

Bronchial lavage and transbronchial lung biopsy in the diagnosis of legionnaires' disease

PETER L CHIODINI, ALAN J WILLIAMS, JOHN BARKER, JOHN A INNES

From the Departments of Communicable and Tropical Diseases and Thoracic Medicine and the Public Health Laboratory, East Birmingham Hospital, Birmingham

Legionnaires' disease is increasingly recognised as a cause of community acquired pneumonia.¹ Although there are no controlled trials of antimicrobial chemotherapy in legionnaires' disease, an early bacteriological diagnosis will confirm the need for treatment directed at *Legionella* or will redirect treatment should another pathogen be isolated. Serological tests provide only a retrospective diagnosis; while rapid antigen detection (for example, by ELISA or latex agglutination with urine samples²), although permitting early diagnosis, does not allow isolation of the organism. We report three cases of legionella pneumonia where the organism was isolated from material obtained during life by bronchoscopy.

Case reports

CASE 1

A 55 year old black man presented with a two week history of increasing dyspnoea, cough productive of frothy blood stained sputum, and muscle aches. He had experienced frequent palpitations for the last two days. He smoked 20 cigarettes a day. There was no history of foreign travel. Examination revealed a temperature of 40°C, a respiratory rate of 30/min, and widespread inspiratory lung crackles. A chest radiograph showed extensive bilateral pulmonary shadowing. Ventilation was soon required and treatment started with intravenous erythromycin, rifampicin, and flucloxacillin. Fiberoptic bronchoscopy via the endotracheal tube showed reddened bronchial mucosa bathed in yellowish secretions. Bronchial secretions were aspirated. Bronchial lavage was performed and transbronchial lung biopsy specimens were taken from a segment of the right lower lobe. Despite intensive support, the patient died 15 hours after admission. Necropsy confirmed a severe pneumonia affecting almost all areas of both lungs.

L pneumophila serogroup 1 was isolated from bronchial secretions obtained at bronchoscopy and from the transbronchial lung biopsy specimen, identifiable colonies appearing on the third day of culture. *Legionella* was not isolated from expectorated sputum or from blood. Indirect immunofluorescent antibody testing (IFAT) for *L pneumophila* gave a negative result on the transbronchial lung biopsy specimen but a positive result on a postmortem lung specimen.

Address for reprint requests: Dr PL Chiodini, Department of Communicable and Tropical Diseases, East Birmingham Hospital, Birmingham B9 5ST.

Accepted 28 September 1984

CASE 2

A 47 year old white man who had previously been well presented with a six day history of fever and "flu" like symptoms followed by diarrhoea, confusion, and a cough. His chest radiograph showed left lower lobe consolidation and treatment was started with intravenous ampicillin. Over the next 48 hours he deteriorated, with consolidation in the right lung as well. Treatment was changed to erythromycin and the patient was transferred to this hospital. He required mechanical ventilation and a bronchoscopy was performed via the nasotracheal tube. Small amounts of golden coloured bronchial secretions were aspirated with the aid of bronchial lavage and transbronchial biopsy specimens were taken. Erythromycin treatment was continued, with the addition of rifampicin. Despite intensive support, however, he continued to deteriorate and died the following day.

At necropsy both lungs were found to be heavily consolidated, with very little normal tissue remaining. IFAT of the lung biopsy specimen gave a positive result on the first day and postmortem lung tissue was also IFAT positive for *Legionella*. *L pneumophila* serogroup 1 was cultured from both specimens on the third day of incubation. IFAT staining of tracheal aspirate was negative for *Legionella*.

CASE 3

A 59 year old white man became unwell five days after returning from a holiday in Portugal and presented to hospital with a history of five days' headache, three days' diarrhoea, and two days' shivering and sweating. His temperature was 39.5°C and there were extensive crackles at the right lung base. A chest radiograph confirmed the diagnosis of pneumonia. Bronchoscopy was undertaken and transbronchial lung biopsy specimens were taken from the right lower lobe. *Legionella pneumophila* serogroup 1 was isolated from the bronchial washings after three days of culture but not from the transbronchial biopsies. IFAT staining for *Legionella* gave a negative result on the washings and the biopsy specimens. He was treated with imipenem³ and recovered uneventfully.

Discussion

Clinical diagnosis of legionnaires' disease can be difficult and the differential diagnosis relatively wide,⁴ and in most cases the diagnosis is made in the laboratory. Although it is clearly justified to start treatment on clinical grounds, early laboratory confirmation of the diagnosis may not only benefit the individual patient but also permit

early epidemiological investigation, which is particularly important in nosocomial cases.

Various techniques can be used in making an early diagnosis. Staining by rapid silver impregnation⁵ will sometimes provide a presumptive diagnosis from samples of body fluids or tissue sections; but this technique is not widely used in British laboratories. More definite evidence that the organisms seen are legionellae can be provided by direct or indirect fluorescent antibody testing of the samples with polyvalent serum, suitable specimens being tracheal aspirates, bronchial washings, and transbronchial lung biopsy specimens. Definite proof of *Legionella* infection, however, requires bacterial culture, which has important advantages: Firstly, more cases will be diagnosed—in the series of Edelstein *et al*⁶ three of 32 cases were identified only by a positive culture, having negative fluorescent antibody staining of clinical specimens and negative serological results. Secondly, new serogroups may be isolated, which would be missed by IFAT and serological tests using existing reagents. Thirdly, sensitivity testing is possible—we have no reason to suspect that *Legionella* does not have the potential to develop resistance to the currently useful antibiotics.

What specimens are useful for early diagnosis by culture of legionellae? Culture of expectorated sputum may not be possible as only approximately half of patients with legionnaires' disease have a productive cough although there are reports of successful isolation from sputum cultured on selective media.⁷ Transtracheal aspiration of sputum provides a sample largely free of contamination with oral flora. Bronchoscopy provides the option of a transbronchial biopsy in addition to bronchial aspiration and lavage. For lavage, sterile distilled water is preferable to saline as sodium ions inhibit the growth of *L. pneumophila*.⁷ Open lung biopsy is clearly more invasive

but its place is well established in the investigation of pneumonia in the immunocompromised.

We have shown that legionellae may be isolated from transbronchial lung biopsy specimens when the organism is neither seen by IFAT nor cultured from tracheobronchial aspirate (case 2); while the reverse held in case 3, the yield of positive cultures is likely to be greater if both procedures are undertaken. We feel that this justifies the small increase in risk inherent in transbronchial lung biopsy. While a comprehensive diagnostic screen for *Legionella* infection in the individual patient requires IFAT staining and culture of clinical specimens, including blood, with the addition of serological tests, only the first two are likely to provide early confirmation of the diagnosis. We advocate early bronchoscopy with aspiration of bronchial secretions and bronchial lavage plus transbronchial lung biopsy in patients thought to be suffering from legionnaires' disease.

References

- 1 Ward MJ, Finch RG, Macrae AD, Macfarlane J. Hospital study of adult community acquired pneumonia. *Lancet* 1982;ii:255–8.
- 2 Sathapatayavongs B, Kohler RB, Wheat LJ, White A, Winn WC. Rapid diagnosis of legionnaires' disease by latex agglutination. *Am Rev Respir Dis* 1983;127:559–62.
- 3 Chiodini PL, Barker J. Successful treatment of legionella pneumonia with imipenem. *Lancet* 1984;i:401.
- 4 Meyer RD. Legionella infections: a review of five years of research. *Rev Infect Dis* 1983;5:258–78.
- 5 Faine S, Edelstein P, Kirby BD, Finegold SM. Rapid presumptive bacteriological diagnosis of legionnaires' disease. *J Clin Microbiol* 1979;10:104–5.
- 6 Edelstein PH, Meyer RD, Finegold SM. Laboratory diagnosis of legionnaires' disease. *Am Rev Respir Dis* 1980;121:317–27.
- 7 Edelstein PH, Meyer RD. Legionnaires' disease, a review. *Chest* 1984;85:114–20.