Oral Oncology (2006) **42**, 275–280

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ORAL ONCOLOGY

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Screening for distant metastases in patients with head and neck cancer: Is there a role for ^{18}FDG-PET?

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Received 25 May 2005; accepted 25 July 2005

KEYWORDS
Distant metastases;
Synchronous primary tumours;
Squamous cell carcinoma;
Head and neck cancer;
Screening;
Chest CT;
^{18}FDG-PET

Summary The detection of distant metastases and second primary tumours at the time of initial evaluation changes the prognosis and influences the selection of treatment modality in patients with HNSCC. Until recently chest CT was the single most effective test to screen for distant metastases in HNSCC patients. In this observational cohort study we prospectively compared the yield of whole body ^{18}FDG-PET and chest CT to detect distant metastases and synchronous primary tumours. The results of whole body ^{18}FDG-PET and chest CT were analysed in 34 consecutive HNSCC patients with previously established risk factors for the presence of distant metastases. Four patients were diagnosed with distant metastases or second primary tumours: CT as well as ^{18}FDG-PET identified one patient with lung metastases and another with primary lung cancer. In addition, ^{18}FDG-PET detected second primary tumours in two patients (hepatocellular carcinoma and abdominal adenocarcinoma). However increased uptake sites at ^{18}FDG-PET in lung, liver and pelvis in five patients were not confirmed by other imaging modalities. The added value of whole body ^{18}FDG-PET versus chest CT was to identify unknown malignancy in 6% of the patients. Confirmation of positive ^{18}FDG-PET findings is feasible and necessary.

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1368-8375/$ - see front matter
doi:10.1016/j.oraloncology.2005.07.009

Introduction

The detection of distant metastases at the time of initial evaluation changes the prognosis and influences the selection of treatment modality in patients with head and neck squamous cell carcinoma (HNSCC). Distant metastases usually occur late in the course of the disease. The lungs, bone and liver are the most frequent sites of distant metastases. The prevalence of distant metastases in HNSCC at autopsy (37–57%) is much higher than in clinical studies (4–26%).[1–4] Distant metastases that appear during follow-up in patients who achieved locoregional control must have arisen from subclinical distant spread already present at the time of treatment. Patients with distant metastases are generally not considered curable and almost always receive only palliative treatment.[5]

Because of the relatively low incidence of distant metastases at presentation, only patients with risk factors should undergo evaluation for distant metastases. In a previous study[6] in the 1990s, we evaluated the value of screening for distant metastases retrospectively in 101 patients with advanced stage HNSCC, scheduled for major surgery, who underwent chest radiographs, chest computer tomography (CT), ultrasound or CT scan of the liver and bone scintigraphy. We identified several risk factors for development of distant metastases and found that chest CT was the single most important technique that was available for screening for distant metastases in HNSCC patients at that time. Besides lung metastases, chest CT can also detect primary lung cancer, mediastinal lymph node metastases, bone metastases in spine and ribs, and can be extended to the liver. Therefore, we continued performing chest CT only in screening for distant metastases in HNSCC patients with risk factors: three or more cervical metastases, bilateral or low-jugular (level IV) cervical metastases, cervical metastases larger than 6 cm, recurrence or second primary tumours.

Despite negative screening and locoregional tumour control some patients develop distant metastases. These distant metastases must have been present at diagnostic work-up, but were apparently below the detection limit of screening tests. If distant spread occurs early after major surgery with curative intent these patients probably underwent inappropriate extensive treatment.

Thus a more sensitive diagnostic technique which preferably examines the whole body is needed. Positron emission tomography (PET) using the radiolabeled glucose analog 18-fluoro-2-deoxy-glucose (^{18}FDG) offers a functional imaging approach for the entire body. ^{18}FDG-PET is shown to be able to detect various types of tumours, among which HNSCC.[7] However, false positive results can occur and confirmation of PET findings can be problematic. The current study evaluates the value of ^{18}FDG-PET in screening for distant metastases in HNSCC patients. The ^{18}FDG-PET results are compared with the results of chest CT in HNSCC patients with risk factors for distant metastases.

Materials and methods

Between May 1998 and August 1999, 34 consecutive HNSCC patients (12 females and 22 males, mean age 59 years, range 25–85), who had risk factors for developing distant metastases underwent screening for distant metastases and synchronous second primary tumours. Primary tumour sites included oral cavity, oropharynx, hypopharynx, larynx, nasopharynx and lymph node metastases of unknown primary tumour. Some patients were already known with secondary primary HNSCC at the time of screening. These patients had the following risk factors for development of distant metastases: three or more lymph node metastases (n = 1), bilateral lymph node metastases (n = 11), lymph node metastases of 6 cm or larger (n = 10), low-jugular (level IV) lymph node metastases (n = 1), locoregional recurrence (n = 6) and second primary tumour (n = 5). In all 34 patients a spiral chest CT was performed using a fourth-generation Siemens Somatom Plus (Siemens AG, Erlangen, Germany) after intravenous administration of contrast medium (Ultravist, Schering AG, Berlin, Germany). Contiguous axial scanning planes were used at 10 mm slice thickness without interslice gap. Radiological criteria for lung metastases were: smoothly defined and subpleurally located lesions, multiple and located at the end of a blood vessel; for bronchogenic carcinoma, solitary, spiculated, and centrally located lesions; and for mediastinal lymph node metastases, a minimal axial diameter of more than 10 mm.

All patients underwent ^{18}FDG-PET after at least a 6 h fast. Sixty minutes after intravenous administration of 370 MBq of ^{18}FDG, imaging of the mid-femur–cranial vault trajectory was started using a full ring BGO PET scanner (ECAT EXACT HR + CRI/Siemens). A PET scan was considered positive if there was an abnormal focally enhanced tracer uptake, which could not be attributed to normal physiological uptake.