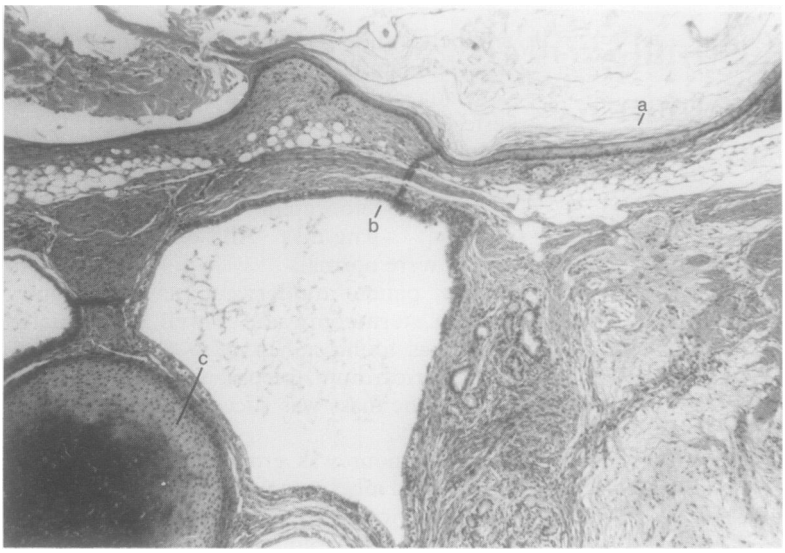

Figure 2 Photomicrograph of the tumour showing the three basic tissue elements: a, ectoderm (epidermis); b, endoderm (respiratory epithelium); and c, mesoderm (cartilage). Original magnification ×80, reduced to 63% during origination.

removal of residual tumour. Sometimes even benign tumours may need to be removed to avoid erosion into vital structures (pericardium, aorta, and oesophagus) and life threatening complications.

Including this patient, only 23 cases have reported a mediastinal germ cell tumour occurring in association with Klinefelter's syndrome.[2,3] Of these, 10 were classified as teratocarcinomas, three choriocarcinomas, three embryonal cell carcinomas, three teratomas, two mixed cell tumours, one seminoma, and one remained unclassified. The association between Klinefelter's syndrome and mediastinal germ cell tumours appears to be more than coincidental, with 21 (7·7%) of 272 men with mediastinal germ cell tumours reviewed retrospectively having underlying Klinefelter's syndrome.[2] Considering that the incidence of Klinefelter's syndrome overall appears to be 0·2%,[2] the chance of a man with an anterior mediastinal mass having Klinefelter's syndrome is approximately 40 times greater than in the general population.

While reasons for the association between Klinefelter's syndrome and mediastinal germ cell tumours remain speculative, some have proposed an aberration occurring during embryogenesis as the potential mechanism.[4] During embryogenesis cells of the germinal epithelium, which arise from the embryonic disc apart from the urogenital ridge, migrate through the mediastinum towards the developing gonads. If this migratory process is disrupted, a group of these cells may be abnormally found in the mediastinum. However, other factors such as an abnormal hormonal milieu may also contribute to the failed embryonic cell migration.[4]

In summary, as this case illustrates, patients with Klinefelter's syndrome appear to be at an increased risk for the development of a mediastinal mass of germ cell origin. Chest physicians in particular should be aware of this association.

The authors express appreciation to Dr Si-Chun Ming for performing the histological examination of this case.

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Thorax 1994;**49**:284–286

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Received 7 December 1992
Returned to authors 2 February 1993
Revised version received 7 June 1993
Accepted for publication 9 June 1993

Imaging of bronchial carcinoid tumours with indium-111 pentetreotide

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Abstract

Neuroendocrine tumours are characterised by the expression of high affinity binding sites for somatostatin. The detection of bronchial carcinoid tumours through scintigraphic imaging is described in two patients using the novel radiolabelled somatostatin analogue indium-111 pentetreotide.

(*Thorax* 1994;**49**:284–286)

Large numbers of high affinity somatostatin binding sites have been found on most tumours characterised by the expression of neuroendocrine markers.[1] The development of radiolabelled somatostatin analogues for radiodiagnostic purposes has led to the detection of such tumours in vivo through scintigraphic imaging.[2–6] In a recent study Lamberts *et al* detected the primary tumours or metastases in 12 of 13 patients with gastrointestinal carcinoid tumours.[2] Bronchial carcinoid tumours are well differentiated neuroendocrine malignancies which account for approximately 5% of all lung tumours. We have investigated the efficacy of the radiolabelled somatostatin analogue indium-111 pentetreotide[6] in detecting disease in two patients with biopsy proven bronchial carcinoid tumours before surgery.

Methods

Indium-111 diethylenetriaminopentaacetic acid linked SMS 201 995 (octreotide), indium-111 pentetreotide, was supplied by Mallinck-

rodt Medical, Holland. The agent was administered to the fasting patient in the nuclear medicine department as an intravenous bolus injection. Case 1 (see below) received a dose equivalent to 118 MBq radioactivity and case 2 received 88 MBq. Imaging was performed four and 24 hours after administration using an IGE 400 ACT gamma camera with medium energy, parallel hold collimator. Two energy peaks were used, 171 and 245 keV, each with a 20% window. Anterior and posterior planar images of the thorax and abdomen were obtained at four hours. These were repeated at 24 hours, together with an anterior view of the skull and anterior and posterior views of the pelvis. The 24 hour planar images were followed by single photon emission computed tomographic (SPECT) imaging of the thorax and upper abdomen using an elliptical 360° orbit with 64 projections at 20 seconds per projection.

Case reports

CASE 1

A 64 year old woman presented to her general practitioner complaining of shoulder pains. As part of her investigations a chest radiograph was taken which revealed a round lesion in the lingula. She was referred to St James's Hospital for further investigation. Tissue obtained at bronchoscopy revealed a stromal infiltrate of the bronchial mucosa with "packaged" cells strongly suggestive of carcinoid tumour. Planar imaging with indium-111 pentetreotide showed the tumour, and SPECT images improved anatomical localisation of the disease (fig 1). The tumour was successfully resected. Histological examination revealed a well circumscribed, encapsulated, bronchial carcinoid tumour with a maximum diameter of 2·5 cm. Seven mediastinal lymph nodes were free of disease.

CASE 2

A 61 year old man presented with a history of intermittent haemoptysis over several months. Physical examination revealed a harsh inspiratory sound in the right axilla. Bronchoscopy showed a cherry red lesion on the right side in the bronchus intermedius. Histological appearances were consistent with a bronchial carcinoid tumour. Chest radiography failed to demonstrate the lesion; a computed tomographic scan of the thorax and upper abdomen revealed a small opacity in the right main bronchus but no other abnormality was seen.

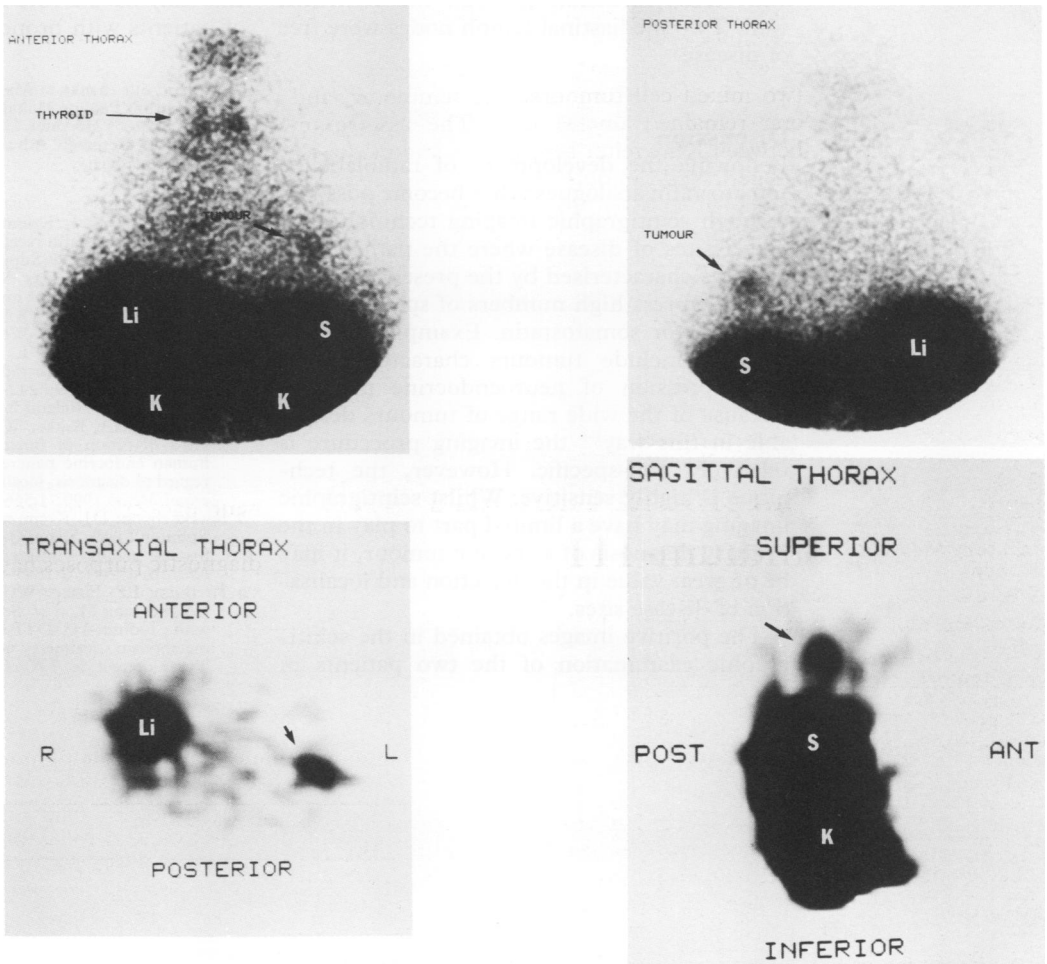

Figure 1 The images in A and B represent anterior and posterior planar acquisitions of the thorax in case 1. Pathological accumulation of the radiolabel is seen at the base of the left lung. The images in C and D represent SPECT acquisitions of case 1. The transaxial (equivalent to a computed tomographic image) and sagittal (a lateral view through the tumour) images shown here demonstrate uptake of the radiolabel (arrows) in keeping with the known site of the carcinoid tumour in the lingula, thereby improving anatomical localisation of the disease. Physiological uptake is noted in the liver (Li), spleen (S), and kidneys (K).

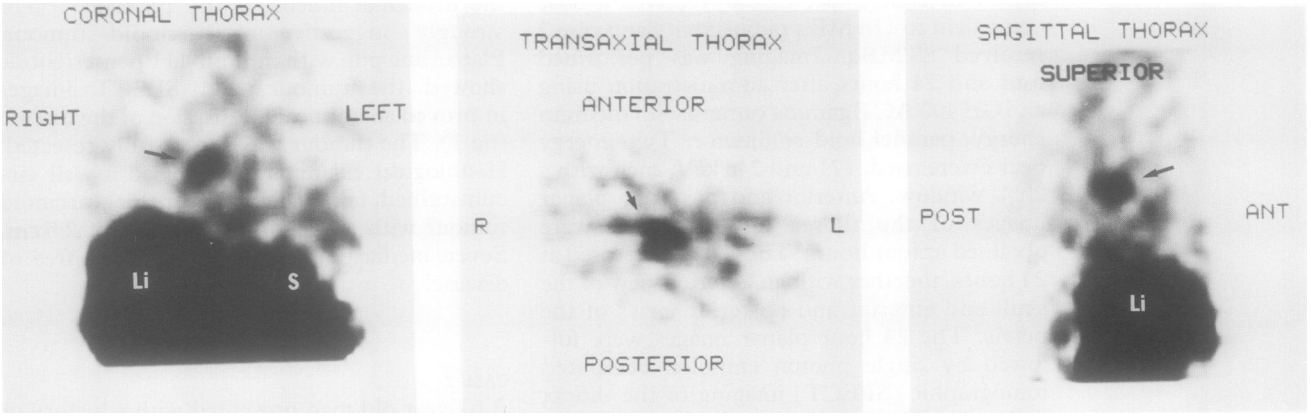

Figure 2 SPECT acquisitions of case 2 including a coronal image (anterior view through the tumour). The tumour is seen in the right lung, its position in keeping with the known site of disease in the bronchus intermedius. Non-specific uptake is seen in the liver (Li) and spleen (S).

Planar images with indium-111 pentetreotide gave equivocal results. The disease was detected and localised with SPECT imaging (fig 2). A 1 cm diameter tumour measuring 1·5 cm in length was successfully resected. Histological examination confirmed a well circumscribed endobronchial carcinoid tumour with focal extension through the bronchial wall. Two mediastinal lymph nodes were free of disease.

Discussion

Following the development of radiolabelled somatostatin analogues it has become possible, through scintigraphic imaging techniques, to detect sites of disease where the pathological lesion is characterised by the presence of cells which express high numbers of specific binding sites for somatostatin. Examples of such diseases include tumours characterised by the expression of neuroendocrine markers. Because of the wide range of tumours detectable in this way[1-6] the imaging procedure is relatively non-specific. However, the technique is highly sensitive. Whilst scintigraphic imaging may have a limited part to play in the primary diagnosis of a specific tumour, it may be of great value in the detection and localisation of disease sites.

The positive images obtained in the scintigraphic examination of the two patients in this report suggest that bronchial carcinoid tumours, like their gastrointestinal counterparts, express specific binding sites for somatostatin. The detection of the 1 × 1·5 cm lesion on SPECT imaging underlines the sensitivity of this technique. We conclude that scintigraphic imaging with indium-111 pentetreotide may have a role in the clinical evaluation of patients with bronchial carcinoid tumours.

We extend our thanks to Ms Angela Montgomery, Ms Helen Ryder, and Ms Pauline Malone of the Nuclear Medical Department, St James's Hospital, Dublin. This study was supported by a Cancer Research Advancement Board Grant from the Irish Cancer Society.

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