

Role of Fibreoptic Bronchoscopy in The Management of Immunocompromised Patients with Pulmonary Infiltrates

Pages with reference to book, From 311 To 312

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Abstract

Immunocompromised patients are prone to develop various pulmonary complications. The range of diagnostic possibilities is wide, infection being the commonest cause. Non-invasive diagnostic tests are often unrewarding. In this study, we have evaluated the diagnostic efficacy and safety of fibreoptic bronchoscopy in immunocompromised patients with pulmonary infiltrates. Patients tolerated the procedure well. This technique identified the etiology in upto 75% of cases. After treatment based on the result of bronchoscopy, 63% patients improved and were discharged (JPMA 48: 311,1998).

Introduction

Immunocompromised patients are prone to develop various pulmonary complications and appearance of lung infiltrates in such patients is not an uncommon occurrence. Infection remains the commonest cause of pulmonary infiltrates but upto 30% of cases may be due to non-infectious causes such as radiation and drug induced pneumonitis, metastases, hemorrhage and pulmonary embolism. Chest radiographic patterns are often non-specific and sputum and blood analyses may be unrevealing. Failure to identify the causative organism could delay the initiation of specific therapy or result in empirical use of large numbers of expensive and potentially toxic antibiotics. Concomitantly, these patients may have bleeding diathesis that can make invasive procedures hazardous. In this study, we have evaluated the diagnostic efficiency and safety of fibreoptic bronchoscopy in immunocompromised individuals with radiologically evident pulmonary infiltrates.

Patients and Methods

We performed an analysis of immunocompromised patients, admitted between June, 1992 and June, 1994 at the Aga Khan University Hospital, who underwent fibreoptic bronchoscopy for establishing the etiology of pulmonary infiltration. Information was collected about clinical history, physical examination, radiology and laboratory investigations including sputum and blood cultures. The main indication for fibreoptic bronchoscopy in these individuals was failure to respond to empirical antibiotic therapy and/or failure to isolate the causative organism by non-invasive tests. The procedure was not performed in those individuals who had severe hypoxia ($\text{PaO}_2 < 60$ mm Hg despite maximal oxygen therapy) or severe thrombocytopenia (platelet count $\times 10^9 / \text{l}$). Patients with a prolonged prothrombin time (> 15 seconds) received fresh frozen plasma immediately before the procedure. Bronchoscopy was performed under local anesthesia and intravenous sedation. Bronchial tree was inspected for endobronchial lesion and washing was sent for bacterial, fungal and mycobacterial stains and cultures and for cytology. Stain for *Pneumocystis* was performed in selected cases. Results of fibreoptic bronchoscopy and final outcome of hospital stay was noted.

Results

Total of 19 fibreoptic bronchoscopies were performed on 18 patients, one had the procedure performed twice over a 3 month period. Mean age was 45.2 (range 18-70) years, with a male to female ratio of 3.5:1. All the cases were immunocompromised, of these 17 had underlying malignancy and had received chemotherapy and/or 'high dose corticosteroid, one had AIDS and one had Sjorgen's syndrome being treated with high dose corticosteroid. Clinical features included fever (90%), chest pain (45%), dyspnoea(33%) and haemoptysis (5%). All had pulmonary infiltrates on chest radiograph, the infiltrates were unilateral in 53% and bilateral in 47% cases. Evidence of cavitation was seen in 31% and pleural effusion in 31% patients. Pneumothorax was seen in one (5%) patient. Initial laboratory investigation revealed that nearly half of the patients had hemoglobin under 10 mg/dl, one third had platelet count below $100 \times 10^9/l$ and a quarter had pmthrombin time more than 16 seconds. White cell count was below $2 \times 10^9/l$ in 26% and electrolyte imbalance was seen in 21% subjects. Patients tolerated the procedure well, the only complication being brisk hemorrhage in one case, which settled with conservative therapy. There was no mortality associated with the procedure.

Table. Results of fibreoptic bronchoscopy and its correlation with chest radiograph findings (total No. of bronchoscopy=19).

I. Organism identified on bronchial washing	14 (74%)*
Pseudomonas aeruginosa	4
Aspergillus	4
Mycobacterium tuberculosis	3
Staphylococcus aureus	2
Haemophilus influenzae	1
Cryptococcus	1
Candida albicans	1
II. Radiographic appearance and causative organism.	
a) Infiltrates with cavitation	
Aspergillus	(3)
Staphylococcus	(2)
Cryptococcus	(1)
b) Infiltrates without cavitation	
Pseudomonas	(4)
Tuberculosis	(3)
Aspergilus	(1)
Haemophilus	(1)
Candida	(1)
*Two patients had more than one organism isoalted from bronchial washing.	

The Table summarizes the fmdingsofbronchoscopy and correlates them withchanges on chest radiograph. It illustrates that this technique had a potential to identify the etiology in upto 75% of cases. Most cavitating pneumonia were caused by Aspergillus and Staphylococcus aureus, whereas

tuberculosis produced noncavitating pneumonia in immunocompromised patients. After treatment based on the results of bronchoscopy, 12 (63%) patients improved and were discharged, whereas 37% died during their hospital stay.

Discussion

Management of immunocompromised patients with pulmonary infiltrates is a difficult clinical problem. The range of diagnostic possibilities is wide, infection being the commonest cause. Non-invasive diagnostic tests are often unrewarding. Although guidelines for management have been developed^{1,2}, they are mostly based upon single institution studies from Western countries and are not necessarily relevant to physicians' home geographic locations. However, before performing an invasive procedure, thought must be given to what changes in management may be made once results are known.

At the time of presentation, the physician has to make a decision whether to start empirical therapy or to perform an invasive diagnostic test. Fiberoptic bronchoscopy is well tolerated, is safe and is often the initial procedure of choice³. It provides access to the lower respiratory tract secretions and tissue in a number of ways:

- a) bronchial washing, collection of pooled secretions from airways,
- b) bronchoalveolar lavage, large volume of saline (100-240 mls) is instilled and then collected by suction from a distal airway;
- c) bronchial brushing, a brush is projected through a catheter into the desired segment and samples are obtained; and
- d) biopsy, either of the airway (bronchial) or the alveoli (transbronchial).

Other invasive investigations are transtracheal aspiration, percutaneous needle aspiration, core needle biopsy of the lung and open lung biopsy. The choice of procedure depends on the expected yield and the complication rate of the procedure, suspected diagnosis and the clinical situation.

In a study of 118 patients⁴, the yield of fiberoptic bronchoscopy with brushing, lavage and transbronchial biopsy was found to be 73%. The pattern of infection varied according to the cause of immunosuppression. *Pneumocystis carinii* was the predominant pathogen in HIV positive patients, cytomegalovirus in transplant recipients and bacteria (including mycobacteria) in patients receiving immunosuppressive and/or cytotoxic drug therapy. Our study confirms the usefulness of fiberoptic bronchoscopy in identifying the organisms that leads to rationalizing of antibiotic therapy. In our series *aspergillus*, *pseudomonas*, *staphylococcus* and *mycobacterium tuberculosis* were the most commonly identified organisms. TB often presents in an atypical manner in immunocompromised patients i.e., non-cavitating or lower lobe lesion and this fact has been observed in other studies⁵.

Growth of bacteria and *Candida* from bronchial washing should always be viewed cautiously because of the possibility of colonization and contamination from upper airways. To circumvent this problem, protected brush specimen have been used but it may not always provide an uncontaminated specimen⁶. Secondly, quantitation of the organism recovered may help to determine whether the organism is an upper respiratory contaminant or represents lower respiratory infection⁷. In general, if the specimen has $>10^5$ colony forming units/ml then it represents pneumonia. With the use of more myelosuppressive combination chemotherapy, the risk of developing pulmonary and other infections has increased. The choice in early management is mainly limited to empirical therapy or use of an invasive procedure to identify the causative agent. Our study has shown that the use of fiberoptic bronchoscopy in experienced hands is safe and is able to identify the organism in 74% of cases. Some of the organisms appeared to be the definite cause (fungal and mycobacterial) whereas others (bacterial) were probable

cause of the pulmonary infiltrate. However, even this knowledge was helpful as it helped to rationalize the drug therapy. Other causes of an abnormal radiograph such as endobronchial obstruction (leading to distal collapse or pneumonia) can also be identified. In 21% cases the results were non-diagnostic. We now need prospective randomized studies to assess whether early use of invasive procedures would influence the final outcome of these patients.

References

1. Rosenow EC, Wilson WR, Cockerill FR. Pulmonary disease in the immunocompromised host. *Mayo Clin. Proc.*, 1985;60(7):473-87.
2. Staszewski H. Diffuse pulmonary infiltrates in immunocompromised patients. Reconciling theory and practice. *Post Grad. Med.*, 1993;94(1):69-78.
3. Matthay RA, Farmer WC, Odero D. Diagnostic fiberoptic bronchoscopy in the immunocompromised host with pulmonary infiltrates. *Thorax.*, 1977;32:539-45.
4. Heurlin N, Brattstrom C, Lonnqvist B et al. Aetiology of pulmonary diseases in immunocompromised patients. *Eur. Resp.J.* 1991 ;4(1): 10-18.
5. Asimos AW, Ehrhardt J. Radiographic presentation of pulmonary tuberculosis in severely immunocompromised HIV-seropositive patients. *Am. J. Emerg. Med.* 1996; 14(4):359-63.
6. Wimberley N, Faling LJ, Bartlett JG et al. A fiberoptic bronchoscopy technique to obtain uncontaminated lower airway secretions for bacterial culture. *Am. Rev. Respir. Dis.*, 1979;119:337-43.
7. Winterbauer RH, Hutchinson JF, Reinhardt GNM et al. The use of quantitative cultures and antibody coating of bacteria to diagnose bacterial pneumonia by fiberoptic bronchoscopy. *Am. Rev. Respir. Dis.*, 1983;128:98-103.