Efficacy of Bronchial Wash Cytology and its correlation with Biopsy in Lung Tumours

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Abstract

Objective: To evaluate bronchial wash cytology with histology in our set up.

Methods: Seventy three specimens were obtained by flexible fiberoptic bronchoscope at pulmonology department of Military Hospital Rawalpindi. All the preserved samples were processed under standard conditions. The slides were stained with Papanicolaou and Haematoxylin and Eosin stains.

Results: A total of 73 patients were studied. The age range was 21 to 80 years . Male to female ratio was 8:1. Complete cytological and biopsy consensus was found in 55 (77.4%) cases. Cytology revealed 24 cases as malignant and nine as atypical/suspicious. Benign and inadequate were 29 and 2 respectively. Histopathology of these cases confirmed 24 (32.9%) as malignant and 29 (39.8%) as benign. True positive alongwith suspicious/atypical were 33 and true negative cases were 29. False positive was one case only whereas false negative cases were eight. The bronchial wash cytology showed sensitivity (80.5%), specificity (96.6%) and accuracy (87.3%). Positive predictive value and negative predictive value were 97% and 78.4% respectively. The commonest types of tumours were squamous cell carcinoma and small cell carcinoma.

Conclusion: It is concluded that bronchial wash cytology is a valuable tool and yields almost same information as biopsy. It is useful in patients with evidence of obstruction or risk of haemorrhage (JPMA 54:13;2004).

Introduction

Lung cancer is one of the most frequent malignancies in the industrialized nations. It is the commonest cause of death from cancer in males. According to recent studies the incidence is on the rise in women.[1] It is the most common visceral malignancy of males in Pakistan[2,3] and is more prevalent in males between 40 and 70 years age with a peak incidence in 6th or 7th decade.

To combat the disease successfully, it should be diagnosed at earliest possible stage. For early diagnosis different diagnostic modalities are available which include; radiology, bronchoscopy, bronchial biopsy, exfoliative cytology, brushing, washing and fine needle aspiration cytology. It is not possible to perform all techniques in each patient because each has specific advantages and disadvantages. However their combined use yields the best results.[4-6]

Before any aggressive treatment, a clear distinction between small cell carcinoma and non-small cell carcinoma should be made by obtaining a tissue diagnosis. For that histopathological examination remains, the mainstay of the diagnosis.

Bronchial biopsies cannot be performed in more peripheral sites or in patients at risk of haemorrhage. So alternative methods for obtaining diagnosis are sometimes required. Bronchoscopic washing, brushing and fine needle aspirations may complement tissue biopsies in the diagnosis of lung cancer.[7,8] The bronchial washing is a safer technique and the malignant cells can be readily recognized and typed.[9,10] There is still disagreement as to the value and reliability of wash and brush cytology in comparison with histology for the diagnosis of malignancy.

The aim of this study was to determine the sensitivity, specificity and diagnostic accuracy of bronchial wash cytology with histopathological examination of bronchial tissue biopsy.

Materials and Methods

From January 2000 to October 2002, a total of 73 cases were studied. Bronchial wash cytology and biopsy specimen were taken simultaneously during fiberoptic bronchoscopy for different signs and symptoms at pulmonology unit of Military Hospital, Rawalpindi. The clinical, radiological and bronchoscopic data was completed by the pulmonologist on first examination of patient and at the time of bronchoscopy.

Out of 73 cases studied, clinically strong suspicion of malignancy was raised in 57 cases whereas 16 patients were provisionally diagnosed as carcinoma/tuberculosis.

Two to four biopsy specimens were taken from suspected abnormal areas within bronchoscopic range. The tissues were fixed in 10% formal-saline. These were processed in automatic tissue processor, Sakura-Japan for 16 to 18 hours. Later on paraffin embedded blocks were prepared and thin sections of 4 to 5 millimeters thickness were taken with the help of manual rotary microtome, American Optical (AO). The sections were then stained with haematoxylin and eosine and period acid Schiff where and when required. The diagnosis and typing of tumour was made according to World Health Organization's classification.[11]

The bronchial wash material was obtained from the bronchial tree by instilling 30 to 50 milliliters of isotonic saline and re-aspirating it. All the samples were preserved in 50% ethyl alcohol. The specimens were centrifuged for five minutes at 1500 revolutions per minute. Three to four slides were prepared from cell concentrate and stained with haematoxylin and eosine and papanicolaou stain.[12] All the slides were evaluated by same pathologist. The smears were grouped into malignant, benign, suspicious/atypical and unsatisfactory/inadequate according to criteria described by Willis and Ramzy.[13]

The malignant cells were further typed as squamous cell carcinoma and small cell carcinoma, adenocarcinoma and undifferentiated.

For both cytology and histology only specimen with unequivocal malignant features, were considered to be positive. Histological result was used as diagnostic reference. Unsatisfactory and inadequate smear were those which showed poor cellularity, degenerated cells, too much blood or necrotic debris.

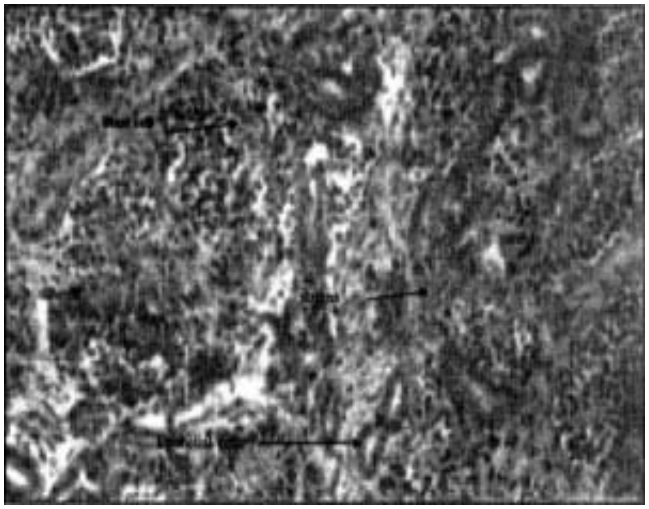
The sensitivity, specificity, accuracy, positive and negative predictive values were calculated by utilizing the predictive value model of Galen and Gambino.[14]

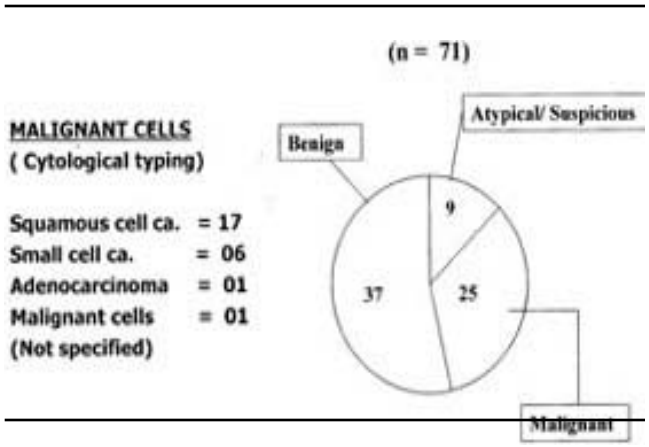
True positive were those cases which were cytologically and histologically malignant. All the suspicious/atypical cases which later on histopathology proved to be malignant were also included in this category. True negative were the cases which were both cytologically and histologically benign. Any case with a malignant or atypical cytodiagnosis which on histopathology turned out to be benign was labeled as false positive. False negative was a case diagnosed benign on cytology but later on histopathology turned out to be malignant. Sensitivity defined as the percentage of cases in which biopsy proven cancer cases were correctly diagnosed by the cytology. Specificity was the percentage in which biopsy proven benign (negative) cases were correctly diagnosed negative on cytology. Accuracy/efficiency meant fraction of patients whose conditions were correctly diagnosed by cytology.

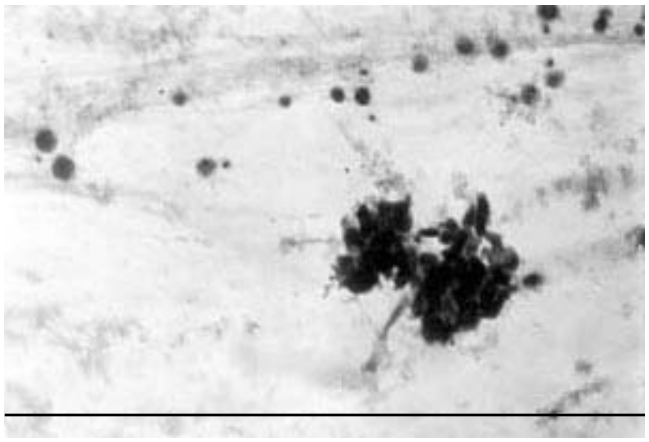
Results

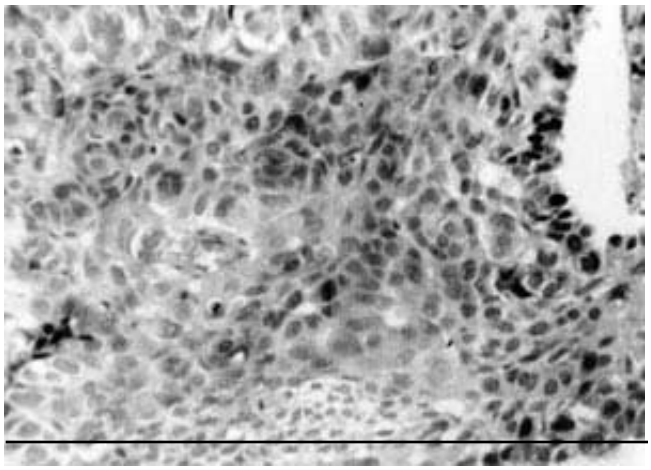
Samples from 75 patients were evaluated. Male to female ratio was 8:1. The age range was 21 to 80 years. Majority of the malignant cases were seen between 5th and 6th decades. Two bronchial aspirates and biopsy materials were unsatisfactory due to poor cellularity, crushed and degenerated cells or presence of too much blood.

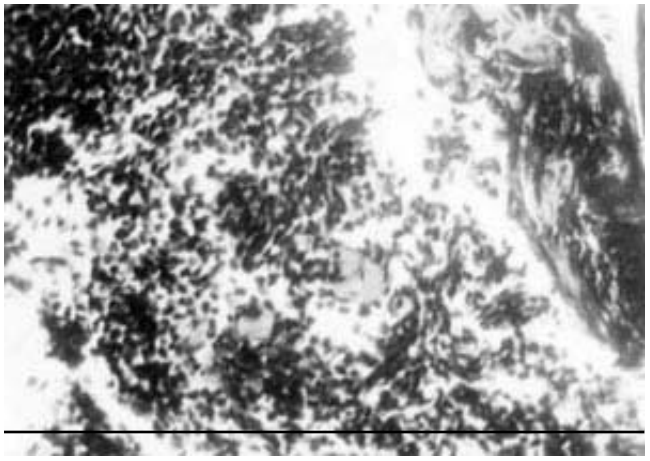
Cytological examination revealed 25 malignant alongwith 9 atypical/suspicious cases. All these atypical cases, later on histopathology proved to be malignant. So these cases were included in true positive category. Only one case was false positive which on histopathological examination showed signs of squamous metaplasia and dysplastic changes. Twenty nine cases were labeled as true negative because these were confirmed on biopsy also. Eight smears were false negative because cytologically these were benign and on histology proved to be malignant (Figure 1). Cytological typing of tumour showed, 17 cases of squamous cell carcinoma, six small cell carcinoma, one adenocarcinoma and one malignant (Figures 2 and 3).

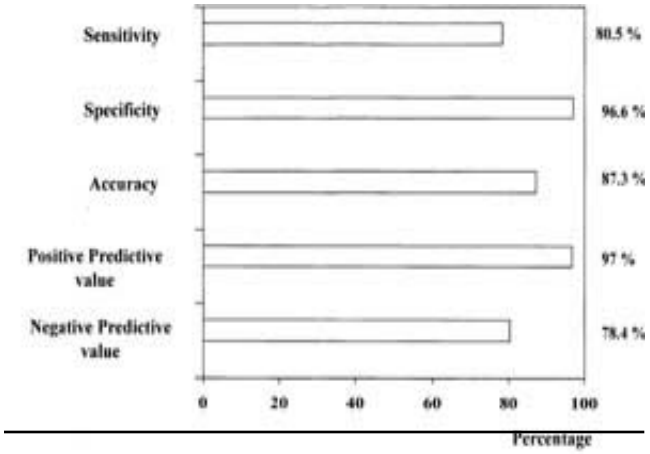












On tissue biopsy examination 41 cases (57.8%) were malignant whereas 30 cases (42.2%) were benign. Amongst the malignancy, squamous cell carcinoma was found in 28 cases (Figure 4), small cell carcinoma; 9 cases (Figure 5), adenocarcinoma; 2 cases and atypical carcinoid in one patient only. In the benign category, chronic granulomatous inflammation (most likely tuberculous in origin) was noted in five patients whereas twenty five cases revealed acute on chronic non specific inflammation.

The bronchial wash cytology revealed sensitivity (80.5%), specificity (96.6%) and accuracy (87.3%) (Figure 6). As far as malignant and benign lesions are concerned, complete cytological and histological concordance was observed in 55 cases (77.4%) (Table).

Table. Comparison of cytological and biopsy results (n=73).

Diagnostic categories	Cytological (No. of cases)	Histopathological (No. of cases)
Malignant	25	41
Benign	37	30
Atypical/suspicious	9	-
Inadequate	2	2

Cyto-histological concordance = 77.4%

Discussion

Lung tumours are the most common cause of death due to cancer in men and are now emerging as important cause of neoplastic mortality in females.[1] The male to female ratio in this study is 8:1 which is closer to a local study.[15] Majority of these cases were found in their 5th and 6th decades. This could be due to higher prevalence of smoking in males in our society.

Pulmonary cytology and histopathology are valuable tools in the diagnosis of lung malignancies. The first realization that cancer of the lung could be accurately diagnosed and typed by the microscopic study of expectorated cells is generally attributed to Dudgeon and Barret.[16]

Fibreoptic bronchoscopy was introduced in 1968 as a diagnostic procedure. Since then apart from sputum, different methods for obtaining satisfactory specimens have become available. Examination of sputum can provide evidence of malignancy in case of cancer. The specimens collected by fiberoptic bronchoscope yield a higher positive rate. The sensitivity of bronchial aspirates in diagnosing lung cancers has been 75 to 88.1 % at various centres.[10,17] Due to difficulties in obtaining representative material from the bronchial tree, the examination of bronchial secretion has been discontinued. Now bronchial brushings are favoured for the cytological investigation of proximal lung cancers.

From management point of view, lung tumours are generally separated into small cell carcinomas and non-small cell carcinomas. For small cell carcinomas intensive chemotherapy is advised whereas the non-small cell carcinomas are better treated surgically. More than 80% cases have been correctly typed by Truong and co-workers with sputum, washing or brushing cytology.[18]

In our study only one case was false positive which is less than a local study by Tanwani and Haque.[15] This false positive case was due to squamous metaplasia along with dysplasia. False positivity may be due to misinterpretation by the cytopathologist due to chronic inflammatory process, epithelioid cells of tuberculosis, atypical histiocytes or squamous metaplasia. These false positive cytological results may have serious consequences for the patients in which biopsy is not possible due to risk of haemorrhage or evidence of obstruction. Therefore it is better to under report with cautious comments in suspicious/atypical cells. But this trend should not predominate at the cost of sensitivity of the cytological procedure.

Out of 71, eight cases were false negative which is higher than the previous study.[15] The reasons for false negative results could be superadded inflammation, non-representative material or hypocellular aspirates.

In this study exact concordance between histological and cytological results was found in 55 of 71 (77.4%) satisfactory specimens which is similar to the study by Naryshkin and Daniel.[19] In another two studies this correlation was 81.8%[20] and 88.4%[17] respectively. The diagnostic efficacy of cytology in our series showed 80.5% sensitivity and 96.6% specificity which is comparable to a study by Jay and colleagues.[21]

The overall accuracy of bronchial washing was 75% and 75.4% by two other studies by Truong et al[18] and Chaudhary et al[22] respectively, whereas in present study it was slightly higher (87.3%).

As for as the typing of lung tumour on cytology is concerned, it was 61% which is quite low as compared to another study where it was 90%.[23] The difficulties in specifying the tumour might be lack of cell groups, keratinisation, mucus production and scant cellular material.

In our series the frequency of suspicious/atypical cases was 12.6% whereas Spjut[24] has reported 10%. All the nine cases (100%) with a suspicious/atypical cytologic report in our series had a final diagnosis of malignancy which is higher to another study at USA (1995) where 94% suspicious cases proved malignant on histology.

Conclusion

1. Pulmonary wash cytology has excellent sensitivity specificity and accuracy.

2. It yields almost same information as biopsy and is particularly useful in patients with evidence of obstruction or risk of haemorrhage.

3. It is quite safe, economical and an experienced cytopathologist is necessary for interpretation of smears.

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