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MALIGNANT LUNG TUMORS;
EFFICACY OF BRONCHIAL WASH CYTOLOGY AND ITS CORRELATION WITH BIOPSY IN DIAGNOSIS

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ABSTRACT... Objective: To determine sensitivity and specificity of bronchial wash cytology in diagnosis of malignant lung tumors, with histopathology as gold standard. **Design:** Validation study of bronchial wash cytology as a screening procedure. **Setting:** Pulmonology unit,Department of Medicine, Military Hospital Rawalpindi. **Duration:** Six months (from Nov 2004 to May 2005) **Patients and methods:** Hundred indoor patients of either gender with clinical suspicion of lung tumors were included in this study by convenience non probability sampling. Transbronchial biopsies of the lesions were done and samples of tissues were collected for histopathological examination. Ten ml of reaspirated isotonic saline was sent for bronchial wash cytology examination. **Results:** Out of 100 patients histopathological examination confirmed malignancy in 75 (75%), whereas cytology could detect malignancy in 58 (58%). Thus bronchial wash cytology had a sensitivity of 77.33% and a specificity of 100%. **Conclusion:** Pulmonary wash cytology has good sensitivity and specificity but yields less information as compared to biopsy. It is particularly useful in patients where the latter is contraindicated or the required expertise is not available.

Key words: Lung cancer, transbronchial biopsy, bronchial wash cytology.

INTRODUCTION

Lung cancer remains the leading cause of cancer-related death in men, and in women it has surpassed even breast cancer[1,10,13].

A simple chest radiograph may reveal a pulmonary mass and subsequent computed tomography of the chest and upper abdomen will allow rapid assessment of any extension of the tumor into the mediastinum and of any metastases to the liver and adrenals. Tissue diagnosis should then be performed by the most appropriate means (e.g., transthoracic fine-needle biopsy, transbronchial biopsy, or mediastinoscopy). Flexible fiberoptic bronchoscopy is the main diagnostic technique used for lung cancer[2,11]. The effectiveness of this technique depends on the tumor size and location. Although fiberoptic bronchoscopy washing and forceps biopsy have the highest diagnostic yield, brushing and postbronchoscopic sputum examination are also diagnostic manoeuvres and should be routinely performed. The introduction of flexible fiberoptic bronchoscopy for the diagnosis and treatment of pulmonary disorders in the late 1960s had an immediate practical impact.

The ability to safely visualize and biopsy bronchial lesions, combined with bronchial brushing and washing for cytologic and bacteriologic sampling and obtaining parenchymal biopsies, virtually eliminated the need for rigid bronchoscopy in many instances and substantially

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reduced the need for open lung biopsy or mediastinoscopy in the diagnosis of lung cancer and interstitial lung diseases[3,12].

The technique was quickly adapted for use in sampling the contents of the lower respiratory tract by means of subsegmental bronchoalveolar lavage (BAL), and it became a major tool of clinical investigators. Since that time these techniques, fiberoptic bronchoscopy and BAL, have gained widespread acceptance and provided information about the cellular and molecular components of the alveolar epithelial lining fluid in normal persons, has aided in the diagnosis of opportunistic infections, and has provided insights into the diagnosis, pathogenesis, and assessment of activity of lung tumors[4].

Forceps biopsies should be performed with a gentle avulsion technique to minimise bleeding. Pulling forcefully on the end of the forceps can cause damage to the delicate linkage mechanisms in the bronchoscope when the forceps is suddenly released from the tissue. Instead the bronchoscopist should gently pull the bronchoscope and forceps back as a unit.This same technique should be used for transbronchial biopsies of peripheral lesions. To obtain the highest diagnostic yields for central lesions (bronchoscopically visible) at least three biopsy samples should be obtained with either brushings or washings[5].

After brushing a lesion, the brush can be pulled through the working channel of the bronchoscope (withdrawn technique), or the bronchoscope with the brush protruding from the distal end (non withdrawn technique) can be removed as a unit to avoid losing tissue sample in the working channel. Brush samples should then be applied to a slide in a circular motion and immediately put in preservative solution to prevent air-drying.

Bronchial washings (instillation of small volumes of saline, followed by aspiration of the fluid into a suction trap) is a third type of specimen that can be processed cytologically. Washings are appropriate for central (bronchoscopically visible) tumors[6].

The diagnostic yield for forceps biopsy, brushing, and washing in central lesions is 76%, 52%, and 49%, respectively. The combination of forceps biopsy with brushing or washing increases the diagnostic yield to 95%. There is little advantage of performing all three techniques, and thus for cost effectiveness, this should not be done for central lesions.

Though histopathological examination of bronchial tissue biopsy is considered the gold standard for diagnosis of lung tumours, it has certain drawbacks. It is an invasive procedure and more expertise are required. Bronchial tissue biopsy can only be taken when the lesion is accessible through bronchoscope[7].

It can not be undertaken unless the lesion is sufficiently large to be detected through radiological or bronchoscopic techniques. This procedure is also associated with complications like respiratory arrest, pneumonia, pneumothorax, airway obstruction, vasovagal reaction, cardiac arrhythmias, bleeding and aphonia. All these points make this bronchial tissue biopsy a less favoured diagnostic procedure[14].

Bronchial wash cytology on the other hand is a relatively safe procedure requiring less expertise, can be undertaken in peripheral lesions and in patients at risk of bleeding[8]. Even those lung tumours which are not visible through bronchoscope might be picked up in bronchial wash cytology. These advantages as compared with bronchial tissue biopsy make this procedure the more favoured one in the diagnostic work up of lung tumors.

The present study was carried out to determine the sensitivity and specificity of bronchial wash cytology so as to establish its reliability as a diagnostic tool for lung tumors.

PATIENTS AND METHODS

This study was conducted at Pulmonology unit, Department of Medicine, Military Hospital Rawalpindi, Pakistan, a 500 bedded tertiary care hospital. Hundred indoor cases were observed over a period of six months (from Nov 2004 to May 2005) through convenience non probability sampling.

Procedure of data collection

Study was done on indoor patients, with clinical suspicion of lung tumours, including both males and females with age group ranging from 20 to 70 years. The study did not include patients who were terminally ill, unwilling, had any co-morbid condition or bleeding diathesis. Fiberoptic bronchoscopy was performed with Olympus fiber optic bronchoscope model number BF-P40 and BF-P60. Transbronchial biopsy of the lesion was done and samples of bronchial tissues were collected with Forceps no. 19C, 20C and 21C in formalin for histopathological examination.

Thirty to fifty ml isotonic saline was instilled and re-aspirated, out of which 10 ml fluid was put in a sterile bottle for bronchial wash cytology examination. All the samples were sent to Armed Forces Institute of Pathology for analysis.

Results of bronchial wash cytology and histopathology were recorded (tables I and II).

DATA ANALYSIS

Data was analyzed using SPSS version 10. Sensitivity, specificity, positive and negative predictive values were calculated for bronchial wash cytology, with histopathology as gold standard for malignant tumors.

RESULTS

In this study a total of 100 consecutive cases with clinical suspicion of lung tumor admitted to Pulmonology unit, Military Hospital Rawalpindi from Nov 2004 to May 2005 were studied.

Out of 100 patients 86 were males and 14 were females. Both bronchoscopic biopsy/histopathology and bronchial wash cytology were performed for diagnostic purposes.

A total of 100 transbronchial biopsies were performed which revealed 75 malignant lesions, 16 benign lesions and 9 atypical lesions (table I).

Table-I. Results of Bronchial Biopsy (n=100)

Histopathological Examination	Frequency	%age
Atypical	9	9.0
Benign	16	16.0
Malignant	75	75.0

Analyses of bronchial wash cytology samples (n=100) showed malignant cells in 58 , and no malignant cells were seen in 42 samples (table II)

Table-II. Results of Bronchial wash cytology (n=100)

Bronchial wash cytology examination	Frequency	%age
No Malignant Cells	42	42.0
Malignant Cells	58	58.0

When compared with the results of transbronchial biopsies which were taken as gold standard in the diagnosis of lung cancer in this study, bronchial wash cytology had specificity of 100% and sensitivity of 77.33 % with a positive predictive value of 100% and a negative predictive value of 59.52%.

Table-III. Diagnostic accuracy of bronchial wash cytology (n=100)

	Gold standard - Histopathology		
Cytology for Malignancy	Disease Present	Disease No Present	Total
Test positive	True positive 58	False Positive 0	58
Test Negative	False Negative 17	True Negative 25	42
Total	75	25	100

DISCUSSION

This study has shown that bronchial wash cytology is a reasonably sensitive diagnostic tool for lung tumors. Hence it can be relied upon as an alternative to bronchoscopic biopsy where the latter is contraindicated or is not possible due to lack of expertise/equipment.

However this study has certain limitations. The number of patients in this study was small, so the results cannot be generalized to the general population.

This study was conducted in military tertiary care hospital and patients presenting here may not be representative of the general population. The diagnostic yield of bronchial biopsy and bronchial wash cytology is dependent upon the technique and experience of the pulmonologist as well as the histopathologist. The level of expertise of both was not taken into account while reporting the results.

Most frequent indication for bronchoscopy and bronchial wash cytology in this study was mass revealed in chest X-ray(78%) followed by lung collapse (15%). The male to female ratio in this study is 6:1. Majority of these cases were found in 5th and 6th decades. This could be due to higher prevalence of smoking in males in our society[9,15].

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

Fiberoptic bronchoscopy was introduced in 1968 as a diagnostic procedure. Since then apart from sputum, different methods of 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. Due to difficulties in obtaining representative material from the bronchial tree, the examination of bronchial secretion has been discontinued. Now bronchial brushing is favoured for the cytological investigation of proximal lung cancers.

From management point of view, lung tumors are generally separated in 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[16,17]. There was no fatality associated with the procedure. Complications observed in this study were hypoxaemia, post biopsy bleeding and bronchospasm. Hypoxaemia responded to oxygen supplementation while post biopsy bleeding was controlled with topical epinephrine spray. Bronchospasm was reverted with bronchodilators but the procedure had to be abandoned early.

CONCLUSION

Pulmonary wash cytology has good sensitivity and specificity but yields less information as compared to biopsy. It is particularly useful in patients where the latter is contraindicated or the required expertise is not available. It is quite safe, economical and an experienced cytopathologist is necessary for interpretation of smears.

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