Bronchoscopy in patients with haemoptysis and normal computed tomography of the chest is unlikely to result in significant findings

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ABSTRACT

INTRODUCTION: The standard evaluation of haemoptysis in a department of respiratory medicine would currently consist of chest radiography, contrast-enhanced computed tomography (CT) and fibre-optic bronchoscopy (FOB), regardless of the result of the CT. Our aim was to evaluate whether patients presenting with haemoptysis but no positive finding on a contrast-enhanced CT of the chest are at risk for having serious disease, first of all lung cancer, and thus whether FOB is mandatory for such patients.

METHODS: We searched the literature and retrospectively reviewed all records of patients referred with haemoptysis between 2000 and 2010 at the Department of Respiratory Diseases and Allergy, Aarhus University Hospital, Denmark.

RESULTS: A total of 379 patient records were reviewed for inclusion in the clinical part of the study. Of these, 269 had the information required for the study and had been examined with CT. In all, 16 of the 269 patients were diagnosed with lung cancer. In all of these, a tumour or other findings indicating a possible tumour were seen on the chest CT. No additional cases of lung cancer were discovered during FOB, and no cases had been missed by the CT.

CONCLUSIONS: CT should be used as first-line examination in patients with a history of haemoptysis. Furthermore, in patients above 40 years of age with positive findings of any kind on the CT, further examination with FOB is indicated. However, if the chest CT is without pathological findings, it is most unlikely that FOB will reveal anything of significance.

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Haemoptysis is an unsettling symptom for many patients, and it is an alarm symptom for lung cancer. Hence, people presenting with haemoptysis in primary care are normally referred to fast-track cancer evaluation at a department of respiratory medicine. In 13-30% of referred cases, the cause of haemoptysis is found to be malignancy [1-6]. However, several other conditions can also cause haemoptysis, including tuberculosis and bronchiectasis.

The standard evaluation of haemoptysis in a department of respiratory medicine would currently consist of chest radiography (CXR), contrast-enhanced computed tomography (CT) and fibre-optic bronchoscopy (FOB).

But is FOB really necessary in the routine evaluation of all patients? If the general practitioners are given the opportunity to refer the patients directly for CT [7], it becomes increasingly important to know whether all patients need to be referred to a hospital for further examination, such as FOB, regardless of the result of the CT.

Several studies have shown that CT has a superior diagnostic yield for lung cancer compared with both CXR and FOB. McGuinness et al [3] found the diagnostic yield of CT and FOB to be 61% and 43%, respectively, and that CT was diagnostic in 50% of cases with a negative FOB. Furthermore, Millar et al [8] showed that 50% of patients with negative CXR and FOB findings have positive findings on CT – including two missed cancers and two missed cases of active tuberculosis.

Our hypothesis is that CT will identify all serious causes of haemoptysis and thus obviate the need for bronchoscopy in patients presenting with haemoptysis whose CT is without pathological findings. Such patients would therefore not need to be referred to a hospital for further examination.

Scope of study: The primary purpose of the study was to contribute to assessing the risk of significant underlying disease, i.e. lung cancer, when a chest CT is without any abnormalities. A secondary aim was to evaluate if the clinical circumstances or the amount of haemoptysis may be used to identify patients with a higher risk of cancer as such knowledge may ensure that the right patients are referred for further evaluation without delay.

METHODS

Clinical data

We retrospectively reviewed the patient records of all of the 379 patients who had been evaluated at the Department of Respiratory Diseases at Aarhus University Hospital, Denmark, with a referral for haemoptysis in the period from 2000 to 2010. We obtained data on the following clinical variables: age, gender, pack-years, clinical circumstances of the episodes of haemoptysis (unprovoked, in connection with lower respiratory tract infec-

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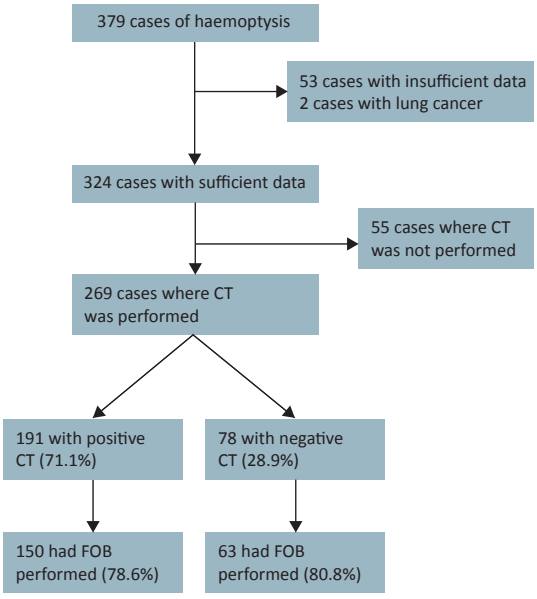
FIGURE 1

The distribution of the 379 cases referred for haemoptysis between 2000 and 2010.



CT = computed tomography; FOB = fibre-optic bronchoscopy.

tion, chronic cough or other), the amount of haemoptysis (streaks in the sputum, a few ml or a cup of blood), final diagnosis, and the results of diagnostic tests like CXR, chest CT, biopsy and bronchoscopy. A chest CT with any kind of pathology noted was considered a positive chest CT.

We excluded patients with a known diagnosis of lung cancer before the haemoptysis referral (two cases (0.5%)), those with incomplete information in the patient record for the purpose of the study (53 cases (14%)), and those who had not been examined with CT (55 cases (14.5%)) (**Figure 1**). Those categorised as having insufficient information also included 11 cases (20.8% of the 53 cases) in which it was stated in the patient record that they actually had not had haemoptysis but haematemesis or epistaxis. Otherwise, the missing information was very diverse.

If a patient developed lung cancer within two years of having an episode of haemoptysis, cancer was considered the cause even though no cancer was found at the time.

Statistics

We compared the clinical variables between the patients using the Wilcoxon-Mann-Whitney test and Fisher's exact test. A p-value < 0.05 was considered significant. The Stata 13.1 statistical package (StataCorp LP, College Station, Tex, USA) was used.

Trial registration: not relevant.

RESULTS

The distribution of the 379 cases referred to the department for haemoptysis between 2000 and 2010 are shown in Figure 1. Clinical variable and circumstances of the included cases are summarised in **Table 1**.

Only 326 of the 379 patient records had the information required for the study, and of these two already had a diagnosis of lung cancer. Of the remaining 324 cases, 55 had not been examined with CT. Among the

TABLE 1

Demographics and clinical characteristics.

	All	Bronchiectasis	Cancer	p-value[a]
Patients				
Total, n (%)	269	63 (23.4)	16 (6.0)	
Age, yrs, mean ± SD	55.4 ± 15.3	51.9 ± 16.4	66.9 ± 11.9	0.001[b]
Pack-yrs, median	20	15	50	< 0.001[b]
Male, n (%)	159 (59.0)	30 (47.6)	8 (50.0)	1.000[c]
Circumstances, n (%)				0.367[c]
Unprovoked	70 (26.0)	12 (19.1)	5 (31.3)	
During infection	78 (29.0)	24 (38.1)	4 (25.0)	
Chronic cough	116 (43.1)	26 (41.3)	6 (37.5)	
Others	5 (1.9)	1 (1.6)	1 (6.3)	
Volume of haemoptysis, n (%)				0.552[c]
Blood-tinged sputum	149 (55.4)	36 (57.1)	8 (50.0)	
1-2 tablespoons	84 (31.2)	15 (23.8)	6 (37.5)	
A cup of blood	36 (13.4)	12 (19.1)	2 (12.5)	

SD = standard deviation.
a) Comparison of patients with bronchiectasis vs patients with cancer.
b) Wilcoxon-Mann-Whitney rank-sum test.
c) Fisher's exact test.

269 cases examined with CT, 191 (71.1%) had a pathological finding on the CT, while 78 (28.9%) had none.

Of the 78 cases with no pathological findings on the chest CT, 63 (80.8%) had FOB performed. In 36 (57.1%) of these cases, FOB detected no pathology, in 15 cases signs of bronchitis were detected, and in 12 cases only a vulnerable mucosa. None of the 15 cases that had no FOB performed developed lung cancer within two years of the episode.

Of the 191 cases with a positive chest CT, 150 (78.6%) were examined with FOB and 16 (10.7%) were found to have lung cancer. None of the 41 cases that had no FOB performed developed lung cancer within the two-year follow-up after the episode.

In all of the 16 cases in which the cause of haemoptysis was found to be cancer, the CT had shown any kind of pathology. Patients diagnosed with cancer were significantly older and had smoked more than patients without cancer (Table 1). However, analysis of the clinical circumstances and the amount of haemoptysis showed no difference between the group diagnosed with cancer and the rest of the population; nor was any difference found relative to the group of patients with a diagnosis of bronchiectasis.

A diagnosis of bronchiectasis was significantly more frequent in the younger population (age ≤ 40 years) referred with haemoptysis as it was diagnosed in 16 of 43 younger patients (37.2%) compared with 47 in 226 patients older than 40 years (20.8%) (p = 0.029, Fisher's exact test).

DISCUSSION

Comparison with other studies

The rate of cancer in our population is significantly lower (5.5%) than the rates in comparable studies which range between 13 and 30% [1-6]. We do not known whether this is the result of a higher prevalence of benign causes of haemoptysis in Denmark or if patients in Denmark are more frequently referred for examination when they report to have experienced a minor haemoptysis.

We found no cases of lung cancer by bronchoscopy or during the two-year follow-up period among the 78 patients with a normal CT, which means that CT had been 100% sensitive for detection of lung cancer among the 269 patients who had been examined with CT.

In four other studies [3, 5, 6, 9], CT was also found to identify all lung cancers. These studies included a total of 499 patients of whom 99 (19.8%) had cancer. However, in two other studies [1, 4] including a total of 445 patients, 72 (16.2%) of whom had cancer, CT missed four cases of lung cancer. Lee et al [10] reviewed 228 patients with haemoptysis who had no lesions on CT explaining the haemoptysis (although only 36% of scans were considered normal, which reduced the population with a normal CT to 82 patients), and found that CT missed one case of cancer. Combined with our study that amounts to a total of 1,498 cases of haemoptysis with 190 cases of cancer (12.7%) where CT apparently missed five cases. But in four out of these five cases, CT had, in fact, shown abnormalities. However, these abnormalities were not considered to be indicative of malignancy. If these cases were considered to have had a positive chest CT (as they would have been in the current study), the resulting sensitivity of the chest CT would be 189/190 = 99.5%.

We found no significant difference in clinical circumstances or amount of haemoptysis between patients with cancer and those without. This shows that even slightly blood-tinged sputum during an airway infection can be a sign of underlying malignancy and has to be taken seriously.

Like other studies [1, 3, 11, 12], we found that patients diagnosed with cancer were significantly older and had smoked more than patients without cancer.

Based on our own findings combined with the findings of others, we conclude that CT is superior to both conventional CXR and bronchoscopy in the evaluation of patients presenting with haemoptysis, both in finding the cause and in identifying underlying malignancies.

CONCLUSIONS

Based on our own results and those of others, we recommend that patients with haemoptysis be examined with CT regardless of the clinical circumstances and the amount of haemoptysis. If the CT is normal, it is not necessary to perform a FOB. For patients older than 40 years, we recommend further examination with FOB if the CT reveals any abnormality. In the younger population (age ≤ 40 years), the incidence of lung cancer is so low that a routine FOB seems unnecessary unless the CT reveals clear indications of a tumour. However, for this age-group, bronchiectasis accounts for 37% of haemoptysis cases, and recognition of this condition may be employed to improve their quality of life [13].

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