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# Diagnostic Yield of Conventional Fiberoptic Bronchoscopy in a Resource Limited Setting

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**Introduction**
*Fiberoptic Bronchoscopy is a commonly performed minimally invasive procedure in respiratory practice. Diagnostic yield of bronchoscopy varies considerably depending on indications and techniques used during bronchoscopy. Diagnostic innovations which increase the yield like endobronchial ultra sound, auto fluorescence bronchoscopy and electromagnetic navigation are not available even at tertiary care centers in India.*
**Material & Methods:** *All 100 consecutive bronchoscopies performed in bronchoscopy suite of a tertiary care centre over a period of 1 year were evaluated in this study.*
*All adult patients with undiagnosed respiratory conditions, patients not responding to treatment and patients with suspicious radiological shadows requiring treatment were included in the study.*
**Results:** *100 patients were studied. The mean age of the study population was 53.2 yrs (range 18 to 78 yrs). 70 % were males, 30 % were females. A total of 86 Bronchial washings & 14 Bronchoalveolar lavage were performed. 34 patients were subjected for bronchoscopic biopsies.*
*Diagnostic yield of endobronchial biopsy was 88.23 % and of endobronchial washing was found to be 64.70%. The yield of washings for no endobronchial demonstrable lesion was 66.66%.*
**Conclusion:** *The diagnostic yield of conventional bronchoscopy techniques is very high, technique is safe with few and acceptable complications.*
**Key words**: *Fiberoptic Bronchoscopy, Bronchial washings, Bronchoalveolar lavage, Endobronchial biopsy*

## INTRODUCTION

Bronchoscopy had its origins during the waning years of the nineteenth century. The next century witnessed tremendous advances in the application of bronchoscopy in clinical practice. In this twenty first century, bronchoscopy has become the most commonly employed invasive procedure in the practice of pulmonary medicine. Fiberoptic bronchoscopy is a minimally invasive procedure which is commonly performed in clinical respiratory practice for various indications.The diagnostic yield of bronchoscopy is regarded high, however it varies considerably depending on indications and techniques used during bronchoscopy [1,2] The last decade has seen several diagnostic innovations in the bronchoscopy suite which include endobronchial ultrasound, auto fluorescence bronchoscopy and electromagnetic navigation [3,4] These modalities have been introduced with the aim to increase the diagnostic yield of bronchoscopy however such innovations are mainly limited to the specialized centers and do not reflect the application of this technique in routine clinical practice. the diagnostic yield of routine bronchoscopy techniques presently is very high and centers without facilities for advanced bronchoscopy techniques showed to optimally use the current routine armamentarium. We therefore performed this study to assess the diagnostic yield of routine bronchoscopy techniques including bronchial washings, bronchoalveolar lavage (BAL) and endobronchial biopsy in our center.

## MATERIALS AND METHODS

**Aims and Objectives:**

-To assess the diagnostic yield of flexible bronchoscopy in various respiratory diseases.

-To compare the diagnostic value of fibreoptic bronchoscopy with other specific investigations.

- To compare the safety of routine bronchoscopy techniques in tertiary care centre.

We evaluated retrospectively all 100 consecutive bronchoscopies performed in our bronchoscopy suite over a period of 1 year.Patients included inpatients from different departments of the hospital. Patient selection was done by specific inclusion and exclusion criteria.

**Inclusion Criteria:**

-Symptomatic patients with undiagnosed respiratory conditions.

-Patients with respiratory disease which has not responded to the earlier treatment.

-Patients with suspicious radiological shadows requiring confirmatory diagnosis.

**Exclusion criteria:**

-Paediatric patients.

-Any contraindication for bronchoscopy.

Flexible Bronchoscopy was performed for all the patients thus selected using a routine bronchoscopy protocol.

Statistical Analysis: The data thus collected for this observational study was analysed using SPSS Software, version no. 22 and Microsoft Excel 2013.

## RESULTS

The mean age of the 100 patients was 53.2 years (range-14 year-78 year) and 70% were males.

**Table 1:Diagnostic Indications**

| Indications | Number | | % of diagnostic indications |
|---|---|---|---|
| | M | F | |
| Suspected malignancies | 33 | 8 | 41 |
| Suspected infections | 11 | 3 | 14 |
| Non-resolving pneumonia | 7 | 5 | 12 |
| Suspected tuberculosis | 8 | 3 | 11 |
| ILD | 5 | 6 | 11 |
| Haemoptysis | 1 | 3 | 4 |
| Chronic cough | 2 | 1 | 3 |
| Others | 3 | 1 | 4 |
| Total | 70 | 30 | 100 |

A total of 14 BAL, 17 Endobronchial biopsies and 86 Bronchial washings were performed. Of the 14 BAL ,11 (78.57%) were supportive to the diagnosis. Of the 17 Endobronchial biopsies, 15 (88.23%) were diagnostic and of the 86 bronchial washings ,66 (76.74%) were diagnostic.

**Table 2: Suspected Malignancy Age and Sex Distribution**

| Age (in years) | Males | Females |
|---|---|---|
| 20-40 | 3 | - |
| 41-60 | 15 | 5 |
| >60 | 15 | 3 |
| Total | 33 | 8 |

Type of malignancy diagnosed with endobronchial lesion: In our study total of 17 patients of the suspected 41 malignancies had endobronchial lesions. Yield of endobronchial biopsy was 88.23% and that of washings was 64.70% (Table-3)

**TABLE 3**

| Type | Biopsy | Washings |
|---|---|---|
| Sqamous cell carcinoma | 10 | 9 |
| Adenocarcinoma | 2 | 1 |
| Small cell carcinoma | 1 | 1 |
| Others* | 2 | - |
| Total | 15 | 11 |

(*-Pleomorphic carcinoma and Inflammatory pseudopolyp)

Type of malignancy diagnosed by bronchial washings without an demonstrable endobronchial lesion: In our study out of 24 cases in which malignancy was suspected had no endobronchial lesion As seen in table 4

**TABLE 4**

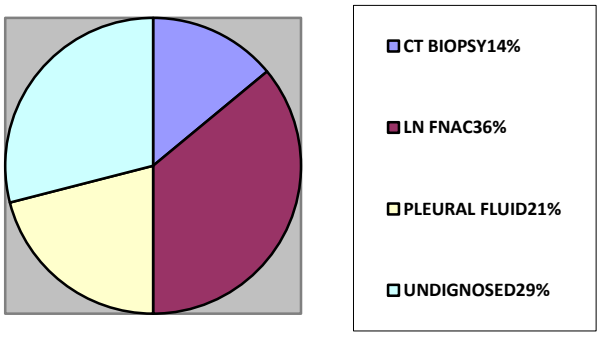
| Type | Washings |
|---|---|
| Sqamous cell carcinoma | 6 |
| Adenocarcinoma | 6 |
| Small cell carcinoma | 1 |
| Non Small cell ca | 3 |
| Total | 16 |

**Table 5: Gender Distribution of Bronchogenic Carcinoma According to the Histological Type**

| Type | Males | Females | Total |
|---|---|---|---|
| Sq cell carcinoma | 13 | 3 | 16 |
| Small cell carcinoma | 2 | - | 2 |
| Adenocarcinoma | 3 | 5 | 8 |
| Non small cell carcinoma | 1 | 2 | 3 |
| Others | 1 | - | 1 |

Diagnosis of malignancy in cases remained undiagnosed by bronchoscopy is shown in figure 1:

**Figure 1**




We performed 14 bronchoscopies for suspected pyogenic infections ( table 6). We found the pathogenic organisms in all cases by bronchoscopy

whereas pathogenic organisms were isolated only in 1 (7.4%) of these patients.

**Table 6: Results of the cases with suspected infections**

| Organism isolated | Number of patients |
|---|---|
| Kl. pneumoniae | 6 |
| Strepto. pneumoniae | 3 |
| Fungi | 2 |
| Others* | 3 |
| Total | 14 |

(*=of these 2 were positive for tuberculosis)

In our study 12 patients were non-resolving consolidation the etiology of which could not be established by sputum examination and CT scan.

**Table 7: Bronchoscopic results of non-resolving consolidation**

| Diagnosis | Number of patients |
|---|---|
| Malignancy | 2 |
| Bacterial infection | 5 |
| Tuberculosis | 2 |
| Undiagnosed | 3 |
| Total | 12 |

Interstitial lung diseases could not be diagnosed only by the bronchoscopies because of the unavailability of the transbronchial biopsy armamentarium and also due to the diagnostic limitations of our laboratory set up. However bronchoscopy was supportive in the diagnosis of ILDs.

M. tuberculosis was found in 7 (63.63%) of the 11 suspected cases of sputum negative cases Of the 4 cases presented with only hemoptysis as a symptom, 3 were found to have endobronchial tuberculosis seen as endobronchial tubercles, plaques and mucosal ulcerations and all three were positive on Z-N staining. One patient was diagnosed as sqamous cell carcinoma by endobronchial biopsy.

Three patients had only chronic cough as a presenting symptom and one of them had BAL eosinophoila.

Four patients were grouped as 'Others' of which two cases were peripheral Solitary Pulmonary Nodule, etiology of which remained to be determined, one was referred to us from ENT for suspected post-operative tracheal stenosis which was confirmed and also severity could be assessed so that patient was taken up for reconstruction and the other had post operative right lung collapse due to mucous plug which was removed by bronchoscopy

In this study we did not encounter any major complication however minor complications like cough, minimal hemoptysis and epistaxis, tachycardia were observed in few patients being self limiting did not require specific treatment.

## DISCUSSION

In this retrospective analysis of 100 consecutive bronchoscopies performed at our center over a period of one year, we found an overall diagnostic yield of 68%. This is comparable/not matching to the results of the study conducted by Ladina Foos, Nicola Patuto, Prashant Chhajed and Michael Tamm at University hospital, Basel, Switzerland [5]. In this study they found a diagnostic yield of 57%.

The diagnostic yield of bronchoscopy for detection of malignancy was 73.13%.The highest yield was for endobronchial biopsy(88.88%) followed by bronchial washings(65.68%).In the recent

systematic review, where the diagnosis of endobronchial disease by bronchoscopy in 30 studies showed the highest yield for endobronchial biopsy (74%), followed by cytobrushing(59%) and washings(48%) [6]. The diagnostic yield in our study was highest in cases with a macroscopically visible tumour(75.60%) which is comparable to the data of Popovich *et al* [7] .

Also in this study sqamous cell carcinoma was diagnosed in 53.33%, small cell carcinoma in 6.66%, adenocarcinoma in 26.66%, non-small cell carcinoma (not differentiated in subtypes) in 10% and others were diagnosed in 3.33% of the total diagnosed cases of malignancy by bronchoscopy alone. Of which 43.33% males and 10% females had sqamous cell carcinoma, 6.66% males had small cell carcinoma, 10% males and 16.66% females had adenocarcinoma. 63.63% of the diagnosed cases were either past or current smokers. Mean age for bronchogenic carcinoma was found to be 60.25 years. In similar study by Muhammad Imran Sullman and Rushid Jibran they concluded that bronchogenic carcinoma is more frequent beyond the middle age group, it is more common in the males and those who are smokers, sqamous cell carcinoma is the commonest type followed by small cell carcinoma and adenocarcinoma is more common in females [8]. In this study 14% of the total included cases had suspected infections of which 72.42% were found to be bacterial infections in which Kl. Pneumonia was the commonest organism isolated.However in study conducted by Luis Guerrero H., he found that Pseudomonas was isolated in 46.5%, Pneumococci in 18.6% and fungi were isolated in 5.6% [9]. As per the study conducted by Bughman Roberyt P. BAL has been an important research tool in understanding an inflammatoty response of lung in sarcoidosis and IPF. Its role in the diagnosis and management of the disease is not clear because there is some variation in the inflammatory response and the effects of the therapy. Nevertheless BAL has been supportive in making the diagnosis of many ILDs [10]. In this study 17% of the non resolving consolidation cases were diagnosed as malignancy, 41% had bacterial infection, 17% had tuberculosis and 25% remained undiagnosed by bronchoscopy alone. In a study conducted by Steven H. Feinsilver, Alan M. Fein, Michael Neiderman in non resolving consolidation, malignancy was diagnosed in 12% of the patients, tuberculosis was diagnosed in 8% and 50% patients had bacterial pneumonia. Overall fiberoptic bronchoscopy was diagnostic in 86% of the patients in whom specific diagnosis was found [11].

In this study 63.63% of cases of sputum negative pulmonary tuberculosis were diagnosed by bronchoscopy.

In a study conducted by B.N. Panda, K.E.Rajan and J. Jena, they found that the diagnostic yield of flexible bronchoscopy in sputum negative pulmonary tuberculosis was 25% by smear examination [12]. In our study we found that 75% of the patients with hemoptysis as the only presentation were diagnosed of having tuberculosis and 25% as malignancy. However in study conducted by Maria Tsoumakidou, Georgios Chrysofakis for hemoptysis alone, active tuberculosis was a rare finding and bronchiectasis,

acute and chronic bronchitis, lung cancers were the main causes of hemoptysis in a Greek cohort [13].

In this study, three patients presented with chronic cough of which one had eosinophils predominant BAL, in others specific diagnosis could not be established by bronchoscopy alone. Similarly in a study conducted by Terrance W. Barnes, Bekele Afessa, Karen Swanson at the department of internal medicine, Mayo clinic they found that fiberoptic bronchoscopy adds little to the diagnosis of chronic cough in the context of normal or non localizing chest radiographic or CT findings. Fiberoptic bronchoscopy did not result in successful treatment alteration nor did it contribute to the identification of the cough etiology [14].

The assessment of the safety of fiberoptic bronchoscopy was a further aim of our study. Overall, bronchoscopy related complications were rare and included only minor and non-life threatening complications. In a large retrospective study, minor complication rates amounted to 0.8% and major life threatening complication rates to 0.5% [15]. Also in a study conducted by Ladina Foos, Nicola Patuto, Prashant Chhajed and Michael Tamm at University hospital, Basel, Switzerland [5], the minor complication rates were 1.6%.

## CONCLUSIONS

The diagnostic yield of fiberoptic bronchoscopy for detection of bronchogenic carcinoma is high. The yield is enhanced by different bronchoscopy techniques used simultaneously. Malignancies which are centrally located and present with endobronchial lesions have better diagnostic yield as compared to those which are peripherally located or with no endobronchial presentation.

Klebsiella pneumoniae and Streptococcus pneumonae were the commonest organisms responsible for causing undiagnosed lower respiratory tract infections.

BAL has only a supportive role in the diagnosis of ILDs especially sarcoidosis and IPF, HRCT and histology being more informative and diagnostic of ILDs.

Fiberoptic bronchoscopy is overall effective in the diagnosis of non resolving consolidation and sputum smear negative pulmonary tuberculosis

Overall, routine fiberoptic bronchoscopy techniques continue to be safe procedures with very less and acceptable complications.

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