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Utility of various diagnostic bronchoscopic materials

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ABSTRACT

Background : Flexible bronchoscopy is a procedure commonly performed for diagnostic and therapeutic purposes. The aim of the study was to compare yield and diagnostic utility of various diagnostic bronchoscopic materials like Broncho-alveolar lavage (BAL), brushing, Transbronchial needle aspirates (TBNA) and biopsy.

Methods: The study was conducted in the Department of Pathology, SMVMCH, Puducherry, from October 2014 to September-2015. During the study period 62 cases of mass in the lung were sampled. Among these 33 cases having more than one type of samples were included in the study. The samples were obtained by flexible fiber-optic bronchoscopy (FOB) done by the pulmonologist. Air-dried and wet-fixed smears were prepared from BAL, Bronchial brushing, pleural brushings and TBNA and stained with May-Grunwald Geimsa and Papanicolaou stains respectively. Bronchial biopsies were stained with Hematoxylin and Eosin.

Results: There were 5 adenocarcinoma, 6 squamous cell carcinoma, 7 poorly differentiated carcinoma, 2 suspected malignancies, 13 non-malignant lesions out of 33 cases. Malignancies were having male predominance with high incidence in 6th and 7th decade. Among the 18 malignancies 12 were identified on brushing and 11 were identified on biopsy. BAL was not representative of malignancy. The rate of nondiagnostic material was more in biopsy.

KEYWORDS

Introduction:

Bronchogenic carcinoma is one of the leading causes of all cancer associated deaths in the world. It is the commonest cause of death from cancer in males. According to recent studies the incidence is on the rise in women. For early diagnosis different diagnostic modalities like radiology, FOB, bronchial biopsy, exfoliative cytology, bronchial brushing, washing and fine needle aspiration cytology are available.[1]

Previously bronchogenic carcinoma was considered to be infrequent in India, but in the recent past a trend of increase in its incidence has been noticed.[2]

The use of cytological methods are generally acclaimed as one of the most successful applications in the diagnosis of malignant lesions of respiratory tract.[3] The utilities of cytology is extensive as sometimes they help in planning the treatment without the requirement for an open biopsy.[4] Bronchial biopsy has also been used as the gold standard diagnostic test to assess the efficacy of other cytologic techniques.[5]

In view of importance of cytology in diagnosing the lung malignancies, we decided to study to compare yield and diagnostic utility of various diagnostic bronchoscopic materials like Broncho-alveolar lavage (BAL), brushing, Transbronchial needle aspirates (TBNA) and biopsy.

Material and methods

The present study was conducted in the Department of Pathology, SMVMCH, Puducherry, from October 2014 to September-2015. Out of 62 cases of mass in the lung, 33 cases having more than one type of samples were included in the study. There were 28 BAL, 13 TBNA, 29 brushing and 21 biopsy obtained by flexible fiber-optic bronchoscopy done by the pulmonologist. Air-dried and wet-fixed smears were prepared from BAL, Bronchial brushing, pleural brushings and TBNA and stained with May-Grunwald Geimsa and Papanicolaou stains respectively. Bronchial biopsies were stained with Hematoxylin and Eosin.

Results:

In present study, out of 62 cases of mass in the lung, 33 cases having more than one type of samples were included.

We received total of 28 samples of brushing, 13 samples of TBNA, 21 Specimen of biopsy, 29 samples of BAL.

Out of 33 cases 26 were male, constituting 78.79% of total samples and 7 were female, constituting 21.21% of total samples. Average age of patients was 58.79 years. Youngest patient was 21 years and eldest was 80 years old. With increase in age there was increase in incidence of malignant cases.(Table 1)

Table 1: Age wise distribution of case based on gender and diagnosis.

Age	Total	Male	Female	Malignant	Non malignant	Suspicious of malignancy
0-20	0					
21-30	1	0	1	0	1	0
31-40	2	1	1	0	2	0
41-50	8	7	1	2	6	0
51-60	9	7	2	5	3	1
61-70	10	8	2	8	1	1
>70	3	3	0	3	0	0

Out of 33 cases 5 were adenocarcinoma(Fig 1-4), 7 were poorly differentiated carcinoma (Fig 5,6), 6 were squamous cell carcinoma (SCC)(Fig 7,8), 13 were nonmalignant lesions and 2 were suspicious of malignancy.(Table 2). Out of 18 confirmed malignant cases 14 were male and 4 were female with male to female ratio of 3.5:1.

Table 2: Incidence of various types of lesions

Diagnosis	No of cases	Percentage
Adenocarcinoma	5	15.15%
Squamous cell carcinoma	6	18.18%
Poorly differentiated carcinoma	7	21.21%
Non malignant	13	39.39%
Suspicious of malignancy	2	6.06%

Total 28 brush samples were received and out of these 28 cases, 12

were diagnosed as definitive malignant lesions and 16 were diagnosed as non malignant lesions. Out of total 13 samples of TBNA 6 were diagnosed as definitive malignant, 1 as suspicious of malignancy, 3 as nonmalignant and 3 were non diagnostic or inadequate. Out of 21 samples of biopsy 11 were diagnosed as definitive malignancy, 4 as non malignant and 6 were non diagnostic or inadequate. Out of 29 BAL samples 5 were diagnosed as definitive malignancy, 1 as suspicious of malignancy, 2 as dysplasia, 20 as nonmalignant and 1 was non diagnostic or inadequate. (Table 3).

Table 3: Diagnosis obtained by various techniques

Diagnosis	Brush(n=28)	TBNA(n=13)	Biopsy(n=21)	BAL(n=29)
Definitive malignancy	12	6	11	5
Suspicious for malignancy	0	1	0	1
Dysplasia	0	0	0	2
Non malignant	16	3	4	20
Non diagnostic/inadequate	0	3	6	1

Out of 5 confirmed adenocarcinoma cases, we received 5 brushing samples, 3 TBNA samples, 5 biopsy samples and 5 BAL samples. For adenocarcinoma brushing was having 100% accuracy as all 5 cases were diagnosed as adenocarcinoma. Out of 3 samples of TBNA 2 were diagnosed as adenocarcinoma(accuracy 66.67%). Out of 5 samples of biopsy 3 were diagnosed as adenocarcinoma (accuracy 60%) . Only 2 out of 5 samples of BAL were diagnosed as adenocarcinoma (accuracy 40%). Out of 6 confirmed cases of squamous cell carcinoma, we received 4 brushing samples, 3 TBNA samples, 5 biopsy samples and 6 BAL samples. For squamous cell carcinoma biopsy was having 100% accuracy. Out of 4 samples of brushing 2 were diagnosed as SCC (accuracy 50%). Out of 3 samples of TBNA 2 were diagnosed as SCC(accuracy 66.67%). No SCC was diagnosed by BAL. Similarly the accuracy for poorly differentiated carcinoma on brushing was 66.67%, TBNA was 100%, biopsy was 75% and BAL was 28.51%. (Table 4).

Table 4: Comparison of accuracy of each technique for various diagnosis

Diagnosis	Brush	TBNA	Biopsy	BAL
Adenocarcinoma (n=5)	5(n=5)(100%)	2(n=3)(66.67%)	3(n=5)(60%)	2(n=5)(40%)
SCC(n=6)	2(n=4)(50%)	2(n=3)(66.67%)	5(n=5)(100%)	0(n=6)(0%)
Poorly differentiated carcinoma(n=7)	4(n=6)(66.67%)	2(n=2)(100%)	3(n=4)(75%)	2(n=7)(28.51%)
Non malignant(n=13)	13(n=13)(100%)	1(n=3)(33.33%)	4(n=7)(57.14)	9(n=9)(100%)
Suspicious of malignancy(n=2)	0(n=0)	1(n=2)(50%)	0(n=0)	1(n=2)(50%)

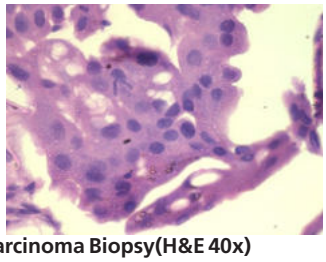

Fig 1: Adenocarcinoma Biopsy(H&E 40x)

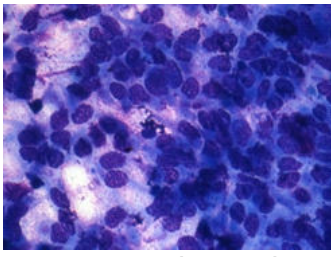

Fig 2: Adenocarcinoma cytology(MGG 40x)

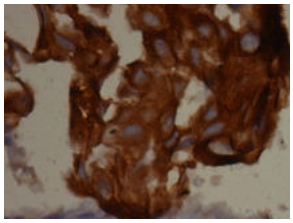

Fig 3: Adenocarcinoma Biopsy(Cytokeratin 40x)

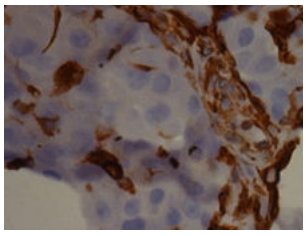

Fig 4: Adenocarcinoma Biopsy(Vimentin 40x)

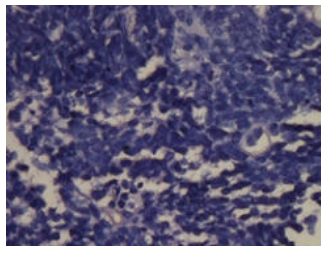

Fig 5: Poorly differentiated Ca. biopsy(H&E 40x)

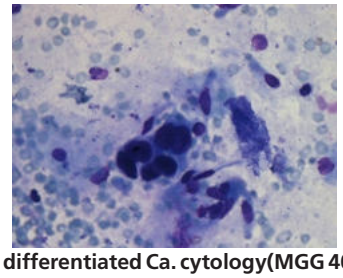

Fig 6: Poorly differentiated Ca. cytology(MGG 40x)

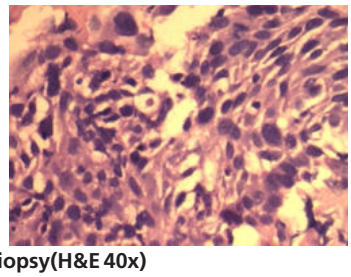

Fig 7: SCC Biopsy(H&E 40x)

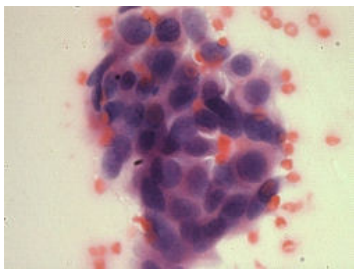

Fig 8: SCC cytology(PAP 40x)

Discussion:

The present study was done to compare yield and diagnostic utility of various diagnostic bronchoscopic materials like BAL, brushing, TBNA and biopsy.

Table 5: Comparison of percentage incidence of various

types of lung cancers

Author	Squamous cell carcinoma	Adeno. carcinoma	Bronchiolo alveolar carcinoma	Small cell carcinoma	Large cell carcinoma	Undiff. carcinoma	Other
Agarwal et al[6]	55	21.5	1.08	10.88	-	5.89	5.65
Adnan et al[7]	31.57	25.3	-	-	12.4	7.2	5.4
Kotadia et al [8]	39.39	21.21	4.54	13.63	7.57	4.54	6.06
Joos et al[9]	34.45	18.2	5.0	11.10	10.1	-	-
Present study	33.33	27.78	-	-	-	38.89	-

In the present study incidence of poorly differentiated carcinoma was high compared to other studies. It may be due to the fact that many patients coming to our hospital were in the advanced stages of disease with pleural effusion, lymphnode metastasis, pleural nodules and metastasis.

Biopsy is considered to be gold standard. But in our study, 6 out of 21 samples of biopsy turned out to be non-diagnostic or inadequate. Out of these 6 cases, 2 were adenocarcinoma, 1 was poorly differentiated carcinoma and 3 were nonmalignant cases. Limiting factors were mucous sampling, area of necrosis or very superficial sampling. One of the advantages of biopsy is that it can be used for special stains, if necessary.

In our study we found that brushing yields far better material compared to BAL. Brushing was 100% accurate in diagnosing adenocarcinoma and nonmalignant cases. For diagnosing SCC it was having 50% accuracy. For poorly differentiated carcinoma it was having 66.67% accuracy. One nonmalignant case demonstrated AFS +ve.

TBNA was having 100% accuracy for poorly differentiated carcinoma and 66.67% accuracy for adenocarcinoma and SCC.

BAL was useful in nonmalignant cases (accuracy 100%).But in malignant cases its accuracy was 22.22%. Some of the limiting factors were non representing cellularity, hemorrhage.

In general for TBNA, Brushing and BAL, there was one common limitation. In all these methods, many air dried MGG stained smears were showing artefactual nuclear enlargement, opening of nuclear chromatin and sometimes nuclear molding. On the other hand, PAP stained smears were showing dark staining of nuclear material in samples with hemorrhage.

In our study it was observed that the superficial lesions yielded adequate and representative samples in brush and BAL, whereas the deep seated lesions were diagnosed by TBNA and biopsy.

There has been a controversy related to bronchial washing as it should be routinely used or not. In the past, studies like Trevisani et al.[10], Karahalli et al[11] , recommended that washing should not be routinely used as addition of bronchial washing to bronchial biopsy did not increase diagnostic yield significantly. Whereas, authors likes Mak et al.[12], Jones et al.[13] have suggested that to obtain optimal diagnostic yield, bronchial biopsy, brushing and washing should be performed. Liwsrisakun et al.[14] have observed that the addition of bronchial washing to either biopsy or brushing is not cost-effective but improves diagnostic accuracy.

In our study, direct smears were prepared from brushings and TBNA, therefore it was not possible to do special Immunocytochemistry(ICC) stains. However, cell blocks can be obtained by rinsing the brush and needle in formal saline to perform ICC.

Harvesting the cells shed from the tumour during bronchoscopic needle aspiration or brushing, by rinsing the needle or brush, has already been reported to be useful.[15]

Conclusion :

Bronchial brushing is a superior technique than BAL in the diagnosis of bronchoscopically visual lung malignancies, as it yields diagnostic material far better. Biopsy is gold standard, but mucus and superficial sampling were limiting factors in some cases. BAL and bronchial brushing are ideal for superficial lesions and for deep lesions TBNA and biopsy are preferred.Combined use of these techniques increases the accuracy of the diagnosis than using single technique.

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