pregnancy: clinical features, diagnosis, management and public health implications. *Br J Obstet Gynaecol* 1988; 95:294–8.
10 Stenstrom R, Jansson E, Wager O. Ornithosis pneumonia with special reference to roentengenological lung findings. *Acta Med Scand* 1962;171:349–56.
11 Jorgensen MB, Steffenson KA. Ornithosis. An analysis of 44 human cases with positive complement fixation tests. *Dan Med Bull* 1956;3:20–4.
12 Crosse BA. Psittacosis—a clinical review. *J Infect* 1990; 21:251–9.
13 Schultz T, Milre WC, Bedrossian CWM. Clinical application of measurement of ACE level. *JAMA* 1979;242: 439–41.
14 Scadding JG, Mitchell DN. The Kveim reaction. In: *Sarcoidosis*. 2nd ed. London: Chapman and Hall, 1985:468.
15 Cornog JL, Hanson CW. Psittacosis as a cause of miliary infiltration of the lung and hepatic granulomas. *Am Rev Respir Dis* 1968;98:1033–9.
16 Thomas PD, Hunninghake GW. Current concepts of the pathogenesis of sarcoidosis. *Am Rev Respir Dis* 1987; 135:747–60.
17 Kurashima K, Watanabe A, Kawamura Y, *et al*. Bronchoalveolar lavage fluid findings and lung function in psittacosis [English abstract]. *Jap J Thorac Dis* 1989;27:1288–93.
18 Harris AA, Pottage JC, Kessler HA, Zeihen M, Levin S. Psittacosis bacteraemia in a patient with sarcoidosis. *Ann Intern Med* 1984;101:502–3.
19 Mitchell DN, Rees RJW. A tranmissible agent from sarcoid tissue. *Lancet* 1969;ii:81–2.

Thorax 1991;46:606–607

Pneumomediastinum after a transbronchial biopsy

Matthew Naughton, Lou Irving, Allan McKenzie

Department of Thoracic Medicine
M Naughton
L Irving

Department of Diagnostic Radiology
A McKenzie

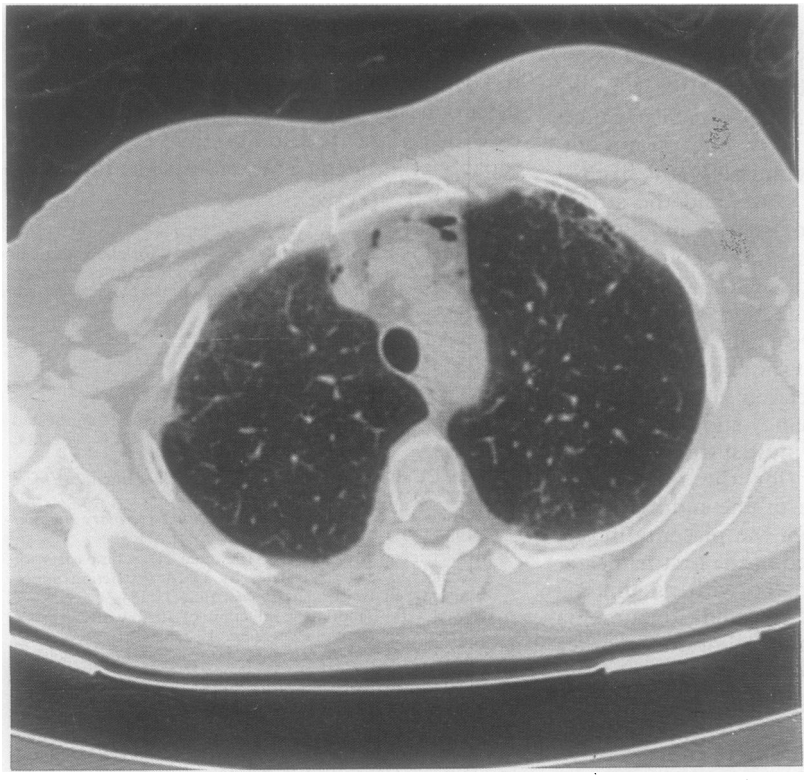
Repatriation General Hospital, Heidelberg, Victoria 3081, Australia

Reprint requests to:
Dr Naughton

Accepted 15 February 1991

Abstract

A pneumomediastinum occurred after a transbronchial biopsy in a woman with pulmonary fibrosis and was confirmed by computed tomography. Although pneumomediastinum has a pathogenesis similar to that of pneumothorax it has not been reported after transbronchial biopsy.



Computed tomogram of the chest showing fine reticular nodular pattern, a few small cysts, and gas in the anterior mediastinum.

Transbronchial biopsy via the flexible fibreoptic bronchoscope is a useful and well tolerated investigation. The overall complication rate is reported as 2–15%[12] and the incidence of pneumothorax as 0·5–5%.[13] We report a case of pneumomediastinum that followed transbronchial biopsy as this has not been reported previously.

Case report

A 53 year old housewife was admitted to hospital for investigation of a four week history of exertional dyspnoea, haemoptysis, and a bilateral pulmonary fine reticular nodular pattern on the chest radiograph. She had had non-erosive arthritis, malar rash, Raynaud's phenomenon, and the sicca syndrome for several years. Results of previous serological tests were positive for antinuclear factor (1/640, nucleolar pattern), suggesting systemic lupus erythematosus. She was an ex-smoker and denied contact with tuberculosis. She had otherwise been in good health. Her medication was naproxen 250 mg daily. The only abnormal finding of the clinical examination was pulmonary crepitations. There was no rash, clubbing, lymphadenopathy, or organomegaly.

Investigations, including sputum examination for acid fast bacilli and malignant cells, ventilation-perfusion lung scanning, urine and blood culture, serological testing for atypical pneumonia, examination of the clotting profile, and electrocardiography, gave normal results. Respiratory function tests showed that FEV_1 was 2·5 l (109% predicted), vital capacity 2·9 l (100% predicted), and transfer factor for carbon monoxide 4·6 mmol/min/kPa (61% predicted).

She underwent flexible fibreoptic bronchoscopy and transbronchial biopsy of the left lung under local anaesthesia with oxygen administered intranasally; she was monitored by electrocardiography and pulse oximetry. She was calm throughout the procedure and there was no excessive coughing. Fluoroscopy was used for the transbronchial biopsy. After the fourth biopsy specimen had been taken she suddenly developed severe substernal chest pain. There was no fall in oxygen saturation or change in cardiac rhythm or vital

signs. Clinical examination disclosed no new abnormality and fluoroscopy and a standard chest radiograph did not show a pneumothorax. The procedure was terminated. An electrocardiogram taken soon after the procedure showed T wave inversion in the anterior leads, suggesting the possibility of myocardial ischaemia. Repeated clinical examinations failed to detect any cardiorespiratory abnormality. No arrhythmias or rise in cardiac enzymes were noted. Her electrocardiogram returned to normal within 48 hours, and four days later a cardiopulmonary exercise test showed normal cardiac function.

As part of the investigation of her lung infiltrate computed tomography of the chest was performed five days after the bronchoscopy. The scan showed gas in the anterior mediastinum but no pneumothorax, consistent with pneumomediastinum. There was also an increased reticular pattern in the middle and lower lobes, consistent with pulmonary fibrosis (figure). A barium swallow, performed to exclude oesophageal rupture, showed nothing abnormal. The transbronchial biopsy specimens showed non-specific pulmonary fibrosis. Her pain gradually resolved over 10 days, and she was discharged home well.

Discussion

Since 1968 the fibreoptic bronchoscope has gained popularity as a useful and safe tool for investigating and managing many pulmonary conditions. The reported incidence of pneumothorax after transbronchial biopsy ranges from 0·5% to 5·0%,[1 3] about half the cases requiring an intercostal catheter. No reports mention pneumomediastinum, perhaps reflecting difficulty in making the diagnosis or the fallacy that a normal chest radiograph after biopsy excludes pneumomediastinum. Certainly in this case pneumomediastinum was not noted on the plain chest radiograph, nor was it suspected as the cause of the chest pain and the acute electrocardiographic changes.

Pneumomediastinum may develop under three circumstances[4]: (1) mediastinal sepsis from gas forming organisms introduced from infected soft tissues nearby, commonly the head and neck; (2) traumatic disruption of large gas containing structures (oesophagus, trachea), frequently in association with positive pressure ventilation, or from the retroperitoneal space; (3) damage to alveoli and to bronchioles, allowing gas to leak along the bronchovascular bundle towards the mediastinum—this may occur with small airway obstruction, as in asthma, where a ball valve effect allows distal hyperinflation, or with an inhaled foreign body. Pneumomediastinum was first documented by Simmons in 1784, according to Faust,[5] after the Valsalva manoeuvre during labour. Hamman established the clinical features[6] in 1945 and Macklin and Macklin[7] the pathophysiology. The main symptoms are substernal chest pain aggravated by movement or swallowing, dysphagia, and dyspnoea. Examination may reveal subcutaneous emphysema or Hamman's sign (a crunching sound synchronous with the heart beat, heard over the precordium).

The chest radiograph is often normal, though it may show a thin vertical line of lucency along the left heart border, highlighting of the aortic knob, and a continuous diaphragm sign.[4] The lateral film may show retrosternal air.[8] In our patient computed tomography was more helpful than the chest radiography. The electrocardiogram may show low voltages, non-specific axis shift, ST-T wave changes, or ST elevation.[9]

Conservative management with oxygen, analgesia, and reversal of the underlying condition is usually all that is required. If the patient needs positive pressure ventilation low pressures should be considered. Surgical decompression may be required if signs of imminent cardiovascular collapse or large airway impingement occurs.

We assume that the biopsy procedure in our patient damaged the bronchiole running within the bronchovascular bundle, with the result that gas travelled along the bundle into the mediastinum.

The possibility of pneumomediastinum complicating a transbronchial biopsy should be considered in patients developing chest pain, new chest signs, or acute electrocardiographic changes after bronchoscopy, even in the presence of a normal chest radiograph.

1 Fulkerson WJ. Current concepts—fibreoptic bronchoscopy. *N Engl J Med* 1984;**311**:511–3.
2 Herf SM, Suratt DR, Arora NS. Deaths and complications associated with transbronchial lung biopsy. *Am Rev Respir Dis* 1977;**115**:708–11.
3 Pereira W, Kovnat DM, Snider GL. A prospective cooperative study of complications following flexible fibreoptic bronchoscopy. *Chest* 1978;**73**:813–6.
4 Maunder RJ, Pierson DJ, Hudson LD. Subcutaneous and mediastinal emphysema pathophysiology diagnosis and management. *Arch Intern Med* 1984;**144**:1447–53.
5 Faust RC. Subcutaneous emphysema during labour. *North West Med* 1940;**39**:24–6.
6 Hamman L. Mediastinal emphysema. *JAMA* 1945;**128**:1–6.
7 Macklin MT, Macklin CC. Malignant interstitial emphysema of the lungs and mediastinum as an important occult complication in many respiratory diseases and other conditions. An interpretation of the clinical literature in the light of laboratory experiment. *Medicine (Baltimore)* 1944;**23**:281–352.
8 Pierson DJ. Pneumomediastinum. In: Murray JF, Nadel JA, eds. *Textbook of respiratory medicine*. Philadelphia: Saunders, 1988:1795–808.
9 Aisner M, Pranco JE. Mediastinal emphysema. *N Engl J Med* 1949;**241**:818–25.