the detection of positive facial lymph nodes is linked to a high risk of treatment failure as well as to poor prognosis.

Pestinis *et al*. [16], reported that patients with SCC of the oral cavity, regardless of their individual characteristics, have 13.9% possibility of metastases in the SFLN. They studied 43 patients. None of them had clinically palpable SFLN at initial examination. The authors speculated that facial lymph nodes may be affected by metastases from submandibular lymph nodes, which are very close and receive lymph from them.

Shehan and Colreavy [17], stated as early as 2003, in their study on 76 cases of oral SCC, wherein he dissected the SFLN separately, and he found these nodes diseased in 24% of cases. He found that the sites of the primary disease in patients with facial lymph node metastases were retromandibular trigone, the floor of the mouth, buccal mucosa, and tongue base. He also stated that there was no difference in the T classification of the primary tumor between patients with positive and negative nodes.

Barry [18], noted metastases in the SFLNs in patients previously treated for oral SCC. The primary lesions were in the buccal mucosa, maxillary gingiva, maxillary sinus, and tongue. In their study, the incidence of recurrence to facial lymph nodes was 10%.

Okura *et al*. [8,19], studied the incidence of facial lymph node involvement in oral SCC. They studied a sample of 254 neck dissections. Regardless of the cervical lymph node status, they encountered positive parotid lymph nodes in 10% of cases when the primary lesions were in the buccal mucosa, lower alveolar margin, and tongue. They recommended the resection of the parotid gland tail enblock with the extraglandular and intraglandular parotid lymph nodes as a routine practice during neck dissection for the management of primary oral SCC of the above-mentioned sites. The findings that the possibility of metastases in SFLN is relatively high when the primary sites are in the lower alveolar margin, the buccal mucosa, and the lips is explained by the close anatomical proximity of SFLN to these sites and by the large number of lymph routes that end at the SFLN region.

Wu [20], studied 18 cadaveric halves of the superficial tissues of the head and neck to detect their lymphatic vessels. He produced a map of the head and neck lymphatics to help management of trauma and malignancies in this region. He found that the SFLNs drain the buccinator lymph nodes that drain the buccal mucosa. In our study, we found a trend towards positivity of the SFLN with higher T stage and less differentiated tumors. This adds more caution so as not to miss these nodes when advanced stages and grades are shown in the primary tumors. This agrees with Pestinis *et al*. [16], who found that SFLNs are usually affected in advanced stages.

As early as 1997, Savary *et al*. [21], stated that the main obstacle that makes surgeons hesitate to go above the inferior border of the mandible is the fear of damage of the marginal mandibular nerve that results in various functional problems that can impact the patient's quality of life. This should not hinder proper evaluation of the facial lymph nodes in cases at risk of metastases. Careful dissection in the current series yielded 76.7% success rate in handling the marginal mandibular nerve. This should encourage using this technique to avoid the high possibility of nodal involvement that surely outweighs the relatively minor risk of nerve affection. Temporary paralysis of the marginal mandibular nerve is usually related to stretch injury from retraction or operative manipulation. Irrespective of the site of skin incision, skin flaps should be carefully elevated in a plane immediately deep to the platysma muscle (subplatysmal plane), and superficial to the investing layer of the deep cervical fascia. It is not the level of the skin incision that is important, but it is the level of transection of the investing layer of the deep cervical fascia.Nason *et al*. [22], reported that the distance between the lower border of the mandible and the marginal mandibular nerve varies significantly. The nerve may be above the lower border by up to 1.3 cm or below the lower border by 1.7 cm.

Potgieter *et al*. [23], found that the position of the patient's head is an important factor to consider during marking of skin incisions in the submandibular region. The neck should always be extended by placing a roll under the shoulders to maintain the extended position.

The head is placed where the mandible is placed in the most perpendicular position to the patient's coronal plane. Hyperextension of the neck carries the nerve more anterior and downward.

Conclusion

We conclude that SFLN is a probable site of lymph node metastases in SCC of the lower alveolar margin and buccal mucosa. This probability increases with the advancement of the tumor and the tumor grade. Careful dissection above the inferior border of the mandible can safely remove these SFLNs without significant injury to the marginal mandibular branch of the facial nerve.

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Conflicts of interest
None declared.

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