

Bronchoscopy: A Modern Tool in the Diagnosis of Pulmonary Infections

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ABSTRACT

Aim: To assess the significance of bronchoalveolar lavage and fiberoptic bronchoscopy in the early diagnosis of sputum smear negative pulmonary infections.

Methods: This descriptive study was undertaken at the Department of Thoracic Surgery, King Edward Medical University/Mayo Hospital Lahore. A total of 115 patients of age 15 and above with clinical and/or radiological evidence of an infective pulmonary disease process and an inconclusive sputum smear were registered in this study. Chest radiographs were obtained in all of the cases. Flexible Bronchoscopy and Bronchoalveolar Lavage (BAL) were performed in all cases. Bronchial washings obtained from each patient were divided into two specimens. One was sent for ZN staining while the other was sent for gram staining and pyogenic culture and sensitivity. BAL findings were then noted in relation to radiological and bronchoscopic findings.

Results: A total of 115 patients, 66 males and 49 females with clinical and/or radiological suspicion of a pulmonary infection and a negative sputum smear were subjected to Flexible Bronchoscopy during which Bronchoalveolar lavage was performed and Bronchial washings were taken. Each sample was divided into two specimens to look for AFB's or pyogenic bacterial growths separately via stains and culture. Final results of BAL analysis revealed 41(35.7%) out of 115 samples to be positive for AFB's, 41(35.7%) positive for pyogenic infections while 33(28.7%) samples exhibited no evidence of any bacterial growth.

Conclusion: We suggest that physicians actively consider performing Bronchoscopy in sputum smear negative patients suspected of TB and other pulmonary infections.

Keywords: Fiberoptic Bronchoscopy (FOB), Bronchoalveolar Lavage (BAL)

INTRODUCTION

Fiberoptic Bronchoscopy (FOB) is an important entity in the armamentarium of procedures listed in diagnosis of respiratory problems. It is a universally accepted procedure both in the diagnosis and therapy of various pulmonary disorders. This procedure allows not only careful inspection of the bronchial tree for endobronchial lesions or foreign body but also helps in recovery of deep respiratory secretions, brushings and biopsy, which are useful in diagnosis of uncommon infections, neoplasm and other non infectious causes¹.

When detailed history, proper clinical examination, chest radiology and sputum analysis do not yield a definite diagnosis for the cause of cough, Bronchoscopy is indicated². Fiberoptic Bronchoscopy is used for diagnosis of various pulmonary disorders³. In adults, the main method of diagnosis of pulmonary tuberculosis is isolation of the organism from sputum. However, difficulties arise when a patient both clinically and radiologically suspected of active tuberculosis does not produce sputum. About 50% of

patients with active pulmonary tuberculosis suspected clinically or radiologically may fail to produce sputum, or when it is available acid-fast bacilli (AFB) may be negative on repeated smear examination⁴. In children, gastric lavage is recommended for the collection of respiratory secretions⁵.

Flexible fiberoptic bronchoscopy with bronchial aspiration and bronchoalveolar lavage under local anesthesia is a relatively safe procedure and is well tolerated by most of the patients. Its safety and diagnostic yield have been reported before. Complications are known but rare in occurrence^{6,7}.

PATIENTS AND METHODS

This descriptive study was undertaken at the Department of Thoracic Surgery, King Edward Medical University/Mayo Hospital Lahore. A total of 115 patients of age 15 and above with clinical and/or radiological evidence of an infective pulmonary disease process and an inconclusive sputum smear were registered in this study. Paediatric patients and patients with clinical and radiological suspicion of a pulmonary malignancy were excluded from this study. Patients were evaluated clinically and history

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was taken on a pre-defined questionnaire. Patients were assessed for presence of symptoms like cough, expectoration, hemoptysis, fever, night sweats and weight loss. Chest radiographs were obtained in all of the cases. Flexible Bronchoscopy and Bronchoalveolar Lavage (BAL) were performed in all cases. Bronchial washings obtained from each patient were divided into two specimens. One was sent for ZN staining while the other was sent for gram staining and pyogenic culture and sensitivity. BAL findings were then noted in relation to radiological and bronchoscopic findings. Results of BAL were then classified in three groups i.e. AFB positive, Positive for pyogenic organisms and samples with no isolates. These results were then tabulated in accordance with radiological and bronchoscopic findings and various percentages were calculated.

RESULTS

The results of this study are summarized in Tables 1 and 2. A total of 115 patients, 66 males and 49 females with clinical and/or radiological suspicion of a pulmonary infection and a negative sputum smear were subjected to Flexible Bronchoscopy during which Bronchoalveolar lavage was performed and Bronchial washings were taken. Each sample was divided into two specimens to look for AFB's or pyogenic bacterial growths separately via stains and culture. Final results of BAL analysis revealed 41(35.7%) out of 115 samples to be positive for AFB's, 41(35.7%) positive for pyogenic infections while 33(28.7%) samples exhibited no evidence of any bacterial growth.

Table 1 shows the distribution of patients according to BAL findings in relation to radiological zones of the disease process. The results show that 51(44.3%) out of 115 patients had radiological evidence of disease process in the right lung alone, 45(39.1%) had radiological evidence of disease process in the left lung alone, whereas 19(16.5%) had radiological disease in both lungs. Out of 41 AFB positive cases, 18(43.9%) had radiological evidence of disease in the right lung alone, 18(43.9%) had radiological evidence of left sided disease alone while 5(12.2%) cases had bilateral disease. Out of 41 samples positive for a pyogenic infection, 23(56.1%) had an isolated right lung involvement, 12(29.3%) had isolated left lung involvement whereas 6(14.6%) had bilateral disease on chest radiographs. The BAL samples of the remaining 33 cases with a radiological evidence of disease process produced results negative for both AFB's and pyogenic bacteria out of which 10(30.3%) had radiological disease in the right lung, 15(45.5) had a left sided disease while 8(24.2%) had bilateral radiological disease.

Based on evidence of disease process with respect to radiological zones, 40(34.8%) out of 115 cases had radiological disease in the upper zone on either of the two sides, 25(21.7%) had diffuse lung involvement, 19(16.5%) had middle zone involvement on one of the two sides, 18(15.7%) had lower zone disease of either of the two sides, 10(8.7%) had combined upper and middle zone involvement on the same side, 2(1.7%) had middle and lower zone disease on the same side whereas 1(0.9%) case had disease in right upper and left middle zone.

The 41 AFB positive cases had involvement of upper zone on either side in 19(46.3%) cases, 10(24.4%) cases had involvement of middle zone, 6(14.6%) had radiological disease in all three zones, 4(9.8%) had disease in the lower zone while 2(4.9%) had involvement of both upper and middle zones. Out of 41 cases with pyogenic infection on BAL analysis, 11(26.8%) had upper zone disease, 10(24.4%) had involvement of all the zones, 8(19.5%) had lower zone disease, 6(14.6%) had involvement of both upper and middle zones, 3(7.3%) had middle zone involvement alone, 2(4.9%) had disease in both middle and lower zones while 1(2.4%) had disease involving right upper and left middle zones. 10(30.3%) upper, 9(27.3%) diffuse, 6(18.2%) middle, 6(18.2%) lower and 2(6.1%) combined upper and middle zone radiological disease cases had negative BAL analysis for both AFB's and pyogenic bacterial infections.

Table 2 summarizes the Bronchoscopic findings and their relation with the final results on BAL analyses. Out of 115 cases, 34(29.6%) had normal bronchoscopic findings while BAL in these cases revealed 14(41.2%) samples positive for AFB's, 06(17.6%) samples positive for pyogenic infection while 14(41.2%) samples were negative for any growth. In 26(22.6%) cases, phlegm and mucoid secretions were visualized on Bronchoscopy and BAL from these cases revealed 09(34.6%) samples positive for AFB's and 17(65.4%) samples positive for pyogenic infection. Mucosal inflammation and hyperemia were observed on Bronchoscopy in 21(18.3%) cases with BAL findings positive for AFB's in 10(47.6%), pyogenic infection in 06(28.6%) and no evidence of AFB or other bacteria in 05(23.8%) cases. Distorted, dilated or stenosed airways were found on Bronchoscopy in 14(12.2%) cases, BAL of whom revealed AFB's in 05(35.7%), pyogenic infection in 05(35.7%) and no growth in 04(28.6%) cases. External compression of airway was noticed during Bronchoscopy in 05(4.3%) cases. BAL findings in these cases had 1(20%) sample positive for pyogenic infection and 04(20%) samples with no growth. Blood in bronchial tree was visualized in Bronchoscopy of 03(2.6%) cases whose BAL was

positive for AFB in 01(33.3%), pyogenic infection in 01(33.3%) and no growth in 01(33.3%) sample. Endobronchial lesion was found on Bronchoscopy in 02(1.7%) cases. BAL in these cases revealed AFB's

in both cases (100%). The remaining 10(8.7%) cases had other miscellaneous findings on Bronchoscopy and their BAL revealed pyogenic infection in 05(50%) cases and no growth in the remaining 05(50%) case.

Table 1: Distribution of Patients According to BAL Findings in Relation to Radiological Zones of Disease Process

| | AFB | BACT | NO | Total |
|------------|-----------|-----------|-----------|-----------|
| Male | 26 | 21(51.2%) | 19(57.6%) | 66(57.4%) |
| Female | 15(63.4%) | 20(48.8%) | 14(42.4%) | 49(42.6%) |
| Total | 41(100%) | 41(100%) | 33(100%) | 115(100%) |
| Right side | 18(43.9%) | 23(56.1%) | 10(30.3%) | 51(44.3%) |
| Left side | 18(43.9%) | 12(29.3%) | 15(45.5%) | 45(39.1%) |
| Bilateral | 5(12.2%) | 6(14.6%) | 8(24.2%) | 19(16.5%) |
| Total | 41(100%) | 41(100%) | 33(100%) | 115(100%) |
| Lower zone | 4(9.8%) | 8(19.5%) | 6(18.2%) | 18(15.7%) |
| Mid zone | 10(24.4%) | 3(7.3%) | 6(18.2%) | 19(16.5%) |
| Mid+lower | 0 | 2(4.9%) | 0 | 2(1.7%) |
| RUZ+LMZ | 0 | 1(2.4%) | 0 | 1(0.9%) |
| Total | 6(14.6%) | 10(24.4%) | 9(27.3%) | 25(21.7%) |
| Upper | 19(46.3%) | 11(26.8%) | 10(30.3%) | 40(34.8%) |
| Upper+mid | 2(4.9%) | 6(14.6%) | 2(6.1%) | 10(8.7%) |
| Total | 41(100%) | 41(100%) | 33(100%) | 115(100%) |

Table 2: Distribution of Patients According to BAL Findings in Relation to Bronchoscopy Findings

| Bronchoscopy findings | AFB | BACT | NO | Total |
|--|-----------|-----------|-----------|----------|
| Normal | 14(41.2%) | 06(17.6%) | 14(41.2%) | 34(100%) |
| Phlegm & Secretions | 09(34.6%) | 17(65.4%) | 00 | 26(100%) |
| Mucosal Inflammation & Hyperemia | 10(47.6%) | 06(28.6%) | 05(23.8%) | 21(100%) |
| Distortion, Dilatation, Stenosis of Airway | 05(25.7%) | 05(35.7%) | 04(28.6%) | 14(100%) |
| External Compression | 00 | 01(20%) | 04(80%) | 05(100%) |
| Blood in Bronchial Tree | 01(33.3%) | 01(33.3%) | 01(33.3%) | 03(100%) |
| Endobronchial Lesion | 02(100%) | 00 | 00 | 02(100%) |
| Others | 00 | 05(50%) | 05(50%) | 10(100%) |

DISCUSSION

Drug resistance in tuberculosis is a serious health problem throughout the world especially, after the emergence of multi drug resistance strains.⁸ Since its introduction in 1968 Ikeda et al. flexible fibreoptic bronchoscope has become a very useful tool in patient care and medical research. Proper selection of instrument is necessary to ensure effective and safe procedure. The insignificant difference in the clinical presentations, X-ray and other findings in our study suggest that though the signs, symptoms and radiographic findings provide important clue for pulmonary tuberculosis and other pyogenic infections, they cannot confirm the diagnosis of pulmonary tuberculosis. Acid fast stain positivity and culture isolation can only provide the definitive diagnosis. Therefore, patients with radiographic and clinical findings compatible with Pulmonary TB but sputum smear negative are a challenge for the physician as to start ATT or not. It has been reported that 74% of these patients develop active tuberculosis in five years if not treated.⁹ Flexible fibreoptic Bronchoscopy is considered as a safe

diagnostic and interventional tool. It was concluded that bronchoscopy should be conducted on all patients without expectoration and negative sputum bacilloscopy and that bronchoalveolar lavage performance should be a routine procedure as it is a simple and usually uncomplicated technique.¹⁰

Among various bronchoscopic specimens, BAL is considered best for diagnosis of TB.¹¹ In one study, a BAL sample had significantly higher yield than bronchial wash. The higher yield is said to be due to large volume of saline used and less use of the anesthetic agent.¹² Bronchoscopic samples has a lower yield in several studies but at the same time some of studies have significant results and have emphasized the usefulness of BAL samples in the diagnosis of sputum smear negative pulmonary tuberculosis.

CONCLUSION

In conclusion, our results suggest that fibreoptic Bronchoscopy has good sensitivity and specificity and was useful in the rapid diagnosis of sputum smear negative pulmonary tuberculosis and the

exclusion of non TB in sputum smear negative TB suspected patients. We suggest that physicians actively consider performing Bronchoscopy in sputum smear negative patients suspected of TB and other pulmonary infections.

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