ORIGINAL ARTICLE

Audit of Fiberoptic Bronchoscopy Guided Cytologic Techniques, Year 2015-2016: Diagnostic Accuracies of Bronchalveolar Lavage, Bronchial Brushing and Transbronchial Needle Aspiration

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ABSTRACT

BACKGROUND: Early diagnosis of lung cancer plays a pivotal role in reducing lung cancer death rate. Bronchoscopic washing, brushing and transbronchial needle aspirations(TBNA) not only complement tissue biopsies in the diagnosis of lung cancer but also comparable. **OBJECTIVE:** To find out diagnostic yield of bronchoalveolar lavage, bronchial brushing and transbronchial needle aspiration in diagnosis and to compare relative accuracy of these three cytological techniques. **MATERIAL AND METHOD:** All patients who came with clinical or radiological suspicious of lung malignancy over a period of two years were included in study. Fiberoptic bronchoscopy was done and bronchoscopy guided bronchoalveolar lavage, brushing and transbronchial needle aspiration was taken. **RESULT:** The most sensitive technique was TBNA (100%), followed by bronchial brushing (79.39%) and BAL (70.37%). Specificity and positive predictive value were 100% for each of all techniques. **CONCLUSION:** Fiberoptic bronchoscopy is an excellent tool to evaluate endobroncheal lesions. Bronchial brushing, BAL and TBNA are having high yield in diagnosing such lesions. TBNA allows sampling of subcarinal and paratracheal lymph nodes and thus helps in staging with minimal complications.

Key words: Lung cancer, Fiberoptic bronchoscopy, bronchial brushing, BAL, TBNA

INTRODUCTION

Lung cancer is the leading cause of cancer death both in men and women worldwide.([1]) The two main types are small-cell lung carcinoma (SCLC) and non-small-cell lung carcinoma (NSCLC).([2])Non-small cell lung cancer (NSCLC) accounts for about 80 to 85% of all lung cancers and is classified according to the World Health Organization criteria into three major types: adenocarcinoma (50%), squamous cell carcinoma (30–35%), and large cell carcinoma (5–10%).([2])

New developments in the field of thoracic oncology have challenged the way of approach in the diagnosis of pulmonary carcinoma. Only a diagnosis of *Non small cell carcinoma* is no longer an adequate

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diagnostic category. It is required to further classify tumors, since specific therapy are now recommended, depending on the morphology and genotyping of tumour.

Prospective randomized studies have shown that new chemotherapeutic (i.e., pemetrexed) and molecular-targeted agents (i.e., gefitinib, erlotinib, and bevacizumab) may lead to improved results, as compared with prior standard therapeutic options, in nonsquamous advanced lung carcinoma. Therefore, there is an increasing demand for pathologists to differentiate between squamous and nonsquamous NSCLC tumors. As most lung cancer patients present at diagnosis in an advanced unresectable stage, small biopsies or cytological samples are frequently the only available material for diagnosis.

Symptoms such as fever, cough, expectoration, hemoptysis, weight loss, and anorexia are common to both tuberculosis (TB) and lung cancer. A significant number of lung cancer cases

are initially misdiagnosed and treated as TB.[3] More so in our country where TB is still the most common disease and is the main culprit for delay in diagnosis and treatment of lung cancer.

Although histopathology remains the gold standard, but it is not possible to perform bronchial biopsies in all patients with suspicion of cancer. In cases where lesions are peripheral, and there is risk of haemorrhage taking bronchial biopsy becomes more difficult and requires expertise. Biopsies are time-consuming and there is increased pressure on pathologist to report cases as early as possible. Cytological techniques are safer, economical, and provide quick results. Bronchoscopic washing, brushing, and TBNA not only complement tissue biopsies in the diagnosis of lung cancer but are also comparable.

The availability of good reliable investigation will enable us to diagnose lung cancer at an early stage, making it amenable to current treatment regimes.[4] This will ultimately affect patient's survival.

MATERIALS AND METHODS

The study was carried out at the Department of Pulmonary medicine, Shri M. P. Shah Government medical college, Jamnagar. The retrospective analysis on the data from all patients who came with clinical or radiological suspicion of lung malignancy in our institute in year 2015-2016 was done.

There were total of 176 bronchoscopies done over a period of 2 years and bronchial brushing, BAL and TBNA were taken in all possible patients. TBNA was possible only in 9 patients where as BAL 141 and bronchial brushing was taken in 100 patients.

Bronchoscopy specimens include:

- Bronchoalveolar lavage (BAL)
- Bronchial brushing (BB)
- Transbronchial needle aspiration (TBNA- bronchoscopy guided)

Procedure

In general, both washings and brushings were taken from any clinically suspicious area, by repetitive instillation of 3–5 ml of sterile balanced saline solution. Brushings were obtained by small circular stiff-bristle brush.

In the absence of cells or agents, diagnostic of pathological process, large number of well preserved, optimally stained ciliated bronchial cells, and macrophages were required for specimen adequacy. Those specimens with few cells or cell details obscured by blood or air dried were deemed unsatisfactory for analysis. Excessive numbers of ciliated or squamous epithelial cells (>5%) were indicative of contamination by bronchial or oral material, indicating that the BAL specimen was not representative of the distal portion of the respiratory tract. Criterion for rejection was (1) Paucity of alveolar macrophages, (<10 alveolar macrophages per 10 high-power fields (HPF) or <25 alveolar macrophages per HPF in combination with criterion two and three), (2) excessive number of epithelial cells either showing degenerative changes or exceeding the number of alveolar macrophages, (3) a mucopurulent exudates of polymorphonuclear cells, (4) numerous red blood cells with anyone inadequacy criterion, (5) degenerative changes or artifacts.

BAL and BW after receiving in the laboratory were stirred with the help of applicator stick, poured into centrifuged tubes, and subsequently centrifuged at 2000 rpm for 10 min. The supernatant was decanted, and three smears were made from sediment on previously albuminized slides, two smears fixed in 95% of ethyl alcohol fixative, and one slide kept dry for Giemsa staining. Staining was done by Harris's haematoxylin (regressive staining).

Inclusion criteria:

1) Patients with primary lung cancer.
2) Age group >18 yrs.
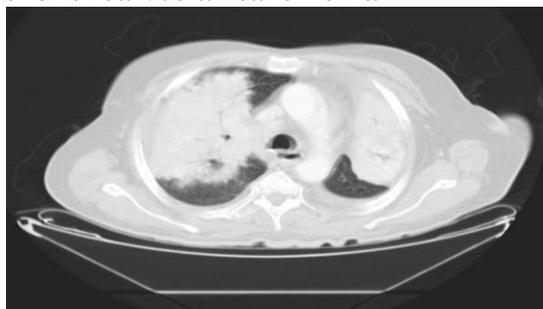3) Patients who gave consent for bronchoscopy and sampling

Exclusion criteria:

1) Age < 18 years
2) Bleeding diathesis
3) Terminally ill patients
4) Poor respiratory reserve
5) Unwilling patients

Figure 1: Left side lung mass

Figure 2: Huge lung mass-bronchoalveolar carcinoma

RESULT

Total of 176 fiberoptic bronchoscopy were done over a period of 2 years from 1st January 2015 to 31 December 2016.

Table 1: Type of Cytological Specimens

Nature of Specimen	Total Number	Percentage
Bronchoalveolar Lavage	141	80.11%
Bronchial brushing	100	56.82%
Transbronchial Needle Aspiration	9	5.11%
No Sample Taken	14	7.96%
Total FOB	176	100%

Bronchoalveolar lavage (80.11%) was the most common type of cytological specimen followed by bronchial brushing (56.82%) and TBNA (5.11%) being the least frequently taken. While in 14 patients (7.96%), no sample was taken. [Table 1]

Table 2: Age-wise distribution of Cases

AGE	NUMBER	PERCENTAGE
>60 YEARS	129	73.3%
<=60 YEARS	47	26.7%
TOTAL	176	100%

73.3% patients were more than 60 years of age and 26.7% patients were less than or equal to 60 years of age. Mean age being 65 years [Table 2], with male to female ratio of 8.4:1[Table 3].

Table 3: Gender wise distribution of Cases

GENDER	NUMBER	PERCENTAGE
MALE	147	83.5%
FEMALE	29	16.5%
TOTAL	176	100%

Table 4: Presenting Complaint

Symptoms	Number of Patients with malignancy	Percentages
Cough	138	78.41%
Hemoptysis	113	64.20%
Breathlessness	127	72.16%
Chest Pain	98	55.68%
Fever	46	26.14%
Weight Loss	84	47.73%

Cough was the most common presenting complaint (78.41%) followed by dyspnoea (72.16%), hemoptysis (64.20%), chest pain (55.68%), weight loss (47.73%) and fever (26.14%).[Table 4]

Table 5: Smoking History

Smoking Status	Male	Female	Total	Percentage
Smoker	141	16	157	89.2%
Non-Smoker	6	13	19	10.8%
Total	147	29	176	100%

The prevalence of smoking was 89.2%, while 10.8% were non smoker.

Table 6: Chest x ray finding in malignant cases:

Finding in Chest X ray	Number of Patients	Percentage
Primary Parenchymal Lesion(Mass)	134	76.14%
Consolidation	46	26.31%
Collapse	37	21.02%
Pleural involvement(Mostly Effusion)	42	23.86%
Lymph Node Invasion(Hilar and/or Mediastinal)	94	53.41%
Chest wall/rib involvement	13	7.34%

Mass lesion or primary parenchymal lesion(76.14%) was the most common chest x ray finding observed. Other findings included consolidation(26.31%), collapse(21.02%),pleural involvement mostly as effusion or nodule(23.86%) and chest wall or rib involvement(7.34%). Hilar and/or mediastinal lymph nodes were found in 53.41%.

Table 7: Comparison of various cytological techniques

Characteristics	BAL (N=141)	Brush (N=100)	TBNA (N=9)
Sensitivity	70.37%	79.39%	100%
Specificity	100%	100%	100%
False Positive	0%	0%	0%
False Negative	13.66%	8.52%	0%
Positive Predictive Value	100%	100%	100%
Negative Predictive Value	71.43%	63.41%	100%

The most sensitive technique was TBNA(100%) but was infrequently used, used in 4 patients only, followed by bronchial brushing(79.39%) and BAL(70.37%). The positive predictive value of all three techniques was 100%. Low false negative were from TBNA(0%),

while highest in BAL(13.66%). The negative predictive value was highest of TBNA(100%) and lowest of bronchial brushing(63.41%).

Table 8: Cytology-bronchoalveolar lavage

Diagnosis	Number of Patients	Percentage
Adeno Ca	10	7.09%
NSCLC	10	7.09%
Squamous Ca	28	19.86%
Small Cell Ca	9	6.38%
Inconclusive	11	7.80%
Infective	14	9.93%
Suspicious of Ca	11	7.80%
Neg	46	32.62%
Low Cellularity	2	1.43%
Total	141	100%

Total 141 BAL samples were taken, in which 7.09% were adenocarcinoma, 7.09% were NSCLC, 19.86% were squamous cell carcinoma, 6.38% were small cell cancer were reported, while 7.80% were suspicious of malignancy but typing was not made and 7.80% inconclusive,1.43% were having low cellularity and 32.62% were negative for malignancy.

Table 9: Cytology-Bronchial brushing

Diagnosis	Number of Patients	Percentage
Adeno Ca	12	12%
NSCLC	10	10%
Squamous Ca	28	28%
Small Cell Ca	9	9%
Inconclusive	8	8%
Infective	1	1%
Suspicious of Ca	5	5%
Neg	25	25%
Low Cellularity	2	2%
Total	100	100%

Total 100 bronchial brushing were done and sample was obtained by that, in which 12% were adenocarcinoma, 10% were NSCLC, 28% were squamous cell carcinoma, 9% were small cell cancer were reported, while 5% were suspicious of malignancy but typing was not made and 8% inconclusive,2% were having low cellularity and 25% were negative for malignancy.
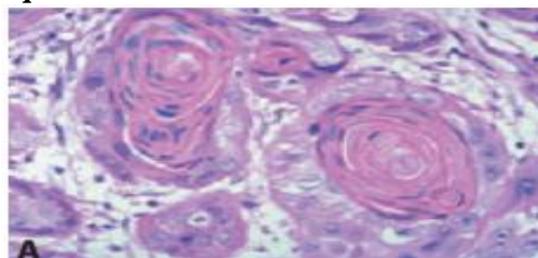
Table 10: Cytology-Transbronchial Needle Aspiration (TBNA)

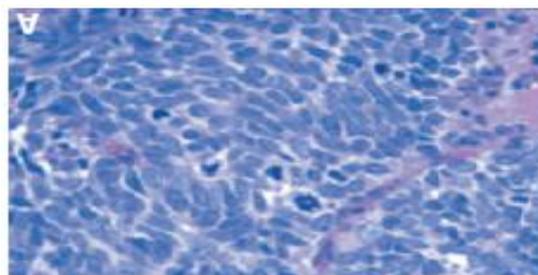| Diagnosis	Number of Patients	Percentage
Adeno Ca	2	22.22%
Squamous Ca	3	33.33%
Small Cell Ca	1	11.12%
Neg	3	33.33%
Total	9	100%

From 9 patients TBNA was taken and 22.22% were adenocarcinoma, 33.33% squamous carcinoma, 11.12% were small cell cancer and 33.33% were negative for malignancy.

Squamous cell carcinoma

Small cell cancer

Adenocarcinoma

DISCUSSION

All three techniques were not used simultaneously in all patients.

- **Age distribution**

In the present study patient above the age group of 20 were included

Sr. No	Studies	21-40 years	41-60 years	>61 years	Total
1	Jagdish Rawat et al(2009)[5]	9.86%	53.2%	36.94%	100%
2	Present study	26.7%		73.3%	100%

Case study by Jagdish rawat et al[5] in 2009 showed maximum number of patients in the age group of 40-60 years(53.2%)

In the present study the highest number of patients were in the age group of >61 years(73.3%).

- **Gender ratio**

Sr. No	Study	Male: Female ratio
1	Jagdish Rawat et al(2009)[5]	8.2:1
2	Present study	8.4:1

Both the studies mentioned showed male predominance with studies by Jagdish Rawat et al(2009)[5] showed a male to female ratio of 8.2:1. The present study showed a high male predominance with a male :female ratio of 8.4:1.

• **Clinical presentation**

Sr. no	Clinical presentation	Jagdish Rawat et al(2009)[5]	Present study
1	Cough	72.9%	78.41%
2	Hemoptysis	25.1%	64.20%
3	Chest pain	55.6%	55.68%
4	Dyspnoea	50.7%	72.16%
5	Fever	58.1%	26.14%
6	weight loss	56.6%	47.73%

Jagdish Rawat et al(2009)[5] reported cough(72.9%) as a predominant symptom , while other symptoms in frequency of hemoptysis(25.1%), dyspnoea(50.7%), chest pain(55.6%), fever(58.1%) and weight loss(56.6),which is comparable with the present study which reported cough(78.41%), hemoptysis(64.20%),chest pain(55.68%), dyspnoea(72.16%), fever(26.14%) and weight loss(47.73%)..

• **History of smoking**

Sr. no	Study	History of smoking Males	Females	Total Smokers	Total non smokers
1	Jagdish Rawat et al(2009) [5]	79.3%	2.4%	81.7%	18.3%
2	Present study	89.81%	10.19%	89.2%	10.8%

Out of 81.7% smokers in Jagdish Rawat et al(2009)[5] study, 79.3% were male and 2.4% were female, while 18.3% were non smoker.

Which was comparable with present study, total 89.2% smokers and 10.8% non smokers. Among smokers, 89.81% male and 10.19% female were found.

• **Radiological presentation**

Sr. No	Types of lesion	Jagdish Rawat et al(2009)[5]	Present study
1	Central parenchymal mass lesion	46.31%	76.14%
2	Peripheral parenchymal mass lesion		
3	Pleural effusion	4.4%	23.86%
4	Collapse	40.8%	21.02%
5	Consolidation		26.31%

Study by Jagdish Rawat et al(2009) [5] showed radiological presentation of lung cancer cases as parenchymal mass lesion in 46.31% cases , pleural effusion was present in 4.4% cases, collapse and consolidation together in 40.8% cases and combination of more than one type of radiological lesion were present in 8.37% cases.

In the present study parenchymal mass lesion as radiological presentation were present in a total of 76.14% cases. The difference in the presence of mass lesion from other studies mentioned could be because of the difference in characterising criteria. Pleural involvement(mostly as effusion or nodule) 23.86%, collapse 21.02% and consolidation 26.31% reported.

CONCLUSION

In this retrospective study, 176 patients suspected of malignancy underwent bronchoscopy. Most of the cases were male and of age group of more than 60 years. Most of the lung cancer cases were in their 6th decade. There was a definite male predominance in the study with a male: female ratio of 8:4:1.Cough was the most common presenting symptom(88% cases).89.2% of the cases were smokers and rest 10.8% were non smokers. Radiologically 76.14% cases had exclusive parenchymal mass lesion 23.86% cases had pleural involvement (effusion or nodule), consolidation(26.31%) and collapse(21.02%) and 7.34% cases had chest wall or rib invasion detected on CT scan. Sensitivity of TBNA was highest(100%), followed by bronchial brush(79.39%) and BAL (70.37%). All three cytological techniques were highly specific(100%).

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