Original Research Article

Comparative Study of efficacy of Broncho-alveolar lavage, bronchial brush and bronchial biopsy in diagnosis of lung tumours

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Abstract

Background: Lung carcinoma is oneof the most common malignancies in the industrialized countries and now a leading cause of death in developing countries like India. There are different methods to diagnose lung carcinoma. Broncho-alveolar lavage cytology, bronchial brush cytology and bronchial biopsy are three important techniques which are becoming more popular. The aimof the study is to compare the efficacy of these three methods. **Materials and methods:** This is a retrospective study in known patients with lung cancer, during a period of 18 months from July 2016 to December 2017. The materials obtained from Broncho-alveolar lavage, bronchial brush and bronchial lung biopsy are studied and their efficacy in diagnosing lung malignancy is compared. **Results:** The present study showed that sensitivity of Broncho-alveolar lavage, Bronchial brush and bronchial biopsy are 44%, 74% and 84% respectively. **Conclusion:** Bronchial biopsy and bronchial brush cytology are more sensitive than broncho-alveolar lavage cytology. However, combination of these three techniques helps to increase the rate of positive diagnosis.

Keywords: Lung carcinoma, Broncho-alveolar Lavage, Bronchial Brush, Bronchial Biopsy, Efficacy

Introduction

Lung cancer is one of the leading causes of cancer death around the world. It is the most common cause of death due to malignancy in the United States [1]. It is estimated that approximately 239,320 new cases of lung cancer are diagnosed in the United States in the year 2010 [2]. The five year survival rate of lung cancers is only 15.6%. The increase in lung carcinoma cases is also seen in the developing countries like India.

Approximately nowhalf of the cases occur in the developing countries. Cigarette smokingis associated with increase in death rates in men. Increased risk of developing lung carcinoma increases with duration of smoking and the number of cigarettes smoked per day. Lung carcinoma also occurs in never smokers. Of all types of lung cancers, squamous cell carcinoma is common in cigarette smokers and adenocarcinoma is common with never smokers [3]. To make the treatment of lung cancer in the best possible and successful way, early screening and diagnosis at early stage plays a key role. Different methods are used to diagnose lung carcinoma including radiology, bronchoscopy, bronchial brushing, Broncho-alveolar lavage cytology and bronchial biopsy. However bronchial biopsy cannot obtained in all cases, especially in peripheral lung-tumors and in patients at risk of hemorrhage. Bronchial washing and bronchial brushing can be used as complementary tools to biopsy in the diagnosis of lung lesions [4]. Bronchial lavage was originally developed as therapeutic tool in conditions like pulmonary proteinosis, cystic fibrosis and intractable asthma. It has gradually emerged and has been accepted as a tool for diagnosing lung carcinoma [5]. Broncho-alveolar lavageis obtained by introducing a bronchoscope into lower respiratory tract and specimens obtained by means of suction apparatusafter infusing 60 ml of saline and re-aspirating it in a mucous extractor.

Bronchial brushingis another method in which a bronchoscope is introduced into the suspected lesion of lung and scrapings taken in smears and stained. This method was done in 1973 where itwas found to analyze highly suspicious cells. Complications of bronchoscopy are rare (0.5 and 0.8% for major and minor complications, respectively), and include laryngospasm,

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bronchospasm, disturbances of cardiac conduction, seizures, hypoxia and sepsis. The incidence of major complications is higher for transbronchial biopsy (6.8%). Confirmation of lung malignancy is done in almost all cases by bronchial biopsy. The aim of this study was to compare the efficacy of Bronchoalveolar Lavage, Bronchial Brush cytology and Bronchial Biopsy in the diagnosis of lung carcinoma.

Materials and Methods

Type and place of study: This is a retrospective study among patients in respiratory medicine in Karpagam Faculty of Medical Science and Research who were finally diagnosed to have lung carcinoma. The study was conducted over a period of 18 months from June 2016 to December 2017.

Inclusion criteria

1. Adults over 18 years without sex specification
2. Cases diagnosedto have lung carcinoma.

Exclusion criteria

1. Pediatric patients.
2. Patients withbenign and non-neoplastic lung lesions.
3. Patients with inconclusive diagnosis.

Sampling Method: After obtaining well-informed written consent, all the bronchoscopies were performed as an elective procedure. Food and drinks were withheld at least 6 hours prior to bronchoscopy. Pre-bronchoscopy screening was done with history, physical examination, BT, CT, PT, platelet count, fresh X-ray chest PA and lateral views and ECG, sputum smear for AFB. Injection atropine 0.6 mg intramuscularly was given 30 minutes prior to the procedure. Local anaesthesia was achieved by spraying the orophayrnx with 4-5 ml of 4% xylocaine. The total dose of xylocaine never exceeded 400 mg. Small amount of additional 2% lignocaine was used during bronchoscopy to suppress coughing. All bronchoscopies were performed by a single operator and were done with the patient lying supine on the operation table with the operator standing at the head end. Trans-nasal passage was used for bronchoscopy.Thorough examination of nasopharynx and larynx was done. Nasal passage functions as a stint for the passage of flexible fibreoptic bronchoscope, permitting leisurely inspection of upper airways and observation of the glottis and trachea under dynamic or static conditions. The brush and biopsy instrument are withdrawn through internal channel. The same fibreoptic bronchoscope – Pentax FB15P– was used throughout the study. Collection and handling of tissue sampling materials. The combination of washing, biopsy, and brushing was carried out in these patients in most cases, especially when tumour was visible. When no lesion was seen, endoscopically blind cytology was performed by brushing and washing the appropriate segment as determined by the postero-anterior and lateral chest radiographs.

Adequate smears: Smears withbronchial epithelial cells/alveolar macrophage were considered adequate. Smears were considered satisfactory for reporting when there were noartefactual changes or excessive haemorrhage with blood elements obscuring cellular details.

Unsatisfactory smears: Smears were considered unsatisfactory based on the presence of degenerated / poorly preserved cell morphology, excessive haemorrhage with blood elements obscuring cellular details.

Inadequate smears: Smears that lacked alveolar macrophages or epithelial cells.

The analysis of Bronchoalveolar Lavage and Bronchial Brush of all patients were taken and compared with the biopsy interpretation.

Results

The present study consisted of 50 patients which included 37 males and 13 females.

Table 1 compares the sensitivity of Bronchoalveolar Lavage, Bronchial Brush cytology and Biopsy techniques in diagnosing lung carcinoma.

Table-1: Comparison of sensitivity of three methods in diagnosis of lung tumours (Lung biopsy considered to be the gold standard technique in the diagnosis)

Diagnostic Technique	Sensitivity
Broncho-alveolar lavage	44%
Bronchial biopsy	74%
Bronchial Biopsy	84%

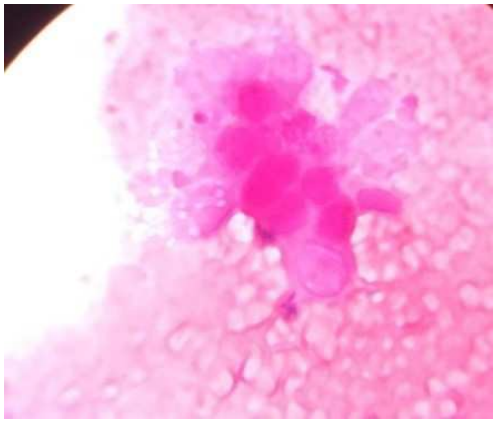

Figure-1: Broncho-alveolar lavage cytology showing malignant epithelial cells.

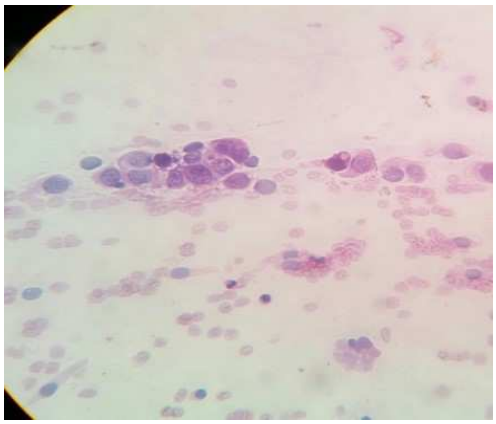

Figure-2: Bronchial brush cytology showing atypical cell clusters with cells showing anisonucleosis

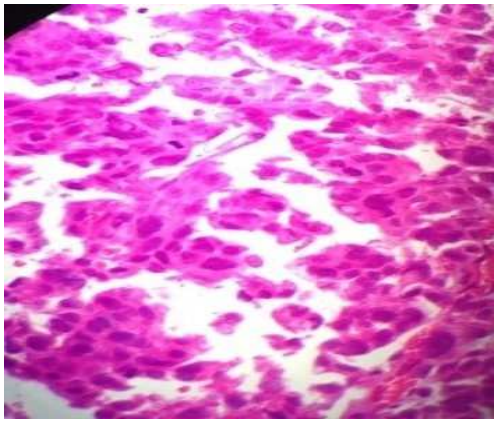

Figure-3: Bronchial biopsy showing squamous cell carcinoma with pleomorphic squamous cells.

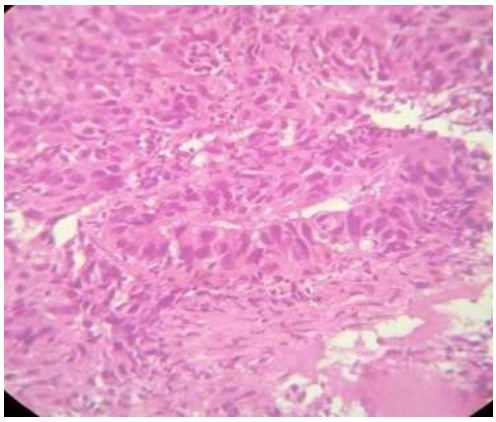

Figure-4: Adenocarcinoma showing pleomorphic glands in bronchial biopsy

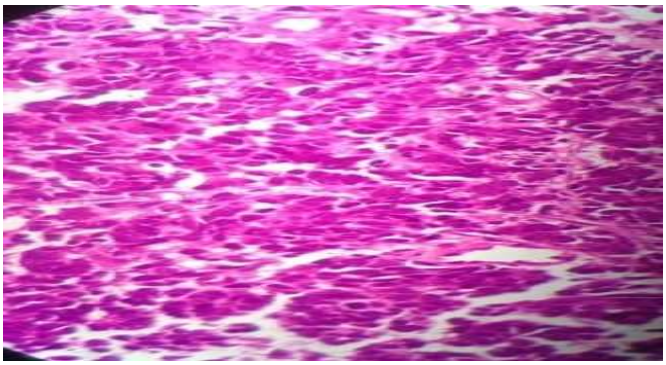

Figure-5: Small cell carcinoma showing pleomorphic small round to oval cells with cant cytoplasm nuclear moulding

Microscopy showed malignant cells inbroncho-alveolar lavage and bronchial brush with high nuclear-cytoplasmic ratio and anisonucleosis (Figure 1 and Figure 2). Various types of lung carcinoma had been finally diagnosed in bronchial biopsies, most common being squamous cell carcinoma, followed by adenocarcinoma and small cell carcinoma (Figure 3, Figure 4 and Figure 5)

Discussion

After the advent of flexiblefibre-optic bronchoscope, cytology techniques including bronchial washings and bronchial brush are now used and samples are collected from respiratory tract lesions yielding significant amount of material.

To obtain a bronchial wash specimen, 3 to 5 ml of isotonic saline is introduced through bronchoscope and samples collected. Fluid containing cells, micro-organisms or other material from upper respiratory airways- trachea, bronchi and bronchioles is aspirated

into the trap. The material is centrifuged to concentrate the cells, stained and examined by light microscopy or culture if infection is suspected. In a study by Lee HS, it is found that bronchial washing is a useful procedure in bronchoscopically visible lesions [6]. However, bronchial washing may not be cost effective procedure as found in a study by Liwsisakun [7] but beneficial when combined with brushing and biopsy.

Bronchial brushing was first analysed in 1973, when it showed high suspicious cells in lung carcinoma. In general, bronchial brushing provides diagnostic material in nearly 70% of cases with central lung cancers in nearly 45% of cases with peripheral lung tumours. The brush for this technique was first introduced in 1979 in cases of pneumonia. Bronchial brush specimens are collected using the special brush that is enclosed in a double catheter sheath.

Bronchial biopsy is done using a flexible rigid bronchoscope. A small amount of lung parenchyma may be included in the biopsy. Assessment of interstitial and parabronchial changes should made with caution because the findings may be misleading. For invasive malignancies, reports are given as primary epithelial tumours, non-epithelial tumors or metastatic tumors. However the diagnostic yield in bronchial biopsies is influenced by etiology and location of lung tumors [8]. Cell typing can be done in bronchial brush smears and in bronchial biopsies.

Both techniques have their own advantages in identifying the type of lung carcinoma [9]. Even the peripheral lung tumors can be diagnosed by transbronchial lung biopsy and hence this is considered as the reliable method in all peripheral tumors. Types of lung biopsy include transbronchial lung biopsy, transthoracic biopsy, thoracoscopic biopsy and open lung biopsy. Among these methods, transbronchial biopsy has been widely spread. Minimal complications occur after lung biopsy such as pneumonia and bleeding. The optimal sequence for performing these 3 techniques is highly controversial.

The British Thoracic Society guidelines on diagnostic flexible bronchoscopy, published in 2001, indicate that the optimal sequence for performing endoscopic techniques for visible endobronchial neoplasms is unclear and that further studies are needed. Lee and Metha [6] in a reference manual, recommend that washing be performed before brushing and biopsy to prevent blood from contaminating the sample and making it more difficult to perform cytology. The authors say that an exception to this recommendation may be lesions with submucosal involvement, in which alterations to the integrity of the mucosa may actually increase the yield of bronchial washing performed afterwards. In this study, bronchial brush cytology and biopsy were more sensitive compared to bronchoalveolar lavage technique which is found in accordance to the study byAgarwal and Gaur at al [6]. Similar results were seen in a study conducted by Shalinee Rao et al in which bronchial wash cytology had low sensitivity in detecting pulmonary lesions [11].

In a study by Richa Sharma, it is found that broncho-alveolar lavage is a good screening procedure for diagnosing malignant cells in lung [12]. Similarly a study by Poletti V, bronchoalveolar lavage was found to be useful diagnostic tool in diagnosing lung tumors [13]. A study by Tomar V concluded that Bronchial brushing has a better sensitivity compared to bronchoalveolar lavage, which is similar to the results obtained in the present study [14].

Another studyconducted by Dinesh R et al showed that bronchoscopic bronchoalveolar lavage was positive in 30% cases, bronchial brush was positive in 88% of cases and bronchial biopsy was positive in 925 cases [15]. In astudy by Choudhry M, it was concluded that bronchial brush cytology is a definitive diagnostic tool in those cases in which tissue diagnosis is not possible [16].

Matsuda et al in his study concluded that the diagnostic yield of bronchial brushing ishigher than biopsy and that a combination of two techniques gives the highest percentage of positive diagnoses [17].

This is contraindication to the present study where biopsy yields higher positive results compared to bronchial brushing. This study also shows similar results to a study by DS Gaur in which it was concluded that bronchial brushing is a much superior technique in the diagnosis of lung cancers [12].

Conclusion

In this study, it is concluded that bronchial brushing and bronchial biopsy are more effective in diagnosis of lung carcinoma compared to bronchial washings. And bronchial biopsy is always recommended as the standard procedure to diagnose lung tumours.

The cost effectiveness of these methods does not vary much. Hence, acombinationof all these three methods is always recommended to yield higher percentage of positive diagnosis.

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