

# The Utility of Transbronchial Needle Aspiration and Conventional Diagnostic Procedures in the Diagnosis of Bronchogenic Carcinoma

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## Abstract

**Background:** Lung tumours often present as masses or nodules situated beyond the range of even new-generation fiberoptic bronchoscopes. The aim of this study to compare diagnostic yield of TBNA with CDP for diagnosis of Bronchogenic carcinoma. **Subjects and Methods:** The study was carried out and data were gathered in a prospective fashion and all the data were reviewed retrospectively. All the suspected patients were diagnosed on the basis of clinical, radiological and video bronchoscopic examination (CDP+TBNA); and further diagnosis was confirmed on the basis of histological and / or cytological examination. **Results:** In the present study, after TBNA & CDP, the overall diagnostic yield for carcinoma was 93% (28/30). CDP was diagnostic in 100% cases of EML and only 70% in SPD. TBNA provided an additional diagnostic yield of 30% in Cases of SPD where CDP was not possible for taking samples, which is seen to be statistically significant ( $p = 0.02$ ). **Conclusion:** We conclude that TBNA is a safe procedure that should be routinely used to increase diagnostic yield in patients with EML or SPD.

**Keywords:** TBNA, CDP, EML, Bronchial Carcinoma.

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## Introduction

Lung Cancer is the leading cause of cancer deaths worldwide. The disease is more common in men than women, although this difference has become smaller. Recently, mortality rates have been falling in men of all ages. Although the incidence of the disease continuous to claim in the older age.<sup>[1]</sup> The incidence of the lung cancer is globally increasing 0.5% each year as a result of tobacco consumption rates.<sup>[2]</sup> Lung cancer is responsible for 12.8% of cancers and 17.8% of cancer related deaths worldwide.<sup>[3]</sup> In recent past, an increasing trend in the incidence of primary lung cancer has been reported from various parts in India.<sup>[4]</sup> Early diagnosis and treatment of the tumor is the only hope of cure at current state of knowledge.<sup>[5]</sup> The cell type pattern had varied in different studies. While squamous cell variety is the commonest seen in about one third of patient, there has been a definite increase in small cell carcinoma and adenocarcinoma in recent years. The cell type is largely influenced by smoking habits, age and sex. Squamous cell carcinoma occur almost exclusively in smokers and in males, females have an inverse increase in adenocarcinoma. The cell type pattern also varies with age.<sup>[6]</sup>

Lung tumours often present as masses or nodules situated beyond the range of even new-generation fiberoptic

bronchoscopes. The low diagnostic yield of the standard combination of bronchial washing, bronchial brushing and endobronchial biopsy in these abnormalities often requires the use of higher risk procedures. In order to improve the yield of bronchoscopy for diagnosis of mediastinal masses and nodules the transbronchial needle aspiration (TBNA) technique is being employed in several centres.<sup>[7-9]</sup> TBNA has been shown to be useful in the diagnosis of primary pulmonary lesions,<sup>[9-12]</sup> in addition to its use as a staging procedure in patients with lung cancer and mediastinal adenopathy.<sup>[11]</sup>

Conventional transbronchial needle aspiration (TBNA) is a beneficial, safe, and minimally invasive bronchoscopic technique. It was first introduced by Wang et al in the late 1970s. This method is usually performed through a flexible bronchoscope and provides cytologic or histologic sampling of mediastinal lesions that lie adjacent to the tracheobronchial tree.<sup>[13-15]</sup> Particularly in the presence of peribronchial and submucosal lesions and vascular lesions, diagnosis with CDT such as BW, BB, and FB is more difficult. However, applying a needle into the lesion provides access to lower layers of the bronchus and adjacent lesions. Despite its advantages in diagnosis, TBNA is still an underutilized procedure in many centers because of the risk of damage to the bronchoscope, need for experienced

staff, and high cost.<sup>[14]</sup> The aim of this study to compare diagnostic yield of TBNA with CDP for diagnosis of Bronchogenic carcinoma.

## Subjects and Methods

The study was carried out and data were gathered in a prospective fashion and all the data were reviewed retrospectively. Patients came to the Respiratory Medicine OPD and Indoor of TB & Chest Disease Hospital, attached to RNT medical college, Udaipur, Rajasthan, with suspicion of bronchogenic carcinoma were registered for the study.

A detailed clinical history with complete physical examination was carried out in all the patients including the symptoms, duration of illness, smoking history; as per Performa given.

All the suspected patients were diagnosed on the basis of clinical, radiological and video bronchoscopic examination (CDP+TBNA); and further diagnosis was confirmed on the basis of histological and / or cytological examination.

### Inclusion Criteria

Patients found to have endobronchial disease, hilar or mediastinal lymph nodes (Mediastinal masses and adenopathy) on Chest X-Ray or computed tomography. Patients found to have EML or SPD during routine fiberoptic bronchoscopy has been entered in the study.

### Exclusion Criteria

- Patients with pre-existing known malignancy.
- Patients in whom bronchoscopy was contraindicated were excluded from the study.

Samples were collected from all patients bronchial washings (BW), brush biopsy (BB), EBB, and TBNA. The procedural sequence between EBB and TBNA was randomly allocated to either of the two sequences:

(1) BW and TBNA, or (2) BW, EBB, BB and TBNA

### Sample Collection

#### Following specimen has been collected:

**Bronchial Washing:** This was the first sample collection before endobronchial biopsy or bronchial brushing with instillation of normal saline(0.9% NaCl solution), when growth was visualize, the bronchoscope was fixed in close proximity and 10 to 15 ml normal saline was introduced through the internal channel of the bronchoscope. The material was immediately be sucked out again and has been collected in a sterile specimen TRAP bottle to be placed in the suction pathway and bronchoscope. The bronchial washing was centrifuged and the supernatant was discarded. The sediment was smeared over 4 to 5 glass slides.

Air dry slides was fix in 70% ethyl alcohol, later on stain with M.G.G stain (May Grunwald and Giemsa stain) for malignant cells.

#### TBNA/EBNA:

- (A) To obtain adequate TBNA specimens three passes for endobronchial vascular lesions and two passes for mediastinal masses and adenopathy with the cytology needle (19 or 21-gauge; Length 15mm to 18mm) was

performed. Both smear preparation and flushed aspirates was sent for cytology evaluation and ROSE was not be performed because of unavailability of facility in the hospital and limited resources.

- (B) For obtaining specimens from EML, the needle was directly inserted into the lesion, avoiding necrotic areas as practiced with other CDP.
- (C) For submucosal lesions, the needle was partially introduced at an angle of 45° into the bronchial wall, whereas complete penetration through the wall was performed in the case of extrinsic compression from peribronchial disease<sup>7</sup>. The bronchoscopic findings has been correlated with the anatomic location of the peribronchial lesion on CT scans of the chest.

**Bronchial Brushing:** The brushing was taken by Nylon brush-BC-9C, an area of suspected malignancy has been brushed 4 to 5 times; and smeared directly on glass slide, smears are immediately fixed in 70 % alcohol and stained by Papanicolau's/MGG stain method.

**Bronchial biopsy:** When an endobronchial growth was seen or any abnormal area was seen on bronchoscopic examination, it was biopsied 3 to 4 times in order to provide an adequate material for histopathological examination with the help of biopsy forcep-FB-20C. Then the biopsy specimen was placed in 10% formalin vial and sent for histopathological examination.

Results of various specimens were compared - Cytologic analysis has been considered positive only when large numbers of definitely malignant cells was present.

The primary outcome measures of this study was to establish the diagnostic yield of TBNA and compare with CDP (combination of BW, BB, and EBB). Furthermore, we were analyze the impact on diagnostic yield from each of the individual procedures as well as on the basis of the nature of the lesion, ie, EML or SPD. We were also study whether presence of lesion in upper lobes and sequence of performing TBNA and EBB influence the diagnostic yield. Any procedure-related complications and damage to the bronchoscope was also be noticed.

## Results & Discussion

The present study showed that the maximum number (70%) of patients were belonged to 50-60 years and above age group [Table 1].

Maximum aspiration for sampling were performed on the right side at 4R station (43.33%) followed by 4L (20%) and 13.33% from 7 and 11R stations. 10R was the least with only 6.66% cases. In this study TBNA needle aspiration was performed more on right side (67.75%) compared to other nodal station [Table 2].

In the present study, after TBNA & CDP, the overall diagnostic yield for carcinoma was 93% (28/30). 18 (60%) cases were confirmed as NSCLC followed by 8 (26.66%) cases of SCLC. 1 case (3.33%) each of NHL, TB, Anaplastic carcinoma and Nonspecific inflammation was also diagnosed in the study [Figure 1].

CDP was diagnostic in 100% cases of EML and only 70%

in SPD. TBNA provided an additional diagnostic yield of 30% in Cases of SPD where CDP was not possible for taking samples, which is seen to be statistically significant ( $p = 0.02$ ) [Table 3].

Overall diagnostic yield in the present study was 93%. TBNA was diagnostic in 87% and it was solely positive in 31% cases [Table 4].

**Table 1: Age wise distribution**

Years	Male	Female	Total	Percent
30 - 40	0	0	0	0%
41 - 50	7	2	9	30%
51 - 60	9	1	10	33.33%
> 60	10	1	11	36.66%
Total	26	4	30	-

**Table 2: Site of Nodal / Mass TBNA (Station Wise)**

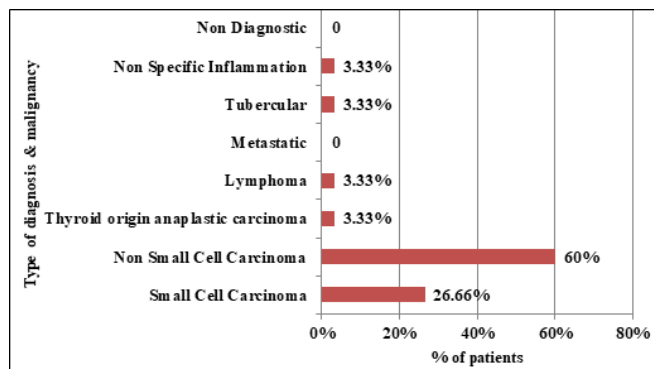
Site of TBNA	No.	%
2R	1	3.33%
4R	13	43.33%
4L	6	20%
7	4	13.33%
10R	2	6.66%
11R	4	13.33%
Total	30	-

**Table 3: Diagnostic yield from CDP versus CDP & TBNA**

Condition (n=30)	CDP		CDP + TBNA		p Value
	No.	%	No.	%	
EML (n=14)	14	100%	14	100%	$p < 0.05$
SPD (n=20)	14	70%	20	100%	$p = 0.02$

**Table 4: Diagnostic yield of TBNA, Washing, Brushing & EBB (n=28)**

Procedure	Positive Cases	%
Bron. Wash (BW)	8/30	27
Bron. Brushing(BB)	14/30	47
EBB	9/15	60
TBNA	26/30	87
EBB+BW+BB	20	67
TBNA+BW+BB	28	93
TBNA+EBB+BW+BB	28	93



**Figure 1: Types of Diagnosis and malignancy**

## Discussion

In the present study, 70% patients were belonged to 50-60year and above age group. Out of that (n=30), 26 were male and only 4 were female. These findings were

consistent with other study.

The average age was 58.07 year in the study has been quite similar to other study. The male: female ratio in present study M:F: 6.5:1 quite comparable to other studies (Narang et al 1977 and Malhotra et al 1986).<sup>[16,17]</sup>

The overall diagnostic yield was increased with the use of TBNA technique. In bronchoscopic procedure in suspected cases of malignancy in various studies. In the present study, the additional diagnostic yield was increased from 67% to 93% (26%) which is very much similar to other studies i.e. Benan Caglayan et al (26%) and Ashok Dasgupta et al (20%) and it was higher to Thida Win et al (6%) and Frank Reichenberger et al (16%).<sup>[18-21]</sup> This may be because of highly selective cases for procedure.

In cases of SPD, the additional diagnostic yield was increased from 70% to 100% (30%) which were similar to the studies of Ashok Dasgupta et al (31%) and Benan Caglayan et al (27%).<sup>[18,19]</sup> This defines the use of TBNA increase the diagnostic yield of biopsy with minimal risk.

Bronchial washing (BW) was also performed in all 30 cases. A positive result was obtained in 8 (27%) cases and were never positive when any of the other procedures result were negative (Kvale et al,<sup>[22]</sup> Ashok Dasgupta et al).<sup>[19]</sup>

Bronchial brushing (BB) was also used in all 30 cases with a positive results in 14(47%) cases. In 1(7%) case this was the only technique with a positive result.

Endobronchial biopsy (EBB) was used in 15 (50%) cases and lead to a diagnosis in 9 (60%) cases. It was solely positive technique in 1 (11%) case. For all the 30 cases, BW, BB and EBB together had a diagnostic yield of 67%.

The TBNA alone provide a positive result in 31% of cases. The addition to CDP, use of TBNA increase the overall diagnostic yield from 76% to 93%. In cases of SPD the additional use of TBNA increase the diagnostic yield from 70% to 100%. That results are similar to previous studies (Ashok Dasgupta et al, Benan Caglayan et al).<sup>[18,19]</sup>

The diagnostic yield of BW was 27% which was least in the present study. The similar result were also obtained in previous studies i.e. Ashok Dasgupta et al,<sup>[19]</sup> (27%), Frank Reichenberger et al (22%),<sup>[21]</sup> David A. Schenk et al,<sup>[23]</sup> (29%) but the higher result was found in study of Thida Win et al (45%).<sup>[20]</sup> In the present study BW did not positive when any of the other test results were negative while it was solely diagnostic in studies i.e. Frank Reichenberger et al (6%),<sup>[21]</sup> Thida Win et al (4%).<sup>[20]</sup>

The diagnostic yield of BB was 47% in the present study. This result is similar with the previous studies of Ashok Dasgupta et al 1999 (55%) and David A. Schenk et al 1987 (40%).<sup>[19,23]</sup> The yield of BB was higher with the study of Frank Reichenberger et al,<sup>[21]</sup> 1999(30%) and Thida Win et al 2003 (27%).<sup>[20]</sup> The BB was solely diagnostic in 1(7%) case and it was consistent with other studies i.e. Ashok Dasgupta et al 1999 (6%) and Frank Reichenberger et al 1999 (10%) given as additional diagnosis.<sup>[19,21]</sup>

EBB was performed in 15 cases in the present study and it was diagnostic in 60% cases. The similar results were obtained in various study i.e. Ashok Dasgupta et al 1999 (60%),<sup>[19]</sup> Thida Win et al 2003 (61.4%) and David A. Schenk et al 1987 (56%) and it was very high to the study

Frank Reichenberger et al 1999 (17%).<sup>[20,21,23]</sup>

The low diagnostic yield of EBB in Frank Reichenberger et al,<sup>[21]</sup> study only 17% was because of more than 10 bronchoscopist had been introduced to bronchoscopy and the different diagnostic methods including handling, preparation was the fact and also stated that EBB was used very reluctantly in this study because many lesions were not accessible to the biopsy forceps. This discussion reveals that the training and expertise of bronchoscopist with preparation and handling of sample with or without ROSE significantly influenced the diagnostic yield of the procedure.

The EBB was solely diagnostic in 11% of cases in the present study which is very similar to the Thida Win et al,<sup>[20]</sup> 2003 (12%) and it is higher to the Ashok Dasgupta et al 1999 (3%).<sup>[19]</sup> Moreover, the particular cell type of the tumor could influence yield from EBB. Crush artifacts produced during biopsy sampling of small cell cancer may result in a negative result. This situation was seen in two of the cases in which TBNA was diagnosed. Jones et al,<sup>[24]</sup> have similarly reported on the critical diagnostic value of TBNA in five patients with small cell cancer who demonstrated crush artifacts on non-diagnostic EBB.

In the present study TBNA was performed in all 30 cases and found positive in 26(87%) of cases. The results were consistent with study of Ashok Dasgupta et al,<sup>[19]</sup> 1999 (85%) but higher to study i.e. Frank Reichenberger et al,<sup>[21]</sup> (35%), Thida Win et al 2003<sup>[20]</sup> (41.9%), David A. Schenk et al 1987 (45%).<sup>[23]</sup> On comparison addition of TBNA for diagnostic procedure given the additional diagnostic yield comparably similar to Ashok Dasgupta et al,<sup>[19]</sup> Frank Reichenberger et al,<sup>[21]</sup> David A. Schenk et al,<sup>[23]</sup> with present study. The higher results of TBNA in present study may be because of highly patients selection workup for malignancy, expertise of bronchoscopist, the choice of needle selection (19G), combination of TBNA technique and pathologist.

The TBNA was solely diagnostic in 31% (8/30) cases in the present study. Out of that 1 case has both EML & SPD finding. In 5 cases had SPD, 2cases had only mediastinal lymphadenopathy and mass presentation without mucosal involvement.

The high results of TBNA in present study may be because of used 19G needle which gave good material for histopathological examination. These finding are consistent with the studies of Ashok Dasgupta et al (20%),<sup>[19]</sup> Frank Reichenberger et al,<sup>[21]</sup> (20%) and Benan Caglayan et al,<sup>[18]</sup> (34.3%). The overall diagnostic yield was in the present study 93% with (CDP+TBNA) which is consistent with Ashok Dasgupta et al (96%).<sup>[19]</sup>

Submucosal disease, as defined earlier, and peribronchial disease presenting as narrowing and extrinsic compression, have significantly lower yields with CDP.<sup>[25-27]</sup> Shure and Fedullo<sup>25</sup> showed an increased yield with TBNA (71%) compared with EBB (55%), similar to results obtained by Buirski et al,<sup>[26]</sup> (EBB, 43%; TBNA, 100%). The individual yield from EBB and TBNA in our series (EBB=60%; TBNA=87%) is similar to that reported in the above series. The addition of TBNA to CDP increased the diagnostic

yield in our study. In submucosal disease, involvement tends to occur in a submucosal plane along the lymphatics with minimal mucosal abnormality. Similarly, extrinsic compression from peribronchial disease tends to leave the mucosal surface predominantly intact. CDP using EBB or BB or BW tend to sample mainly the surface rather than deep within the lesion. In these situations, the ability of TBNA to provide adequate sampling by penetrating either the submucosa or directly through the bronchial wall into the tumor mass could enhance diagnostic yield. In our study the diagnostic yield of 67% with CDP, compared with the 93% yield obtained by the addition of TBNA, is probably a reflection of this anatomic variation that occurs with SPD.

Analysis of diagnostic yield from individual procedures and their combinations revealed several interesting facts. The best yield from any individual procedure was obtained with TBNA (87%), followed by EBB (60%), BB (47%) and BW (27%) In SPD, the yield from TBNA was far superior to the yield from any other individual procedure or their combination. Thus, use of TBNA alone or in combination with CDP would have diagnosed disease in all these patients. The best results being obtained by a combination of TBNA+EBB+ BB+BW (93%). In the present study in the cases of SPD the diagnostic results are consistent with Ashok Dasgupta et al,<sup>[19]</sup> and Benan Caglayan et al.<sup>[18]</sup>

## Conclusion

We conclude that the overall diagnostic yield of flexible bronchoscopy procedure is increased in patients with EML or SPD by the addition of TBNA. The TBNA is a safe procedure that should be routinely used to increase diagnostic yield in patients with EML or SPD. In cases of SPD, TBNA should be considered the procedure of choice.

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