



THE ROLE OF COMPUTED TOMOGRAPHY (CT) IN INVESTIGATING INEXPLICABLE HEMOPTYSIS

Radio-Diagnosis

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ABSTRACT

Computed tomography was used to examine 40 patients with a history of hemoptysis, normal chest radiographs other than those showing signs of chronic airflow restriction and normal fiberoptic bronchoscopy (or just blood in the bronchial tree). Of the 40 CT scans, 20 (50%) revealed abnormalities. Seven of the patients (18%) showed bronchiectasis symptoms, and one of them also had a mass. Four cases (10%) saw the presence of a mass alone (two tuberculous, two malignant). Alveolar consolidation was evident in four further scans (10%), and aberrant arteries were found in three cases (7%). Cystic alterations were visible in the scan of one patient, while the final patient's scan revealed numerous nodules. We come to the conclusion that computed tomography is useful in examining patients who have unexplained hemoptysis.

KEYWORDS

INTRODUCTION

Patients with complaints of hemoptysis are commonly referred to chest physician. However, despite clinical history and examination, conventional chest radiographs and fiberoptic bronchoscopy, up to 50% of such patients may remain without a diagnosis.^[1-3] Compared to conventional chest radiographs, computed tomography characteristics enable more precise mapping of the position and physical density of structures within the thorax.^[6] Patients with hemoptysis have suggested this procedure as a new line of inquiry in specific instances^[7,8]. We wished to ascertain whether CT has a role in the investigation of patients with unexplained hemoptysis (normal chest X-ray or evidence of chronic airflow limitation alone, fiberoptic bronchoscopy normal or only showing blood in the bronchial tree) both as a diagnostic aid and to establish which patients require long-term medical supervision.

METHODS

Patients were recruited who presented with the symptom of hemoptysis occurring on at least two occasions and the hemoptysis being described as at least a teaspoonful of blood in volume (not streaking in sputum). All such patients were studied in whom postero-anterior and lateral chest X-ray, cytological and microbiological examination and other appropriate investigations provided no diagnosis to explain hemoptysis. Chest X-rays suggestive of chronic airflow limitation were not regarded as sufficient explanation for hemoptysis. Any additional abnormality would result in exclusion from the study. Forty patients fulfilled these criteria. CT examination was offered to these patients and all 40 underwent this investigation. CT scans were performed with and without contrast, using Siemens somatoscope scanner with a scan time of 5s. The patients were recruited from Sree Mookambika Institute of Medical Sciences. All patients studied were followed as outpatients.

RESULTS

The age, smoking habits and CT diagnosis of the 40 patients with hemoptysis are shown in Tables 1 and 2. They were 65% smokers and had a mean age of abnormalities were detected in 20 of the scans (Table 1). Bronchial wall thickening and dilatation, which are signs of bronchiectasis, were seen in seven scans (Nos. 2-8)^[9,10]. It was also discovered that patient No. 8 had an unusual tumour that was possibly cancerous. There were abnormal masses in four patients; The masses in two cases (Nos. 9 and 10) were calcified and resembled ancient tuberculous lesions^[11], the masses in the two additional atypical instances (Nos. 11 and 12) were highly suggestive of malignant illness^[12]. Areas of alveolar consolidation in four patients (Nos. 13-16) were consistent with intrapulmonary blood. One patient (patient number 13) later experienced increased shadowing that was visible on a conventional chest radiograph, and a subsequent bronchoalveolar lavage revealed M. tuberculosis by culture. When contrast was

administered, aberrant arteries were seen in three cases (Nos. 17-19), and two of these patients showed CT appearances of arterio-venous malformations (Nos. 15,16). On CT scan, one patient (No. 20) had several nodules, she had a history of chondrosarcoma. A normal scan was one in which no evidence of a recognized cause for hemoptysis was detected, e.g. a retrosternal goitre was detected in one of the 'normal scans'. There were no significant differences between the mean ages, smoking patterns, whether or not there are abnormalities (unpaired t-test).

Table 1 Details Of Patients With Haemoptysis And Abnormality Detected By Ct Scanning

Patient No. (sex)	Age (years)	Smoker	Blood at FOB	Additional Investigation/ pathology	CT diagnosis
1 (F)	22	Y	Y	-	Cystic disease
2 (F)	25	Y	N	-	Bronchiectasis
3 (F)	43	Y	N	ENT	Bronchiectasis
4 (F)	46	Y	N	-	Bronchiectasis
5 (M)	78	N	N	-	Bronchiectasis
6 (F)	43	N	N	-	Bronchiectasis
7 (M)	75	Y	N	-	Bronchiectasis
8 (F)	72	Y	N	-	Bronchiectasis + NG
9 (M)	64	Y	N	-	Tuberculoma?
10 (F)	53	N	Y	-	Calcified mass with bronchial dilation
11 (F)	57	Y	Y	-	Mass prob NG
12 (M)	42	N	N	-	Mass
13 (F)	26	N	Y	VQ	Alveolar consolidation
14 (M)	46	Y	N	-	Blood + alveolar consolidation
15 (M)	78	Y	N	-	Alveolar consolidation
16 (M)	45	Y	N	-	Alveolar blood
17 (F)	26	N	N	VQ	A V malformation
18 (M)	23	Y	Y	ENT	Large abnormal vessel
19 (M)	43	Y	N	-	Abnormal blood vessel
20 (F)	46	N	N	Chondro-sarcoma	Nodules

Abbreviations: NG, neoplasm; VQ, ventilation/perfusion scan

performed; ENT, ear, nose and throat examination; Y, yes; N, no.

DISCUSSION

Investigation of hemoptysis is crucial since this symptom, especially in patients who smoke and are older than 40 years old, may be caused by a malignant disease^[13]. Many studies have considered the value of bronchoscopy in patients with hemoptysis and normal or minimally abnormal chest radiographs^[14], and most conclude that in patients aged 40 and over this investigation is worthwhile as 3-6% of such cases will have neoplastic disease. Since significant pulmonary pathology is uncommon, outpatient follow-up is indicated for individuals aged 40 or younger. However, up to 50% of patients presenting with hemoptysis remain without a diagnosis despite the advent of fiberoptic bronchoscopy.

The previously published particular investigations of conventionally undetected hemoptysis did not make use of CT, a non-invasive investigation that has advantages. The fine collimation of radiation ensures a lower radiation dose than with conventional tomography, and comparable with that of a lumbosacral spine X-ray or a barium enema. One study has compared conventional chest X-ray data with CT in non-selected patients with hemoptysis and found the latter gave increased information as might be anticipated^[15]. Simply ten patients, in contrast to the current study, had chest X-rays that were normal or only exhibited evidence of chronic airflow limitation, and only one of these patients' bronchoscopies was regarded as normal.

Table 2 Details Of Patients With Haemoptysis When No Abnormalities Were Detected In Ct Scans

Patient No. (sex)	Age (years)	Smoker	Blood at FOB	Investigation pathology	CT diagnosis
21 (M)	64	N	N		Retrosternal goitre
22 (M)	38		N		Normal
23 (F)	59	N	Y		Normal
24 (F)	65	N	Y		Normal
25 (M)	38	N	N		Normal
26 (M)	64	Y	N		Normal
27 (F)	58	Y	N	VQ	Normal
28 (M)	48	Y	Y		Normal
29 (F)	56	N	N		Normal
30 (M)	22	N	N		Normal
31 (M)	33	N	N		Normal
32 (M)	34	N	N		Normal
33 (M)	33	Y	N		Normal
34 (M)	35	N	N		Normal
35 (F)	56	N	Y		Normal
36 (F)	37	Y	N		Normal
37 (M)	30	Y	N		Normal
38 (M)	30	Y	N		Normal
39 (M)	43	Y	N		Normal
40 (M)	79	Y	N		Normal

Abbreviations: VQ, ventilation/perfusion scan performed; Y, yes; N, no.

Poe et al studied 136 patients with unexplained hemoptysis and normal chest X-rays, by fiberoptic bronchoscopy. Twelve neoplasms were found, and in a further 33 patients another specific diagnosis was made. All these patients were followed up for a minimum of 1 year and in 59% for 2 yr; two were subsequently found to have carcinoma of the lung. The ratio of neoplastic to non-neoplastic disease found at the initial bronchoscopy in this study was 12 to 33 which implies that if two neoplasms were diagnosed at follow-up, a further six cases of non-neoplastic disease remained occult. Furthermore, lung neoplasms not visible at bronchoscopy are likely to be peripheral and as such are those most amenable to curative surgery^[16].

Bronchography has been used to investigate patients with hemoptysis and normal chest X-rays and in one study detected abnormalities in 11 of 74 patients; however, two patients in whom no abnormalities were detected were found to have bronchogenic carcinoma subsequently. There is considerable evidence that CT can detect most bronchiectasis demonstrable by bronchography and the former technique is less invasive.^[17,18]

According to the findings, chest X-rays that are normal or only

demonstrate chronic airflow restriction alone, as well as normal fiberoptic bronchoscopy, can discover abnormalities in 50% of patients with unexplained hemoptysis.

A specific diagnosis was made in 25% of the study group and confirmation of hemoptysis in a further 25% of the study group. Although many of these abnormalities would have caused recurrent hemoptysis and necessitated additional testing, quick detection may have saved some of these patients' lives and ensured that any further tests were necessary. A negative CT scan gives patients more comfort, but longer-term research is required to confirm that such a finding may be utilized to safely stop monitoring such individuals. In patients with hemoptysis and chest X-rays that are normal or show evidence of chronic airflow limitation alone, we recommend CT scans be performed before bronchoscopy so that the cytological and microbiological sampling can be directed to areas of abnormality and, in addition, can detect peripheral neoplasms that are not visible at fiberoptic bronchoscopy.

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