

Opacities of the middle and upper lobes in combination

B. T. LE ROUX

Thoracic Unit, Wentworth Hospital, Durban, and the Department of Surgery, University of Natal

The diagnosis of bronchial carcinoma was confirmed in 8 of 17 patients who presented with the radiographic appearances of a combination of right upper and middle lobar opacification. In 9 patients the cause of the combination of lobar shadows was inflammatory, in 2 destructive. This experience serves to emphasize that the investigation of lobar and segmental shadows, in whatever combination, must, at an early stage, include bronchoscopy.

In certain combinations, shrinkage of more than one lobe, or of segments separated by aerated lung, diminishes the likelihood of a common bronchus-obstructing lesion, such as bronchial carcinoma of central type, as the cause of pulmonary shrinkage. Thus, while shrinkage of the middle and right lower lobes together is common and usually diagnostic of a bronchus-obstructing agent in the intermediate (lower part of right main) bronchus—whether this be mucus, a foreign body, carcinoma or other lesions—shrinkage of the middle and right upper lobes together without shrinkage of the lower lobe should not denote a common bronchus-obstructing lesion because of the length of the intermediate bronchus between the bronchi which serve the shrunken lobe (Fig. 1). Exceptions to this rule—called by Felson (1960) the 'double lesion sign'—are common, and bronchoscopy remains an early requisite in the investigation of all lobar and segmental shadows in whatever combination. Exceptions are common because, in the circumstances in which relatively widely separated lobes or segments are opaque and shrunken, the bronchus-obstructing lesions may be dissimilar. Thus, bronchial carcinoma which obstructs the right upper bronchus may be associated with mucus obstruction or external compression of the middle bronchus by mediastinal glandular metastasis.

The purpose of this paper is to illustrate and outline the pathology in 17 examples of shrinkage and opacification of the right upper and middle lobes in combination. The patients were all adult men of an age which made likely bronchial carcinoma as the cause of a pulmonary lesion. In all but four patients the upper and middle lobes together occupied a volume of the right hemi-

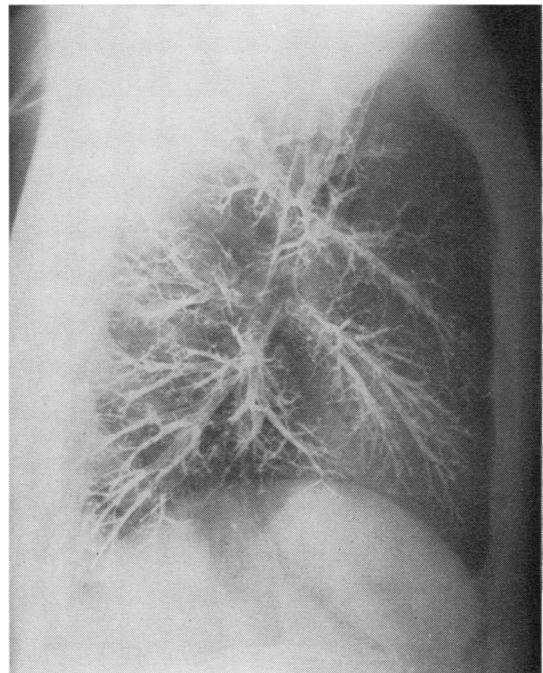
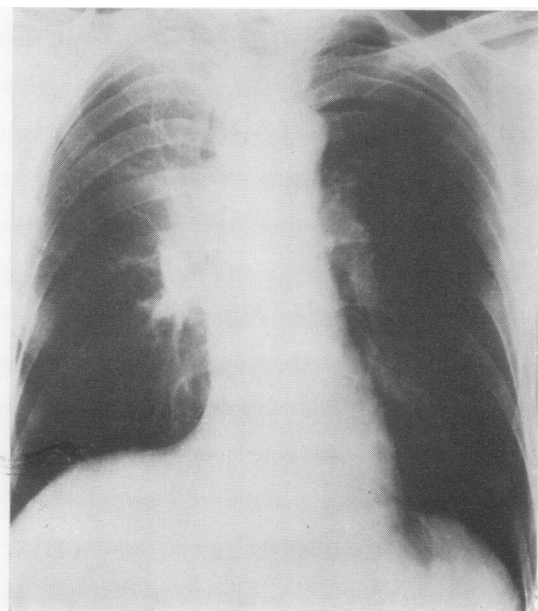
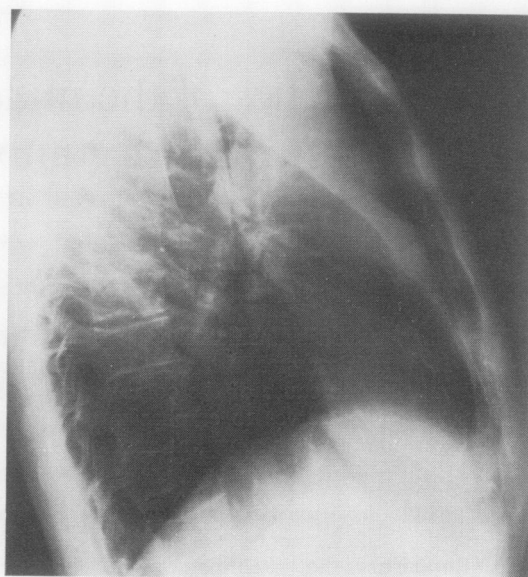


FIG. 1. A right lateral bronchogram shows why a common bronchus-obstructing lesion is unlikely to be the cause of a combination of a middle and upper lobar shadow on the right, while the lower lobe is spared. Middle and upper bronchial orifices are separated by the length of intermediate (lower part of main) bronchus through which air must pass to reach the lower lobe.

The bronchogram was made in late convalescence for the youngest patient in the series who had shrinkage of the middle and upper lobes together, and in whom the cause was an evanescent infection.



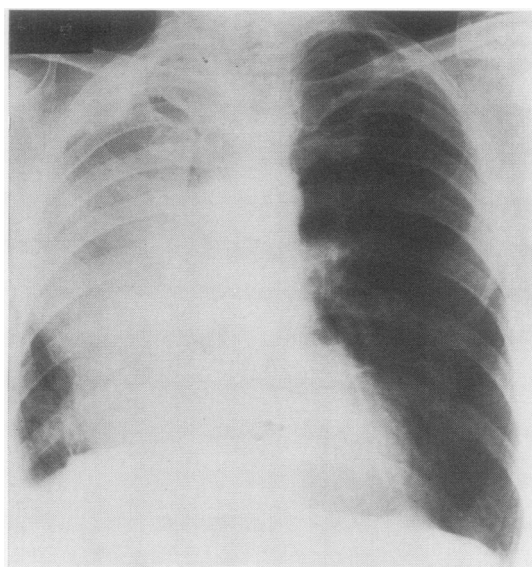
(a)



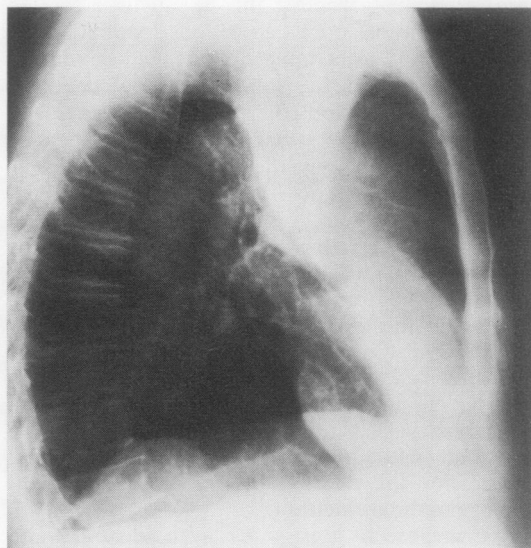
(b)

FIG. 2. *Postero-anterior (a) and right lateral (b) radiographs show shrinkage of middle and right upper lobes, together with considerable compensatory emphysema of right lower lobe.*

In this patient carcinoma obstructed the right upper bronchus and mucus the middle bronchus.



(a)



(b)

FIG. 3. *Postero-anterior (a) and right lateral (b) radiographs in which (PA view) the translucent right lower lobe can be seen through the opaque and shrunken middle and upper lobes, and the anterior translucency, which is left lung, is well seen in the lateral view.*

In this patient carcinoma was seen to obstruct the right upper bronchus, and the middle bronchus was compressed to a slit, without mucosal disruption. At exploratory thoracotomy the carcinoma was technically irresectable, because of superior vena caval and atrial invasion, and large glands lay in close relation to the middle bronchus and were the cause of its compression.

thorax smaller than normal. In one, shrinkage was gross (Fig. 2), and in the others it varied from considerable (Fig. 3) to minor (Fig. 4). The degree of compensatory emphysema of the right lower lobe varied appropriately with the extent of right upper and middle lobar shrinkage. Left-sided pulmonary translucency was visible behind the sternum in most, but the depth and extent of this varied over a wide range, as shown in the lateral films (Figs 2b, 3b and 4b).

In four patients the radiographic opacity interpreted as middle and right upper lobar was associated with caudally and posteriorly directed convexity of the oblique fissure, which suggested that at least part of the opaque lobes was of larger than normal size, whether from bulk of tumour or distension in relation to infection with suppuration (Fig. 5). In two with middle and upper lobar 'distension' there was, in early radiographs, a fluid level (Fig. 5).

BRONCHOSCOPIC FINDINGS

In nine patients the only abnormality at bronchoscopy was pus in the bronchi, which, in the two patients with fluid levels, was of large volume. In eight patients there was bronchoscopic evidence of tumour. In three of these eight, the tumour occluded the right upper bronchus and mucus or pus occluded the middle bronchial orifice, which, after aspiration of the foreign material, looked normal. In these three patients, at exploratory thoracotomy which included pneumonectomy, the transverse fissure was absent or vestigial. The carcinoma was of central type and in none larger than a golf ball, and in each there was airless, shrunken, solid lung distal to the tumour which, because of absence of the transverse fissure, made upper and middle lobes appear as one. Histologically, the inflammatory changes distal to the tumour were evenly distributed between middle and upper lobes, as if these behaved as a single functioning unit. The bronchial anatomy was normal.

In three others of the eight patients with middle and upper lobar opacities and pulmonary carcinoma, the tumour was seen at bronchoscopy to obstruct the right upper bronchus and the middle bronchus was compressed to a horizontal slit. Exploratory thoracotomy was undertaken in two of these patients and completed by pneumonectomy in one; in each, it could be demonstrated that compression of the middle bronchus was consequent upon enlargement of related nodes in which there was metastatic tumour. In one of these two patients the transverse fissure was com-

plete; in the other it was incomplete but easily recognizable. In the third patient in this group there was gross oesophageal displacement presumed to be from mediastinal glandular metastasis, and a thoracotomy was not made. In this patient it is presumed that middle bronchial compression was consequent upon related tumorous glands.

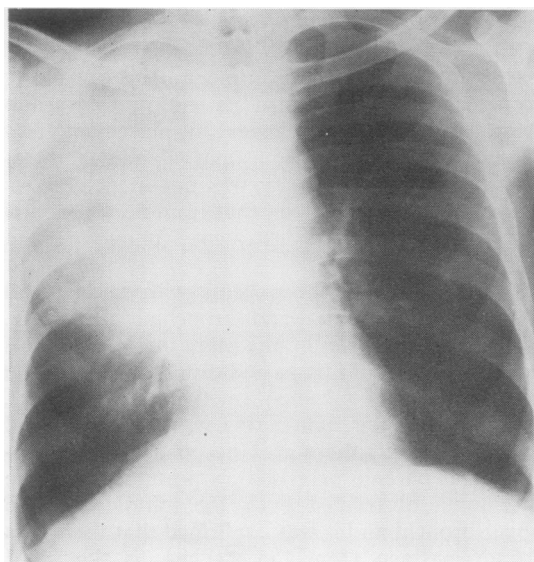
In one of the eight patients with middle and upper lobar opacities and bronchial carcinoma, tumour was visible in the right main bronchus and a bougie could be passed distally as far as the basal bronchi, a fact confirmed radiographically. In this patient the main carina was widely invaded by tumour and there was oesophageal displacement and phrenic paresis. It is presumed that the carcinoma obstructed both the middle and the upper bronchi and it was confirmed that there was an air passage from the trachea to the basal bronchi.

In the last patient in this group of eight, right upper bronchial carcinoma was associated with a middle bronchus that looked in every respect normal. At exploratory thoracotomy, which included pneumonectomy, the middle lobe was a tiny, shrunken wedge and the transverse fissure was obliterated by adhesions. This is the only patient in the series with two unrelated diseases—right upper bronchial carcinoma and bronchiectasis of a shrunken middle lobe, the latter presumably of long standing.

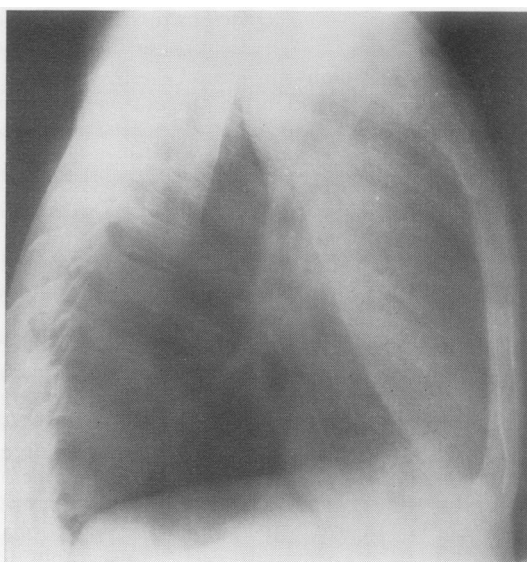
AETIOLOGY

The cause of combined middle and upper lobar pulmonary opacities in eight patients was bronchial carcinoma: in three, with distal inflammatory changes in the upper and middle lobes which were anatomically inseparable, although the bronchial anatomy was normal, and in these three patients the tumour was in the right upper bronchus; in three patients, right upper bronchial carcinoma was associated with compression of the middle bronchus by mediastinal glands; in one patient, carcinomatous involvement of the middle and upper bronchi was associated with retention of an air passage to the basal bronchi; and in the last of this group, right upper bronchial carcinoma was associated with bronchiectasis in a shrunken middle lobe.

In seven of the nine patients in whom the bronchoscopic appearances, apart from the presence of pus, were normal, the middle and upper radiographic opacities cleared slowly during a period of physiotherapy and with the exhibition

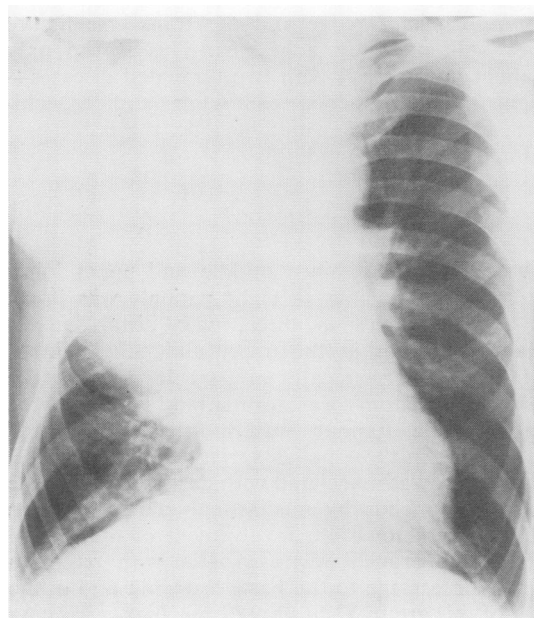


(a)

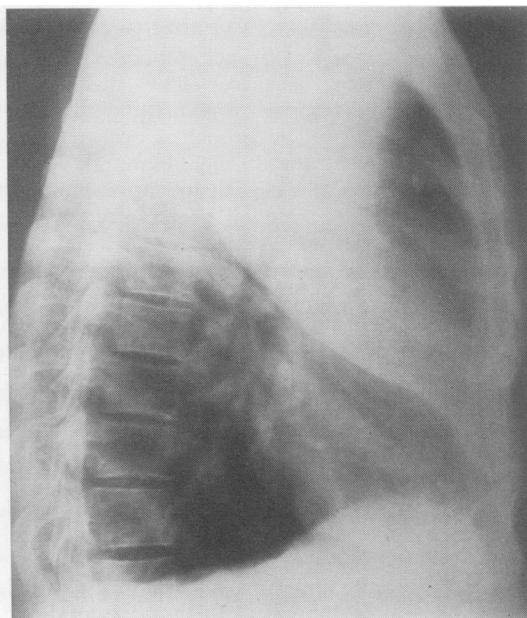


(b)

FIG. 4. *Postero-anterior (a) and right lateral (b) radiographs of a patient in whom carcinoma obstructed the right upper bronchus and mucus the middle bronchus.*



(a)



(b)

FIG. 5. *Postero-anterior (a) and right lateral (b) radiographs of a patient who had a carcinoma obstructing the right upper bronchus. The middle bronchus looked normal and a bougie passed distally into both divisions for a considerable distance. At exploratory thoracotomy, the transverse fissure was obliterated by adhesions, the right upper lobe was distended with pus distal to a quite small central carcinoma, and the middle lobe was a shrunken wedge, the seat of chronic non-specific inflammatory changes, presumably of long standing, and with sacculated bronchiectasis of the middle lobe.*

of an appropriate antibiotic—determined on the ground of sensitivity of organisms in the sputum. Bronchography was undertaken in these seven patients at a late stage in convalescence and the bronchographic appearances were normal, as was the bronchial anatomy. Friedländer's bacillus was isolated from one of the two patients with 'dis-

tension' of the upper and middle lobes. From one patient pneumococci were isolated, and from the others staphylococci.

In the two patients in whom middle and upper lobar shadows included a fluid level, the course of the illness was prolonged, the opacities cleared slowly, and there was clear radiographic evidence

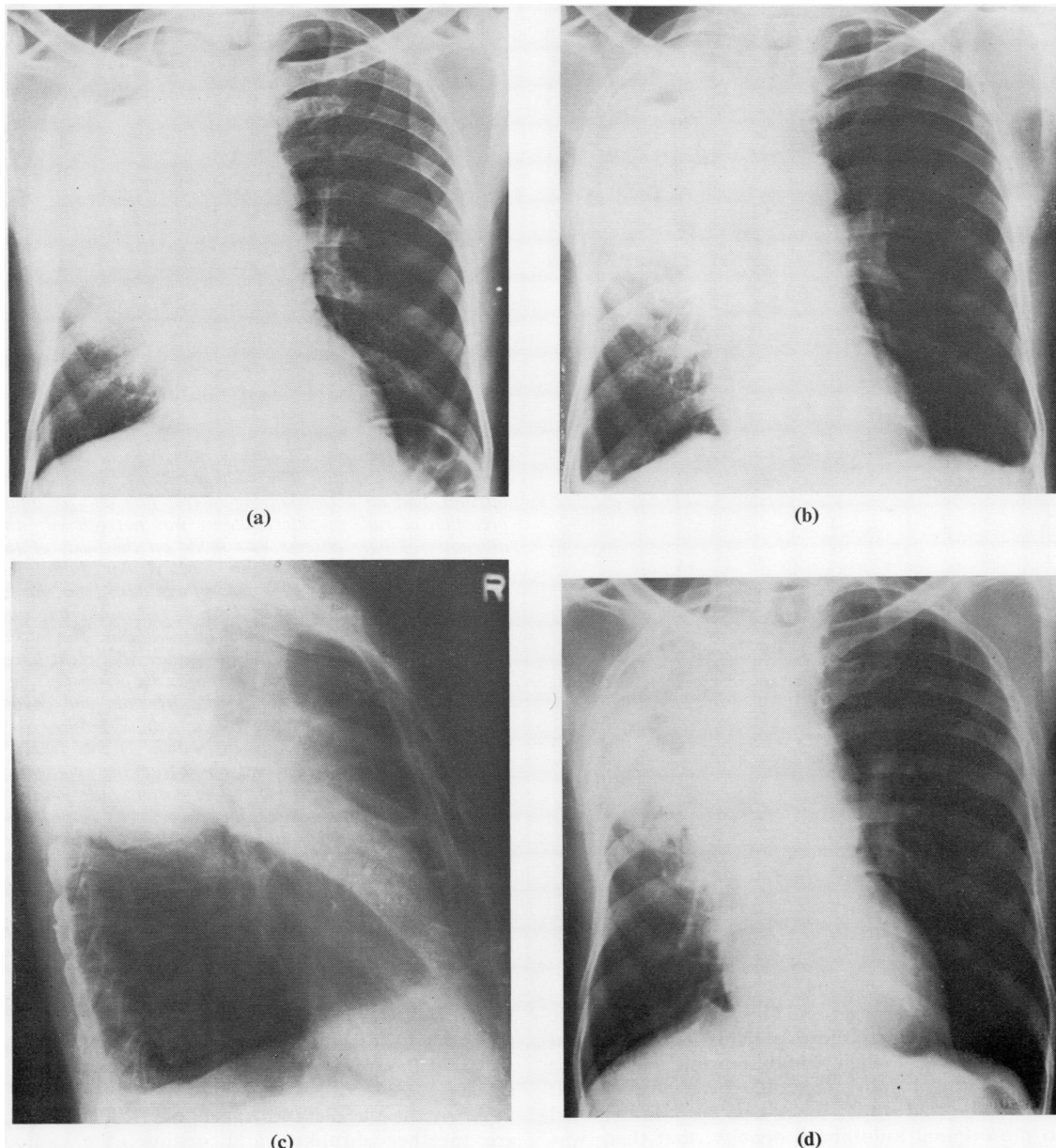
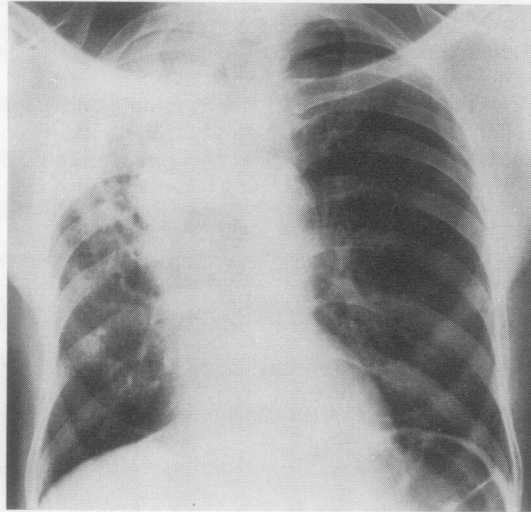
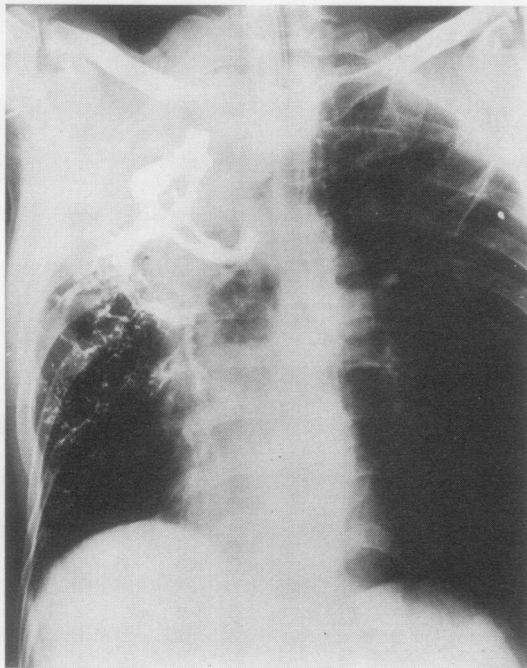


FIG. 6. *Legend on page 60.*

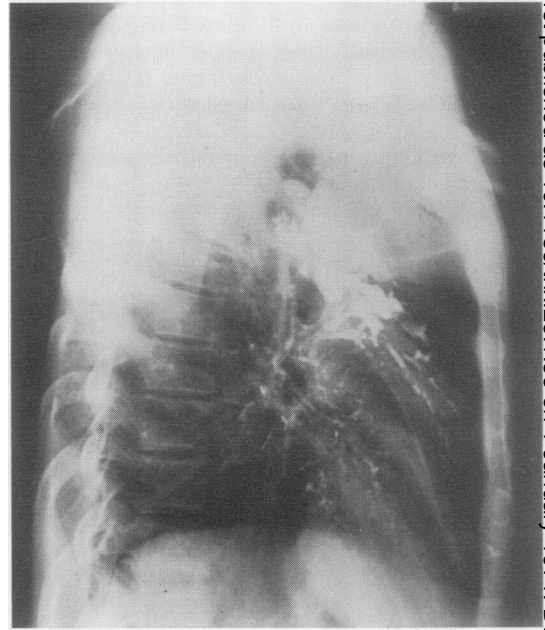


(e)



(f)

of pulmonary destruction. The serial radiographic changes in one of these patients are illustrated (Fig. 6 a to g). When finally a bronchogram was made (Fig. 6 f and g), it could be confirmed that the middle and upper lobes had both contributed to the original pulmonary opacity; that there was persistent shrinkage of both lobes, although there



(g)

FIG. 6. The patient, an elderly man, was acutely ill on admission to hospital. The radiograph (a), made on admission, had no accompanying lateral film and an interpretation of radiographic anatomy was not offered; the diagnosis of lung abscess was made on the basis of the clinical features and the right subclavicular fluid level. Radiographs (b and c) were made three days later, during which time management had been by chemotherapy and physiotherapy, with some clinical improvement. The lateral film (c) clearly shows the oblique fissure (the right lower lobe fills more of the right hemithorax than is usual), left pulmonary translucency behind the sternum, and caudal bowing of the posterior ends of the oblique fissure, as if part of the upper lobe were distended. At this juncture the bronchi were examined and, apart from their content of pus, were seen to be normal. The postero-anterior films (d and e) were made three and five weeks respectively after admission. Clinical improvement was now impressive and a bronchogram (f and g) was made. Although the bronchogram is of poor quality, with the right lower bronchi incompletely filled, it is sufficiently informative to enable the diagnosis of destruction of the right upper lobe to be made, together with bronchiectasis of at least the medial segment of the middle lobe.

was now some aeration in the middle lobe; that there was gross destruction of the upper lobe; and that there was residual middle lobar bronchiectasis.

When the middle and upper lobes on the right are together shrunk and opaque, the radiographic appearances on the right are similar to

those on the left when the left upper lobe is shrunken and opaque.

COMMENT

In his original description of the 'double lesion sign' Felson (1960) stresses that 'one should not be dogmatic in interpreting the double lesion sign. I have, myself, been guilty of overselling this sign and, after encountering four failures in the past few years, have lost a little of my original faith in it.' Two of the failures were cases of bronchial carcinoma, in one of which the tumour was in the upper lobe and there was an apparently unrelated pneumonia of the middle lobe; and in the other, the carcinoma involved the stem bronchus with an airway to the basal bronchi. Other reasons for 'failure' of the double lesion sign to make unlikely the diagnosis of a common bronchus-obstructing lesion include multicentric neoplasm; separate areas of collapse produced by the primary neoplasm and its metastases; extension of a tumour through a fissure to involve another large

bronchus; a tumour in one location and an unrelated lesion in another; and anatomical variations in the distribution of bronchi. In 8 out of 17 cases the invalidity of the double lesion sign as an exclusion of bronchial carcinoma serves only to emphasize that the investigation of lobar or segmental shadows, in whatever combination, demands, at an early stage, bronchoscopy. That there is bias in the selection of these cases is undeniable—all were referred to a thoracic surgical unit from medical wards where, during a period of observation, the lobar opacities had failed to clear, and it was the chronicity of the pulmonary pathology which prompted referral. It is not known how many quickly clearing combined middle and right upper lobar lesions were treated during the period when nearly half of those referred for a surgical opinion were shown to be related to pulmonary carcinoma.

REFERENCE

Felson, B. (1960). *Fundamentals of Chest Roentgenology*. Saunders Philadelphia and London.