IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 18, Issue 7 Ser. 8 (July. 2019), PP 01-19
www.iosrjournals.org

A Comparative Study of Diagnostic Utility of Bronchial Washings And Brushings.

Dr. Manik Mahajan[1], Dr. Reetika Gupta[2], Dr. Rahul Gupta[3]
(Senior Resident)[1], (3rd Year Resident, Pathology,Ascoms)[2],(Associate Professor & Head)[3]
Department Of Respiratory Medicine, Govt, Medical College Jammu, (J&K) INDIA.

Abstract
Background*: Bronchoscopic materials are commonly subjected to cytological evaluation whenever there is a suspicion of malignancy. Radiological evidence of a mass and direct visualization of the lesion through a bronchoscope are not definitive evidence of malignancy. Further investigation when cytological material is positive for malignant cells gives the treating clinician an edge in early treatment of lung malignancies. An elaborate search of literature regarding various methods employed during bronchoscopy opined different combinations of cytological materials along with biopsy. However bronchial washings and brushings have been commonly preferred by many clinicians as well as pathologists. In view of compliance and to some extent cost effectiveness in investigations, this study aims at evaluating the superiority between bronchial washings and brushings.*
Objectives*:*
The objective of the study are
1. *To assess the diagnostic utility of bronchial washings and brushings in diagnosing various pulmonary lesions.*
2. *To evaluate the cytological pattern of various lung pathology in bronchial washings and brushings.*
3. *To identify the pitfalls in diagnosis by bronchial washings and brushings.*

Materials & Methods*: The present study was carried out in Govt. Medical College Jammu, Department Of Respiratory Medicine, cover a period of 2 years from May 2017 to May 2019.(one year retrospective i.e from May 2017 to May 2018 and one year prospective, i.e From June 2018 to May 2019) which included a total of 100 cases. All patients were clinically and/or radiologically suspected to have a malignant lung lesion. Both bronchial washings and brushings were collected and sent to the department of pathology for cytological evaluation. Bronchial washings were centrifuged and precipitant material was smeared, wet fixed and air dried. Wet fixed smears were stained with papanicaloau stain and air dried smears with Leishman's stain. Bronchial brushings were sent smeared on slides, wet fixed and air dried and similarly stained. The findings were tabulated, analyzed and statistically evaluated.*
Results: *Comparing the positivity between the bronchial washings and brushings, bronchial brushings show 63.2% and bronchial washings show 18.4% positivity. The statistical analysis by McNemar's Test reveals a p value of < 0.001(highly significant).*
Conclusion: *This study reveals that the bronchial brushings are more reliable in diagnosis of malignancy than bronchial washings. In view of higher positivity in future, bronchial brushings can be very useful in early detection of lung cancer by using molecular techniques. Thus it can be costeffective with early confirmatory diagnosis.*
Key Words: *bronchial washings, bronchial brushings, bronchoscopy, bronchogenic carcinoma*

Date of Submission: 05-07-2019 Date of acceptance: 20-07-2019

I. Introduction

Pulmonary lesions are diagnosed using various investigations that are both Non-invasive and Invasive.

Non invasive investigations include Sputum examination, chest X-ray, CT scan, and MRI. Invasive investigations include bronchoscopic examination, with cytological examination of bronchial washings, bronchial brushings, and bronchoalveolar lavage (BAL) materials.

The role of any diagnostic technique usually refers to its utility and limitations. Cytopathological methods provide rapid, inexpensive, simple means of diagnosis, with little injury and better acceptance by patients and physicians. It allows a closer look at intimate cellular details due to isolated cells, and a three dimensional view by focusing the microscope up and down. The relation of the cells to the supportive stroma cannot be established in cytology. Interpretation of cellular morphology is sometimes subjective and variable. Cytological diagnosis is not always final and it must often be confirmed by histology.

A cytological evaluation of bronchoscopic material will aid in early detection of lung cancer. It is useful in determination of type of clinically suspected carcinoma. Diagnosis of certain benign pulmonary lesions such as pneumoconiosis, fungal infections and granulomatous inflammation are also possible by means of cytology. The choice of cell collection technique can be based on the factors such as the personal preference of the physician, the status of the patient, the location of the lesion, and the differential diagnosis.[1]

Bronchoscopic cytology

With the advent of flexible fibre-optic bronchoscopy, a new chapter of respiratory cytology kick started with various possibilities of cytological sample such as bronchial washings, bronchial brushings, bronchial biopsy rinse fluid, bronchoalveolar lavage material, transbronchial needle aspiration. With this, the emphasis shifted to respiratory cytology as first line diagnostic procedure in the diagnosis of lung cancer, so much so that crucial management decisions were taken based on the cytological diagnosis. However all cytological samples need not be equally efficient, and it is not practical to obtain all types of samples in every patient. The patient compliance, feaslibilty in each case would vary according to the disease presentation. Hence in this study an attempt is made to compare the efficiency in diagnosis by bronchial washings and bronchial brushings, as the two samples can be routinely done in the same sitting, but in view of cost effectiveness while using molecular methods in diagnosis, anyone can be used, whichever is better.

II. Aims And Objectives Of Study

1. To assess the diagnostic utility of bronchial washings and brushings in diagnosing various pulmonary lesions.
2. To evaluate the cytological pattern of various lung pathology in bronchial washings and brushings.
3. To identify the pitfalls in diagnosis by bronchial washings and brushings

III. Materials And Methods

SOURCE OF DATA:

A cross sectional study of Pulmonary cytology material obtained as bronchial washings and brushings, received in cytology section at Govt Medical College hospital, Jammu. 100 cases were studied between January 2017 to May 2019. Histopathological correlation was done wherever possible.

METHOD OF COLLECTION OF SPECIMEN:

Procedure of bronchoscopy: The instrument used was fibre optic bronchoscope, Pentax FB15P. Accessories used were forceps for biopsy, bronchial brush for taking brushings. A detailed history and clinical evaluation was done. Investigations included routine blood examination, random blood sugar, blood urea, serum creatinine, screening for HIV and HbsAg, ECG, X- Ray chest. Patients were taken up for the procedure after overnight fasting. Informed consent for the procedure was taken. Skin sensitivity test for Lignocaine was done. Oxygen saturation was monitored during the procedure with pulse oximetry. Lignocaine 2% solution was instilled through the suction channel to anesthetise the vocal cords. The bronchoscope was introduced either tran-nasally or orally. Supraglotic airways were first inspected for any abnormalities. Then vocal cords were examined for any growth or defective movement. The scope was then gently advanced carefully observing for any abnormalities of mucosa, growth, bleeding spots, luminal distortion or any other abnormality. Samples were obtained only after careful complete visualisation of both sides. [2]

Bronchial washings

Bronchial washings are obtained by introducing a bronchoscope in the lower respiratory tract and specimens obtained after infusing about 5- 10 ml saline and respirating the resulting material by means of suction apparatus.

Bronchial Brushings

The sample is obtained during broncoscopy after complete visualization of tracheobronchial tree. A 1.3 mm nylon brush mounted on a steel guide wire is introduced through the inner channel of the bronchoscope to brush the areas which are considered abnormal under bronchoscopy.

Preparation of smears [3]

The bronchial washings received in the lab is centrifuged and the sediment is poured in to a clean petri dish, keeping it against a black background. Any solid particle or bloody material is picked and smeared on to the slide, in such a way, that the smear is only slightly thicker than the blood smear and even. These smears are then fixed.

Fixation and fixatives [3]

Materials obtained by bronchial washings and brushings can be fixed with various fixatives. Different fixatives are used by various investigators. The commonly used fixatives are 95% ethanol, 70% ethanol, ether alcohol, 95% propanol. The smears are freshly prepared and then placed in a fixative. This is called post fixation Collecting material in a container with these fixatives is called prefixation.

In our set up, the sample from bronchial washings is centrifuged and sediment is smeared. These smears are then fixed with 95% methanol or air dried. Samples from brushings are sent smeared on clean glass slide. The smears are prefixed with 95% methanol or air dried.

Staining of smears[3]

In cytopathology, papanicolaou stain is commonly used with wet fixed smears. This stain yields well stained nuclear chromatin, differential cytoplasmic counter staining and cytoplasmic transparencies. In the present study, the smears fixed with methanol are stained using papanicolaou stain. The air dried samples are stained with Leishman stain and/or May Grunwald Giemsa stain. These stains yield a better visualization of cytoplasmic details, although air drying would increase the nuclear size.

Clinical details

Name, address, age, sex of the individual is noted. Chief complaints and relevant history of presenting complaints are noted. Relevant physical examination details are noted. Relevant X- ray, CT scan findings and bronchoscopic findings are also noted. In each case, combinations of brushings and washings were taken. Bronchial washings were also sent for gram stain, bacterial culture and sensitivity, AFB staining, fungal smear, fungal culture to microbiology department.

INCLUSION CRITERIA:

All cases to be included under this study are of adult age group without any sex specifications. Preference is given to those with some bronchoscopic findings such as endobronchial lesions, a patch or mucosal surface alterations. Suspected malignancy cases screened for primary in the lung also are included. Suspected cases of pulmonary tuberculosis are also included under the study. Patients who underwent diagnostic broncoscopy where broncoscopic washings and brushings were collected were included in the study.

EXCLUSION CRITERIA:

In cases where both bronchial washings and brushings could not be collected were excluded. Pediatric age group is excluded in the study.

The smears were screened for malignant cells and non neoplastic lesions. Cytological diagnosis was made. Histopathological correlation was made whenever feasible.

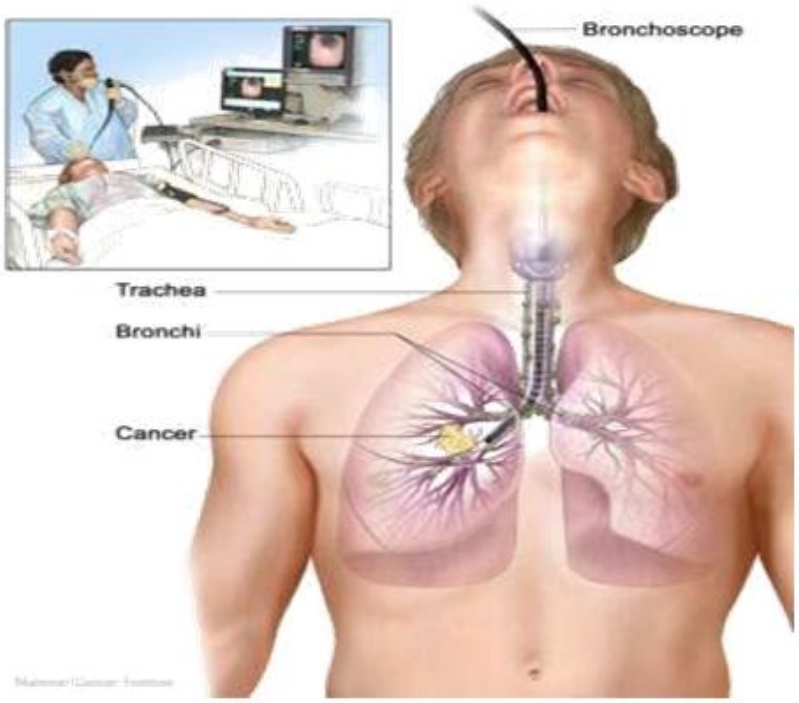

Figure 1: Fibreoptic bronchoscope
Available from www.daviddarling.info/images/bronchoscopy.jpg

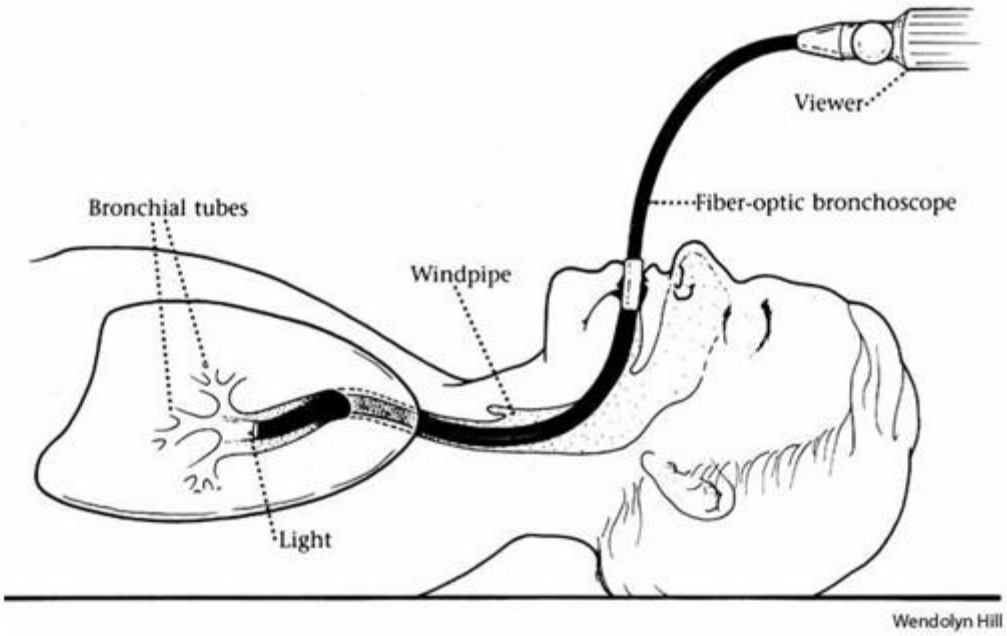

Figure 2: Procedure of bronchoscopy
Available from www.content.answcdn.com/main/content/img/medtest/f007001.jpg

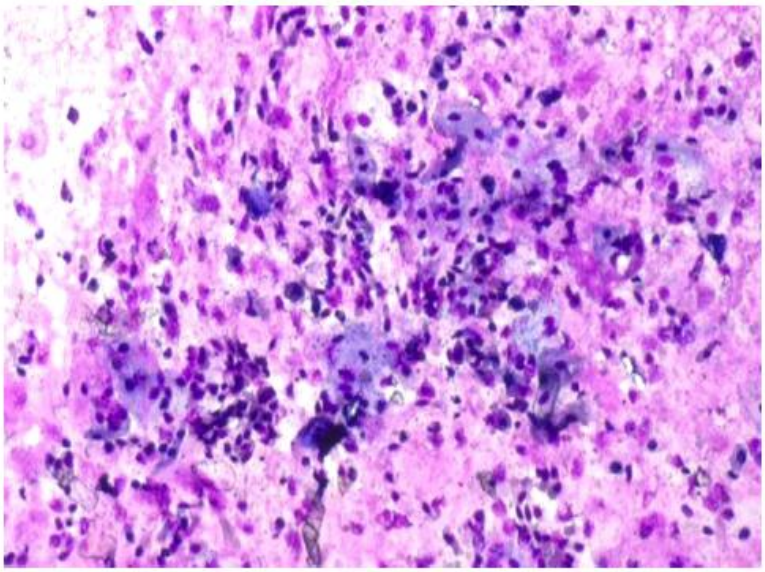

Figure 3: Adequate smear in bronchial washings: (MGG stain,10x)

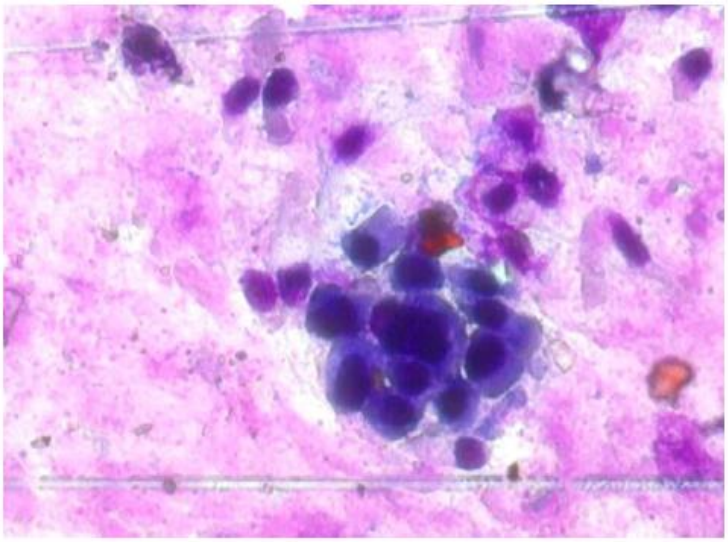

Figure 4: Adequate smear in bronchial washings (Leishmann stain,40x)

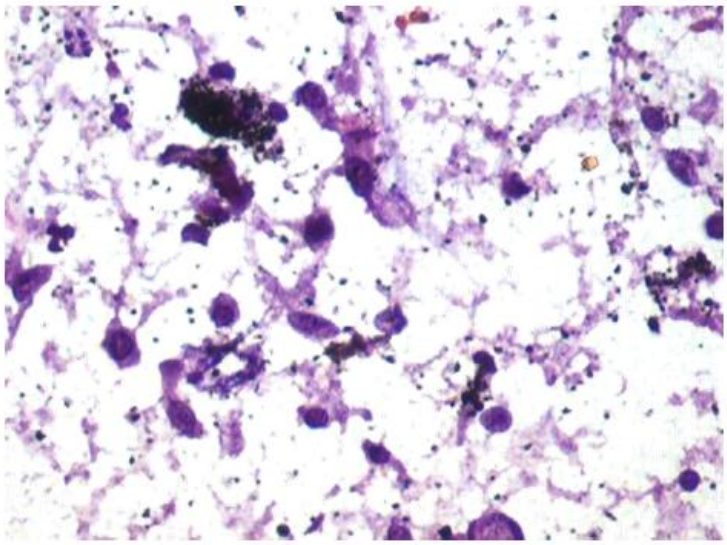

Figure 5: Adequate smear in bronchial brushings: (papanicaloau stain,10x)

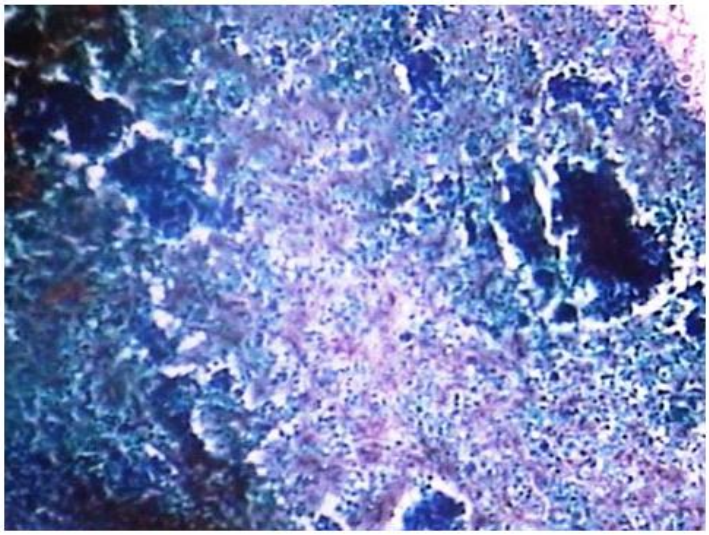

Figure 6: Adenocarcinoma in bronchial brushings (papanicaloau stain,5x)

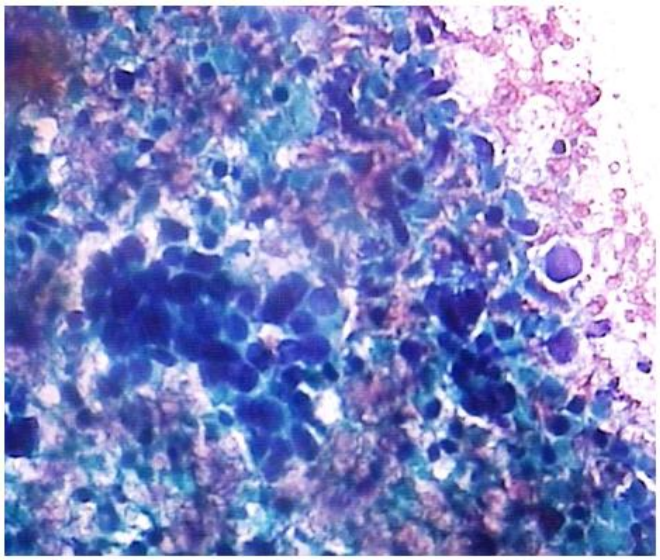

Figure 7: Adenocarcinoma in bronchial brushings (papanicaloau stain,10x)

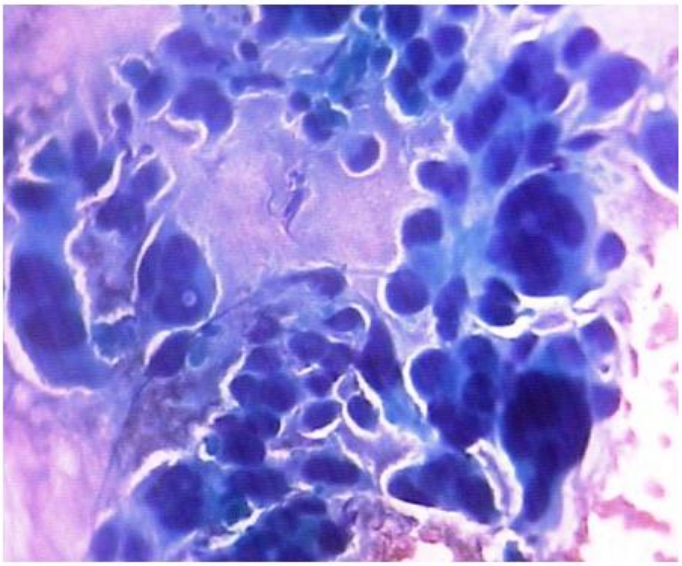

Figure 8: Adenocarcinoma in bronchial brushings (Papanicaloau stain,40x)

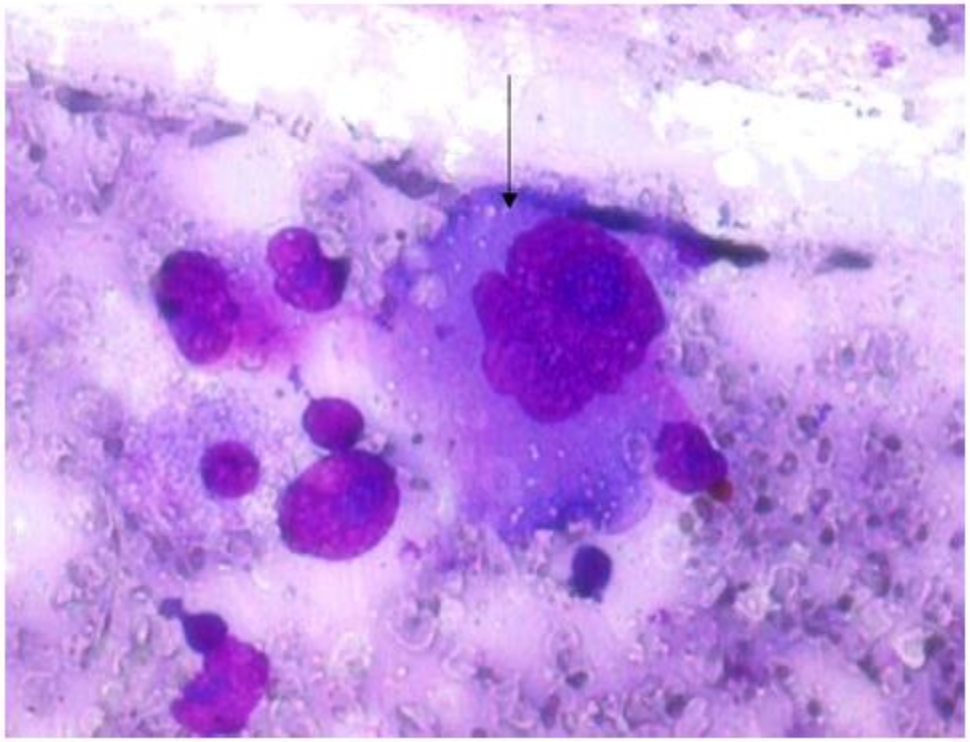

Figure 9: Adenocarcinoma in bronchial brushings: Tumor giant cell (Leishmann stain,10x)

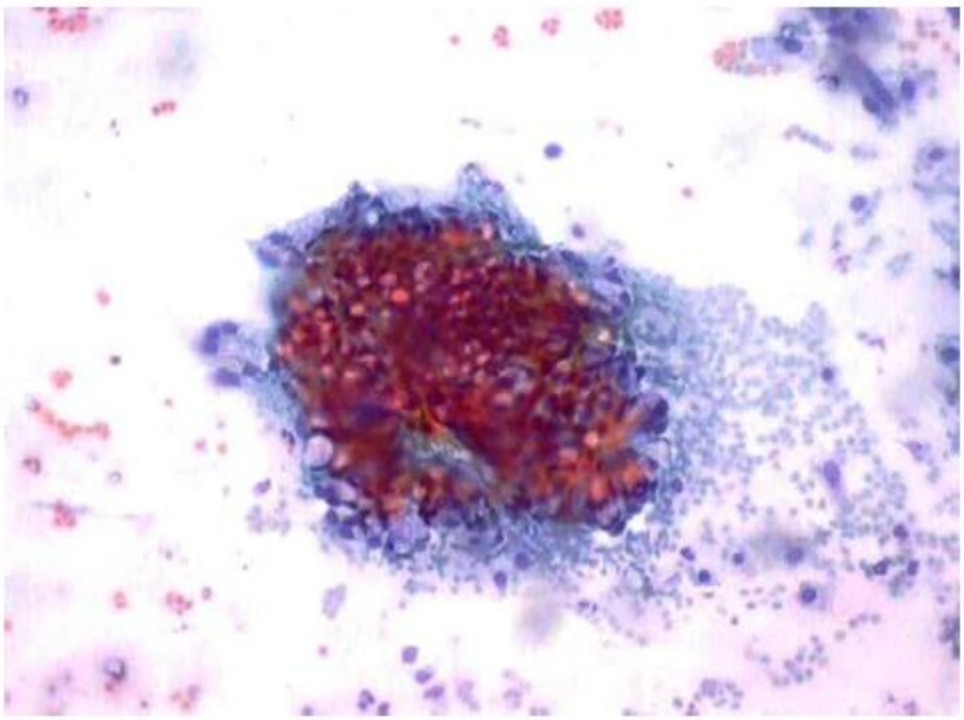

Figure 10: Squamous cell carcinoma in bronchial brushings (Papanicaloau stain, 5x)

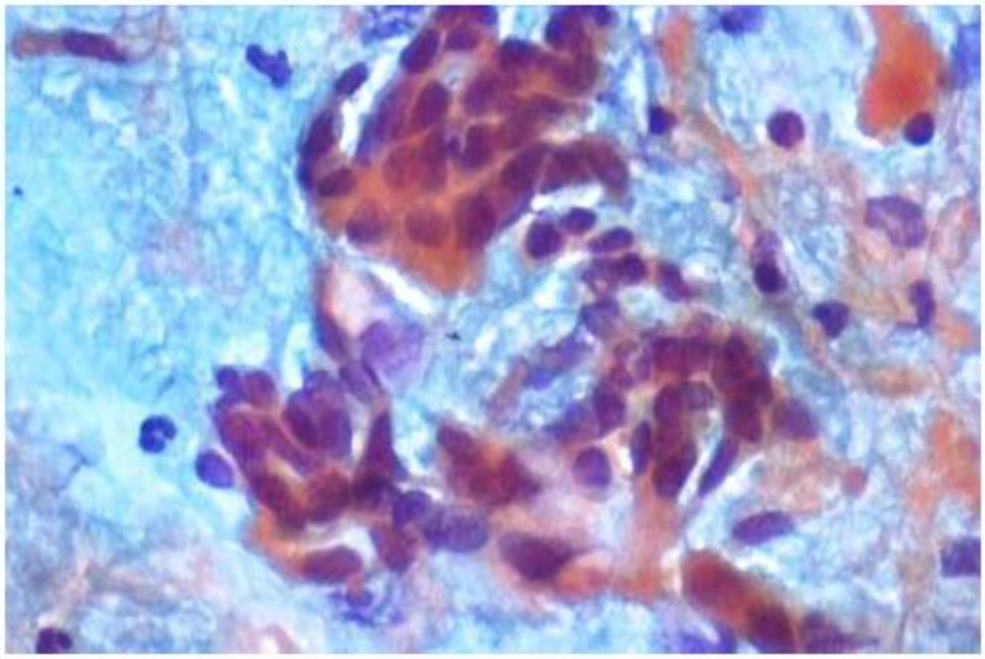

Figure 11: Squamous cell carcinoma in bronchial brushings (Papanicaloau stain,10x)

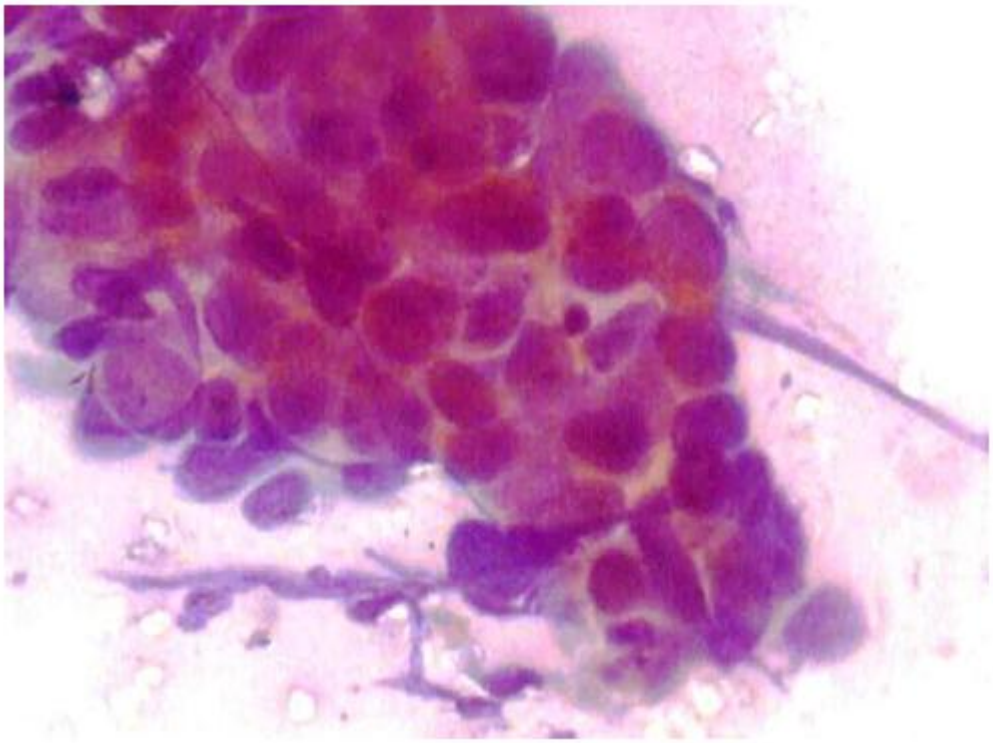

Figure 12: Squamous cell carcinoma in bronchial brushings (Papanicaloau stain, 40 x)

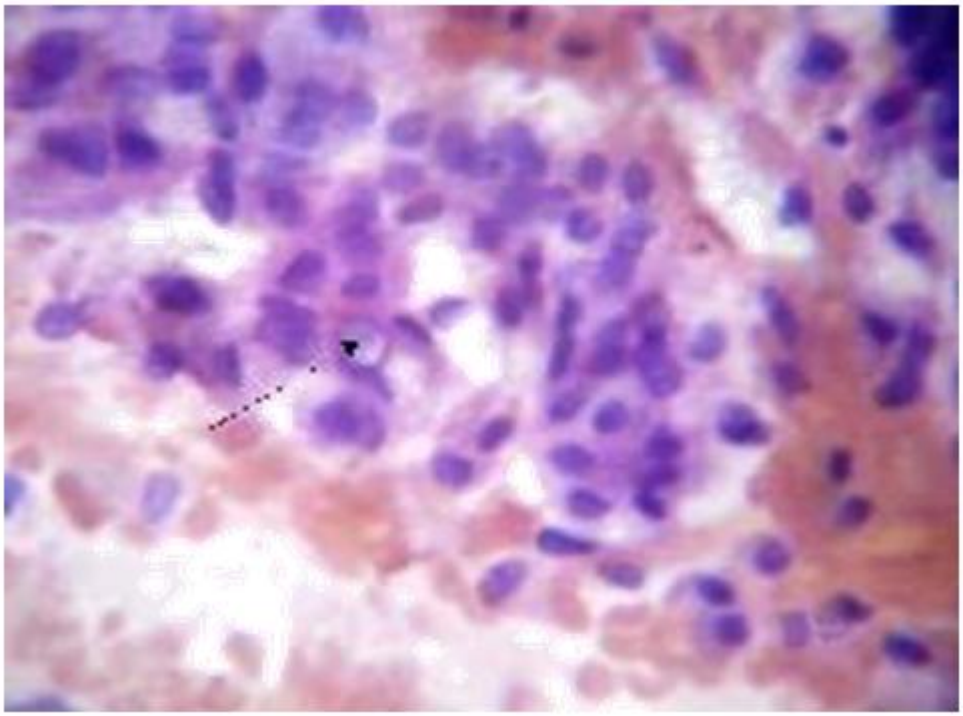

Figure 13: Bronchilo alveolar carcinoma with intranuclear cytoplasmic inclusion (Papanicaloau stain, 40 x)

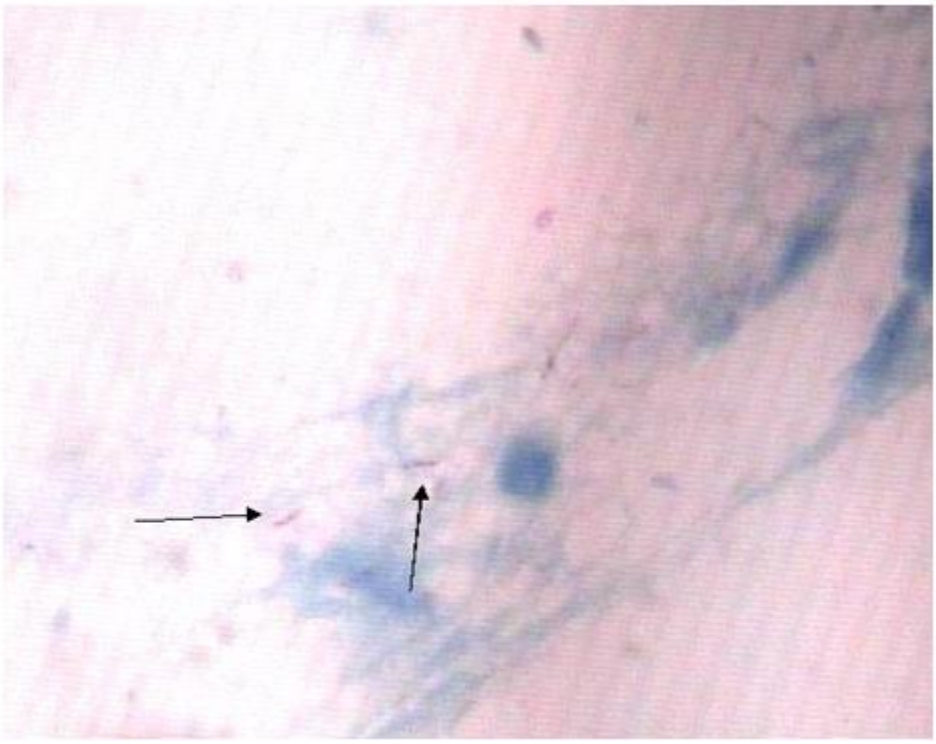

Figure 14: Acid Fast Bacilli in Bronchial washings: (Zeil Nelison Stain, 100x)

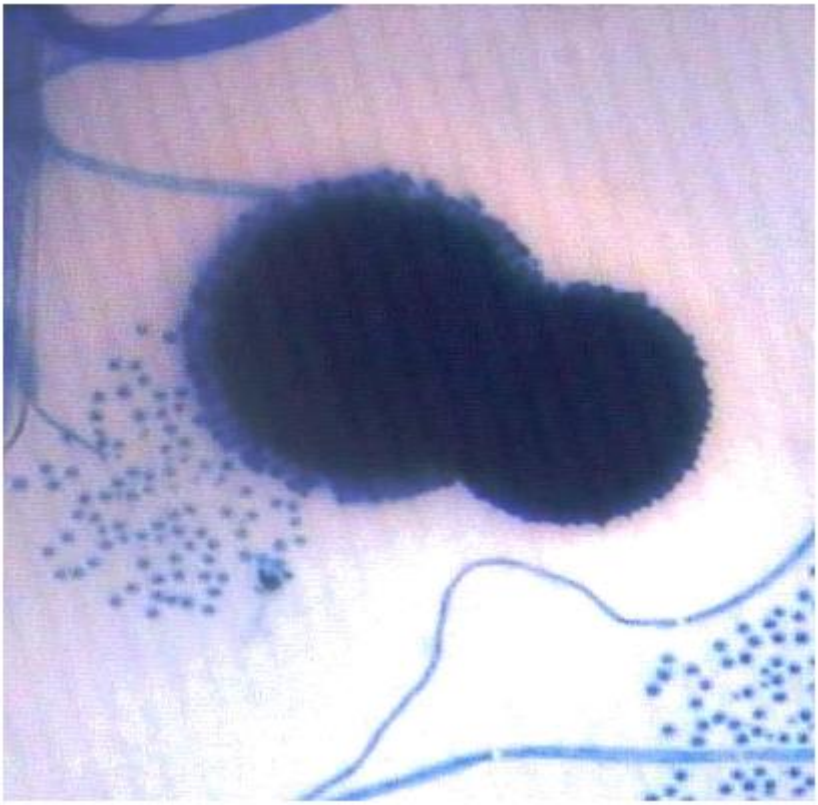

Figure 15: Aspergillus Fumigatus : seen on Lactophenol Blue wet mount preparation(40x) after subculture isolated from bronchial washings.

Figure 16: Aspergillus fumigatus as seen on Lacto phenol Blue wet mount preparation(40x) after subculture isolated from bronchial washings.

IV. Results And Analysis

Cytological samples of bronchial washings and brushings were obtained from 100 patients suspected of mass radiologically and who were undergoing bronchoscopic examination with only few cases undergoing bronchoscopic biopsy. The cytologically positive cases were referred to cancer hospitals and could not be followed up to know the true positive, true negative, false positive and false negatives. Hence the limitation of

the study is the inability to calculate the sensitivity and specificity. However positivity and negativity are calculated along with Mc Nemar's Test to know if there is any significant difference between the two tests. Fischer's exact Test was applied to know the significant difference between biopsy and brushings in the diagnosis of malignant cases.

Age Distribution of Study Population:
The age distribution of positive cases studied showed significant incidence in ages 40 to 75 years. 79 of them were males and 21 were females.

Table 1 : Age and sex distribution of study population

Age	Males	Females	Total
15-24	3	1	4
25-34	5	2	7
35-44	8	3	11
45-54	18	6	24
55-64	23	4	27
65-74	20	5	25
75-84	2	0	2
total	79	21	**100**

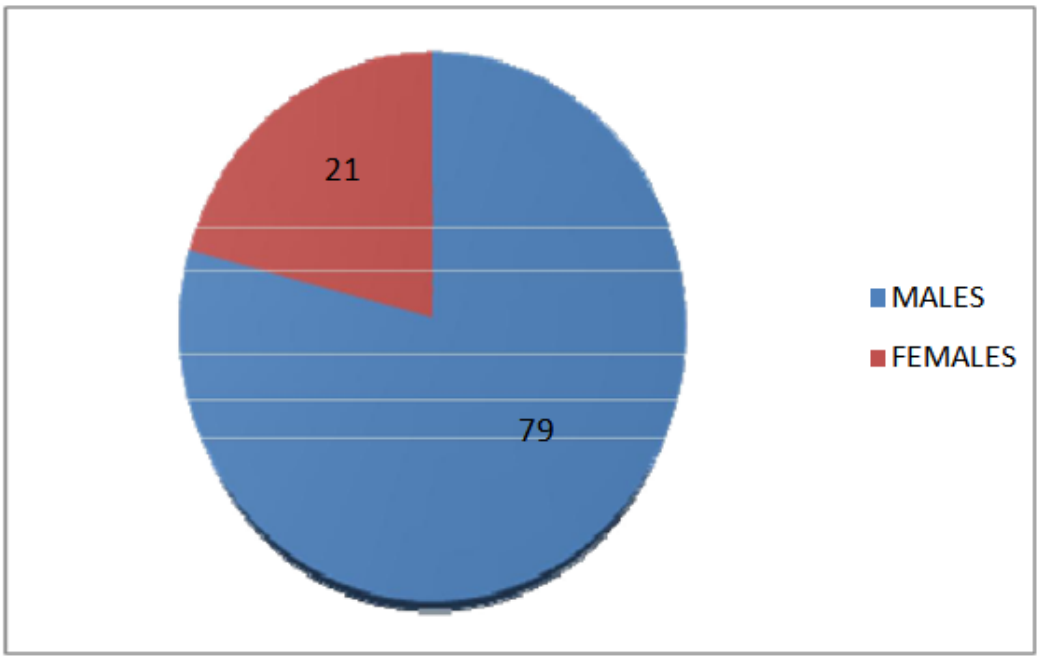

Figure 17: Sex distribution of study group:

Adequacy of the samples:
Bronchial washings are considered adequate when smear showed carbon laden macrophages and / or endobronchial cells with or without squamous epithelial cells even when cellularity is lower.
Bronchial brushings also considered adequate by the presence of endobronchial cells or carbon laden macrophages with or without squamous epithelial cells.

BRONCHIAL WASHINGS

Table 2: Outcomes of bronchial washings:

BW	**NORMAL**	**MALGN**	**INFLM**	**TOTAL**
INAD	8	4	9	21(21%)
POS	0	1	15	16(16 %)
NEG	7	33	23	63(63%)
TOTAL	15(15%)	38(38%)	47(47%)	100(100%)

In the present study of 100 bronchial washings studied, 21 were inadequate. Out of the 21 inadequate, 8 of them were inadequate in bronchial brushings, 4 of them were malignant in bronchial brushings and 9 of them were inflammatory in bronchial brushings.

The bronchial washings could detect only one malignant case in this study and 15 inflammatory lesions. Of the 63 negative bronchial washings, 7 bronchial brushings were inadequate, 33 were malignant in bronchial brushings, 23 were non malignant in bronchial brushings. Bronchial washings showed positivity of 18.4%. The percentage of positivity was calculated after excluding the inadequate bronchial washings.

BRONCHIAL BRUSHINGS

In the present study of 100 cases, 8 samples were inadequate. Out of the 8 inadequate bronchial brushings, 3 were normal in bronchial washings, 2 were malignant in biopsy, and 3 were non-malignant in bronchial washings. Bronchial brushings showed 54 of them positive including 35 were malignant, 19 were non-malignant, the positivity being 63.2%. The positivity was calculated excluding the inadequate bronchial brushings. Out of the 38 negative, 12 were inadequate in bronchial washings, 25 were non malignant in bronchial washings and 1 was malignant in biopsy. Also out of these 25 non malignant brushings, 4 were suspected to be neoplastic due visible mass by bronchoscopy. Though the material was adequate, no malignancy could be detected. The non neoplastic conditions undergoing bronchoscopy were less compared to neoplastic as the radiologically detectable masses were the majority of the cases included for the study.

Table 3: Outcomes of bronchial brushings:

STATUS	**NORMAL**	**MALGN**	**INFLM**	**TOTAL**
BB INAD	3(3%)	2(2%)	3((3%)	8(8%)
POS	0	35(35%)	19(19%)	54(54%)
NEG	12(12%)	1(1%)	25(25%)	38(38%)
TOTAL	15(15%)	38((38%)	47(47%)	100(100%)

Out of 19 non-neoplastic cases in bronchial brushings, the inflammatory lesions were acute inflammatory process (6), lung abcesses (2), aspergilloma (2), and AFB +ve granulomatous lesions(9). Malignant cases amount to about 34% of the cases and inflammatory lesions amount to 18.6% of the cases.

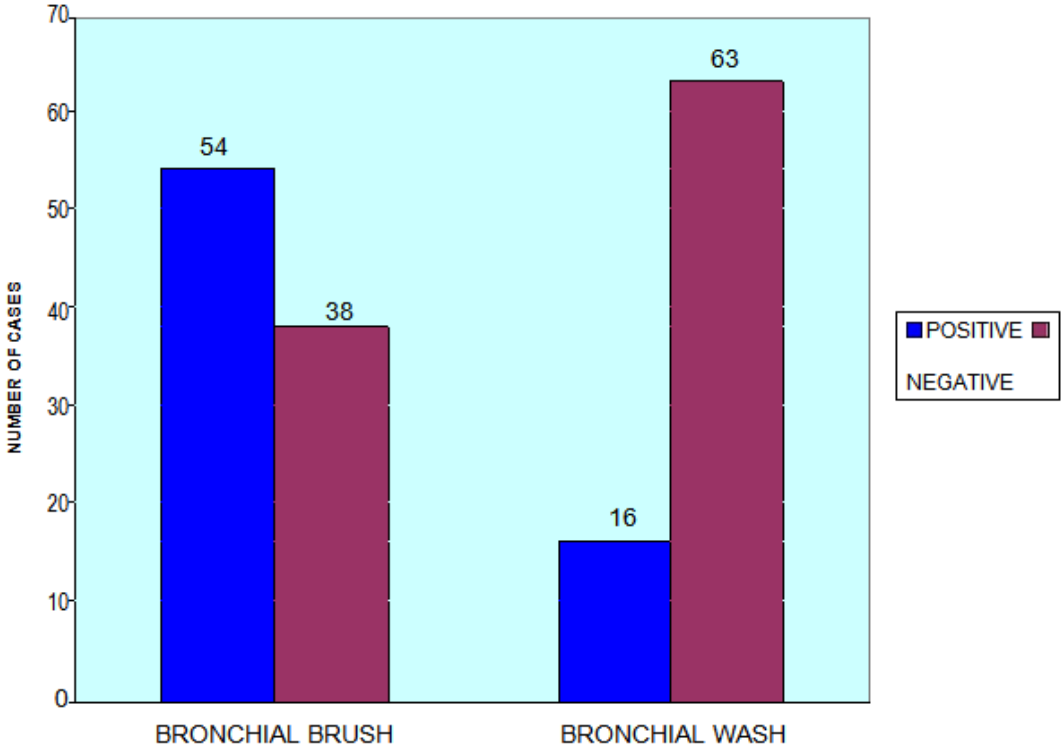

Figure 18: Multiple bar diagram representing the outcomes o brushings& washings

The following data were subjected to Mc Nemar's Test :

Table 4: Comparison of the outcomes of bronchial brushings and bronchial washings:

	BW INAD	**POS**	**NEG**	**TOTAL**
BB INAD	5	2	1	8
POS	6	8	40	54
NEG	10	6	22	38
TOTAL	21	16	63	100

p value < 0.001

Out of 54 positive samples, 8 were positive with both washings and brushings. Out of the 38 negative samples, 22 were negative with both, 5 samples of both were inadequate. Comparing the positivity of bronchial washings with bronchial brushings, bronchial brushings showed a positivity of 63.2 % and bronchial washings showed positivity of 18.4%. When this data was subjected to Mc Nemar's test, the p value was highly significant. (p value <0.001)

The results were proved to have significant difference with respect to Bronchial Washings and Bronchial Brushings cytology with p value < 0.001, which implies that the difference is due to the significant difference in the two methods.

Table 5 : Malignant and non malignant cases detected by bronchial brushings:

BB	**MALGN**	**NONM**	**TOTAL**
POS	35(43.75%)	19(23.75%)	54(67.5%)
NEG	1(1.25%)	25(31.25%)	26(32.5%)
TOTAL	36((45%)	44(55%)	80(100%)

p value <0.001

Bronchial washings could detect only one malignant case, with 18.4% positivity including the non-neoplastic inflammatory lesions. The bronchial brushings showed 63.2% of positive cases of which 42.9% were malignant and 23.4% inflammatory lesions.

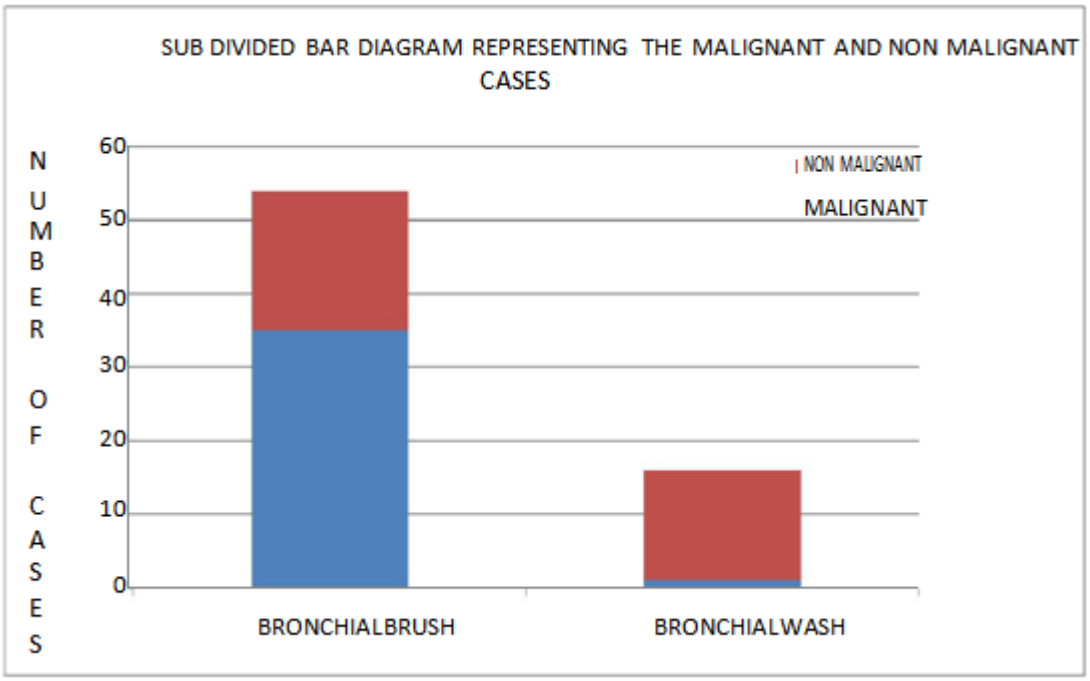

Figure 19: Subdivided bar diagram representing the malignant and non malignant

Out of the non-neoplastic conditions diagnosed by bronchial washings and brushings 9 were AFB Positive. In some of these cases, bronchial washings was AFB positive, with epithelioid histiocytes in its corresponding bronchial brushings suggesting a tuberculous etiology.

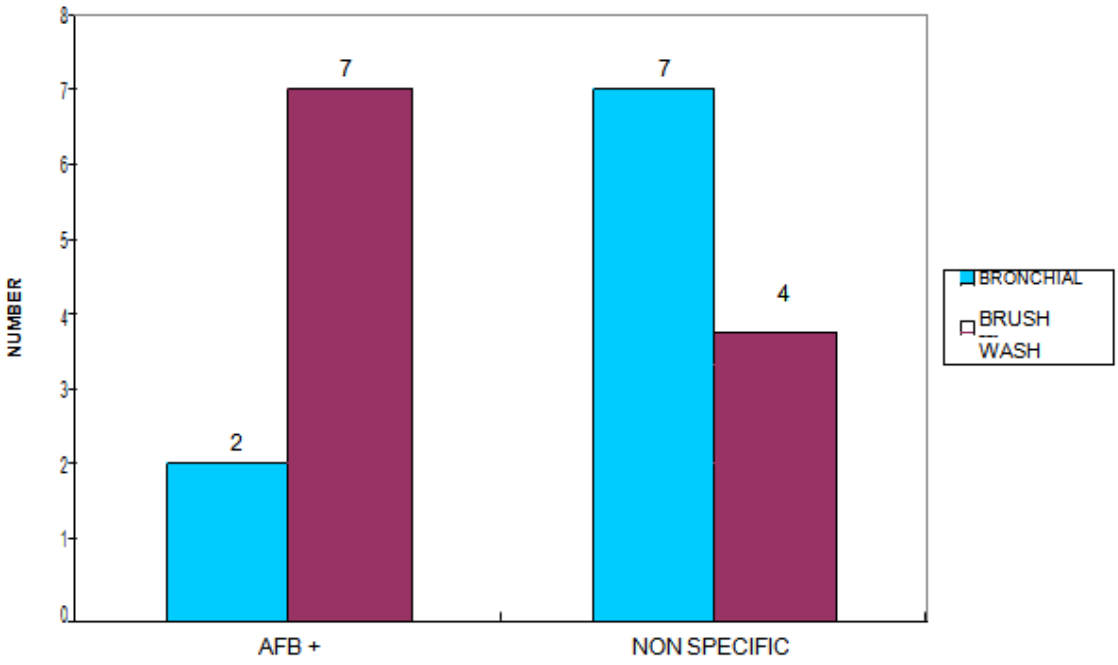

Figure 20 : Multiple bar diagram representing the nonmalignant cases

Table 6: Comparison of the outcomes of bronchial brushings and biopsy:

BB	BX POS	BX NEG	TOTAL
INAD	2(18.2%)	0	2((18.2%)
POS	10(63.9%)	2(18.2%)	12(81.8%)
TOTAL	12(81.8%)	2(18.2%)	14(100%)

p value >0.05

Histopathological correlation was not possible in all cases as the cases were referred to higher centres for further evaluation. However 12 biopsies were studied in this study, 7 out of these were squamous cell carcinoma, 2 adenocarcinoma and one small cell carcinoma. 2/12 were not showing malignancy when bronchial brushings were clearly positive. This disparity was discussed with the clinician and were thought to be due to various circumstances such as non cooperative patient during biopsy, inadequate sampling, missing the actual mass which the brush did not miss.

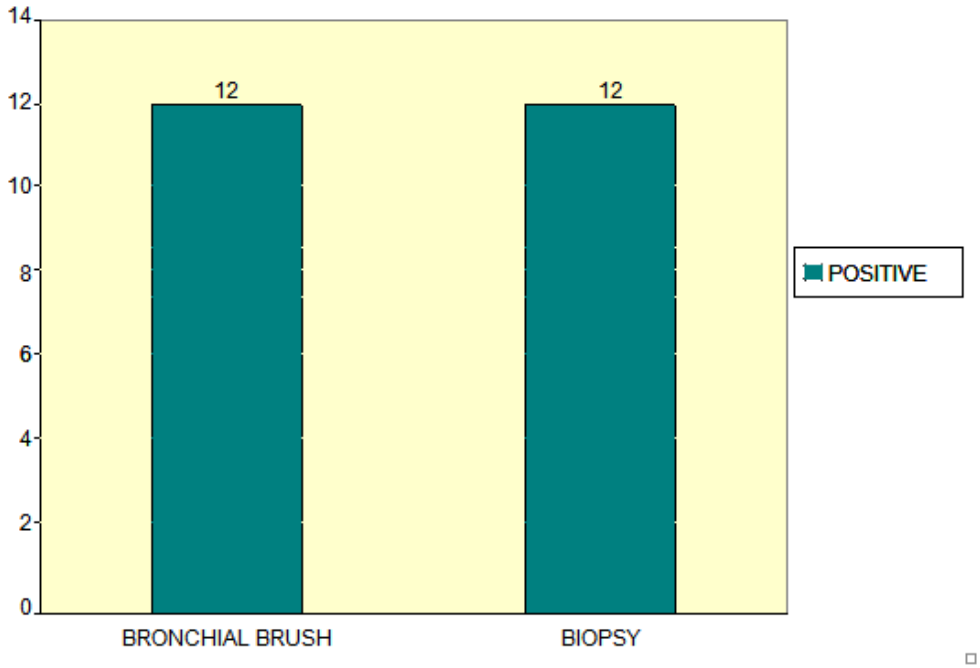

Figure 21: Simple bar diagram representing the outcomes in brushings and biopsy

This data was subjected to Fishers Exact test with p value >0.05, concluding that there is no significant difference in the results of bronchial brushings and biopsy. This implies that the bronchial brushings were equally efficient in diagnosis as biopsy in the present study.

Table 7: Types of malignancy detected in the study group:

Type of Ca	Cases
SCC	19
ADENOCA	10
SM CC	2
PD CA	4
BAC	1
Total	36

The cytological typing of the cases in the present study showed predominantly squamous cell carcinoma (19), Adenocarcinoma (10), Small cell carcinoma (2), poorly differentiated carcinoma (4), and bronchilo alveolar carcinoma (1) of the total 36 malignant cases.

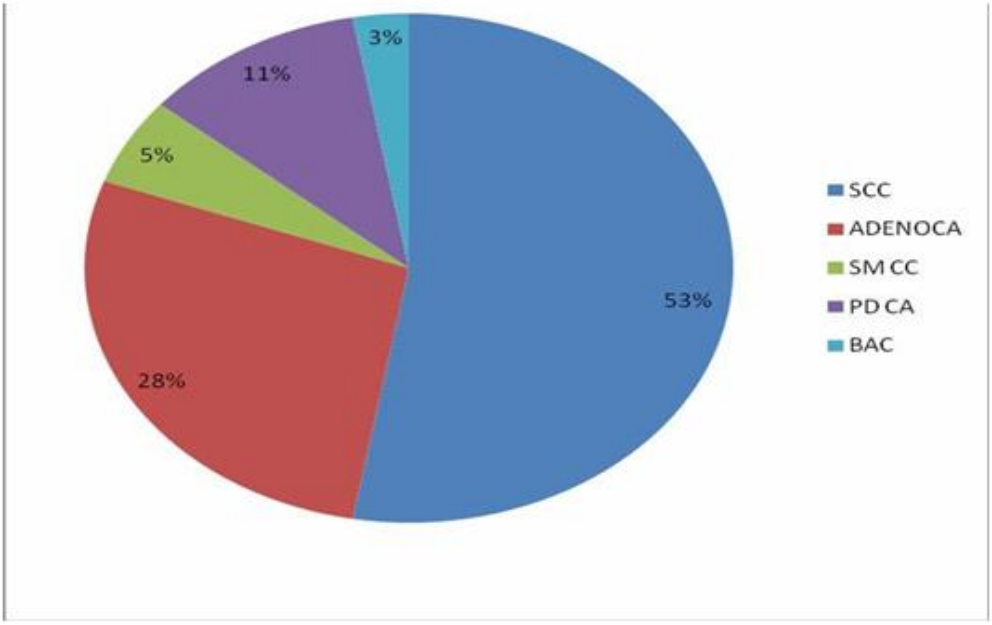

Figure 22 : Pie chart representing the types of malignancy

V. Discussion

Diagnosis of a disease using simple investigations that are cost effective and specific with shorter hospital stay is preferred by both physician and patient. This study aims at comparing the diagnostic utility between bronchial washings and brushings so that the most effective of the procedures can be used alone if feasible or in combination with other sample such as bronchoscopic biopsy, biopsy rinse fluid, which can be accommodated in the same sitting. This will also help to cut down the cost while using the newer techniques such as molecular methods.

Bronchoscopy provides a means of correlating imaging studies with direct visualization of the airways, and it also permits more focused sampling which is extremely helpful for endoluminal or centrally located lesions. Endobronchial lesions can be visualized directly by bronchoscopy, brushings can be used to sample the lesion directly, whereas washing and lavage sample a larger anatomic region through traumatic exfoliation.[63] Hence these cytological samples yield better than sputum cytology.

Bronchial washings:

The present study is compared with various studies done and the following comparison is made:

STUDIES	RESULTS OF BW
Ng and Horak et al	Diagnostic accuracy 74%
J Rawat et al	Sensitivity 47.66%
Kevin et al	Sensitivity 44%
Karahalli et al	Positivity 31.6%
PRESENT STUDY	Positivity 18.4%

These studies reveal the following:

J Rawat et al in their study in 2007 suggest that bronchial washing should be done after endobronchial biopsy to increase the yield of malignant cells in the washings. However they were able to make additional diagnoses of lung cancer from bronchial washing in only 1.86% of the cases.[9]

Funashahi et al[8], Kvale et al[10], Karahalli et al[11] recommended omission of washing in patients with endoscopically visible lesions and felt unlikely to produce any additional diagnosis.

In the study by Karahalli et al, they felt bronchial washings gave no additional benefit to combination of forceps biopsy and brushing.[34] In a cost-effective analysis done by Govert et al revealed that the collection of either washings or brushings was probably the best.[12]

Bronchial washings rely mainly on exfoliated cells in the bronchial epithelium. The adequacy of the sample may depend on a) degree of differentiation of the malignant lesion, as less differentiated cells are more dyscohesive to be exfoliated. b) preservation of the morphology of cytological material obtained as the exfoliated cells undergo early degeneration,c) technical skill of the clinician performing the washings.[13] Various studies have shown that increasing the number of attempts increases the sensitivity of bronchial washings, however, discomfort thus caused to the patient outweighs the benefits of yield in bronchial washings when with

single attempt of bronchial brushings could give better yield.

In the present study tumour size was not taken in to consideration due to limitation of surgeries in the institute and all cases were not visible bronchoscopically.

All cytologically positive cases were further referred to higher centres and treated. Only 16 cases were positive out of 100 cases, with 15 non neoplastic and one malignancy. The positivity in the present study is 18.4%. The higher positives in inflammatory lesions by bronchial washings could possibly due to the presence of exudates or serosanguinous material during inflammation, which can be easily washed out by saline and thus appears better in washings.

Additionally one case showed dysplastic cells, which was considered negative for statistical purpose as the corresponding bronchial brushings also showed only dysplastic cells. The dysplasia could be due to reactive changes and necessarily need not be premalignant. Hence was considered negative. 21 of the samples were inadequate, lower cellular yield could be due to peripheral location of the tumour with limited access, and excessive blood which would reduce the possibility of cellular yield. The amount of normal saline used for washings in our institution was about 5 – 10 ml, hence would not reach far in the bronchial tree. This could possibly be a reason for lower yield in peripherally located tumours. AB Fuladi et al in their study used 20 – 40 ml normal saline as bronchial washings and felt better positivity with peripherally located tumours.[14]Also Gaur DS et al in their study comparing BAL with bronchial brushings used 20 ml of saline instillation, and regarded it as BAL and not bronchial washings.[15] Inadequacy due to drying artifacts were minimal, as washings were sent to laboratory and was smeared and stained by experienced technicians.

Out of the non neoplastic inflammatory lesions, 9 were AFB positive, with few of them showing epithelioid histiocytes in the corresponding brushings sample. However the presence of reactive inflammatory background, with chronic inflammatory cells, epithelioid histiocytes were taken into consideration. Not all corresponding brushings samples showed AFB positivity or epithelioid histiocytes. The mycobacteria other than tuberculosis (MOTT) [16] are a group of organisms which can also be acid fast. These mycobacteria are acid and alcohol fast. Some of them such as M. Kansasi, M. Simiae, MAC complex, M. Fortuitum can cause pulmonary lesions. The M. Kansasi species produces lesions very similar to pulmonary tuberculosis and distinguishing them is not easy.[17] These also can be problematic in treatment due to the resistance to some antitubercular drugs such as streptomycin, isoniacid, and para – aminosalicylic acid.[18]

When in doubt, it becomes important to depend on other investigations to confirm the etiology. Mycobacteriophage-based assay is a newer rapid detection method specific to mycobacterium tuberculosis.[16]

Bronchial brushings:

The results of the present study is compared with various studies done:

STUDIES	**RESULTS BB**
Sing et al	Positivity 50%
Karahalli et al	Positivity 68.4%
Fuladi et al	Positivity 61.53%
Gaur et al	Sensitivity 87.3%
PRESENT STUDY	Positivity63.2%

These studies also reveal :

Karahalli et al concluded in his study that the combination of forceps biopsy and brushing cytology gave best results with a positive result for cancer in 57 cases (90.5%).[19] Piaton et al in their view, biopsy is the cornerstone of diagnosis; however the cytological materials may provide critical information on accurate typing of small cell and non small cell carcinoma of lung. This differentiation is crucial in therapeutic and prognostic implications.[19] In case of bronchial brushings, the lesions are scraped and cells thus dislodged have better preservation of morphology, yield better in well differentiated lesions and benign lesions too. [15] The result of the present study is comparable with study done by Fuladi et al[20].

In the present study bronchial brushings showed 36 cases were positive for malignant lesions, with 63.2% positivity. Comparing the positivity with bronchial washings of 18.4%, bronchial brushings seem significantly better than the bronchial washings in this study. Out of the 38 negative cases, 4 were clinically suspected to be malignant, due to bronchoscopically visible mass. However brushings with adequate material was negative for malignancy. This can be a significant lead in treatment of these non-neoplastic cases. In case of bronchial brushings, the brush reaches on to the lesion after visualization. This favours the possibility of better cellular yield in bronchial brushings. Not only the quantity of the yield, the quality of the cells so as to be able to diagnose malignancy seems better for the same reason. However the brushings were positive in 18 non neoplastic inflammatory lesions, when washings were positive with 15 non neoplastic cases and one malignant case. There seems to less difference between the two samples with respect to inflammatory lesions. The results were subjected to a statistical test called the Mc Nemars test. It is a non parametric method used on nominal data applied to 2 x 2 contingency tables with dichotomous data with matched pair of subjects. It is used to know if

there is any significant difference between two investigations done on the same individual (dependent group) such as bronchial washings and bronchial brushings done on same individual.

Cytological features in bronchial brushings were appropriate for the type of malignancy in majority of the cases. However, not all cases had biopsy to confirm though. Biopsy was not performed in all cases for various reasons at the discretion of the clinician doing the bronchoscopy. Biopsies received were reviewed and analysed. The ability of the brushings to detect malignancy was almost equal to the biopsy. With available number of biopsies to correlate, the data was subjected to fisher's exact test. This revealed a p value of >0.05 implying that biopsy and brushings gave similarly efficient in results both when positive and negative.

Some investigators found that combination of fine needle aspiration with percutaneous core needle biopsies increased sensitivity.[21,22]

However, Advantage of brushing is that it is simpler, takes less time, easier to perform, complications are less when compared to biopsy. All lesions may not be amenable to biopsy, some patients may not be fit due to compromised lung function. Combination of biopsy and brushing ideal for definitive diagnosis, but brushing also gives equally good results as a biopsy.

Incidentally there were cases when biopsy showed no malignancy when brushings showed positive for malignant cells. This was possibly due to the improper visualization and missing of the lesion during biopsy, when brush was already performed and could succeed in getting the malignant cells. In such situations, questions linger as to can biopsy be considered as gold standard to label a case, true positive or true negative.

Kevin et al in their study statistically proved that Fluorescent in Situ Hybridization (FISH) was more sensitive than conventional cytology for detecting lung cancer in bronchial brushing specimens. When FISH was combined with cytology, FISH could improve the diagnostic sensitivity of detecting malignancy in bronchial brushings. FISH and cytology complemented one another in the detection of lung cancer in brushing specimens. Also, FISH and bronchial brushings cytology results combined could improve the detection of early stage lung cancers (stages I, II, and IIIA) over cytology alone.[23]

Hence in future immunocytochemical or molecular methods with hnRNP, a ribonuclear protein that can be demonstrated by antibody A2/B1 can be useful in earlier diagnosis with bronchial washings and brushings. In such situations, the most effective, with better diagnostic yield only can be used to be cost effective as materials used for immunocytochemistry, FISH, are expensive. Thus, this study tries to compare the diagnostic utility between brushings and washings, as either one of the two can only be used for above mentioned expensive tests in countries like ours.

Majority of patients with bronchogenic carcinoma have co-existing COPD. Taking a biopsy in these patients is sometime difficult because of compromised lung function which makes them vulnerable to hypoxia. Brushing on the contrary takes less time, much easier to perform. Besides complications like bleeding is more common following biopsy which can be dangerous in these patients with compromised lung function. Bronchial brushings statistically seems to give better results in this study. However, the sample size of the study, few biopsy correlations are the shortcomings of this study.

VI. Summary And Conclusions

Universally bronchial washings and brushings are considered important adjuncts in the diagnosis of pulmonary lesions along with bronchoscopic biopsy. Bronchial washings has its limitations in diagnosing malignant lesions which require early recognition and treatment for better prognosis. A positivity of 15 cases with inflammatory lesions and one malignancy by bronchial washings suggest the limited diagnostic utility. The present study has no malignant lesions detected by bronchial washings. On the other hand bronchial brushings have showed 63.2% positivity, out of which 36 cases were positive for malignant lesions. The tumour size could not be correlated in this study.

In our country incidence of tuberculosis is very high and hence it is common to get AFB positive cases. In this study, 9 were AFB Positive. In some of these cases, bronchial washings were AFB positive, with epithelioid histiocytes in its corresponding bronchial brushings suggesting a tuberculous etiology. However AFB positivity need not necessarily mean a tuberculous etiology, when some bronchoscopic contaminants and MOTT can be acid fast. Care must be taken to confirm the etiology with careful history and other investigations to confirm pulmonary tuberculosis.

Correlation with biopsy was done but does not stand significant as the sample size of biopsies were less.But comparing the results of biopsy with bronchial brushings, bronchial brushings showed equal efficiency in detecting lung malignancies as well as the type of malignancy.

The cytological typing of the cases in the present study showed predominantly squamous cell carcinoma (19), Adenocarcinoma (10), Small cell carcinoma (2),poorly differentiated carcinoma (4), and bronchiolo alveolar carcinoma (1) of the total 36 malignant cases.

In future, bronchial brushings can be very useful in early detection of lung cancer. The molecular techniques on cytological materials can be very useful for early confirmatory diagnosis.

1) The aims and objectives of this study are met by assessing the diagnostic utility of bronchial washings and brushings in diagnosing malignant and inflammatory pulmonary lesions.
2) The cytological pattern of various lung pathology in bronchial washings and brushings were evaluated. However with limitations was in analyzing variety of cases vowing to small sample size.
3) The pitfalls in diagnosis by bronchial washings is that the malignant cells are not well represented and hence the diagnostic utility of bronchial washings in suspected malignancy seems to be limited.
4) The brushings samples seem to have better diagnostic utility in malignant as well as inflammatory lesions. Hence can be useful diagnostic tool while using immunocytochemical and molecular methods such as in situ hybridization.

Bibliography

[1]. James Linder.Something old something new.Am J clin pathol 2000;114:169-171
[2]. Vishnu SM, Pradeep NP, Anupama N, Mithra PP. Bronchoscopic evaluation and final diagnosis in patients with chronic non productive cough with normal chest X ray. Online J Health Allied Scs. 2010;9(2):8 URL: http://www.ojhas.org/issue34/2010-2-8.htm
[3]. Marluce Bibbo, Comprehensive cytopathology,second edition, W.B.Saunders company 1997, 325 – 389
[4]. Kawaraya M, Gemba K, Ueoka H, Nishii K, Kiura K, Kodani T, et al. Evaluation of various cytological examinations by bronchoscopy in the diagnosis of peripheral lung cancer Br J Cancer. 2003 17; 89(10): 1885–1888.
[5]. Chopra SK, Mohsenifar Z: Fiberoptic bronchoscopy in diagnosis of opportunistic lung infections-Assessment of sputa, washings, brushings and biopsy specimens. West J Med 131:4-7, Jul 1979
[6]. A Haye Saeed, Bronchology-Past, present and future Diagnostic procedures. Endo-Press, Tuttligen 2000. Available from www.szabist.edu.pk/bronchology/p.4 htm.accessed on 27/9/10.
[7]. Walshe WH. Diseases of lungs. Arch med 1843; 2: 44
[8]. Funahashi Akira, Browne TK, Houser WC, Hranicka LJ. Diagnostic value of bronchial aspirate and post bronchoscopic sputum in firboeroptic bronchoscope. Chest 1979; 76 (5): 514-7.
[9]. Rawat.J, Sindhwani G, Saini.S, Kishore.S, Kusum.A, Sharma.A. Usefullness and Cost effectiveness of bronchial washing in diagnosing endobronchial malignancies.Lung India 2007,24: 139-141
[10]. Kvale PA. Collection and preparation of bronchoscopic specimens. Chest 1978; 73 (suppl 5): 707-12.
[11]. Ergün Karahalli, Adnan Yilmaz, Hatice Türker, Kürs¸at Özvaran. Usefulness of Various Diagnostic Techniques during Fiberoptic Bronchoscopy for Endoscopically Visible Lung Cancer: Should Cytologic Examinations Be Performed Routinely? Respiration 2001;68:611–614.
[12]. Govert JA, Kopita JM, Matchar D, Kussin PS, Samuelson WM. Cost-effectiveness of collecting routine cytologic specimens during fiberoptic bronchoscopy for endoscopically visible lung tumor.
[13]. Saleh HA, Haapaniemi J, Khatib G. Bronchioloalveolar carcinoma: diagnostic pitfalls and immunocytochemical contribution. Diagn Cytopathol. 1998;18:301-306.
[14]. Fuladi AB, Munje RP,Tayade BO. Value of Washings, Brushings, and Biopsy at Fibreoptic Bronchoscopy in the Diagnosis of Lung Cancer. JIACM 2004; 5(2): 137-42.
[15]. Gaur DS, Thapliyal NC, Kishore S, Pathak VP. Efficacy of broncho-alveolar lavage and bronchial brush cytology in diagnosing lung cancers. J Cytol [serial online] 2007 [cited 2009 Jun 12];24: pp 73-7. Available from: http://www.jcytol.org/text.asp 2007/24/2/73/41955
[16]. Prakash.S, Katiyar SK, Puruwar S, Singh JP. clinical evaluation of the mycobacteriophage based assay in rapid detection of mycobacterium tuberculosis in respiratory specimens. Indian Journal of Medical Microbiology, 2009 27(2) : 134-8
[17]. Subhash Chandra Parija, The text book of microbiology and immunology, 1st edition, Elsevier (India) Pvt Ltd. 2009; 451
[18]. Lyubsky S,Jacobson MJ. Lung cancer: making the diagnosis.Chest 1991, 100:511-520
[19]. Piaton E, Djelid D, Duvert B, Perrichon M, Saugier B. Sequential use of bronchial aspirates, biopsies and washings in the preoperative management of lung cancers. CytoJournal [serial online] 2007 [cited 2009 Jun 12];4:p 11. Available from: http://www.cytojournal.com/text.asp 2007/4/1/11/41214.
[20]. Fuladi AB, Munje RP,Tayade BO. Value of Washings, Brushings, and Biopsy at Fibreoptic Bronchoscopy in the Diagnosis of Lung Cancer. JIACM 2004; 5(2): 137-42.
[21]. Kim HK, Shin BK, Cho SJ. Transthoracic fine needle aspiration and core biopsy of pulmonary lesions; a study of 296 patients. Acta Cytol. 2002;46:1061-1068.
[22]. Greif J, Marmur S, Schwarz Y. Percutaneous core cutting needle biopsy compared with fine-needle aspiration in the diagnosis of peripheral lung malignant lesions: results in 156 patients. Cancer. 1998;84:144-147.
[23]. Kevin C. Halling, Otis B. Rickman, Benjamin R. Kipp, Aaron R. Harwood; Clinton H. Doerr, James R. Jett. A Comparison of Cytology and Fluorescence in Situ Hybridization for the Detection of Lung Cancer in Bronchoscopic Specimens. Chest 2006; 130:694–701)
[24]. Kawaraya M, Gemba K, Ueoka H, Nishii K, Kiura K, Kodani T, et al. Evaluation of various cytological examinations by bronchoscopy in the diagnosis of peripheral lung cancer Br J Cancer. 2003 17; 89(10): 1885–1888.

Dr. Manik Mahajan.” A Comparative Study Of Diagnostic Utility Of Bronchial Washings And Brushings. " IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 7, 2019, pp 01-19.