Computed tomography in the management of cervical lymph node pathology

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Summary Computerised tomography (CT) is a useful adjunct in the diagnosis of cervical pathology in head and neck carcinoma. However, different criteria used in CT analysis make the comparison of outcome studies difficult. This study compares two different CT criteria (two different lymph node sizes) for detection of cervical lymph node pathology for head and neck tumours in the same patient population. A prospective study was performed on 55 patients, with minimum T2 intraoral squamous cell carcinoma and high risk extraoral malignancies, who underwent 65 neck dissections. Sensitivity, specificity and accuracy of clinical palpation, CT considering lymph nodes larger than 10 mm as positive and CT considering lymph nodes larger than 15 mm as positive are compared. The results are as follows: sensitivity, specificity and accuracy of clinical palpation are 86, 84 and 85%, respectively; sensitivity, specificity and accuracy of CT with lymph nodes exceeding 10 mm are 95, 47 and 63%, respectively; sensitivity, specificity and accuracy of CT with lymph nodes exceeding 15 mm are 86, 81 and 83%, respectively. The outcomes of the study reveal that CT evaluation of cervical lymph nodes with a cutoff value of 15 mm should be preferred to a cutoff value of 10 mm in order to prevent over-treatment in cervical management of head and neck tumours. When accuracy of the results is considered, CT alone does not have an advantage over clinical palpation in this study.

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Metastatic spread of head and neck tumours to the cervical lymph nodes is an indicator that significantly decreases life expectancy. Survival rates in oral squamous cell carcinoma are 50% lower when nodal metastasis is present, therefore early diagnosis is crucial for appropriate intervention.1 Clinical palpation of the cervical lymph nodes is the only standard measure taken to detect metastasis. However, all palpable lymph nodes may not be involved with the tumour and this method is not sensitive enough to detect the occult disease. In fact, clinical palpation alone has a high false negative rate for cancers of the oral cavity, which is reported to be in the range of 8–41%.2–6

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Introduction of computerised tomography (CT) in routine clinical practice contributed to the detection of cervical pathology. Several researches have compared clinical palpation and CT in detecting cervical metastasis.\(^7\)\(^\text{-}\)\(^{11}\) The general outcome of these studies is that CT is a useful method for detecting cervical metastasis. When compared with clinical palpation alone, it has a lower false negative ratio and superior accuracy in most studies\(^5\)\(^\text{-}\)\(^{11}\) but it is not sensitive and specific enough to solely depend on. The literature lacks any numbers for the false negativity rates of palpation or CT evaluation for extraoral tumours of the head and neck region. The lack of interest is partly due to the belief that the extraoral tumours have a low metastatic potential.\(^12\) However, tumours of the head and neck skin or parotid gland with a high risk of lymphatic metastases are not rare, thus, they should not be neglected. If efficacy of CT can further be assessed, it could aid in selecting patients who will undergo neck dissection. Selection criteria of CT-positive necks have not been clearly established, yet. Lymph nodes greater than 10 mm are considered as positive in some studies where as nodes greater than 15 mm are considered as positive in others.\(^7\)\(^\text{-}\)\(^{11}\) In this study, the sensitivity, specificity and accuracy of these two different criteria on the same patient population are compared. The clinical and CT findings of cervical lymph node metastases between a group of patients with intraoral tumours and a group of patients with extraoral high risk tumours are compared.

**Patients and methods**

Fifty-five patients with minimum T2 intraoral squamous cell carcinoma and high risk extraoral malignancies that underwent neck dissections between January 2000 and June 2005 were included in the study. The high risk extraoral malignancy group was selected according to the following criteria: squamous cell carcinomas of the head and neck skin larger than 4 cm,\(^12\) squamous cell carcinomas of the lip larger than 2 cm,\(^13\) malignant melanomas of head and neck skin with Breslow thickness over 1.0 mm and high grade parotid malignancies. None received radiotherapy or chemotherapy prior to surgery. Of these 23 were intraoral squamous cell carcinomas (nine floor-of-mouth, eight buccal, three retromolar, three mobile tongue); 32 were high risk extraoral head and neck tumours (14 squamous cell carcinomas of head and neck skin, eight squamous cell carcinoma of the lower lip, seven malignant melanoma of head and neck skin, three parotid adenocarcinoma). The patient age at the time of the operation ranged between 42 and 73 years (mean age 62.5 years). Thirty-five of the patients were male, 20 were female. The patients were thoroughly evaluated for palpable cervical lymph nodes by one of the authors (A.S.), preoperatively. All patients scheduled for operation had cervical CT (General Electric High Speed Spiral CT, Milwaukee, WI, USA). Axial sections (3 mm thick) were obtained using iomeprol for contrast. All CT images were evaluated according to two different sets of criteria, by the same radiologist. In the first place, CT were considered positive for lymph node pathology if they met one of the following criteria: (1) size greater or equal to 10 mm, (2) any evidence of central necrosis, group of three to four nodes smaller than 10 mm in the primary drainage station of the tumour, (4) loss of tissue planes and evidence of extracapsular spread. This set of criteria was called ‘CT-10 criteria’. In the second place, CT were considered positive if they met the following criteria: (1) size greater or equal to 15 mm, (2) any evidence of central necrosis, (3) group of three to four nodes smaller than 15 mm in the primary drainage station of the tumour, (4) loss of tissue planes and evidence of extracapsular spread. This set of criteria was called ‘CT-15 criteria’. The nodes were evaluated for negativity or positivity rather than actual nodal staging. All patients underwent some form of neck dissection (radical, modified radical or selective), either unilaterally or bilaterally. All dissection materials went through pathological examination. Sensitivity, specificity and the overall accuracy of clinical palpation and CT were calculated with respect to the pathological diagnosis.

**Results**

Sixty-five lymph node dissections were performed in 55 patients because of bilateralism in 10 cases. Thirty-one lymph node dissections were performed in 23 intraoral malignancy patients (eight cases were bilateral). Thirty-four lymph node dissections were performed in 32 extraoral malignancy patients (two cases were bilateral). Types of neck dissections are presented in Table 1.

Thirteen of the 31 dissection materials from the intraoral group were reported to be positive for lymph node metastasis (42%). None of the 34 dissection materials from the extraoral group were reported to be positive for lymph node metastasis (26.5%). The clinical and CT evaluations of the dissection materials with respect to the pathological examination are presented in Table 2. In this series, the sensitivity of clinical palpation is 86%. CT evaluations of the cervical lymph nodes, considering larger than 10 mm as pathological, seem to increase the sensitivity to 95%, whereas the sensitivity of CT evaluations, considering over 15 mm as pathological is 86% (Fig. 1). The specificity of clinical palpation is found to be 84%. CT-15 criteria are more specific than CT-10 criteria (81 and 47%, respectively (Fig. 2). The overall accuracy of clinical palpation is 85%, CT-15 criteria is 83% and CT-10 criteria is 63% (Fig. 3). The false negativity rate for intraoral carcinomas is 12% for clinical palpation, 8 and 10% for CT-10 and CT-15 criteria, respectively. False negativity rate for extraoral malignancies is 5% for palpation, 0 and 5% for CT-10 and CT-15 criteria, respectively.

| Table 1 | Types of neck dissections for intraoral and extraoral malignancy groups |
|---------|--------------------------|--------------------------|--------------------------|
| Intraoral | Extraoral | Total |
| Radical neck dissection | 15 | 12 | 27 |
| Modified radical neck dissection | 12 | 9 | 21 |
| Selective neck dissection | 4 | 13 | 17 |
| Total | 31 | 34 | 65 |
Discussion

Sensitivity rates, in the range of 55–100%, are reported for CT evaluation of cervical lymph nodes in head and neck cancer. The reported specificity rates for CT evaluation range between 71 and 90%. The sensitivity rates for clinical examination are reported to be as low as 60% and as high as 88%. In our group of patients, CT evaluation of cervical lymph nodes is not superior to clinical palpation. The overall accuracy of clinical palpation is 85%, the accuracy of CT-15 criteria is 83%, and the accuracy of CT-10 criteria is 63%.

In defining the criteria for positivity in CT evaluations, central nodal necrosis seems to be the most reliable sign. However, central nodal necrosis cannot be identified in most of the tumour positive cases, so additional criteria are needed to identify the pathological lymph nodes. In the studies aiming to detect the cervical lymph node pathology by CT, either larger than 10 mm nodes, or larger than 15 mm nodes are considered as positive. This makes a comparison between two different studies difficult because of the difference in selection criteria. In the present study, the CT images are evaluated according to two different criteria, on the same patient population. First, lymph nodes larger than 10 mm are considered positive. In the second evaluation, lymph nodes larger than 15 mm are considered positive. Other criteria, such as the presence of central nodal necrosis, or loss of tissue planes are not changed. So the difference in the sensitivity and specificity rates are purely attributable to the lymph node size. The results reveal that the sensitivity of CT-10 criteria is higher than CT-15 criteria. This is an expected outcome, because the smaller the size criteria the less chance one has to omit a pathological lymph node. However, the specificity and the overall accuracy of the CT-15 criteria are higher. In a study conducted by Friedman et al., histological analyses of lymph nodes from 30 neck dissections were compared with the preoperative CT evaluations. They found that if 1.5 cm. was accepted as the cut-off point, the false negative rate was 13%, and if 1.0 cm was accepted as the cut-off point the false negative rate was 7%. They suggested the use of 1.0 cm criteria, preferring the sensitivity to specificity. In our study group of 65 neck dissections, false negative rates for CT-15 and CT-10 criteria are 8% and 5%, respectively. We believe that increased specificity has a significant role in preventing over-treatment and reducing morbidity. Therefore, we suggest the use of the 15 mm criteria.

Another aspect of this study is that it divides head and neck tumours into two categories as intraoral squamous cell carcinoma and extraoral high risk malignancies. Similar studies in the literature aiming to detect neck metastasis had patient populations with intraoral carcinomas (including pharynx, hypopharynx and glottis). This is probably due to the fact that tumours of the head and neck skin are not clinically as aggressive as the mucosal tumours and also due to the difficulty of classification of extraoral malignancies. However, certain extraoral tumours have the potential...
to metastasise to the local lymph nodes, and we believe this group of tumours should not be neglected. In this study, the high risk extraoral malignancy group was selected according to the following criteria: squamous cell carcinomas of the head and neck skin larger than 4 cm,12 squamous cell carcinomas of the lip larger than 2 cm,13 malignant melanomas of the lower lip and therefore they were suited for the extraoral malignancy group. Forty-two per cent of the intraoral malignancies was reported to be positive for lymph node metastasis. Thus, it is revealed that a significant number of extraoral tumours may act aggressively. A wide spectrum of pathologies is included with the extraoral malignancy group, like malignant melanoma, squamous cell carcinoma and parotid malignancies. This brings out the problem of different clinical behaviour and versatility in lymphatic spread potential. However in that sense, intraoral squamous cell carcinoma also has a wide spectrum of clinical picture. For example, a retropharyngeal tumour does not act in the same manner as a gлотic tumour. In this study we did not aim to classify the metastatic potential of the tumours, rather we tried to detect the correlation between the CT criteria and the pathological findings. Therefore we did not divide the extraoral or intraoral pathologies into sub-groups.

In conclusion, in CT evaluation of cervical lymph node pathology in head and neck cancer, 15 mm criteria is more accurate than 10 mm criteria. Secondly, CT evaluation is less accurate in detecting cervical pathology in extraoral high risk tumours when compared with intraoral tumours.

References