RADIOLOGICAL CASE

CLINICS IN DIAGNOSTIC IMAGING (10)

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CASE REPORT

A 21-year-old Chinese man presented with haemoptysis for two days. He coughed out a total of 20ml of fresh blood. The patient was a smoker and had a chronic cough for the past 10 years. He had one previous episode of haemoptysis five years ago. On examination, the patient was found to have right tonsillar enlargement and a low grade fever. There was otherwise no other positive physical finding. In particular, chest auscultation was normal. Except for mild leucocytosis, blood biochemistry and sputum microscopy were normal. Gastroscopy was negative. The nasopharynx was found to be normal during ENT evaluation but bronchoscopy demonstrated bleeding from the distal branches of the left lower lobe bronchus. No endobronchial lesion was detected.

Plain chest radiograph (Fig 1) and high resolution computed tomography (HRCT) of the thorax (Fig 2) were performed. What do these show and what is the diagnosis?

Fig 1 - Frontal chest radiography.

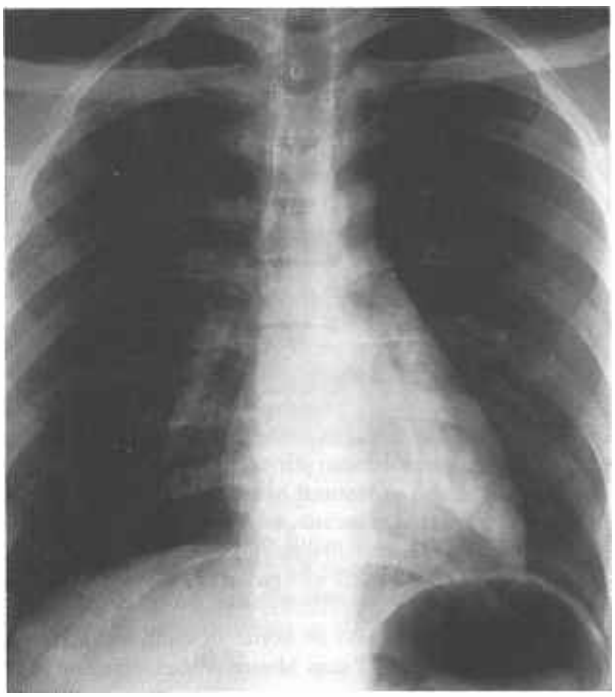

Fig 2 - HRCT of lungs. (a) mid-cardiac level. (b) lower cardiac level.

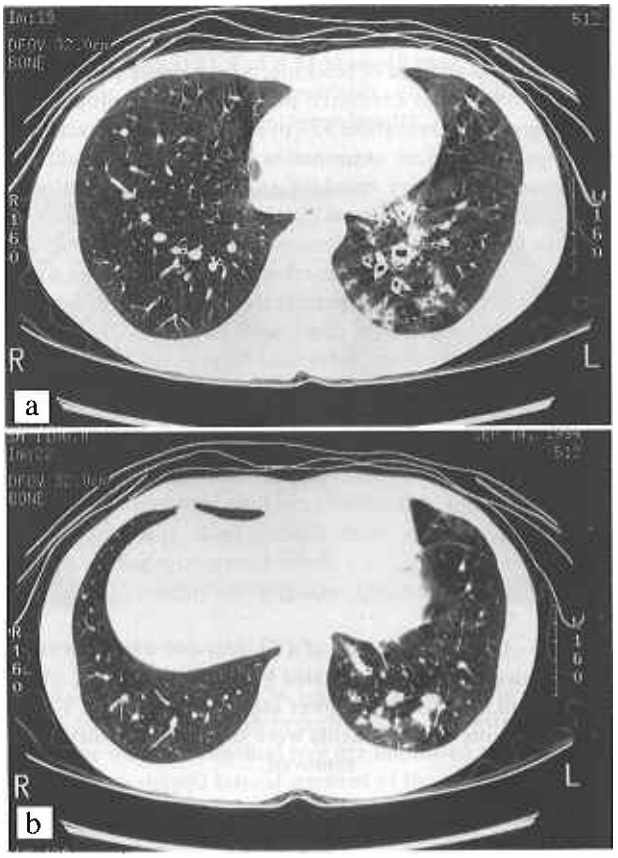

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IMAGE INTERPRETATION

The chest radiograph showed increased linear shadowing behind the left heart outline, with a branching pattern suggestive of bronchial tree pathology (Fig 1). HRCT demonstrated thick-walled bronchial dilatation in the left lower lobe, producing a 'signet ring' appearance (Fig 2a). The bronchial tree was opaque more distally, consistent with retained secretions (Fig 2b). No other lung parenchymal lesion was detected.

DIAGNOSIS

Cylindrical bronchiectasis

CLINICAL COURSE

The patient improved with antibiotic treatment.

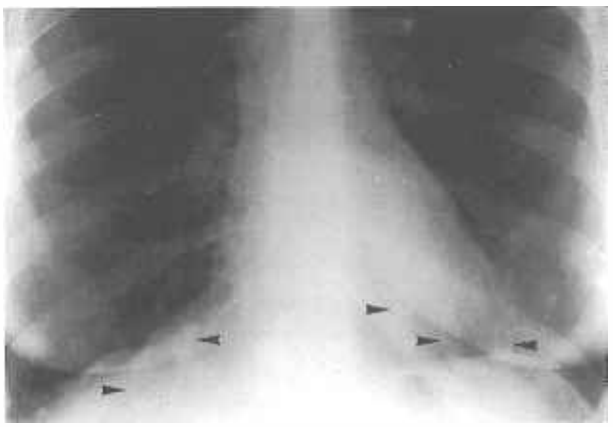
DISCUSSION

Bronchiectasis is defined as permanent abnormal dilatation of one or more large bronchi. It may occur secondary to childhood infections, airway obstruction due to endobronchial tumour, impacted foreign body, aspergillosis or mucus plugs from diseases such as asthma and cystic fibrosis. Other causes include chronic recurrent aspiration, immune deficiency states and congenital bronchial abnormalities[1,2].

In the classic form of bronchiectasis, patients present with chronic cough and excessive purulent sputum production. Haemoptysis occurs in about 50% of adult patients. Characteristic findings on physical examination include finger clubbing, cyanosis, inspiratory crackles and airflow obstruction[2]. However, the severity of these 'classic' symptoms have decreased over the years because of effective immunisation and antibiotic therapy[1]. Nowadays, patients often present with milder forms of the disease, having just a persistent cough with small amounts of sputum or haemoptysis alone, with no or minimal physical signs[3]. In these situations, the clinical diagnosis of bronchiectasis may be difficult.

Plain radiographs are generally suggestive of but are non-specific for the detection of bronchiectasis[4]. Recognised radiographical findings are loss of definition and increase in size of lung markings, and crowding of lung markings indicative of lung volume loss. In severe disease, cystic spaces containing air-fluid levels (Fig 3) or a coarse honeycomb pattern may be identified. Less commonly, radiographic evidence of oligaemia, atelectasis with compensatory overinflation of remaining lung, and pleural thickening may be present[3].

Fig 3 - Chest radiograph of a 51-year-old woman with bronchiectasis showing dilated bronchial branches, with air-fluid levels, in both lower lobes (arrowheads). The bronchiectatic lung segments were subsequently surgically removed.



HRCT is the recommended non-invasive imaging technique for confirming the diagnosis of clinically and radiographically suspected bronchiectasis[4,5], even in milder forms of the disease[3]. It is also the method of choice for examining patients with haemoptysis in whom the clinical index of suspicion for underlying malignancy is low and is superior to bronchiectasis[6]. The CT technique involves use of thin 1 to 2mm colimated axial sections, in conjunction with a high spatial resolution algorithm. Improved resolution may be obtained by decreasing the field of view and ensuring that the patient remains in suspended inspiration during the scan. HRCT allows a better assessment of the type, distribution, and severity of parenchymal abnormalities than is possible on the chest radiograph or conventional CT[4,5,7,8].

In terms of specificity and sensitivity, HRCT is comparable to bronchography for diagnosing bronchiectasis[7]. CT criteria for the diagnosis of bronchiectasis vary with the bronchiectatic pattern as well as the orientation of the bronchi to the scan plane[8]. Cylindrical bronchiectasis, usually present in patients with the mildest form of the disease, show thick-walled and dilated bronchi extending to the lung periphery. In normal subjects, the bronchi cannot usually be visualised beyond a point midway between the hilum and pleural surface, although there is no objective measurement for abnormally thickened bronchial wall. In most instances, the bronchial abnormality is unilateral or multifocal, allowing the normal and abnormal bronchi to be differentiated[9,10]. Depending on the orientation of the bronchi relative to the scan plane, they can simulate tram tracks or a "signet ring". The latter sign refers to the cross-sectional appearance of a branch pulmonary artery adjacent to a dilated bronchus (Fig 2a).

Varicose bronchiectasis produces a similar appearance to cylindrical bronchiectasis except that the bronchial walls are irregular and beaded. Cystic bronchiectasis, the most severe form of bronchiectasis, is easily recognised due to the presence of cystic air-fluid levels. Segmental distribution of the cysts, strings of cysts extending from the hilum along the course of the bronchus (Fig 4) and clusters consisting of several dilated adjacent bronchi are also suggestive (Fig 5). Different types of bronchiectasis may be present in the same patient (Fig 6). Other CT findings of bronchiectasis are branching or oval densities, depending on whether the scan plane is parallel or oblique to the dilated bronchi, due to retained bronchial secretions (Fig 7). Associated CT findings include lobar or segmental collapse secondary to periobronchial fibrosis (Fig 8), oligaemia as a result of bronchoalveolar lesions associated with bronchiectasis, bronchial stenosis and consolidation[8-10].

Potential pitfalls must be borne in mind for accurate interpretation of the HRCT scan. Motion artifacts resulting from both respiratory and cardiac motion may simulate the pattern of bronchiectasis by causing a "double vessel" pattern or "pseudocystic" appearance. Technical factors, such as inappropriately narrow windowing, may give rise to inherent blurring of edges and spurious thickening of bronchial walls, thereby simulating bronchiectasis[10].

HRCT remains the investigation of choice, after chest radiographs, for the diagnosis of bronchiectasis[4,5,8-10]. Bronchography, an invasive procedure with inherent complications, should be reserved for selected surgical candidates in whom HRCT has documented segmental or unilateral involvement and when CT does not reveal bronchiectasis despite strong clinical suspicion[8,9].

Fig 4 - Contiguous axial CT scans of the lungs in a 61-year-old woman with gross cystic bronchiectasis. (a) Upper scan shows several small cysts and a giant cyst, with an air-fluid level (arrowheads), extending distally from the left hilum. (b) Lower scan (10mm distal) shows the branching pattern of several cystically dilated bronchi, 2 of which contain fluid (arrowheads).

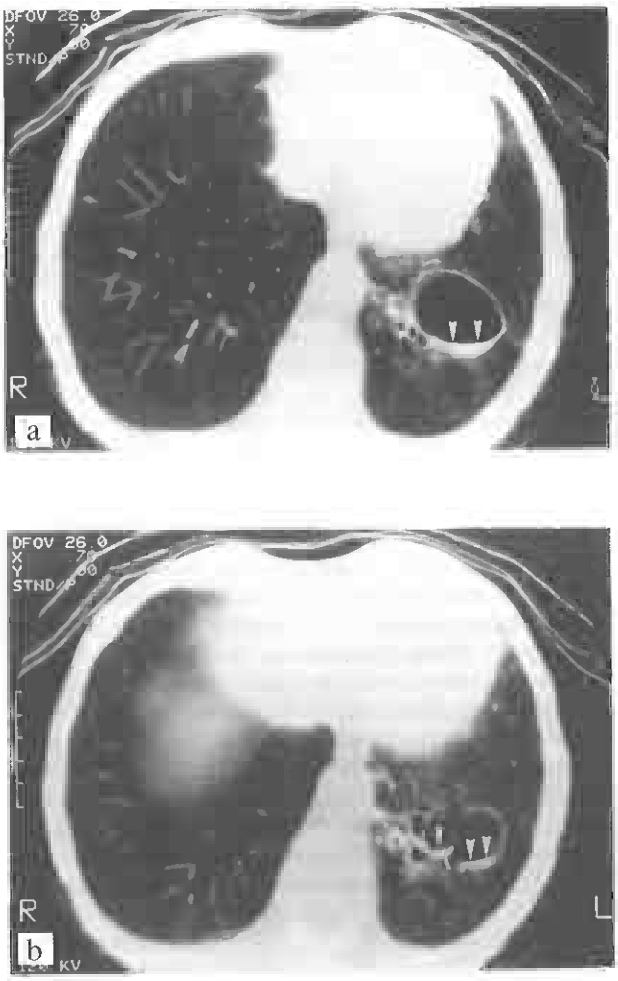


Fig 5 - HRCT of the lower lungs in a 70-year-old man with cystic bronchiectasis and left basal emphysema. A cluster of cystic lesions are demonstrated on the right side, including one containing an air-fluid level (arrowed).

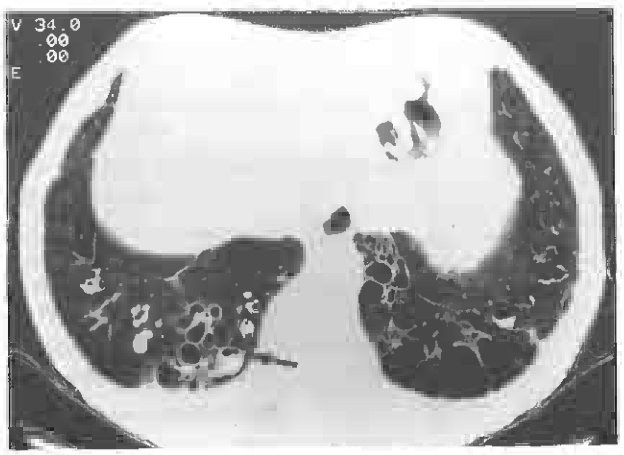


Fig 6 - Lung HRCT of a 61-year-old woman showing mixed types of bronchiectasis; cylindrical type with 'signet ring' sign is present in the left upper and lower lobes, while the cystic type is seen in the right lung.

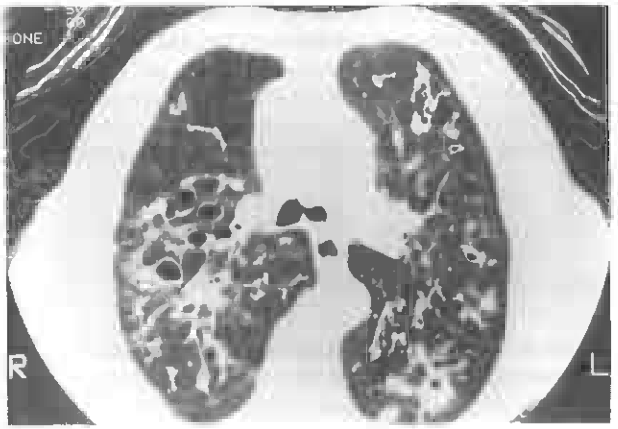


Fig 7 - Lung HRCT of a 33-year-old man shows a V-shaped (or gloved finger appearance) of fluid-filled dilated bronchi (arrowheads).

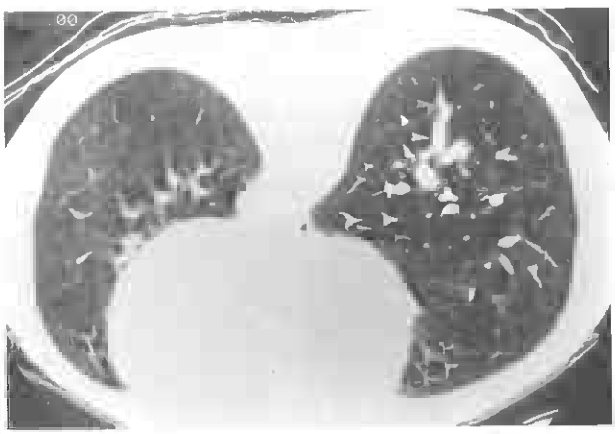
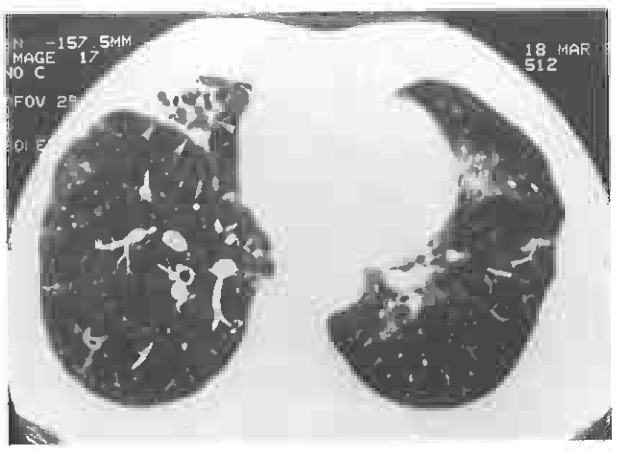


Fig 8 - Lung HRCT of a 56-year-old woman showing lobar collapse associated with bronchiectasis. Crowded lumina of the dilated bronchial tree are identified within the wedge-shaped lateral segment of the middle lobe (arrowheads).



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