ORIGINAL ARTICLE

ROLE OF FIBEROPTIC BRONCHOSCOPY IN NON-RESOLVING PNEUMONIA

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ABSTRACT

Introduction: Non-resolving pneumonia is always a challenging clinical scenario where various diagnostic modalities are greatly required to reach the diagnosis. We aimed to study the role of fiberoptic bronchoscopy in non-resolving pneumonia along with the various comorbidities associated with the disease condition.

Methodology: A cross sectional study in a tertiary care hospital was undertaken. A total of 60 patients diagnosed with non-resolving consolidation were recruited for diagnostic fiberoptic bronchoscopy.

Results: The overall diagnostic yield of fiberoptic bronchoscopy in non-resolving pneumonia was 96.66%. The causes of non-resolving pneumonia were tuberculosis (40 (66.67 %), bacterial pneumonia (8 (13.33 %)), malignancy (6 (10%)), fungal pneumonia (3 (5 %)) and foreign body (1 (1.66 %) in order of decreasing proportions. 2 cases (3.33 %) were undiagnosed. 29 (48.33%) patients had a significant past history which also revealed associated co morbid conditions. Chronic obstructive pulmonary disease (COPD) (14 (23.33 %)) and diabetes (10 (16.66%)) were the leading comorbid conditions.

Conclusion: Fiberoptic bronchoscopy is a great utility tool in reaching the diagnosis in patients with non-resolving pneumonias.

Keywords: Bronchoscopy, pneumonia, consolidation, Fiberoptic, Tuberculosis, COPD, Diabetes

INTRODUCTION

The term non resolving or slowly resolving pneumonia commonly refers to the persistence of radiographic abnormalities beyond the expected time limit. Such patients may be at an increased risk of delayed diagnosis which may adversely affect their outcomes. Evaluation of patients with non-resolving pneumonia is extremely difficult and requires an aggressive approach to prevent the delay in diagnosis and treatment. It accounts for approximately 10% to 15% of nosocomial pneumonias and is estimated to be responsible for approximately 15% of inpatient pulmonary consultation and 8% of bronchoscopies. Delay in diagnosis and treatment may lead to rise of mortality by 3% to 5% in both community-acquired pneumonia and nosocomial pneumonia.[1] Mortality in non-responding pneumonia increases three-fold in community-acquired and five-fold in nosocomial pneumonia compared with global mortality in hospitalized patients.[2] In such a scenario, there is a need of a diagnostic test of increased utility in reaching the diagnosis at an earlier stage. Such an optimum diagnostic test should help the treating physician to identify the underlying etiology so as to be able to plan a specific etiology directed management, a prerequisite for improved treatment outcomes in today's era of evidence based medicine. Among the various diagnostic modalities available to the treating physician, fiberoptic bronchoscopy, as a diagnostic tool has immense potential to deliver this important role in diagnosis of non-resolving pneumonia. Efficacy of fiberoptic bronchoscopy in the etiological diagnosis of non-resolving or slowly resolving pneumonia has been around 70% to 86% in some studies. Detailed microbiological, cytological and histopathological tests of the yielded specimens by this procedure can be done for etiological diagnosis of underlying cause.[1] In this study, we aimed to establish the role of fiberoptic bronchoscopy in evaluating the etiological diagnosis of non-resolving pneumonia or slowly resolving pneumonia and also to find out co-morbid conditions if any associated with non-resolving pneumonia.

METHODOLOGY

Study design: This study was a cross-sectional study, performed in the department of Pulmonary Medicine

at a tertiary care teaching institution of central India over a period of two years (November 2012 to October 2014). Study Population: Sixty consecutive cases of non-resolving or slowly resolving pneumonia of both genders, attending the department of Pulmonary Medicine during the study period, were selected by adhering to the inclusion and exclusion criteria. Inclusion criteria: Non-resolving or slowly resolving pneumonia was defined in this study by the presence of persistence of clinical symptoms and signs (cough, sputum production, with or without fever more than 100°F), failure of resolution of the radiographic features by fifty percent in two weeks or completely in four weeks on serial chest radiographs (indicated in at least two consecutive chest radiographs) in spite of antibiotic therapy for a minimum period of ten days, and sputum for acid fast bacilli (AFB) smear negative for two consecutive days.[1] Exclusion criteria: Known patients of lung cancer or sputum smear-positive pulmonary tuberculosis, bleeding diathesis, patients having very poor general condition, very severe breathlessness, recent history of myocardial infarction, positive test result for human immunodeficiency virus (HIV) infection, and unwilling patients were excluded from our study. Study Protocol: The study was initiated after approval from the institutional ethics committee. After application of inclusion and exclusion criteria, with prior informed consent, the patients were included in the study. Detailed demographic and clinical parameters were recorded in all the patients. All patients were subjected to the following investigations:

1. Screening investigations prior to bronchoscopy: Complete haemogram, random blood sugar, chest radiograph - PA and lateral views, sputum smear examination for AFB - two samples (one spot sample & one early morning sample) carried out by Ziehl–Neelsen (ZN) staining technique, induced sputum smear examination for AFB (if previous test negative), electrocardiogram (ECG), tests for HIV and HBsAg. Ancillary investigations included computed tomography scan (CT Scan) of the thorax and Mantoux test as and when required as per individual assessment of each case.

2. Study Investigation - Bronchoscopy: Next, a fiberoptic bronchoscopy was planned. During bronchoscopy, the macroscopic appearance of the bronchial tree was noted. In most patients, various combinations of bronchial washings, endobronchial biopsy, bronchial brushing and trans-bronchial needle aspiration (TBNA) were carried out according to the bronchoscopic findings. When no lesion was seen, bronchial washings were collected in all patients and bronchial brushing in some patients from the appropriate segments as determined by chest radiograph and CT-scan thorax images. Post bronchoscopy sputum was collected and sent for investigations in all patients. Bronchial washings were sent for cell type, AFB smear and culture for mycobacterium tuberculosis. The methods used for culture of mycobacterium tuberculosis were solid culture -Löwenstein–Jensen (LJ) medium and/ or mycobacterial growth indicator tube (MGIT-960). A growth on either of the two culture media or AFB positive smear or biopsy suggestive of tuberculosis was considered favorable for a definitive diagnosis of tuberculosis. Bronchial washings were also investigated for gram stain and culture, fungal stain and culture, and malignant cells in all patients. Bronchial brushings and biopsy when done, were sent for AFB smear and cytopathology, and histopathology, respectively. Post-bronchoscopic sputum for analysis of AFB smear and malignant cells were also sent.

Analysis of results: After completion of the study, the clinical data as per pro forma was analyzed for all the 60 patients; observation and results were documented. Descriptive statistics like mean, standard error of mean (SEM) were calculated and proportion method were used to express the results. Data were analyzed by Epi Info software.

RESULTS

During the period of two years, sixty consecutive patients of both sexes, having chest radiograph suggestive of non-resolving pneumonia or slowly resolving pneumonia as per the study criteria, were enrolled in this study. Overall, the mean age of the patients was 41.2 ± 1.51 years (mean ± SEM). Among the 60 patients, 45 (75%) were male and 15 (25%) female. Mean duration of illness was 1.6 ± 0.09 months (mean ± SEM). 44 (73.33%) patients had history of smoking, alcoholism or tobacco chewing. Of these, 34 patients (56.66%) were addicted to more than one of these habits. 30 patients (50%) had smoking habits, 19 patients (31.66%) were alcoholic and 33 patients (55%) had tobacco chewing habits. The addiction history of the patients is depicted in table 1.

29 (48.33%) patients had a significant past history which also revealed the associated co morbid conditions. Of these 29 patients, 8 patients had more than one co-morbid condition. 14 patients (23.33 %) had chronic obstructive pulmonary disease (COPD), 10 patients (16.66%) had diabetes mellitus, 5 patients (8.33%) had pulmonary tuberculosis in the past having received treatment for the same. 4 patients (6.66%) had systemic hypertension and 4 patients (6.66%) with bronchial asthma. COPD being the most common comorbidity noted in 14 patients (23.33%) of which, 8 patients were diagnosed currently with active pulmonary tuberculosis, 3 patients with malignancy, 2 patients with bacterial pneumonia and one patient with fungal pneumonia. In 10 diabetic patients, there were 3 patients each of fungal pneumonia, pulmonary tuberculosis, malignancy and

1 case of bacterial pneumonia. All 5 patients with past history of pulmonary tuberculosis were found to have active pulmonary tuberculosis in current study.

Table 1: Distribution of study group by Addiction history (N=60)

Addiction history	No. (%)
Smoking	30 (50.0)
Alcoholism	19 (31.7)
Tobacco chewing	33 (55.0)

Table 2: Gross fiberoptic bronchoscopic findings (N=60)

Findings	No. (%)
Growth	4 (6.7)
Erosion / Ulcer	28 (46.7)
Congestion / Hyperaemia	44 (73.3)
Stenosis	4 (6.7)
Secretions	46 (76.7)
Bleeding	6 (10.0)

Table 3: Diagnostic outcome of fiberoptic bronchoscopy in cases of non-resolving pneumonia (N=60)

Outcome	No. (%)
Pulmonary Tuberculosis	**40 (66.7)**
Bacterial pneumonia	**8 (13.3)**
Klebsiella pneumonia	3 (5.0)
Pseudomonas aeruginosa	2 (3.3)
Streptococcus pneumonia	2 (3.3)
E.coli	1 (1.7)
Malignancy	**6 (10)**
Adenocarcinoma	3 (5.0)
Squamous cell carcinoma	2 (3.3)
Small cell carcinoma	1 (1.7)
Fungal Pneumonia	**3 (5.0)**
Candida albicans	2 (3.3)
Aspergillus fumigatus	1 (1.7)
Foreign body	**1 (1.7)**
Undiagnosed	**2 (3.3)**

Chest radiograph: Analysis of chest radiograph for the site of the lesion among the 60 patients studied revealed that 11 patients (18.33%) had bilateral lesions and 49 patients (81.66%) had unilateral lesions. Of these 49 patients, 31 patients (51.66%) had right sided lesions and the remaining 18 patients (30%) had left sided lesions. Further analysis revealed that 40 patients (66.66%) had infiltrates in one lobe or one segment, whereas 20 patients (33.33%) had multilobar infiltrates. CT scan Thorax: In the study, out of 60 patients, 24 patients had their CT scan thorax done prior to fiberoptic bronchoscopy. Of these 24 patients, the most common radiological lesions on CT scan thorax were consolidation, seen in 21 patients (87.5%) and lymphadenopathy (≥10 mm) in 21 patients (87.5%), followed by tree-in-bud appearance in 9 patients (37.5%), nodule in 8 patients (33.3%) and cavity in 6 patients (25%).

Bronchoscopy: The gross fiberoptic bronchoscopic findings are enumerated in table no.2. The overall diagnostic yield of fiberoptic bronchoscopy in non-resolving pneumonia was 96.66 %. The details are depicted in table no. 3. Specific procedures: i) Bronchial washings: 1) AFB staining: In this study bronchial washings were taken in all 60 patients. 40 patients out of 60 (66.67%) patients with non-resolving pneumonia were diagnosed as pulmonary tuberculosis. 22 patients were positive for AFB smear staining in bronchial washings. 2) AFB culture: All the pulmonary tuberculosis suspected patients' bronchial washings were sent for culture for mycobacterium tuberculosis. 36 patients' specimens were found to be culture positive. 3) Cytology: Bronchial washings were routinely sent for cytological evaluation. Malignant cells were seen in 2 specimens out of which one was squamous cell carcinoma and another was adenocarcinoma. 4) Gram stain, culture and sensitivity: Out of 60 patients, 8 patients were diagnosed with bacterial pneumonia. Bronchial washings bacterial culture yielded 3 cases of Klebsiella pneumonia, 2 cases of Pseudomonas pneumonia, 2 cases of Streptococcus pneumonia and 1 case of E-coli pneumonia. 5) Fungal stain and culture: Out of 60 patients, 3 patients were diagnosed as fungal pneumonia. ii) Bronchial brushing: Bronchial brush cytology proved malignancy in 3 patients. 2 patients had adenocarcinoma and 1 had squamous cell carcinoma. iii) Endobronchial biopsy: Endobronchial biopsy was done in 12 patients. Out of these, malignancy was diagnosed in 6 patients (squamous cell carcinoma in 3 patients, adenocarcinoma in 2 patients and small cell carcinoma in 1 patient). Endobronchial biopsy of 4 patients showed features suggestive of tuberculosis. Nonspecific findings were seen in 3 endobronchial biopsy specimens. iv) TBNA: TBNA was done in 5 patients. Among them 2 patients' TBNA was suggestive of tuberculosis, 1 patient had malignant deposits and remaining 2 patients' TBNA were non-specific. v) Post bronchoscopy sputum: All pulmonary tuberculosis suspected patients had their post bronchoscopy sputum sent for AFB staining and suspected malignant patients' samples were sent for additional cytological evaluation. 5 patients' post bronchoscopy sputum was positive for AFB staining. 1 patient's post bronchoscopy sputum was positive for malignant cells (adenocarcinoma). Complications: Complications during or after bronchoscopic procedure were very few. Minor hemorrhage following forceps mucosal biopsy was seen in only 1 patient (1.66%). Hypoxia during the bronchoscopic procedure was seen in 1 patient (1.66%). However, serious complications like respiratory failure, cardiac arrhythmia & cardiac arrest did not occur in our study group.

DISCUSSION

Amberson was the first person to describe the term "unresolved organizing or protracted pneumonia" in 1943.[3] There is lack of uniformity regarding the definition for non-resolving pneumonia, however in many studies, the entity of "slow resolution" has been defined as failure of radiographic resolution by 50% in two weeks or failure of complete resolution by one month despite adequate antibiotic therapy.[4] A non-resolving pneumonia heralds a clinical scenario where the diagnostic dilemma is a cause of clinical concern. The lack of a definitive etiological diagnosis prevents a more targeted approach in the management. Among the various diagnostic tools available for such a scenario, the role of diagnostic bronchoscopy cannot be undermined.

In our study 23.33% patients were above the age of 50 years. Fein has shown in his study that only 30% of patients above 50 years of age show complete radiological resolution by 4 weeks.[5] Non-resolving or slowly resolving pneumonia is common in elderly patients due to age related impairment of several components of host defenses.

COPD (23.33%) and diabetes (10%) were the common comorbidities in our study. Jaiprakash et al. in their study also found that COPD (35.7%) and diabetes (45.7%) were the major comorbidities in patients of non-resolving consolidation.[6] The presence of these comorbidities should alert the treating physician of a possibility of these patients progressing to non-resolving consolidation at a later time period in the course of the disease and hence initial aggressive management of pneumonia is warranted in these patients.

The overall diagnostic yield of fiberoptic bronchoscopy in our study was 96.66%. Previous studies by Silver et al. and Choudhary et al. demonstrated a diagnostic yield of 86% and 85.7% in similar scenario.[1,7] Thus our study showed a higher diagnostic yield of fiberoptic bronchoscopy compared to previous studies.

Pulmonary Tuberculosis was the most common cause of non-resolving pneumonia in our study (66.67%). This was followed by bacterial pneumonia, malignancy, fungal pneumonia and foreign body respectively in decreasing proportion as the etiology in our study. Thus all non-resolving pneumonia patients should be evaluated for active pulmonary tuberculosis. This finding reiterates the role of fiberoptic bronchoscopy in diagnosis of sputum smear negative pulmonary tuberculosis. Jacomelli et al. in their previous study have also demonstrated the good utility of bronchoscopy for the diagnosis of pulmonary tuberculosis in patients with negative sputum smear microscopy results.[8] Also all patients with past history of pulmonary tuberculosis in this study revealed pulmonary tuberculosis as the etiology of non-resolving consolidation. Thus in patients with past history of pulmonary tuberculosis, there should always be a high index of suspicion of relapse. Any delay in the diagnosis of tuberculosis in such patients may be a risk factor for drug resistant form of the disease.[9] Correct diagnosis and proper treatment is always imperative in such a scenario as any error in either of the two are known detrimental factors in the prognosis of tuberculosis, especially in India.[9,10]

Though two third of the patients (66.67%) were diagnosed to be suffering from pulmonary tuberculosis, remaining one third of the patients were diagnosed with other etiologies like malignancy and bacterial pneumonia. Thus even though tuberculosis was the most common etiology of non-resolving consolidation in this study it is recommended to search for an evidence based diagnosis of the etiology as initiation of empirical anti-tuberculosis treatment could lead to delay in diagnosis of other possible etiologies like malignancy or even foreign body which could adversely affect the disease outcome.[11,12]

Bacterial pneumonia was the etiology of non-resolving pneumonia in 8 patients (13.33 %) in the current study. The possible causes of bacterial etiology of non-resolving pneumonia may be inadequate or inappropriate initial antibiotic therapy or antibiotic resistant pathogens.[13]

Three patients in the current study were diagnosed to be cases of fungal pneumonia. These patients were immunocompetent and did not have any investigative evidence to the contrary. Also previously even rare fungal infection of the lungs has been reported in immunocompetent individual.[14] Thus the differential diagnosis of fungal pneumonia should be considered in cases of non-resolving consolidation even in apparently immunocompetent patients. In this study 73.33% of the patients had addiction to smoking, alcoholism or tobacco chewing. This factor needs to be considered in evaluating a case of non-resolving consolidation. Fiberoptic bronchoscopy is useful in evaluating infective etiology and central mass lesion. It is less useful for peripheral mass lesion wherein a CT guided FNAC can be more reliable. In our study, complications during or after bronchoscopic procedure were very few. Thus, fiberoptic bronchoscopy can be considered to be a relatively safe procedure with minor complications.

To summarize, non-resolving pneumonia is a great clinical challenge along with all the possible uncertainties it brings with its diagnostic possibilities. Fiberoptic bronchoscopy is a great utility tool in reaching the diagnosis among such patients.

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