



The Diagnostic Yield of Bronchoscopic Techniques for Endobronchially Visible and Non-Visible Lung Cancer Lesions: A Prospective Cohort Study

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Abstract:

Lung cancer diagnosis remains a challenge, especially for endobronchially non-visible lesions. This prospective cohort study evaluates the diagnostic yield of various bronchoscopic techniques for endobronchially visible and non-visible lung cancer lesions. We enrolled 100 patients with suspected lung cancer and collected bronchial washings, bronchial brushings and performed endobronchial biopsy. Our study has shown that bronchial biopsy is the bronchoscopic procedure that can give maximum diagnostic yield in a patient with an endobronchially visible lesion, while in patients with no visible endobronchial growth, bronchial brushings gives maximum diagnostic yield thus proving the significance of performing bronchial brushings, even in patients with mere areas of mucosal irregularity on bronchoscopy and an otherwise non-visible growth on bronchoscopy.

Keywords: Lung Cancer, Bronchoscopy

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Introduction:

Lung cancer or bronchogenic carcinoma refers to malignant tumours arising from the epithelium of the bronchus or bronchiole. According to the American Cancer Society Cancer Statistics 2021, it is the leading cause of cancer-related death in men and women worldwide[1]. While smoking is the most common cause of bronchogenic carcinoma in men, women have a larger fraction of non-smoking-related lung cancer.

Bronchoscopy is now the pivotal diagnostic and therapeutic tool in the diagnosis of bronchogenic carcinomas. The flexible fiberoptic bronchoscopy is now most commonly used and has replaced the rigid bronchoscope for most indications. Various bronchoscopic techniques viz., bronchial brushings, bronchial washings and bronchial

biopsy are now being used to obtain samples from suspected patients of bronchogenic carcinoma and subjected to diagnostic tests to make a tissue diagnosis and plan further management.

The present study was done to assess the diagnostic yield of various bronchoscopic techniques for evaluation of lung cancer by comparing endobronchially visible and endobronchially non-visible lesions .

Method:

Study Location:

Study was conducted among patients admitted in the Department of Respiratory Medicine, Goa Medical College, Goa, India from December 2020 to July 2022 after receiving approval from Institutional Ethics Committee.

Study Design:

Prospective cohort study.

Selection of The Subjects:

Inclusion Criteria:

Patients above the age of 18 years, admitted as suspected cases of bronchogenic carcinoma who have undergone flexible fiberoptic video-bronchoscopy and diagnosed as lung cancer by any one of the modality, which included bronchial washings, bronchial brushing or bronchial biopsy or diagnosed by pleural fluid cytopathology, cervical lymph node FNAC or CT guided lung biopsy where there is radiological evidence of primary tumour in the lung.

Exclusion Criteria:

- Patients in whom histologic or cytologic specimens were categorized as "suspicious".
- Proven final diagnosis of non-malignant primary lung disease.
- Patients with metastatic lung disease (with primary being any other organ other than lung).
- Patients lost to follow up with inadequate records.

Study Procedure:

1. A detailed demographic data, clinical history was obtained from all the subjects with the prior informed consent. A detailed physical examination was conducted. All routine investigations were performed prior to bronchoscopy.
2. All the patients included in the study underwent flexible fiberoptic video-bronchoscopy after a standard pre-bronchoscopic evaluation. Patients were divided into two groups on the basis of whether an endobronchial growth was visible or not during bronchoscopy. All patients underwent a varying combination of tissue sampling techniques, viz., bronchial washings, and bronchial brush cytology and endobronchial biopsy.
3. In patients with an endobronchial visible lesion: bronchial biopsy was taken followed

by bronchial washings and then bronchial brushings. In patients without a visible endobronchial growth: bronchial biopsy was taken from any area of mucosal irregularity followed by bronchial washings followed by bronchial brushings. The samples were then subjected to cytopathological / histopathological analysis.

4. All slides were analysed by two independent and blinded pathologists to avoid any bias and only those samples with a definitive diagnosis of malignancy were included in the study. Reports such as inconclusive, suspicious of malignancy or presence of dysplastic changes were not included in the final analysis. In case of discrepancy between cytological and histopathological report, the biopsy/cell block report was always relied upon and treatment decisions were taken on the basis of the same. The results were categorized as adenocarcinoma, squamous cell carcinoma, poorly differentiated carcinoma, large cell carcinoma, and positive for malignancy.
5. In few patients with an endobronchially visible or endobronchially non-visible lesion, a cell diagnosis was made by pleural fluid cytopathology, cervical lymph node FNAC or CT guided lung biopsy where there is radiological evidence of primary tumour in the lung. The samples were processed in the Department of Pathology,Goa medical college,Goa.

Statistical Analysis:

The quantitative data was analysed using chi-square test. The p values of less than 0.05 were considered significant. The data is represented using bar graphs and pie charts. The data was entered in Microsoft Excel and analysed in IBM Statistical Package for Social Sciences Software version 29.

Results:

Out of the 100 patients in whom bronchoscopy was done, 54 patients had an endobronchially visible growth while in 46 patients, no endobronchial growth was seen.

Table 1: The Distribution of Various Histopathological Types of carcinoma and the endobronchial visibility of lesion

Type of carcinoma	Endobronchially visible tumour	Endobronchially non-visible tumour	Total
Adenocarcinoma	3	12	15
Squamous cell carcinoma	28	5	33
Poorly differentiated carcinoma	15	23	38
Small cell carcinoma	3	1	4
Large cell carcinoma	0	0	0
Adenosquamous carcinoma	1	0	1
Positive for malignancy	4	5	9
Total	54	46	100

Among patients with an endobronchially visible lesion on bronchoscopy, majority (N=28) were diagnosed as squamous cell carcinoma while

among patients with no visible growth on bronchoscopy, majority of the patients (N=23) were diagnosed as poorly differentiated carcinoma.

Figure 1: The Distribution of Various Histopathological Types of carcinoma in patients with endobronchially visible lesion (A) and endobronchially non-visible lesionS(B)

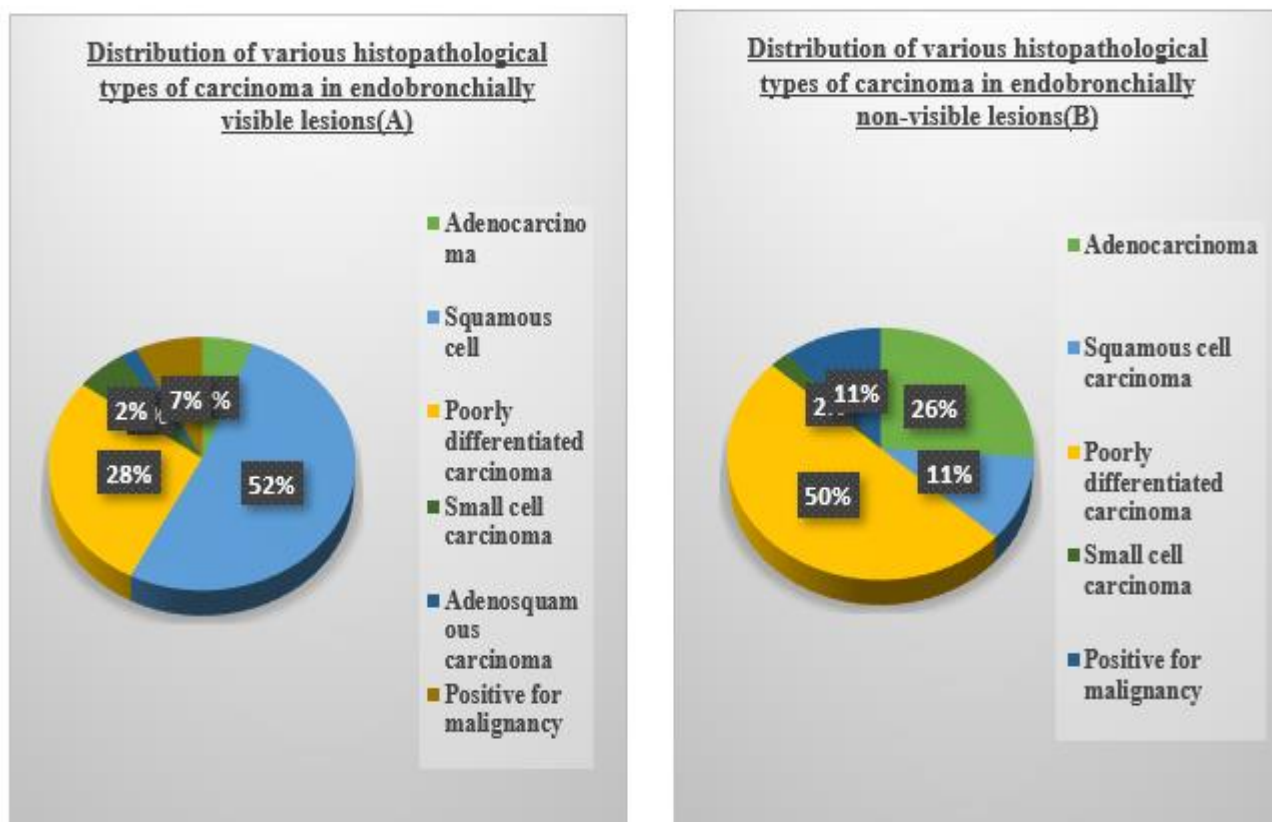


Table 2: Various bronchoscopic procedures and the cell types of bronchogenic carcinoma in endobronchially visible and non-visible lesions

	ENDOBONCHIAALLY VISIBLE LESION						ENDOBONCHIAALLY NON-VISIBLE LESION					
	B W	BB R	BB O	PFC P	LNF C	CT B	B W	BB R	BB O	PFC P	LNF C	CT B
Adenocarcinoma	2	2	2	0	0	0	4	4	2	1	0	3
Squamous cell carcinoma	7	7	26	0	0	1	1	2	2	0	1	1
Poorly differentiated carcinoma	4	10	7	1	1	3	4	15	4	1	1	5
Small cell carcinoma	1	1	3	0	0	0	1	0	0	0	0	0
Adenosquamous carcinoma	0	0	1	0	0	0	0	0	0	0	0	0
Positive for malignancy	4	2	2	1	0	0	1	1	0	1	2	0
Total	18	22	41	2	1	4	11	22	8	3	4	9

(Abbreviations: BW-Bronchial washings, BBR-Bronchial brushings, BBO-endobronchial biopsy, PFCP-Pleural fluid cytopathology, LNFC-Lymph node FNAC, CTB-CT guided biopsy).

Endobronchial biopsy gave maximum yield in patients with a visible endobronchial growth (N=41) while bronchial brushings gave maximum yield in patients with no visible endobronchial growth(N=22) on bronchoscopy.

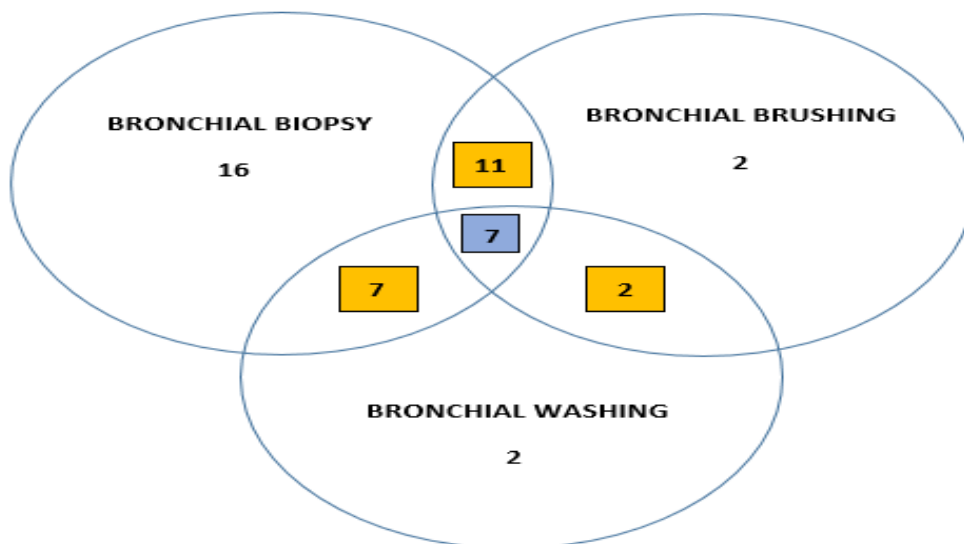
Table 3: Number of patients with malignancy proven exclusively by non-bronchoscopic techniques

	Endobronchially visible lesion	Endobronchially non-visible lesion
Pleural fluid cytopathology	2	3
Lymph node FNAC	1	4
CT guided biopsy	4	7
Total	7	14

In patients with endobronchially visible lesion, 7 out of 54 patients and in those with no visible growth endobronchially, 14 out of 46 patients were diagnosed as malignancy exclusively by non-

bronchoscopic techniques which included pleural fluid cytopathology, lymph node FNAC and CT guided lung biopsy.

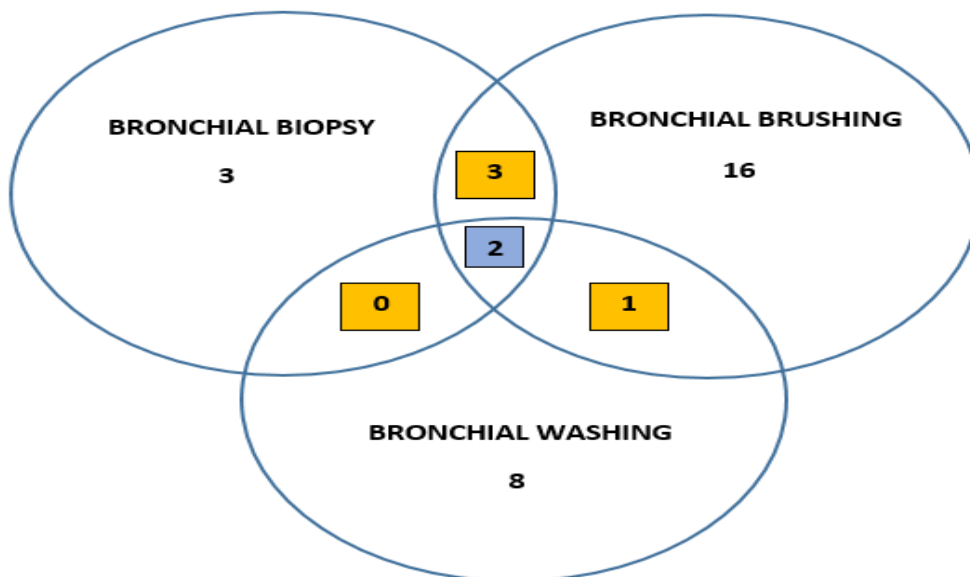
Figure 2: The diagnostic yield of various bronchoscopic techniques in an endobronchially visible lesion



In patients with endobronchially visible lung lesion, 7 patients were proven as malignancy by all

the three bronchoscopic techniques

Figure 3: Showing the diagnostic yield of various bronchoscopic techniques in an endobronchially non-visible lesion



In patients with endobronchially non-visible lung lesion, 2 patients were proven as malignancy by all the three bronchoscopic techniques .

India during the study period of 18 months from December 2020 to July 2022 after receiving approval from Institutional Ethics Committee. 100 eligible participants were included in the study. In this study, the aim was to compare the diagnostic yield of various bronchoscopic techniques in

Discussion:

The study was conducted in the Department of Respiratory Medicine, Goa Medical College, Goa,

patients having endobronchially visible lesion with those without any visible endobronchial growth .

Our study included 100 patients admitted as suspected cases of bronchogenic carcinoma who underwent flexible fiberoptic video-bronchoscopy and diagnosed as lung cancer by any one of the modality, which included bronchial washings, bronchial brushing or bronchial biopsy or diagnosed by pleural fluid cytopathology, cervical lymph node FNAC or CT guided lung biopsy where there is radiological evidence of primary tumour in the lung. Out of the 100 patients, 65 were males and 35 were females.

54 patients out of the 100 patients who underwent bronchoscopy in our study, had a tumour visible on bronchoscopic examination while in 46 patients, no tumour was visible.

In our study, bronchoscopy had a diagnostic yield of 87.03% in endobronchially visible lesions and 69.56% in endobronchially non-visible lesions. A multicentre study by Ost et al[2] on 581 patients who underwent endobronchial biopsy for evaluation of peripheral lesions showed diagnostic yield of bronchoscopy to be 63.7% which is similar to the yield in our study. Guerra et al in a study reported diagnostic yield of bronchoscopy in endobronchially visible lesion to be 87.1%[3]. In patients with endobronchially visible lesion, 7 out of 54 patients and in those with no visible growth endobronchially, 14 out of 46 patients were diagnosed as malignancy exclusively by non-bronchoscopic techniques which included pleural fluid cytopathology, lymph node FNAC or CT guided lung biopsy.

Squamous cell carcinoma was the most common histologic type of tumour seen in patients with endobronchially visible tumour on bronchoscopy in our study. In patients with endobronchially non-visible lesion, poorly differentiated carcinoma was the most common histologic type. This finding reiterates the fact that squamous cell carcinomas of lung often occur in the central part of the lung or in the main airway, such as the left or right bronchus while adenocarcinomas or poorly differentiated

carcinomas are more commonly peripherally located tumours [4,5,6].

Among endobronchially visible lesions, bronchial washings had a diagnostic yield of 33.33% in our study while bronchial brushings and bronchial biopsy had a diagnostic yield of 40.74% and 75.92% respectively. This shows that endobronchial biopsy gives highest diagnostic yield in cases of endobronchially visible lesions. On the other hand, our study showed bronchial brushings to give highest yield of 47.82 % among patients with no visible endobronchial growth on bronchoscopy. The bronchial washings and bronchial biopsy had a yield of 23.91% and 17.39% respectively.

In a study by Lee et al[7] in 2007 on 150 patients with peripheral non-visible lesions, bronchial washings provided a diagnosis of lung cancer in 30 of the 150 patients (20%). A metaanalysis by Chen et al[8] showed that that bronchial brushing cytology has moderate sensitivity (0.67) and high specificity (0.91) for detecting lung cancer and that they have higher sensitivity and specificity than bronchial washings.

Our study showed higher sensitivity of bronchial biopsy in diagnosing malignancy in patients with endobronchially visible lesion as compared to bronchial brushings, while in patients with endobronchially non-visible lesion, bronchial brushings had an increased sensitivity of 71.4 % as compared to bronchial biopsy. This can be attributed to the fact that in patients with no visible endobronchial growth, bronchial biopsy was taken under direct vision merely from area of mucosal irregularity hence resulting in a decreased tissue yield. A study by Soler et al [9] on 86 patients with endobronchially visible lung tumour reported diagnostic yield of endobronchial biopsy to be 79%. The study also found that the best yield for the diagnosis of lung cancer is obtained when two procedures are combined.

Our study has some limitations within which our findings need to be interpreted carefully. First, the sample size was limited as the Covid-19 pandemic during the study period resulted in decreased OPD

visits by patients and decreased admissions in the hospital for bronchoscopy. Secondly, in few of the patients, multiple biopsies could not be done due to low oxygen saturation at the start of the procedure and sudden desaturation during the procedure.

Conclusion:

The aim of our study was to compare the diagnostic yield of various bronchoscopic techniques in patients having endobronchially visible lesion with those without any visible endobronchial growth. Our study has shown that bronchial biopsy is the bronchoscopic procedure that can give maximum diagnostic yield in a patient with an endobronchially visible lesion, while in patients with no visible endobronchial growth, bronchial brushings gives maximum diagnostic yield thus proving the significance of performing bronchial brushings, even in patients with mere areas of mucosal irregularity on bronchoscopy and an otherwise non-visible growth on bronchoscopy.

Acknowledgement:

The authors thank The Dean, Goa Medical College for permission to publish the study.

Conflicts of interest: Nil

Funding: Nil

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