

Initial staging examinations for head and neck squamous cell carcinoma: are they appropriate?

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Abstract

Objectives: The presence of distant metastases affects the therapeutic regime in patients with head and neck squamous cell carcinoma. This study evaluated the necessity to undertake bone scanning, chest computed tomography and abdominal ultrasonography in patients presenting with primary advanced head and neck squamous cell carcinoma.

Study design: Retrospective analysis, university setting.

Methods: One hundred and sixty-three patients with head and neck squamous cell carcinoma who were scheduled for major surgery underwent screening for distant metastases. Chest, head and neck computed tomography, abdominal ultrasonography and bone scanning were performed in all patients.

Results: Distant metastases were detected in 5.52 per cent of the 163 patients. All of these patients had locoregional advanced (stage IV) tumours. Computed tomography scanning of the lungs revealed metastases in six patients. Bone metastases were found in three patients. Only one patient with primary liver metastases was detected by abdominal ultrasonography; this patient also had pulmonary metastases.

Conclusions: Computed tomography of the thorax is the most important technique for screening patients with head and neck squamous cell carcinoma.

Key words: Head And Neck Neoplasms; Squamous Carcinoma; Tumour Metastasis; Imaging

Introduction

The intensity of diagnostic procedures involved in primary cancer staging remains a controversial issue. The presence of distant metastases should alter the selection of the therapy, and also has an impact on quality of life when there is no prospect of cure. The prognosis of patients with distant metastases from primary head and neck squamous cell carcinoma (SCC) is generally poor, with less than two years survival after diagnosis.^{1,2}

Only a limited number of studies have evaluated the incidence of distant metastases at the time of initial presentation. Distant metastases are noted in 7–17 per cent of head and neck SCC patients at presentation.^{3–7} The overall incidence of clinically detected distant metastases from head and neck SCC ranges from 4 to 24 per cent. The lung is the most common site (52–91 per cent), followed by bone (19–36 per cent) and liver (6–20 per cent). Autopsy studies demonstrated the incidence of distant metastases to be as high as 57 per cent. The incidence of distant metastases is directly related to the tumour stage, particularly in patients with advanced node (N) negative stage disease.⁸

A variety of diagnostic techniques are established, routine practice for the initial staging of patients with head and neck SCC. These include: chest X-ray or computed tomography (CT) for evaluation of the lungs; bone scanning and plasma bone-specific alkaline phosphatase levels for bone investigation; and abdominal ultrasonography, CT or magnetic resonance imaging (MRI) plus serum liver function tests for liver evaluation. The role of whole body [F-18]-fluorodeoxyglucose positron emission tomography in combination with CT scanning is still under investigation. The choice of initial staging examinations is influenced by tumour stage, the patient's general condition, the probability of a change in treatment if distant metastases are detected, institutional guidelines and socioeconomic factors.

The purpose of this study was to evaluate the role of bone scanning, computed tomography of the thorax and abdominal ultrasonography in the initial staging of patients presenting with untreated, advanced head and neck SCC.

Materials and methods

One hundred and sixty-three patients (40 women and 123 men) with head and neck SCC were scheduled

for major surgery and underwent screening for distant metastases between January 2000 and December 2004. Patients' mean age was 57 years and ranged from 25 to 90 years. Twenty-nine patients had stage II head and neck SCC, 36 had stage III and 98 had stage IV. Primary tumour sites included the oral cavity ($n = 18$), oropharynx ($n = 62$), hypopharynx ($n = 25$), larynx ($n = 38$), paranasal sinuses ($n = 5$) and nasopharynx ($n = 15$).

All patients with histologically confirmed head and neck SCC underwent screening for distant metastases.

Computed tomography of the head and neck region and thorax was performed in all 163 patients, in order to evaluate primary locoregional tumour extension as well as lung and mediastinal status. Spiral CT scans were obtained with a fourth-generation Siemens Somatom Plus machine (Siemens AG, Erlangen, Germany) after intravenous administration of contrast medium (Ultravist 370; Schering AG, Berlin, Germany). Continuous axial scanning planes were used at 125-mm slice thickness without interslice gap. Radiological criteria were: for lung metastases, multiple, smooth and mostly peripherally located lesions; for bronchogenic carcinoma, solitary, speculated and mostly centrally located lesions; and for mediastinal lymph node metastases, a diameter of more than 10 mm.

In addition, all patients underwent bone scanning, according to the bone scanning procedure guidelines of the Austrian Society of Nuclear Medicine. Bone scans were acquired with a dedicated full-ring scanner, one hour after intravenous injection of 550 MBq Tc-99 m diphosphonate. When no explanation for a scintigraphic abnormality could be found (e.g. osteolysis, osteoarthritis or degenerative changes), plain film images were taken.

In order to evaluate the possibility of liver metastases, 159 patients received an abdominal ultrasound.

Statistical analyses were accomplished using SPSS[®] software. Correlation analyses were calculated using the chi-square test.

Results

Distant metastases were found in nine patients (5.52 per cent). All of these patients had advanced locoregional disease and stage IV tumour. The exact distribution is shown in Table I.

Computed tomography of the thorax revealed lung metastases in six patients (3.68 per cent). Mediastinal lymph node metastases were not detected in any patient.

Abdominal ultrasonography showed metastatic lesions in one patient without any sign of primary abdominal tumour. The other ultrasound examinations showed haemangioma, cysts and liver steatosis as additional diagnoses.

Bone scanning detected abnormalities in 80 patients. For further clarification, spot films and plain X-ray films of different anatomical regions (i.e. hip, shoulder, leg, rib and spine) were made. These additional examinations revealed two cases of metastases in the cervical spine, also detected by computed tomography. In one patient, multiple

TABLE I
RESULTS OF SCREENING FOR DISTANT METASTASES

Pt no	Sex	Primary SCC	TNM	Stage	Metastasis site
1	M	Nasopharynx	T ₄ N ₂ M ₁	IV	Bone
2	M	Hypopharynx	T ₄ N ₂ M ₁	IV	Bone
3	M	Hypopharynx	T ₄ N ₁ M ₁	IV	Lung
4	M	Larynx	T ₄ N ₂ M ₁	IV	Lung
5	M	Oropharynx	T ₁ N ₃ M ₁	IV	Lung
6	F	Larynx	T ₄ N ₂ M ₁	IV	Lung
7	M	Hypopharynx	T ₄ N ₂ M ₁	IV	Lung & liver
8	M	Hypopharynx	T ₃ N ₂ M ₁	IV	Bone
9	M	Oral cavity	T ₄ N ₀ M ₁	IV	Lung

Pt no = patient number; SCC = squamous cell carcinoma; TNM = tumour-node-metastasis; M = male; F = female

metastases in the lumbar spine were incidentally detected by the orthopaedic surgeons; this patient's bone scan had been falsely negative for this anatomical region. In total, bone metastases were found in 1.84 per cent of our patients.

Statistical analysis yielded no significant correlation between advanced locoregional disease and the occurrence of distant metastases. This fact may have been influenced by the high number of stage IV tumours in the cohort.

Discussion

The high prevalence of additional malignant tumours in patients with newly diagnosed head and neck SCC, and the relatively poor detection rate of such tumours by conventional chest radiography, support the routine inclusion of chest CT in primary staging. In one study, only 29 per cent of 66 malignant tumours detected upon chest CT scanning of 189 patients had been detected by chest radiography.⁹

Halpern *et al.* recommended an investigative chest CT prior to initiating any definitive therapy.¹⁰ In this study, nine of 24 patients (37.5 per cent) with advanced head and neck SCC and negative plain chest X-rays had positive findings on their chest CT scans. Chest CT scanning has been proposed to be the most important staging diagnostic technique in all patients presenting with head and neck SCC,^{11,12} and also in patients with three or more lymph node metastases, bilateral lymph node metastases, lymph nodes of 6 cm or larger, low jugular lymph node metastases, locoregional tumour recurrence, or second primary tumours.⁵ In a study of 25 patients, chest CT detected two further suspicious, false positive lesions missed on chest radiograph, whereas in 20 patients neither chest X-ray nor CT showed any evidence of pulmonary metastases.¹³ Nilssen *et al.* reported two patients (of 57) with synchronous tumours with SCC on chest CT.¹⁴ In both cases, the lesions were identified on chest X-ray prior to scanning. Another study reported that staging CT of the thorax had a very low yield in 44 nasopharyngeal carcinoma patients with neck metastases.¹⁵

In the current study, bone scan screening revealed hitherto undetected metastases in two patients. The two with bone metastases were also identified on neck and chest CT scans, and no one presented lung

TABLE II
INCIDENCE OF DISTANT METASTASES AT PRESENTATION: PUBLISHED STUDIES

Author	Year	Incidence (%)	Patients (n)	Tumour type
Dennington <i>et al.</i> ⁷	1980	7.8	64	SCC
Black <i>et al.</i> ⁴	1984	12.3	121	SCC
Bhatia & Bahadur ³	1987	1.1	1127	SCC, ACC, RMS, MM
Jäckel & Rausch ⁶	1999	1.6	1087	SCC
de Bree <i>et al.</i> ⁵	2000	16.8	101	SCC
Present study	2009	5.5	163	SCC

SCC = squamous cell carcinoma; ACC = adenoid cystic carcinoma; RMS = rhabdomyosarcoma; MM = malignant melanoma

or liver metastases. In contrast to our findings, de Bree *et al.* found lung metastases in all four of their patients with bone metastases detected by bone scanning.⁵ Because bone metastases are most likely to be found in the vertebrae and ribs, performing chest CT scanning as screening may detect distant metastases at these sites as well. Routine bone scanning for primary staging of head and neck SCC is not recommended,^{6,16-21} and should be reserved for patients with advanced primary tumours, with regional node metastases or with clinical or laboratory evidence of bone involvement.²² In the event of an elevated alkaline phosphatase level, which has a high specificity (98 per cent) but low sensitivity (20 per cent) for the detection of distant bone metastases, a bone scan is recommended.^{21,23} De Bree *et al.* did not find any significant differences in the biochemical test results of patients with and without bone metastases.⁵

- **At the first presentation of even advanced locoregional head and neck squamous carcinoma, distant metastases are rare**
- **Additional CT of thorax in addition to chest x-ray appears to be the only relevant investigation for the initial staging of patients with advanced head and neck squamous cell carcinoma**
- **Other diagnostic techniques such as abdominal ultrasonography and isotope bone scanning do not provide any further useful information**

The liver is the third most common site of distant metastases in patients with head and neck SCC; however, liver metastases occur rarely in the absence of other distant metastases, particularly lung metastases. Routine use of ultrasonography or CT and MRI in the absence of other distant metastases is generally not recommended;^{5,6,14,19,22,24} however, some findings support examination of the liver in cases with elevated liver function test results.^{21,23} De Bree *et al.* found no significant difference between the liver function test results of patients with and without liver metastases.⁵ In our study, only one patient had liver metastases; this patient's liver function test results were normal at initial staging, and the lung was affected as well.

The incidence of distant metastases in patients presenting with advanced head and neck SCC has been reported as 1–17 per cent (Table II). An advanced tumour (T) stage and/or N stage and a high histological grade are associated with the occurrence of distant metastases.^{1,25} The incidence of distant metastases is also influenced by the location of the primary tumour. Primary tumours of advanced T stage in the hypopharynx, oropharynx and oral cavity are associated with the highest incidence of distant metastases.⁸ Roland found different types of gradings in his selected patients. Less differentiated tumours seem to metastasize more than well differentiated tumours.⁶ In a 1992 series of 2007 patients with histologically proven, graded head and neck SCC, distant metastases were found initially in 3.4 per cent of patients with poor differentiated tumours, compared with 1.8 per cent with well differentiated tumours.²⁶ Patients with four or more clinical neck lymph node metastases or low jugular lymph node metastases had the highest incidence of distant metastases.⁵

Conclusion

At the first presentation of even advanced locoregional head and neck SCC, distant metastases were rare. An additional CT of thorax in addition to chest x-ray seems to be the only relevant investigation for the initial staging procedure in patients with advanced head and neck SCC. Other diagnostic techniques, such as abdominal ultrasonography and bone scanning, do not provide any further relevant information.

References

- 1 Calhoun KH, Fulmer P, Weiss R, Hokanson JA. Distant metastases from head and neck squamous cell carcinomas. *Laryngoscope* 1994;**104**:1199–205
- 2 Merino OR, Lindberg RD, Fletcher GH. An analysis of distant metastases from squamous cell carcinoma of the upper respiratory and digestive tracts. *Cancer* 1977;**40**:145–51
- 3 Bhatia R, Bahadur S. Distant metastasis in malignancies of the head and neck. *J Laryngol Otol* 1987;**101**:925–8
- 4 Black RJ, Gluckman JL, Shumrick DA. Screening for distant metastases in head and neck cancer patients. *Aust N Z J Surg* 1984;**54**:527–30
- 5 de Bree R, Deurloo EE, Snow GB, Leemans CR. Screening for distant metastases in patients with head and neck cancer. *Laryngoscope* 2000;**110**:397–401
- 6 Jäckel MC, Rausch H. Distant metastasis of squamous epithelial carcinomas of the upper aerodigestive tract. The effect of clinical tumor parameters and course of illness [in German]. *HNO* 1999;**47**:38–44
- 7 Dennington ML, Carter DR, Meyers AD. Distant metastases in head and neck epidermoid carcinoma. *Laryngoscope* 1980;**90**:196–201

- 8 Ferlito A, Shaha AR, Silver CE, Rinaldo A, Mondin V. Incidence and sites of distant metastases from head and neck cancer. *ORL J Otorhinolaryngol Relat Spec* 2001;**63**:202–7
- 9 Reiner B, Siegel E, Sawyer R, Brocato RM, Maroney M, Hooper F. The impact of routine CT of the chest on the diagnosis and management of newly diagnosed squamous cell carcinoma of the head and neck. *AJR Am J Roentgenol* 1997;**169**:667–71
- 10 Halpern J. The value of chest CT scan in the work-up of head and neck cancers. *J Med* 1997;**28**:191–8
- 11 Warner GC, Cox GJ. Evaluation of chest radiography versus chest computed tomography in screening for pulmonary malignancy in advanced head and neck cancer. *J Otolaryngol* 2003;**32**:107–9
- 12 Ong TK, Kerawala CJ, Martin IC, Stafford FW. The role of thorax imaging in staging head and neck squamous cell carcinoma. *J Craniomaxillofac Surg* 1999;**27**:339–44
- 13 Tan L, Greener CC, Seikaly H, Rassekh CH, Calhoun KH. Role of screening chest computed tomography in patients with advanced head and neck cancer. *Otolaryngol Head Neck Surg* 1999;**120**:689–92
- 14 Nilssen EL, Murthy P, McClymont L, Denholm S. Radiological staging of the chest and abdomen in head and neck squamous cell carcinoma – are computed tomography and ultrasound necessary? *J Laryngol Otol* 1999;**113**:152–4
- 15 Leung S, Cheung H, Teo P, Lam WW. Staging computed tomography of the thorax for nasopharyngeal carcinoma. *Head Neck* 2000;**22**:369–72
- 16 Ampil FL, Wood MJ, Chin HW, Hoasjoe DK, Aarstad RF, Hilton DL. Screening bone scintigraphy in the staging of locally advanced head and neck cancer. *J Craniomaxillofac Surg* 1995;**23**:115–18
- 17 Piepenburg R, Bockisch A, Hach A, Steinert H, Welkowsky HJ, Kreuz S *et al.* Importance of whole body skeletal scintigraphy within the scope of staging of neoplasms in the ENT area [in German]. *Laryngorhinootologie* 1992;**71**:605–10
- 18 Martin GF, Gullane PJ, Heeneman H. Radionuclide scans in the assessment of distant metastases from squamous cell carcinoma of the head and neck. *J Otolaryngol* 1981;**10**:383–6
- 19 Dost P, Schrader M, Talanow D. Value of abdominal ultrasound and skeletal scintigraphy in TNM classification of tumors in the head and neck area [in German]. *HNO* 1994;**42**:418–21
- 20 Brown DH, Lealos M. The value of a routine bone scan in a metastatic survey. *J Otolaryngol* 1998;**27**:187–9
- 21 Wolfe JA, Rowe LD, Lowry LD. Value of radionuclide scanning in the staging of head and neck carcinoma. *Ann Otol Rhinol Laryngol* 1979;**88**:832–6
- 22 Belson TP, Lehman RH, Chobanian SL, Malin TC. Bone and liver scans in patients with head and neck carcinoma. *Laryngoscope* 1980;**90**:1291–6
- 23 Troell RJ, Terris DJ. Detection of metastases from head and neck cancers. *Laryngoscope* 1995;**105**:247–50
- 24 Wernecke K, Rummeny E, Bongartz G, Vassallo P, Kivelitz D, Wiesmann W *et al.* Detection of hepatic masses in patients with carcinoma: comparative sensitivities of sonography, CT, and MR imaging. *AJR Am J Roentgenol* 1991;**157**:731–9
- 25 Garavello W, Ciardo A, Spreafico R, Gaini RM. Risk factors for distant metastases in head and neck squamous cell carcinoma. *Arch Otolaryngol Head Neck Surg* 2006;**132**:762–6
- 26 Roland NJ, Caslin AW, Nash J, Stell PM. Value of grading squamous cell carcinoma of the head and neck. *Head Neck* 1992;**14**:224–9

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