

SUPRAMANDIBULAR FACIAL LYMPH NODES DISSECTION IN PATIENTS WITH CARCINOMA OF THE ORAL CAVITY AND ITS IMPACT ON FUNCTION OF MARGINAL MANDIBULAR NERVE

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Abstract:

Background: Facial lymph nodes are one of the unusual sites of lymph node metastases. Supramandibular facial lymph nodes (SFLNs) is group of facial LN might be affected in head and neck malignancies and SSC of oral cavity.

Objective: This prospective study investigated possible involvement of SFLNs in cases of squamous cell carcinoma of the oral cavity.

Patients and Methods: This study involved 48 neck dissections obtained from 47 patients (30 males and 17 females) with squamous cell carcinoma of the oral cavity without locoregional recurrence or distant metastases. The tumor site was the tongue (n = 15), mucosa of alveolar margin of the mandible (n = 11), buccal mucosa (n = 11), retromolar (n = 6), floor of mouth (n = 3) and mucosa of alveolar margin of the maxilla (n = 2).

Results: Histopathological examination of the removed SFLN nodes proved positive for metastasis in 10 neck dissections; 5 cases (45.5%) of the lower alveolar margin, 4 cases of buccal mucosa (36.4%) and 1 case of the tongue (6.7%). There was a trend towards SFLN involvement with higher T stage (p = 0.023) and grade (p = 0.007). Positive cervical nodal involvement was significantly associated with SFLN positivity (p < 0.001).

Conclusion: SFLN is a probable site of lymph node metastases in SCC of the buccal mucosa and lower alveolar margin. Careful dissection above the lower margin of the mandible can safely remove these nodes without significant injury of the marginal mandibular branch of the facial nerve.

INTRODUCTION:

Lymph node metastases will upstage a tumour, adversely affect prognosis and influence treatment choice. The principal imaging feature used to identify lymph node metastases is size and the maximum short axis nodal diameter is the most reliable discriminator between normal and malignant nodes. It is most commonly 10 mm, but may be less at some anatomical locations. Tumour lymph drainage is usually along well recognized lymphatic pathways but rarer lymph node sites can be involved and may be the only site of disease, particularly in recurrence¹.

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 also known as supra mandibular facial lymph nodes (SFLNs)^{2,3}.

These lymph nodes are mobile structure lying within the soft tissues of the cheek between skin and buccinator muscle at the anterior border of masseter (fig. 1) and is closely related to the mandibular branch of the facial nerve and facial vessels. Although easily palpable preoperatively, particularly if the patient is asked to clench their teeth to contract the masseter, it can be remarkably difficult to localize in an anaesthetized patient. After the initial incision has been made, the node is mobile, merges with subcutaneous fat and can be even more difficult to locate⁴.

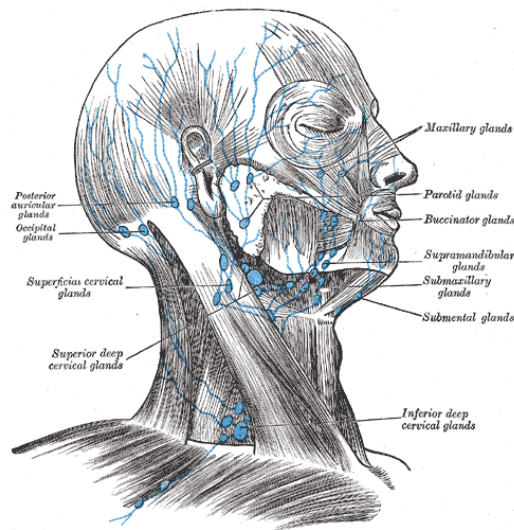


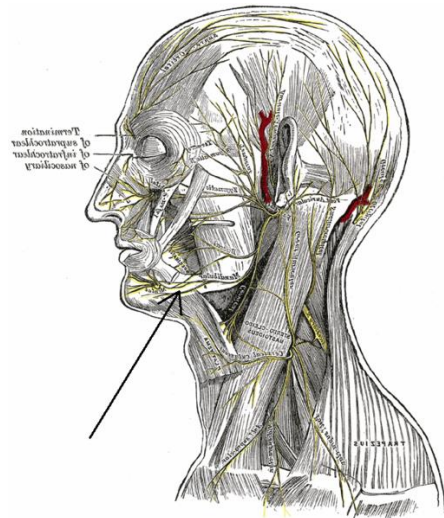
Fig. 1:

Supramandibular lymph nodes (SLN) are particularly important in head and neck malignancies. These lymph nodes are closely related to the facial artery and vein. They drain their lymph into the prevascular and retrovascular submandibular lymph nodes. The prevascular and retrovascular submandibular lymph nodes are often called "facial lymph nodes". However this term should be reserved only for those lymph nodes located above the inferior border of the mandible⁵.

The role of facial lymph nodes in head and neck cancer was not examined in literature. So far, there is no consensus whether facial lymph nodes should be included in neck dissections for treatment of head and neck malignancies⁶⁻⁸.

It is known that the lower border of the mandible is the upper limit of level I cervical lymph nodes dissected in cases of head and neck cancer⁹. Accordingly, surgeons did not usually extend their dissection

above the inferior border of the mandible, where submandibular lymph nodes lie. Thus, although there are many data on metastasis from head and neck squamous cell carcinoma (SCC) in various neck lymph node groups, there are no such data on facial lymph nodes. In fact, surgeons hesitate to handle the facial lymph nodes due to their close relation to the *marginal mandibular branch of the facial nerve*^{10,11}.



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, 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 vein¹².

The mandibular (or marginal mandibular) branch of the facial nerve (VII) lies just below the angle, superficial to the facial artery. **Savary et al.**¹³ after studying 10 fresh cadavers and 1 embalmed cadaver, found several marginal branches, particularly the intermediate ramus, which can form a neural plexus around the facial artery. **Basar et al.**¹⁴ reported that the marginal mandibular branch of the facial nerve was single in 14 facial halves, consisted of two major branches in 24 facial halves, and had multiple major branches in 2 halves.

Injury to the mandibular branch of the facial nerve results in a very slight drooping of the corner of the mouth. The drooping is not noticeable when the mouth is in repose – only when it is in motion (smiling). Depending on the nature of the injury, the drooping may be neuropraxia or permanent. The orbicularis oris and the muscles innervated by buccal branches actually raise the commissure on the affected side. (needs a reference)

The aim of this prospective study was to investigate possible involvement of supramandibular lymph nodes in cases of squamous cell carcinoma of the oral cavity. The ultimate goal is to establish whether to include these nodes in level 1 group of cervical nodes during neck dissection in cases of oral cavity cancers or not and its impact on patient perception of appearance due to marginal mandibular nerve injury during neck dissection.

Patients and Methods

This prospective study was performed in Surgical Oncology Department, Faculty of Medicine, Menofia University and Oral and Maxillofacial Surgery Department, Faculty of Oral and Dental Medicine, Cairo University between March 2006 and May 2010 after approval by the hospital's Ethics Committees. It involved 48 Neck dissection obtained from 47 patients with squamous cell carcinoma of the oral cavity.

Following thorough clinical examination and routine preoperative laboratory tests, a search of locoregional and distant metastases were

done with computed tomography (CT) scan, magnetic resonance imaging (MRI), bone scan and abdominal ultrasonography.

Inclusion criteria included primary oral SSC with no previous treatment and good general condition allowing major surgical procedure. Patients with locoregional recurrence or distant metastases were excluded from the study.

The resections of primary tumors were performed with 1-2 cm safety margins (peripheral and deep margins), wide surgical excision with safety margins, hemiglossectomy and/or hemimandibulectomy according to the anatomical location of the primary tumor.

The studied groups were 47 patients; 30 males (63.8%) and 17 females (36.2%) with a male to female ratio 1.8:1. The age of the patients ranged from 35-68 years with a mean of 53.7 ± 7.6 years. Forty-eight neck dissections were done for these patients. The tumor site was the tongue in 15 cases (31.3%), mucosa of alveolar margin of the mandible in 11 (22.9%), buccal mucosa in 11 (22.9%), retromolar in 6 (12.5%), floor of mouth in 3 (6.3%) and mucosa of alveolar margin of the maxilla in 2 (4.2%). Tumor grade and stage are shown in table 1.

Table 1: Tumor characteristics of the studied sample

	Number	Percentage
Site		
Tongue	15	31.3
Buccal Mucosa	11	22.9
Lower Alveolar Margin	11	22.9
Floor of mouth	3	6.3
Retromolar	6	12.5
Upper Alveolar Margin	2	4.2
T stage		
T1	3	6.3
T2	32	66.7
T3	10	20.8
T4	3	6.3
N stage		
N0	40	83.3
N1	8	16.7
Grade		
1	8	16.7
2	36	75.0
3	4	8.3

For regional control the neck management includes radical neck dissection (RND), modified radical neck dissection (FND) and/or supraomohyoid neck dissection depending on the primary tumor size and location, clinical presentation and involvement of cervical lymph nodes.

Postoperatively, patients with unfavorable pathologic features including involved margin, nodal extracapsular extension, > 2 positive cervical nodes, perineural invasion, or lymphovascular permeation were scheduled to receive adjuvant radiotherapy and/or chemotherapy.

During neck dissection, lymph nodes above the inferior border of the mandible were considered the supramandibular facial lymph nodes (SFLN). They were usually 1 to 3 nodes lying close to the facial artery and vein. The area was dissected carefully for conservation of the

marginal mandibular branch(s) of the facial nerve. For this purpose, we performed the incision 4 cm below the inferior margin of the mandible followed by careful dissection (with flap retraction) through superficial layer of the deep cervical fascia, the incision and undermining of the fascia should extend to 1.5 cm inferior to the mandible to protect the nerve. The submandibular salivary gland is encountered and retracted inferiorly.

The marginal mandibular branch (MMB) of the facial nerve is located close by, within or just deep to superficial layer of the deep cervical fascia, passing superficial to the facial vessels. In this way the nerve can be identified and retracted superiorly through isolation, ligation and superior retraction of the facial vessels.



Fig. 3: Initial incision



Fig. 4: Flap elevation

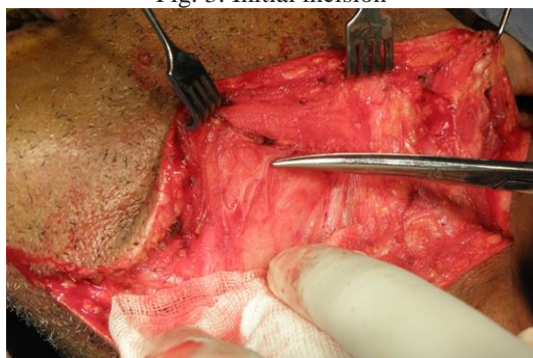


Fig. 5: Identification of the nerve after incision of the superficial layer of the deep cervical fascia.



Fig. 6: Identification of the MMB of the facial nerve (red arrow), superficial SFLN and submandibular gland (blue arrow), submental fascia and lymph nodes (black).

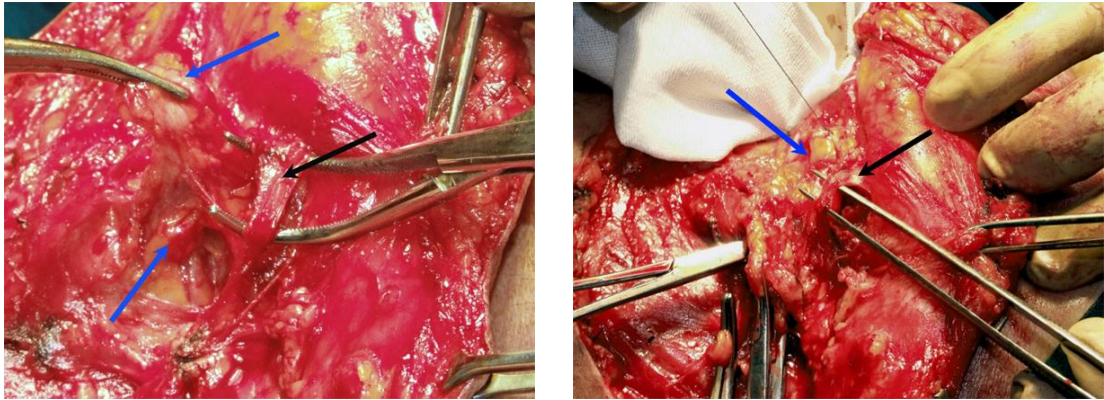


Fig. 6: SFLN (blue arrows), and MMB of the facial nerve (black arrow)

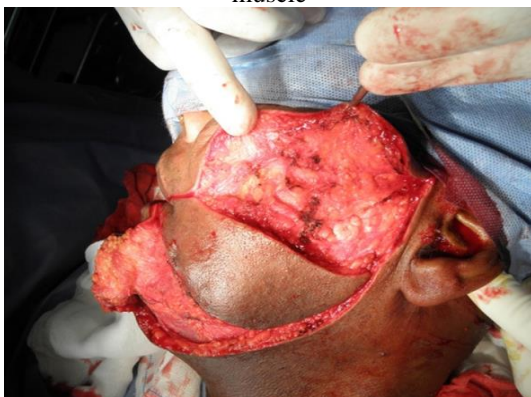
In cases where primary site was the buccal mucosa invading the buccinator muscle with or without clinical palpable SFLN, the excision included skin, buccinator muscle, buccal fat pad together with the marginal mandibular branch *en block* with radical neck dissection.



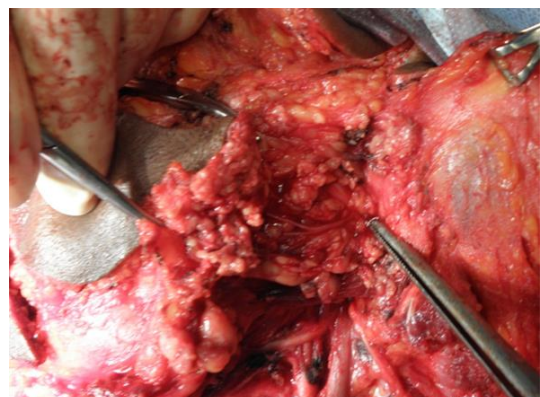
SCC of buccal mucosa invading the buccinator muscle



Clinically palpable SFLN



Skin, SFLN, MMB of facial nerve, buccal mucosa and mandible excised *en block*



Cervicofacial division of the facial nerve



Post-resection appearance



Specimen

Fig. 7: A brief of the procedure in a case of clinically palpable SFLN

Removed specimens were histologically examined. The histopathologic examination of the primary tumour 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 done using H & E stained sections after fixation in neutral buffered formalin. Verification of the tumor type, grade and degree of keratinization were recorded histologically.

The number, size and cut sections of SFLNs were recorded separately. SFLNs were examined by multiple step sections technique and the sizes of metastatic deposits were recorded using the micrometer lens.

In case of negative SFNLs, immunohistochemical staining using the streptavidin-biotin-peroxidase method and the primary antibodies against cytokeratins, 34BE12, AE3 and AE1/AE3 was done. All reagents were supplied by Dako and a dilution of 1:50 of the primary antibodies. The main tumor lesion was stained for these antibodies and was taken as

a positive immunohistochemical control. The pattern of immunostaining in both the primary tumor and in the nodal metastases, the intensity of the stain and the percentage of stained neoplastic cells were recorded.

Results:

Histopathological examination of the removed SFLN nodes proved positive for metastasis in 10 neck dissections; 50% were SCC of the lower alveolar margin. Table 2 shows a trend towards SFLN involvement with higher T stage ($p = 0.023$) and grade ($p = 0.007$). Positive cervical nodal involvement was significantly associated with SFLN positivity ($p < 0.001$).

Table 2: SFLN positivity in relation to clinical and tumor characteristics

	SFLN		P value
	Positive	Negative	
Site			
Tongue	1 (6.7%)	14 (93.3%)	
Buccal Mucosa	4 (36.4%)	7 (63.6%)	
Lower Alveolar Margin	5 (45.5%)	6 (54.5%)	
Floor of mouth	0	3 (100%)	
Retromolar	0	6 (100%)	
Upper Alveolar Margin	0	2 (100%)	
T stage			
T1	0	3 (100.0%)	0.023†
T2	5 (15.6%)	27 (84.4%)	
T3	2 (20.0%)	8 (80.0%)	
T4	3 (100.0%)	0	
Grade			
1	0	8 (100.0%)	0.007†
2	7 (19.4%)	29 (80.6%)	
3	3 (75.0%)	1 (25.0%)	
N stage			
N0	4 (10.0%)	36 (90.0%)	< 0.001
N1	6 (75.0%)	2 (25.0%)	
Age (mean±SD)	52.1±7.4	54.1±7.8	0.353
Sex (Male/Female)	8/2	22/16	0.199

† Jonckheere-Terpstra Test

The injury of marginal mandibular branch (MMB) of the facial nerve in 4 cases. It was resected in 3 cases, and proved to be intact in 41 cases (87.5%). Figure 8 shows the postoperative condition of two patients after successful dissection of the SFLN with intact MMB of the facial nerve and preserved function.



Fig. 8: Postoperative facial smiling appearance and proper function of the facial nerve

Discussion:

Cervical lymph node metastases are the single most important prognostic factor in head and neck cancer patients¹⁵⁻¹⁷. Carcinoma of the oral cavity is most often treated by surgical resection, is associated with clinically evident neck disease in one third of cases, and has a high rate of occult metastatic disease in the N0 neck¹⁸.

Supraomohyoid neck dissection encircling levels I-III well satisfies the requirements of a staging dissection in oral cavity carcinomas. Many studies investigated whether level IV should be included in the treatment of N0 and even N1 necks of patients with cancer of the oral cavity. The current study raises the question of fear of "*micro metastases*" above level I; the supramandibular facial lymph nodes (SFLNs). By far, there is no consensus on the way of handling facial lymph nodes in cases of SCC of the oral cavity.

The results of the current study justify the fear of micro metastases including the SFLN in cases of SCC of the buccal mucosa and lower alveolar margin. SFLN was positive in 45.5% of lower alveolar margin and 36.4% of buccal mucosa cases. One of fifteen cases of tongue carcinoma had positive SFLN. On the other hand, cases of SCC of floor of mouth, retromolar region and upper alveolar margin had negative SFLNs.

Similar to our findings, Maruyama⁹ observed no lymph node metastasis histopathologically in superficial fatty tissues containing the mandibular branch in 26 cases of T2 lingual carcinomas. Chong and

Fan¹⁹ studied the records of 1916 patients with histologically confirmed nasopharyngeal carcinoma. They reported 0.2% affection of facial nodes in their series.

In a series of 29 patients with various types of oral cavity and oropharyngeal carcinomas, Sheahan et al.⁷ discovered metastases in the facial lymph nodes that in 7 cases. Nodal metastasis was 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 and to poorer diagnosis.

Petsinis et al.²⁰ reported that patients with SCC of the oral cavity, regardless of their individual characteristics, have a 13.95% possibility of metastasis in some SFLNS. They studied 43 patients, none of them had clinically palpable SFLNs at initial examination. The authors speculated that facial lymph nodes may be affected by metastases from submandibular lymph nodes, which are very close to them and receive lymph from them²¹.

The finding that the possibility of metastasis in SFLNs is relatively high when the primary sites are located in the mucosa of the alveolar crest of the mandible is explainable by the anatomic proximity of SFLN and mucosa of the alveolar crest of the mandible and because of the large number of lymph routes that end at the SFLN area.

Pan et al.²² studied eighteen cadaveric halves of the superficial tissues of the head and neck to detect their lymphatic vessels. They produced a map of the head and neck lymphatics to help management of trauma and malignancies in the region. They found SFLN drain the buccinator LNs that drain the buccal mucosa.

The current study found a trend towards positivity of SFLN with higher T stage and less differentiated tumors. This adds more caution not to miss these nodes in advanced stage of grade of the primary tumors. This agrees with Petsinis et al.²⁰, who tend to confirm the view that SFLNs are usually affected by metastasis in advanced stages.

The main obstacle that make surgeons hesitate to go above the lower mandibular margin is fear of damage to the marginal branch of the facial nerve, resulting in various functional problems that can impact the patient's quality of life. This should not hinder proper evaluation of facial lymph nodes in cases at risk of metastases. Careful dissection in the current series yielded 87.5% success rate in handling the nerve. This should encourage using this technique to avoid the high possibility of nodal involvement that of course outweigh the relatively minor risk of nerve affection.

Temporary paralysis of the marginal mandibular nerve is usually related to nerve stretch injury from retraction or operative manipulation. The incidence of temporary marginal mandibular nerve paralysis varies between 10% and 30%.^{23,24}

We may conclude that SFLN is a probable site of lymph node metastases in SCC of the buccal mucosa and lower alveolar margin. Careful dissection above the lower margin of the mandible can safely remove these nodes without significant injury of the marginal mandibular branch of the facial nerve.

The current study recommends inclusion of SFLNs in neck dissection in patients SCC of buccal mucosa of lower alveolar margin, especially with advanced T stage or histological grade and with clinically palpable cervical lymph nodes.

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