The diagnostic yield of prebronchoscopy sputa and bronchial washings in patients with biopsy-proven pulmonary tuberculosis

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Summary

We report on a series of 35 patients with pulmonary tuberculosis diagnosed by flexible fibre-optic bronchoscopy and transbronchial lung biopsy after 3 sputum specimens had been microscopy-negative. This study re-evaluates this invasive procedure.

Additional prebronchoscopy specimens of expectorated sputum yielded the diagnosis in 7 of 16 cases (43.8%) on microscopy. Sputum culture results were positive in 12 of 33 (36.4%). Pleural fluid culture was diagnostic in 1 case, and in another miliary tuberculosis was demonstrated on bone marrow trephine biopsy. The availability of these results could therefore have obviated the need for bronchoscopy in 14 of the 35 patients (40%). Bronchial washings were positive for acid-fast bacilli on microscopic examination in 13 of 34 cases (38.2%) and culture-positive in only 18 of 34 (52.9%), and should therefore not be the sole procedure utilised when bronchoscopy is performed. Transbronchial lung biopsy remains a valuable procedure to confirm pulmonary tuberculosis in patients whose sputum is culture-negative for mycobacteria.

Fibre-optic bronchoscopy with transbronchial lung biopsy is accepted as a safe and useful procedure for evaluating patients who are clinically suspected of having tuberculosis but produce sputum that is microscopy-negative for acid-fast bacilli. However, between 22% and 66% of patients with tuberculosis have negative sputum smears which subsequently culture Mycobacterium tuberculosis. Unpublished data from Hillbrow Hospital show that this occurs in 34.3% of our patients. This study was performed to ascertain what proportion of patients subjected to bronchoscopy could have been spared this procedure if culture results had been awaited or other methods of diagnosing tuberculosis had been utilised.

Patients and methods

A retrospective descriptive analysis was made of the records of all patients from Hillbrow Hospital, Johannesburg, who had undergone fibre-optic bronchoscopy during the 6-year period 1981 - 1986. The policy in the respiratory unit was that patients with suspected tuberculosis were not subjected to bronchoscopy for diagnosis unless they were unable to produce sputum or Ziehl-Neelsen-stained smears of 3 consecutive sputum specimens taken at daily intervals were negative for acid-fast bacilli on microscopic examination. Bronchial washings were performed until 20 ml was collected in a Luken trap. The hospital and laboratory records of patients with histological features of tuberculosis on transbronchial lung biopsy were reviewed. Demographic details, symptomatology, chest radiographic features, and results of skin testing using 5 TU purified protein derivative (PPD), Ziehl-Neelsen staining and microscopy of sputum and bronchial washings, mycobacterial culture, lumbar puncture, bone marrow trephine biopsy and pleural biopsy were recorded and analysed.

Results

During the 6-year period 1981 - 1986, the diagnosis of tuberculosis was made on histological examination of transbronchial lung biopsy specimens obtained from 35 patients. Fig. 1 is a Venn diagram indicating the source of specimens that also yielded a positive bacteriological diagnosis of tuberculosis. There were 24 males and 11 females with a mean age of 46.8 years (range 18 - 71 years). Where symptoms had been recorded, weight loss was present in 92.9%, night sweats in 62.5% and haemoptysis in 62.5% and 66%, respectively. Six patients (18.8%) had received chemotherapy for a previous episode of tuberculosis and 3 had recent close contact with an infected individual. Pyrexia was recorded in 54.5% of patients. The chest radiograph showed a combination of pulmonary infiltrates in 13 patients, bronchopneumonia in 12, destructive changes in 9, lobar consolidation in 5, miliary disease in 3, a mass lesion in 2 and a pleural effusion in 1. PPD skin testing was done in 18 patients and was positive in 9; 7 patients were anergic, and the test was not read in 2.

Histological examination of a pleural biopsy specimen obtained from the patient with a pleural effusion was non-diagnostic, but M. tuberculosis was cultured from the exudate. Lumbar puncture was performed in 1 patient but was negative.

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Five patients had bone marrow trephine biopsy and military tuberculosis was diagnosed in 1.

Sputum specimens could not be obtained from 2 non-productive patients. Of 16 patients whose first 3 sputum specimens were negative on Ziel-Neelsen staining and microscopy, 7 (43.8%) subsequently produced a positive specimen before bronchoscopy. M. tuberculosis was cultured from these 7 specimens and 5 patients who had provided only 3 specimens were also found to be culture-positive (total 12 of 33 patients; 36.4%). The results of microscopy and culture of bronchial washings were not recorded for 1 patient. Of the remaining 34 patients, 13 (38.2%) were seen to have acid-fast bacilli in their bronchial washings. M. tuberculosis was cultured from all of these, and from an additional 5 bronchial washing specimens (total 52.9%). Although histological examination of transbronchial biopsy specimens revealed features characteristic of tuberculosis in all patients, acid-fast bacilli were documented in only 6 (17.1%).

The diagnosis of tuberculosis could potentially have been made without resorting to bronchoscopy in 14 of the patients (40%) if more than 3 sputum specimens had been submitted, the results of sputum or pleural fluid culture had been awaited, and bone marrow trephine biopsy had been performed before bronchoscopy in patients with suspected disseminated tuberculosis.

If bronchial washing alone had been performed without transbronchial lung biopsy, tuberculosis would have been diagnosed in only 18 (51.4%) of the 35 patients.

Transbronchial biopsy was the sole procedure of those performed to document tuberculosis in 13 patients (37.1%). No patient had positive bronchial washings and a negative biopsy. No complications of bronchoscopy and transbronchial biopsy were recorded.

Discussion

While fibre-optic bronchoscopy and transbronchial lung biopsy is accepted to be a safe and useful procedure for confirming tuberculosis in smear-negative patients, studies have not reported whether the diagnosis could have been obtained by less invasive procedures or by waiting for the results of mycobacterial culture of the sputum. In this series the diagnosis of tuberculosis could potentially have been made in 40.0% of cases without resorting to fibre-optic bronchoscopy. Particularly important is the fact that further sputum specimens obtained before bronchoscopy were microscopy-positive in 5 patients (14.3%) after the initial 3 specimens had been reported as negative, and 2 patients (5.7%) were actually smear-positive at the time of bronchoscopy. We now require documentation of 4 negative sputum specimens before scheduling bronchoscopy.

If bronchoscopy had been delayed until the results of mycobacterial culture of the sputum were available and no further investigations had been performed, 34.3% of patients would not have required the procedure. Preliminary mycobacterial culture results are often available at 3-4 weeks and bronchoscopy should be delayed until they are available if the patient’s clinical status permits. However, careful follow-up of patients is mandatory because lesions can progress rapidly. The Bactec 12A culture system has been reported to provide a positive result within 6 days even in smear-negative sputum, and use of this culture system would be advantageous when dealing with specimens from patients who are suspected of having tuberculosis before invasive procedures are performed.

Bone marrow trephine biopsy was helpful for confirming tuberculosis in only 1 of the 6 patients with suspected disseminated tuberculosis in whom it was performed, but thoracentesis yielded the diagnosis in the patient with pleural effusion. We cannot recommend that bronchoscopy be delayed in an attempt to obtain a diagnosis by performing bone marrow biopsy, which has a reported yield of 71% in disseminated disease. Pleural fluid culture and pleural biopsy may yield the diagnosis in 25% and up to 80% of patients respectively.

Mycobacterial culture of bronchial washings gave a positive result in 51.4% of cases, which compares favourably with published data. Since mycobacterial culture provides absolute identification of M. tuberculosis and allows drug sensitivity studies, washings should always be collected. We cannot recommend bronchial washings as the sole procedure, however, because of its poor sensitivity (51.4%). The value of post-bronchoscopy sputa was not assessed in this study.

Transbronchial lung biopsy — which was the sole positive test in 37.1% of patients — thereby increased the value of fibre-optic bronchoscopy. Broncho-alveolar lavage may increase the yield over that of bronchial washings because more peripheral lung is reached and the volume of lung sampled is increased. Post-bronchoscopy sputa are frequently positive owing to increased coughing and liberation of organisms from diseased tissue by bronchial brushings and transbronchial biopsy. These tests should be used as an adjunct to clinical and radiographic evidence of disease to confirm the diagnosis of tuberculosis.

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REFERENCES