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A Comparative Study of Bronchial Brushing and Transbronchial Needle Aspiration in Diagnosis of Lung Tumors

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ABSTRACT

Lung tumors are an important cause of deaths worldwide. Early recognition by conventional diagnostic procedures and specialized procedures yield useful material and are of great help. This study evaluates the methods available and their cost benefit effectively.

KEYWORDS: Lung tumors, Bronchial Brushing (BB), Transbronchial needle aspiration (TBNA).

INTRODUCTION:

The use of flexible fibreoptic bronchoscopy has made an important revolution in cytology of respiratory tract.[1]The use of bronchial brushings (BB), bronchoalveolar lavage(BAL)and transbronchial needle aspiration(TBNA) is an important tool for aspirating diagnostic cytological material from various sites of tracheaobronchial passage.[2]As the cytologic diagnosis of lung cancer relies heavily on direct bronchial brushings, bronchial wash and brush specimens collect cells from the surface and the deeper layers of the tumor. .

Respiratory tract is continuously exposed to environmental factors in the form of viruses, bacteria, natural allergens, various pollutants along with products of combustion, in form of tobacco smoke, automobile exhaust fumes

cause infective, inflammatory, immunologic respiratory diseases, in addition to a variable degree of secondary involvement of respiratory system in virtually all terminally ill patients.[3]

Combined study of biopsy and cytology material enhances sensitivity of diagnosis of malignant tumors and their specific subtyping. Washings sent as part of the procedure and are routinely processed add a small increment to sensitivity mainly when brush or biopsy cannot reach the peripheral tumors.

Lung tumors account for most deaths from cancer worldwide.[4] The present study is an attempt to compare efficacy of BB and TBNA in diagnosing carcinomas of lung in our hospital.

MATERIAL AND METHODS:

Cytology samples from tracheaobronchial lesions suspected to be of carcinoma lung were collected by BB and TBNA from1st Jan.2010 to May 2012. with detailed history, clinical and radiological findings .Samples with inadequate cytological material as well as metastasis to lung were excluded.160 samples were included in the study. Signed informed consent from patients was taken. Premedication with atropine was done routinely. Flexible fibroptic bronchoscope was used to collect BB, TBNA samples as well as bronchial biopsy where possible. Bronchial brushings were smeared directly on to glass slides and wet fixed in 95% ethanol. For TBNA needle of 23gauge was attached to the distal end of flexible wire of bronchoscope. Aspirated material was taken as air dried or wet fixed smears. Bronchial biopsies were transferred to 10% formalin containers. Standard methods for processing and preparation of histopathological sections were followed. For wet fixed smears Papanicolaou and Haematoxylene & eosin stains were used and for air dried smears Leishman and May-Grunwald Giemsa stain was used. Biopsy sections were stained with haemotoxylene & eosin stains were used.

OBSERVATIONS:

In our study group total 160 cases were included and 52 were identified as positive cases n=160 cases were studied and 35.2%i.e.52 cases were having tumor. Table I shows age and sexwise distribution of carcinoma lung lesions n=52.Maximum number of cases n=20 were found in age group of 61-70 years followed by 51-60 years of age groups n=12. No cases were found in extremes of age group i.e.,1-30 and above 81 years.

Males formed the major bulk of cases 39 (75%) and females 13(25%).This distribution is attributed to the fact that males are usually cigarette and bidi smokers. Male: female ratio is 3:1.

Table II shows the distribution of carcinomas in various groups of males and females. The bulk of the tumors are NSCC(non small cell carcinoma) formed by squamous cell carcinoma n=20/52-38.40%;M:F being2.5:1 followed by adenocarcinoma n=6/52-11.53%;M:F being 2:1.Inspite of the routine methods 24 of the tumors were categorized as poorly differentiated carcinomas. No benign tumors were observed.

Table III shows positivity of BB and TBNA methods; individually and when used in combination, the false positive, false negative, true positive and true negatives. In these tests only specimens whose biopsies were available for comparison were included. Combination of BB with TBNA showed better results than both techniques attempted individually were included.

Table IV shows the parameters of accuracy of BB and TBNA, as well as their combinations. BB showed better efficiency than TBNA, in terms of the various indices calculated especially sensitivity, specificity and accuracy. The combinations of both the techniques BB and TBNA for diagnosing lung carcinomas is much superior than when used alone in terms of positive predictive value, accuracy and sensitivity. The specificity of both the tests used in combinations is lesser than single tests done alone.

DISCUSSION:

Lung cancer is the most common malignant disease worldwide: and is major cause of death from cancer, particularly among males[3,4,6]. The addition of TBNA to conventional diagnostic procedures increases diagnostic yield in patients with visible endobronchial lesions.[5] Increase in tobacco consumption is directly related to lung cancers .Both number and duration affect cancer development.[6] The positivity of cases show similar results in other studies.[7] The increase in number of lung cancer patients is because of low socioeconomic status and *bidi* smoking. In our study 35.2% cases (n=52/160) is positive for primary lung cancers and M:F ratio is 3:1.The diagnostic yield and complications of TBNA with BB show similar results.[8]

The age incidence is low below 31 years of age group for both men and women. Lung cancer is commonly seen in ages of 40-70

years. The differences in age and gender distribution is mainly because of occupational ,exposure to irritants, habits like cigarette smoking and increased susceptibility.[6]Early lung cancer study has made categories to receive special attention -smokers.55 years of age, persistent cough cases, recurrent pneumonias, persistent radiological abnormality, industrial workers exposed to chemical carcinogens.[6]

Of the non small cell carcinomas of lung squamous cell carcinoma is found to be the most frequent (38.46%) and the M; F ratio is 2.5:1 and these cases were proved on histological biopsy. Some of the cases which morphologically could not be classified into any category n=24 were labeled as poorly differentiated carcinoma. This may be because of late detections of these cases and locally advanced disease process which makes differentiation impossible. Adenocarcinomas were reported to be on rise.[9,10]. When the tumor is peripheral and small, thin section CT scans may be useful. These features also help in distinguishing carcinomas from benign tumors.[10] The use of MRI can also be helpful in assessing chest wall invasion. Squamous cell carcinomas are more often central growing within the main bronchus. The clinical presentation may lead to obstructive pneumonia. About 10% of squamous cell carcinoma undergo central cavitation and so are difficult to diagnose. When poorly differentiated tumors show intracellular mucin they are categorized as adenocarcinomas.

Cytologically,52 cases were reported as malignant but only 22 cases of BB, 18 cases of TBNA were taken for study of efficacy (Table III) Of these 52 cases 12 were positive for both BB and TBNA. The efficacy of tests was calculated by taking into consideration, the sensitivity, specificity, false indices, predictive values and accuracy. (Table IV).

Sensitivity of 85% could be when BB were used alone and specificity was 75%.The combination of BB& TBNA increased sensitivity by 95.23% and specificity upto 100%.Other authors have reported sensitivity as 51to 85% .[15-17] Shroff et al have reported sensitivity of BB as 97.3%.[11] BB were positive in studies of Samerung et al[12] .Bibbo et al [13] have reported a sensitivity of 98%. The overall accuracy of BB in our study was 61.11 %.(Table IV).

Multiple sampling also improves the yield. Transbronchial needle aspiration may give an additional positive yield to forceps biopsy. A combination of forceps biopsy and brushings is the best strategy in the diagnosis of bronchoscopically visible lung cancer.[14] In endobronchial lung cancers transbronchial needle aspiration is a safe diagnostic tool, particularly in cases of submucosal peribronchial disease.[15] Although the diagnostic success was increased in all localizations by the addition of TBNA to conventional diagnostic methods, statistically significant result was obtained only for lesions located at trachea and the main bronchi.[16]The sensitivity of TBNA is 90% in our study. Others have reported sensitivity of TBNA from 51-85%.[15-17] TBNA allows sampling of mediastinal nodes as well as paratracheal masses encroaching on bronchi. This is helpful for those cases which are beyond reach of biopsy forceps. Errors due to superficial necrosis of deeply situated lesions can be avoided with this test. But TBNA is done blindly so its hazards should be kept in mind as representative sample could be missed. The specificity in our study was 50% only. Accuracy in our study was 75%(Table IV).

Thus we observed that BB shows sensitivity, specificity, and accuracy than TBNA.

The combination of both tests can improve the efficacy as more diagnostic cytological material is obtained. Screening examinations were not cost effective taking into consideration the potential harm of false positive invasive tests and high cost.[18-20].The superiority of the tests can be assessed by the positive and negative predictive values which help in better interpretation of disease process. The errors due to re-exploration and re-sampling can be avoided thereby reducing the turn around time.

CONCLUSION:

Bronchial brushing is better technique than TBNA for diagnosing lung tumors. Diagnosis is more reliable if both the techniques are used simultaneously.

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TABLE I:AGE AND SEXWISE DISTRIBUTION OF CARCINOMA LUNG LESIONS

AGE	TOTAL%	MALES%	FEMALES
01-30	-	-	-
31-40	06(11.53)	04(10.25)	02(15.38)
41-50	10(19.23)	08(20.5)	02(15.38)
51-60	12(23.07)	08(20.5)	04(30.76)
61-70	38.46)	16(41.02)	04(30.76)
71-80	04(7.69)	03(7.69)	01(7.69)
81& above	-	-	-
	52(32.5)	39(24.37)	13(8.12)

Total cases=160

TABLE II: DISTRIBUTION OF CARCINOMAS ACCORDING TO CYTOMORPHOLOGY n=52

TUMOR	TOTAL	MALES	FE-MALES	M:F RATIO
SQUAMOUS CELL CARCINOMA	20	14	06	14:6-2.5:1
ADENOCARCINOMA	06	04	02	4:2-2:1
SMALL CELL CARCINOMA	02	02	-	-
LARGE CELL CARCINOMA	-	-	-	-
POORLY DIFFERENTIATED CARCINOMA	24	18	06	18:6-3:1
-	-	-	-	-
Total	52	38	14	21:5-4:1

TABLE III: DIAGNOSTIC POSITIVITY OF VARIOUS CYTOLOGICAL TECHNIQUES IN CARCINOMA LUNG

TECHNIQUE	TOTAL CASES	CASES COMPARED WITH BIOPSY	TP-TRUE POSITIVE	TN-TRUE NEGATIVE	FP-FALSE POSITIVE	FN_FALSE NEGATIVE
BB	100	22	10	06	02	04
TBNA	40	18	10	01	01	06
BB& TBNA	20	12	07	02	01	02
	160	52	-	-	-	-

TABLE IV: PARAMETERS OF ACCURACY OF VARIOUS CYTOLOGICAL TECHNIQUES IN MALIGNANT CASES

Sr.No.	PARAMETER	FORMULA	BB	TBNA	BB& TBNA
1.	Sensitivity	TPx100/TP+FN	86.10	90.90	86.6
2.	Specificity	TNx100/TN+FP	75	50	100
3.	FPI	FPx100/FP+TN	25	50	50
4.	FNI	FNx100/FN+TP	25	85.7	22.2
5.	PPV	TPx100/FP+TP	83.3	90.90	87.5
6.	NPV	TNx100/TN+FN	85.71	14.28	50
7.	Accuracy	TP+TNx100/ TP+TN+FP+FN	72.72	61.11	75

FPI=False positivity index NPV= Negative predictive value
FNI=False negativity index PPV=Positive predictive value

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