Original Research Paper

VOLUME-6 | ISSUE-4 | APRIL - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

Fiberoptic bronchoscopy in lung carcinoma-Comparison of sputum, Bronchial wash and Bronchial brush

Pathology

KEYWORDS: Bronchial brushing(BB), diagnostic efficacy, lung cancer.

Dr Renu Singh — M.D Pathology, Department(s) and institution(s) Study carried out at Department of pathology kasturba medical college, Manipal.

Dr Rangini kudva — M.D Pathology, Department(s) and institution(s) Study carried out at Department of pathology kasturba medical college, Manipal.

ABSTRACT

Background-Fiberoptic bronchoscopy was used to study 91 patient with suspected pulmonary neoplasm between Jan 2006 and September 2010.Aims-The aims of this study were to assess the clinical, bronchoscopic, radiological and pathological correlation of carcinoma lung. Compare the efficacy of postbronchoscopy sputum, bronchial wash and brush in diagnosing lung carcinoma.Evaluate the sensitivity, specificity, positive predictive value, negative predictive value of sputum, bronchial wash and brush in diagnosis of carcinoma lung, taking bronchial biopsy as the 'Gold Standard' diagnostic test.Material and method- Material for cytologic examination was obtained from bronchial brushing, bronchial washing and post-bronchoscopy Sputum. **Result**- In 76 patients, a definite diagnosis was made. The bronchial brush material was positive in 74 of the 89 patients with carcinoma. It was found that Sensitivity of BB 82%,specificity was 63 positive predictive value was 91%,negative predictive value was 42%.Sensitivity of bronchial washing was 18%,specificity was 89% , positive predictive value was 86% ,negative predictive value was 22%.Sensitivity, specificity,positive predictive value and negative predictive value of sputum was 32%,33%,83%,5% respectively.
Conclusion-BB was better than wash and sputum in morphological typing of lung cancers. We conclude that bronchial brushing is a much superior technique in the diagnosis and morphological typing of lung cancers.

INTRODUCTION

The use of lung cytology has evolved in the last few years. Emphasis has shifted from diagnosis of malignancy in inoperable patients and confirmation of metastatic carcinoma to its use as a definitive diagnostic procedure on which crucial patient management decisions are based[1]. The oldest and most fundamental method of diagnosis is based on sputum cytology, which depends on the spontaneous exfoliation of malignant cells. Sputum examination for malignant cells remained the sheet anchor of diagnosis of carcinoma lung for over 60 years. It continues to be used because of the ease of sample acquisition. This was followed by bronchoscopic techniques, like bronchial washings, bronchial brushings and bronchoalveolar lavage. The final frontier for obtaining adequate material is fine needle aspiration cytology (FNAC) [2]. Today these cytological procedures constitute the most useful and least expensive investigative tools available for the detection of pulmonary diseases, especially lung cancer[3].Lung cancer accounts for most deaths from cancer, worldwide. The present study is designed to - Assess the clinical, bronchoscopic radiological and pathological correlation of carcinoma lung.

Compare the efficacy of postbronchoscopy sputum, bronchial wash and brush in diagnosing lung carcinoma.

Evaluate the sensitivity, specificity, positive predictive value, negative predictive value of sputum, bronchial wash and brush in diagnosis of carcinoma lung amongst the patients visiting our hospital for their diagnosis and treatment

MATERIALS AND METHOD:Prospective study

All cytological samples from tracheo-bronchial lesions suspected to be of carcinoma lung received from May 2006 till September 2010 were collected by Bronchial brush, wash, postbronchoscopy sputum and biopsy. Detailed clinical history, radiological and bronchoscopic findings were recorded. Samples with inadequate cytological material, as well as cases of carcinomas metastasizing to lung, were excluded in the present study. The study was conducted at the Department of Pathology Kasturba medical college Manipal.Study has received ethical comitte submission.Informed consent was not needed in this study.

Collection of Specimens

Lesions and suspicious areas visible through the fiberscope were biopsied with the biopsy forceps made for the BF-B2 Olympus bronchoscope. Material on the brush was spread over the surface of several slides which were immersed immediately in 95 percent alcohol. Two or more brushings were made from each lesion. One or two washings with 20-30 ml of normal saline solution were also performed in the appropriate area of the bronchial tree. The precipitated aspirate was prepared for cytologic study. All sputa expectorated during the 24 hours subsequent to bronchoscopy were collected. Wet fixed slides were stained with Papanicolaou.

All of the slides in each cases were reviewed for the presence or absence of following criteria: adequacy,pattern,cytoplasmic and nuclear features.

The cytologic and histologic diagnoses were then compared and the positive and negative predictive value ,sensitivity,and specificity was calculated for entire sample size.

RESULT:

Sputum (post bronchoscopy), bronchial wash, brush and biopsy obtained from all patients, who were clinically or radiologically suspected to have carcinoma lung, presented at Kasturba hospital Manipal from January 2006 to September 2010 were included in this study.91 cases of suspected carcinoma lung were received during this period ,of which 77 had sputum samples,91 wash samples,89 brush samples and 49 biopsy samples. Clinicopathologic and radiologic features of all the 91 cases were studied. Cytohistological correlation was possible only in the 49 cases which had a biopsy. Sensitivity, specificity, positive predictive value, negative predictive value were studied in these 49 cases.

In this study, age of the patients ranged from 40-89yrs and peak distribution was found in the 6th decade. Males were more commonly affected than females. The male to female ratio was 5:1.

The most common symptom was cough with expectoration seen in 91 patients (76 males, 15 females). The next most common symptom was weight loss in 85 patients (71 males, 14 females). Haemoptysis was seen in total of 10 patients (8 males, 2 females).

Smoking was the most common risk factor, seen in 67 patients and out of this, 66 were males and only one was female. Associated infections like Tuberculosis and HIV were seen in 8 and 1 patients respectively (all males). Occupational history was not significant in any of the cases.

Homogenous opacity/mass was the most common radiological finding and was seen in total of 46 cases. Hilar mass was the second most common finding seen in 20 cases. Heterogenous opacity was seen in 17 cases. Cavitory lesion was found in 4 cases and multiple nodules in 1 case. In 3 cases radiological details were not available.

Most common bronchoscopic finding observed was growth seen in 58 cases, out of which 40 cases had intrabronchial growth. Extrabronchial growth was seen in 18 cases. Mucosal bleeding/swelling/irregularity/narrowing were seen in 32 cases. There was one case in which no abnormality was detected on bronchoscopy.

Intrabronchial growth was most commonly associated with haemoptysis.7 out of 10 patients having haemoptysis had intrabronchial growth, 2 had mucosal bleeding/swelling/ irregularity/narrowing and 1 had extrabronchial growth.

Intrabronchial growth was the most common bronchoscopic finding in squamous cell carcinoma. Mucosal bleeding/swelling /narrowing/irregularity was the most common bronchoscopic finding in adenocarcinoma.

The above table(table1) shows that the positive cytological samples were obtained in 20 of 77 sputum samples, 19 of 91 washings, 72 of 89 brushings.

Squamous cell carcinoma was the most common epithelial malignancy (48%)(Figure 2), followed by adenocarcinoma(21%). Combined epithelial carcinoma was the least common.

Most common malignancy associated with smoking was squamous cell carcinoma (40%). Squamous cell carcinoma has strong association with smoking, however other types of carcinoma lung were also associated with smoking.

The most common site involved was right upper lobe followed by hilar mass. Right upper lobe and hilar mass were the most common sites for the occurrence of squamous cell carcinoma followed by left upper lobe.

The percentage yield for sputum of 32% was similar to wash but low as compared to brush and biopsy. Sputum, wash, brush and biopsy all had almost equal degree of cell typing accuracy(table 2)

The sensitivity and specificity of sputum were found to be 32% and 33% respectively. The positive predictive value and negative predictive value were 83% and 5% respectively. (table3, 4)

The sensitivity and specificity of washing were found to be 18% and 89% respectively. The positive predictive value and negative predictive value were 86% and 22% respectively.(table3, 4)

The sensitivity and specificity of brush were found to be 82% and 63% respectively. The positive predictive value and negative predictive value were 91% and 42% respectively.(table3,4)

Discussion

Lung cancer is the most common malignant disease worldwide; and is a major cause of death from cancer, particularly amongst males.

The increase in tobacco consumption has been shown to be directly related to lung cancer. In a study published from Jammu, in 1993, lung was the most common site for malignancy [4]. Reports of National Cancer Registry Program of Indian Council of Medical Reserch, from Bhopal, Delhi and Mumbai, also show lung to be the top site for malignancy amongst males[5].

In our study, 81.3% cases (n=74/91), were found to be positive for primary carcinomas of lung, the male to female ratio being 5:1. The increase in number of lung cancer patients in our study could be a reflection of established causes, the over all low socioeconomic status and highly prevalent habit of smoking bidi and cigarettes, in the local population.

In our study, there were no cases with lung cancer in the age groups below 31 years of age, for both genders. In both men and women, the incidence of lung cancer has been reported to be low before the age of 40, after which it increased up to the age of 70 years. Worldwide, males suffer from malignancies much more than females. According to WHO, for most part, differences in distribution (of malignancies) between both genders are attributable to differences in exposure to causative agents rather than variations in susceptibility.

In our study, in comparison to wash and sputum, bronchial brushing gave higher number of True Positive and True Negative cases, and much lesser number of False Positive and False Negative cases, showing its superiority over wash and sputum in diagnosing lung cancers (Table 3). Oswald[6] and associates found a positive sputum cytology in 48 percent of 2545 patients with primary lung cancer. Sputa obtained after bronchoscopy were frequently positive even if previous sputa were negative.

Washings were positive for cancer in only 22 of 91 patients. Since cytological sampling by wash technique relies mainly on cells 'exfoliated' from the malignant lesion in the bronchial epithelium, the adequacy of its samples depends on several vital factors, especially a) the degree of differentiation of malignant growth;b) preservation of the morphology of cytological material obtained; and c) technical skill of the pulmonologist who is retrieving the lavage fluid from the bronchus . In general, less differentiated, anaplastic lesions have more loosely cohesive cells in comparison to well differentiated lesions. Thus such lesions exfoliate larger number of cells into the bronchial cavity than the well differentiated lesions. Secondly, while these exfoliated cells are lying in the bronchus, they start developing degenerative changes, thus progressively losing their morphological details which are important in differentiating them from non-malignant cells shed off by the normal bronchial epithelial lining.

Bronchial brushing technique has the advantage that the surface of the suspicious lesion is scraped by the help of a brush passed in through the bronchoscope. Thus this technique manages to 'dislodge' the cells from the surface of those well differentiated malignant lesions too, which do not exfoliate cells readily. Thus, the chances of getting adequate diagnostic cytological sample by BB greatly increase in comparison to BAL samplings . Moreover, since the surface of the malignant lesion is scraped by the brush, the cells retrieved show better preserved morphological details in comparison to the cells which have already exfoliated into the bronchial cavity(Figure1,2) . Studies have shown the incidence of squamous cell carcinoma of lung, to be around 29-30% on the basis of histology. In our study, on the basis of histological biopsy, it was 51%, which is not in accordance with the above mentioned studies(figure 3). On the basis of cytology in case of sputum,wash and brush 32%,32%,50% respectivly cases were categorized as squamous cell carcinoma. Adenocarcinoma of lung has been reported to be on the rise by many workers which was found in our study also(Figure4).

In our study, the sensitivity of BB was reported as 82% (Table 4). Studies from various authors show the range of sensitivity for BB from 67% to 97.3%. Shroff et al[7] have reported the sensitivity of BB as high as 97.3%. In a study by Samreung et al[8], bronchial brushing was found to be the only promising cytological method with a sensitivity of 80% in comparison to other non-brush techniques. In study by Gaur et al[9], the values of Sensitivity, Specificity and overall Accuracy of BB were 87.3 %, 97.6 % and 93.9 % respectively, which were much superior to those of wash. The Sensitivity of 82% for BB in our study was in agreement with various other workers like Chopra et al [10] (86.3%); Zavala et al [11] (88.5%); and Solomon et al[12] (89.1%). Shroff et al reported the Sensitivity of BB to be as high as 97.3% in their study. Bibbo et al[13] reported the Sensitivity for BB samples to be only 70%.

VOLUME-6 | ISSUE-4 | APRIL - 2017 • ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 78.46

However they reported the Specificity of BB to be much higher (98%) which was not comparable to our study.

The specificity of BB in our study was 63% (Table4). Bibbo et al reported a higher sensitivity of 98% in their study, The specificity of brush in Gaur et al[14] study was 77.8% and in their study, the overall accuracy of BB was 80.6%.

In our study, the Sensitivity, Specificity and Accuracy of wash samples were 18%, 89% and 86% respectively.Study by Gaur et al the Sensitivity, Specificity and Accuracy Of wash samples were 39.4%, 89.6% and 71.4% respectively, when a single sample of wash was collected . Truong et al [15] reported Sensitivity of 66.0%; while Ng. & Horak [16] reported a Sensitivity as high as 74.0% for wash.

The sensitivity , specificity and accuracy of sputum were found to be 32% , 33%,84% respectively. Erkilic et al[17] (2003) in their study of 2,524 sputum specimens from 768 patients found sensitivity and specificity of 64.5% and 99.7% respectively.

The sensitivity of sputum according to Sing et al [18] (1997) was 40% in 231 patients. Of all the tumor types, the most frequent tumor type detected was squamous cell carcinoma followed by adenocarcinoma which is in concordance with present study. Rivera et al[19] in their study on sputum cytology found sensitivity 87%; specificity90%.

Conclusion

Bronchial brushing is a much superior technique in the diagnosis and morphological typing of lung cancers, as it demonstrates far better Specificity,Sensitivity and Accuracy, in comparison to bronchial wash and sputum.

Table 1: Comparison of rate of positivity for malignant cells by different cytological methods

Sample	Total no. of cases	Total no. of cases unsatisfactory for evaluation	No. of suspicious cases	No. of positive cases	No. of negative cases
Sputum	77	2	5	20	50
Wash	91	5	3	19	64
Brush	89	0	2	72	15

Table 2: Diagnostic accuracy of various methods

	Sputum	Wash	Brush	Biopsy
No. of samples	77	91	89	49
Malignancy diagnosed	25	22	74	39
Percentage yield(%)	32	24	83	80
Accurate cell type diagnosed	21	19	64	33
Percentage accuracy	84	86	86	85

Table 3: Number of True positive, True negative, False positive, False negative cases

	Total no. of cases	No. of cases with biopsy	True positive	True negative	False positive	False negative
Sputum	77	36	10	01	02	21
Bronchial wash	91	48	06	08	01	28
Bronchial brush	89	47	31	05	03	07

REFERENCES-

1. Johnston WW, Elson CE. Respiratory tract. In: Bibbo M, editor Comprehensive cytopathology. 2nd ed. Philadelphia: W.B Saunders Company; 1997. p. 325-401.
2. Fraire AE, Underwood RD, Mc Larty JW, Greenberg SD. Conventional respiratory cytology versus fine needle aspiration cytology in the diagnosis of lung cancer. Acta Cytol 1991; 35 : 385-88.
3. Reynolds HY. Bronchoalveolar lavage. Am Rev Respir Dis 1987; 135 : 250-63.
4. Kapoor R, Goswami KC, Kapoor B, Dubey VK. Pattern of cancer in Jammu region (Hospital based study 1978-87). Indian J Cancer 1993;30: 67-71.
5. Annual Report 1982: National cancer registry. Indian council of medical research, New Delhi, 1985
6. Oswald NC, Hinson KFW, Canti G, et al. The diagnosis of primary lung cancer with special reference to sputum cytology. Thorax 1971; 26: 623-631.
7. Shroff CP. Abrasive bronchial brushing cytology. A preliminary study of 200 specimens for the diagnosis of neoplastic and non-neoplastic broncho-pulmonary lesions. Acta Cytol 1985; 29:1017.
8. Samreung R, Settakorn J, Bhothirat C, et al. Cytological diagnosis of lung cancer in Chiang Mai, Thailand. Cyto-histological correlation and comparison of sensitivity of various methods. J Med Assoc Thai 2002; 85 : 953-961.
9. Gaur DS, Thapliyal NC, Kishore S, Pathak VP. Efficacy of Broncho-Alveolar Lavage and Bronchial Brush Cytology in Diagnosing Lung Cancers. Journal of Cytology 2007; 24 : 73-77.
10. Chopra SK, Genovesi MG, Simmons DH, Gothe B. Fiberoptic bronchoscopy in the diagnosis of lung cancer comparision of pre and pro bronchoscopy sputa, washings, brushings and biopsies. Chest 1997; 111:522-523.
11. Zavala DC. Diagnostic fiberoptic bronchoscopy. Techniques and results of biopsy in 600 tients. Chest 1975;68:12-19.
12. Solomon DA, Solliday NH, Gracey DR: Cytology in fiberoptic bronchoscopy: Comparison of bronchial brushing, washing and post-bronchoscopy sputum. Chest 1974 65:616- 619 . 18.
13. Bibbo M, Fennessy JJ, Lu CT. Bronchial brushing technique for the cytologic diagnosis of peripheral lung lesions: a review of 693 cases. Acta Cytol 1973; 17:245-251.
14. Gaur DS, Kusum A, Harsh M, Kohli S, Kishore S, Pathak VP. Efficacy of Bronchial Brushings and Trans-Bronchial Needle Aspiration in Diagnosing Carcinoma Lung .Journal of Cytology 2007; 24 : 46-50.
15. Truong L D, Underwood RD, Greenberg SD, McLarty JW. Diagnosis and typing of lung carcinoma by cytopathologic methods. A review of 108 cases. Acta Cytol 1985;29:379-384.
16. Ng ABP, Horak GC. Factors significant in the diagnostic accuracy of lung cytology in bronchial washins. Acta Cytol 1983;27:391-396.
17. Erkilic S, Ozsarac C, Kullu S. Sputum cytology for the diagnosis of lung cancer: comparison of smear and modified cell block methods. Acta Cytol 2003; 47:1023 1027.
18. Sing A, Freudenberg N, Kortsik C, et al. Comparison of the sensitivity of sputum and brush cytology in the diagnosis of lung carcinomas. Acta Cytol 1997; 41:399– 408.
19. Rivera M. Patricia, MD, FCCP; and Mehta Atul C. MB, FCCP. Initial Diagnosis of Lung Cancer. Chest 2007; 132:131S–148S