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Research Article

Ultrasonography - Our Aid in Determining Patterns of Cervical Lymph Node Metastasis in Site Specific Oral Cancers - A Retrospective Study

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Abstract

Background: Oral squamous cell carcinomas account for nearly 90% of all cancers in the oral cavity, and has a characteristic predilection toward lymph node metastasis, occurring in about 40% of the patients. Ultrasound is a non-invasive modality used to image the cervical lymph nodes.

Objectives: To establish a connection between the site, side and size of the primary tumor and its predisposition for unilateral/bilateral cervical lymphatic spread.

Methods: A total of 50 patients who had reported to College of Dental Sciences, Davangere who were diagnosed with oral squamous cell carcinoma were studied retrospectively. Data was collected and analyzed using previous records based on clinical parameters and USG reports.

Results and Conclusion : The data analysis done put forth the following points

- Level IB is the most commonly involved lymph node in metastasis, while level V is involved least commonly.
- Irrespective of size of the growth, cancers of the tongue and floor of mouth have a higher tendency for bilateral spread in the neck.
- The chances of skip metastasis are considerably higher in cancers of the tongue and maxillary alveolus.

Keywords: Metastasis; Cervical; Lymph Node; Ultrasonography; Oral Cancer

Introduction

Head and neck cancer is a common neoplasm that encompasses epithelial malignancies of the paranasal sinuses, nasal cavity, pharynx and larynx, representing about 6% of all cases and accounting for an estimated 650,000 new cancer cases and 350,000 cancer-related deaths worldwide every year [1]. Oral cancer is the most frequent type of cancer of the head and neck area, with squamous cell carcinoma being the most common single entity. Despite significant advances in surgery and chemotherapy achieved over the past decades, oral cancer is still characterized by poor prognosis and a low survival rate. In patients diagnosed with tumours at an advanced stage, there is a high occurrence of invasion to surrounding tissues, with lymph node and distant metastasis, and a peculiarly high risk of second malignancy during the patient's lifetime [2]. It represents the most devastating feared stage of malignancy and the leading cause of death from cancer.

Metastasis of oral cancer is a complex process involving detachment of cells from the tumour tissue, regulation of cell motility and invasion, proliferation and evasion through the lymphatic system or blood vessels. This process is due to reduced intercellular adhesion of tumour cells as they progress to malignancy because of loss of E-cadherin [3]; they thereby begin to express proteins such as mesenchymal vimentin and N-cadherin, promoting cell elongation and interfering with cell polarity. This morphological transition, called epithelial-mesenchymal transition (EMT) [4] leads to molecular alterations interfering with the behaviour of these cells.

The major determinant of the prognosis of oral carcinoma is the risk of cervical metastasis.

Lymph nodes are the important anatomical bodies to drain the lymphatics of all the structures of the oral cavity. The lymph nodes

present in the neck are collectively called as cervical lymph nodes. They have been named according to their anatomical position in the neck region as Levels 1A, 1B, II, III, IV, V.

High-resolution ultrasonography has been used extensively in the assessment of cervical lymphadenopathy [5,6]. Ultrasonography (97%) has higher sensitivity than palpation (73%) in the assessment of cervical lymph nodes and has a high specificity (93%) when combined with ultrasound-guided fine-needle aspiration cytology (FNAC). Ultrasonography is particularly more sensitive than clinical examination in patients with previous head and neck cancer and post-radiotherapy neck fibrosis. In addition, ultrasound-guided FNAC is more accurate than blind FNAC for distinguishing metastatic and benign cervical lymph nodes, with fewer false-negative (1% and 8%, respectively) and false-positive (1% and 5%, respectively) findings. Greyscale ultrasonography can be used to assess the distribution and morphology of lymph nodes, whereas Doppler ultrasonography can be used to evaluate the distribution of intranodal vascularity and vascular resistance.

Materials and Methods

A total of 50 patients who had reported to College of Dental Sciences, Davangere, and were diagnosed with oral squamous cell carcinoma were studied retrospectively.

Data was collected and analyzed using previous records based on clinical parameters and USG reports.

Clinical parameters

Site of tumor

- Buccal Mucosa
- Tongue
- Maxillary Alveolus
- Mandibular Alveolus

- **Side of tumor**: Right or Left

Ultrasound parameters

- **Levels of lymph nodes involved**: Level 1A, 1B, II, III, IV, V
- **Side of lymph node**: Right or Left

Characteristic features of lymph node metastasis as viewed on ultrasonography - change in size of node, altered echotexture, loss or preservation of fatty hilum, presence of foci of necrosis.

Statistical tests

The collected data was analysed using descriptive tests.

Results

Maxillary alveolus

Figure 1 a) illustrates that 50% of the cases of Ca of Maxillary alveolus have a tendency for unilateral spread, specifically with a predilection to the left side. 16.6% and 25% left, and right-sided lesions, respectively, have a bilateral cervical lymph node metastasis. This indicates that Ca of the maxillary alveolus can have an equal chance, for unilateral as well as bilateral cervical lymph node metastasis.

Figure 1 b) illustrates the groupings of levels of lymph nodes involved. Most common, is the Involvement of both Level IB and II, as seen in 45.05% cases. Followed by this, is the isolated Level II lymph node involvement as seen in 29.41% cases. This is significant, as it indicates the presence of a skip metastasis, with Level IB lymph node being bypassed completely. Followed by this, is the involvement of Level IB lymph node only, in 17.64% cases.

Figure 1 c) shows the most commonly involved lymph node, which is the Level II followed by the Level IB lymph node, as seen in 82.35% and 70.58% cases respectively. The Level III node is least commonly involved, seen in 5.88% cases.

Tongue

Figure 2 a) illustrates that the spread of primary tongue lesion has a high chance of bilateral spread as compared to other primary sites, with bilateral spread occurring from a left sided lesion in 45.45% of cases, and from a right sided lesion in 9.09% cases. This is significant, since the tongue is a midline structure in the oral cavity, the chances of bilateral lymphatic spread is more, as proved by the analysis of data.

Figure 2 b) indicates the groupings of levels of lymph nodes affected. It illustrates the maximal involvement of the Level IB lymph node, presenting in 40% of cases. Followed by this, is a 25% chance for Level IB as well as II being involved. After this, there is a 20% involvement of isolated Level II lymph node involvement. This is particularly significant, as it indicates the presence of a skip metastasis, with Level IB being bypassed in tongue cancers.

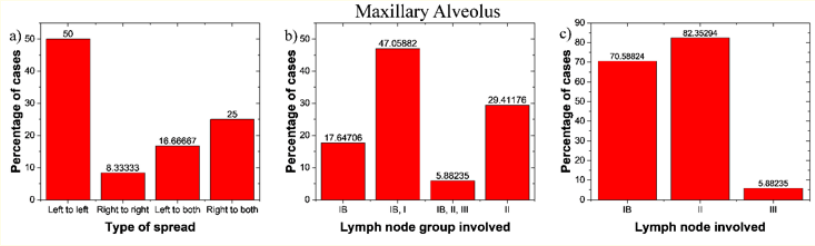

Figure 1: a) Type of spread, b) Lymph node groups affected and c) Individual lymph nodes affected in cases of Maxillary Alveolus lesion.

Figure 2 c) indicates which is the most commonly involved lymph node. 80% cases did have Level IB node involved, and 60% cases had Level II involvement. This indicates that Level IB being in close proximity to the primary, has a very high tendency of being the first involved lymph node in the cervical metastatic spread.

Buccal mucosa

Figure 3 a) illustrates an equal involvement of both left and right sided lesions, with tendency for unilateral spread to the same side in 36.36% cases. There was the presence of bilateral spread in the neck too, as seen in 27.27% cases. This indicates that cases of Ca of the Buccal mucosa have more tendency for a unilateral as compared to the bilateral spread. This could be due to the site of the primary being towards one side of the oral cavity rather than the midline.

Figure 3 b) illustrates the maximal involvement of isolated level IB lymph node, as seen in 28.57% cases, followed by a combination

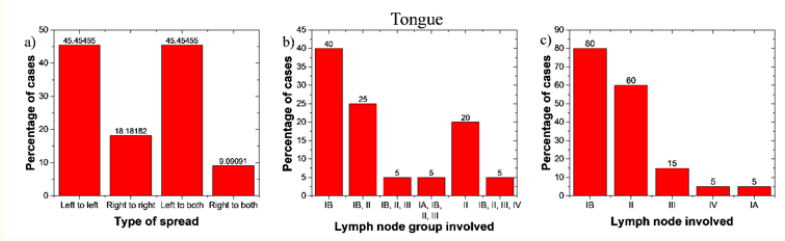

Figure 2: a) Type of spread, b) Lymph node groups affected and c) Individual lymph nodes affected in cases of Tongue lesion.

of level IB and II lymph nodes, as seen in 21.42% cases. Isolated Level II lymph node involvement was less, seen only in 7.14% cases. This provides the conclusion that the presence of skip metastasis from Ca buccal mucosa is relatively lesser as compared to that of tongue and maxillary alveolus.

Figure 3 c) indicates that Level IB is the most commonly involved lymph node, as seen in 92.85% cases, followed by Level II, involved in 57.14% cases.

Mandibular alveolus

Figure 4 a) illustrates that the spread of Ca present in the mandibular alveolus region is limited to the same side (left or right) as the lesion. This indicates that the cancer tends to remain on the same side as the lesion and not cross the oral cavity to involve the other side.

Figure 4 b) indicates the groupings of levels of lymph nodes affected. It can be seen that the most common case is where the cancer spreads from the primary lesion to the level IB only, as seen in 36.36% cases, followed by involvement of Level IB, II, III seen in 27.27% cases. This can be explained by the proximity of the Level IB lymph nodes to the cancerous lesion.

Figure 4 c) shows that Level IB is the most commonly involved lymph node, as seen in 90.90% of the cases followed by Level II in

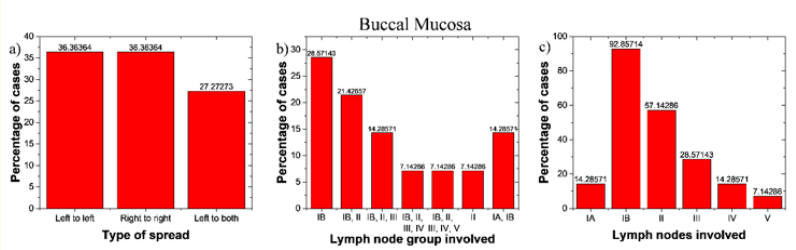

Figure 3: a) Type of spread, b) Lymph node groups affected and c) Individual lymph nodes affected in cases of Buccal mucosa lesion.

54.55% of the cases. The Level III is involved in 18.18% of the cases and the Level IA is involved in 9.09% of the cases. In all cases where Level III is involved, we observe the involvement of Level IB and II as well. We can therefore say that the most common form of spread towards the cervical region takes place starting from IB spreading to II and then to III.

Discussion

Among the 50 cases reported to the Department of Oral and Maxillofacial Surgery, College of Dental Sciences, Davangere and were diagnosed with Oral Squamous Cell Carcinoma, 11 were having Ca of the Mandibular Alveolus, 14 with Ca Tongue, 11 with Ca Buccal mucosa and 12 with Ca of the Maxillary Alveolus.

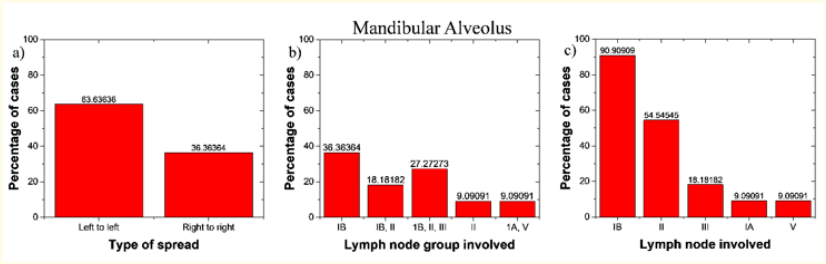

Figure 4: a) Type of spread, b) Lymph node groups affected and c) Individual lymph nodes affected in cases of Mandibular Alveolus lesion.

Oral cancer is known to occur at various sites in the oral cavity, among which tongue and buccal mucosa are the most common sites as per a study conducted by Dhanuthai., *et al.* [7] It can also occur at various other sites such as the alveolus, palate, lip, etc. Each site may have a different pattern of cervical lymph node metastasis.

Cervical node metastases have variable incidence and are widely accepted as one of the major prognostic factors in OSCC patients. Nithya., *et al.* [8] observed in their study that clinical examination of lymph nodes alone lacks sensitivity as well as specificity. Sajeeda., *et al.* [9] documented that ultrasonography is not only useful in detecting neck nodes but is also useful in assessing the nodal characteristic and the degree of vascular invasion.

The results of the ultrasound examination showed that Ca of the mandibular alveolus tends to spread unilaterally in the neck, maximally involving the Level IB node. This correlates well with previous similar studies. It also showed that as the area of the primary lesion increased, the chances of the metastasis spreading further to the Level II lymph node also increased.

The results also showed that Ca tongue had a higher tendency of bilateral cervical metastasis as compared to the other three sites, with a high involvement of Level IB and II lymph nodes. This correlates well with a study conducted by Nithya., *et al.* [8] who conducted a retrospective analysis of 75 patients undergoing primary surgical resection for squamous cell carcinoma of oral tongue between January 1997 and December 1998, in a single surgical unit, to evaluate the pattern of nodal metastasis and survival.

Ca of the maxillary alveolus has an equal tendency for a unilateral as well as bilateral spread, with a grouping of Level IB and Level II being most common. A similar study was conducted by Wen-Bo-Zhang., *et al*. [10] where they noticed that total cervical metastases and occult metastases rate was 32% and 21%, respectively. Positive lymph node detection was likeliest from levels I to III. A study conducted by K Sagheb., *et al*. [11] also showed that as the size of the tumour increases, the chance for bilateral metastasis also increases.

Skip metastasis is defined as lateral lymph node metastasis, without central lymph node involvement. Tumour cells having a possibility of escaping the usual draining nodes and metastasizing to other nodes has been well documented in various studies involving patients with head and neck cancers. This phenomenon of skip metastases in cancer of the tongue is well proven and supported by the anatomic findings described by Rouvière., *et al*. [12] In 1997, Woolgar., *et al*. [13] reported an incidence of 10% skip metastasis at levels II and III nodes in a series of neck dissections from 154 previously untreated patients with diagnosed squamous cell carcinoma of the oral mucosa. In 2000, Hamakawa., *et al*. [14] reported a skip metastasis in a patient with tongue cancer.

However according to Martínez-Gimeno., *et al*. [15] the assessment of cervical lymph node metastasis is still a controversy. No clinical exploration or imaging techniques are able to show micro metastasis in the neck nodes. Carlos Martínez-Gimeno., *et al*. has designed a specific scoring system, known as the Martínez-Gimeno scoring system (MGSS) based on clinical as well as histologic criteria. According to these authors this system is very useful and safe in identifying a group of patients with almost null risk for cervical metastasis. Future studies should focus more on applying this particular scoring system to assess the metastases.

Conclusions

The results of the study helped in drawing the following conclusions

- Level IB is the most commonly involved lymph node in metastasis, while level V is involved least commonly.
- Irrespective of size of the growth, cancers of the tongue and maxillary alveolus have a higher tendency for bilateral spread in the neck.
- The chances of skip metastasis are considerably higher in cancers of the tongue and maxillary alveolus.

Clinical Significance

The severity of oral squamous cell carcinoma and its striking predilection for the cervical neck lymph node metastasis is alarming and largely influences the treatment plan. A sound knowledge of the pattern of spread based upon the individual subsites will help in the same. Given the high sensitivity of ultrasonography, it would certainly play an indispensable role in identification of the metastatic nodes.

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