

Diagnostic comparison of bronchial biopsy with brushing, washing, TBNA and TTNA in the evaluation of lung cancer.

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Abstract

Introduction: Lung cancer is among the five main types of cancer leading to overall cancer mortality contributing about 1.3 million deaths/year globally. Early diagnosis and treatment of the tumor is the only hope of cure at current state of knowledge. Bronchial washing, brushing, and forceps biopsies are often combined to increase the diagnostic yields. However diagnostic tests like, transthoracic needle aspiration (TTNA), Trans bronchial needle aspiration (TBNA) and lung biopsy used if the results of the above test are negative. **Aims and objectives:** To compare the diagnostic yield of various bronchoscopic procedures in the evaluation of bronchogenic carcinoma. **Materials and methods:** The study was carried out in 50 randomly selected cases of lung malignancy proved either by Bronchial washing, bronchial brushing, endobronchial biopsy and other related procedures, who attended the Respiratory medicine department, RNT Medical College, Udaipur, Rajasthan. **Results:** Majority belonged to 41-60 years of age group. Male: Female ratio was 9:1. Majority of cases were smokers 41(82%). 40 (80%) cases had endoscopically visible (Central Lesion), and 10 (20%) had endoscopically non-visible peripheral lesion. Squamous cell carcinoma (34%) was more common followed by adenocarcinoma (26%) and small cell carcinoma (20%). 40 (65%) cases were positive by Bronchial washing, 75% (30) by Bronchial brushing, 92.5% (37) by Bronchial Biopsy. Two cases were solely confirmed by TBNA (mediastinal widening), where tracheobronchial tree were normal endoscopically. **Conclusion:** For central lesion, the diagnostic yield was highest with endobronchial biopsy followed by bronchial brushing, TBNA, and washing. For peripheral lesion bronchial brushing, bronchial washing and CT guided transthoracic lung biopsy was diagnostic.

Keywords: Lung cancer, Bronchial Biopsy, Bronchial washing, TTNA

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Introduction

Lung Cancer is the leading cause of cancer deaths worldwide. Its incidence increased dramatically throughout the twentieth century and still increasing as the twenty first century begins. The disease is more common in men than women, although this difference has become smaller; in the USA and UK, the male/female ratio around 2.5:1 in 1982. Recently, mortality rates have been falling in men of all ages. Although the incidence of the disease continues to claim the older age group [1]. Lung cancer is among the five main types of cancer leading to overall cancer mortality contributing about 1.3 million deaths/year globally [2]. In 2005 cancer killed approximately 8,26,000 people in India of which 5,19,000 were under the age of 70 [3]. Tobacco use is the single most important risk factor for cancer [2]. Various environmental and host factors may also affect the risk of lung cancer. Primary lung cancer in India was reported from rare to extremely infrequent in earlier published reports [4]. In recent past, an increasing trend in the incidence of primary lung cancer has been reported from various parts in India [5]. Early diagnosis and treatment of the tumor is the only hope of cure at

current state of knowledge [6]. From bronchoscopic findings, lung cancer can be divided into central lesions that are endoscopically visible and peripherally non-visible. The role of bronchoscopy in making a diagnosis of lung cancer and differentiating cell types is well established [7]. The smoker: nonsmoker ratios have been lower in most of the Indian studies compared to those in west. This could be attributed in part to comparatively less heavy smoking in Indian people [8]. The other factor like air pollution, exposure to passive smoking and chemical carcinogen are not strictly compartmentalized. These are equally relevant to both smokers and nonsmokers, but are likely to express an inverse increase in the nonsmokers in view of the absence of the predominating factor of smoking in them. The cell type pattern had varied in different studies. While squamous cell variety is the commonest seen in about one third of patients, there has been a definite increase in small cell and adenocarcinoma in recent years. The cell type is largely influenced by smoking habits, age and sex. Squamous cell carcinoma occurs almost exclusively in smokers and in males, since heavy smoking is largely a habit of males in this country, females have an inverse increase in adenocarcinoma [9]. For the diagnosis of centrally located (endobronchial) lung carcinoma, no method has proven more valuable than endoscopic examination of the tracheobronchial tree [10-12]. Bronchial washing, brushing, and forceps biopsies are often combined to increase the diagnostic yields. The diagnostic yield of bronchoscopic procedures for a centrally-located tumors by using endobronchial biopsies is higher (80-90%) followed by bronchial brushing (50 to 77%), however

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the benefit of bronchial washing which provides the diagnostic yields for endoscopically visible tumors between 30-90%, is still controversial [12-16]. There have been many studies that support the role of bronchial washing in addition to endobronchial biopsies and bronchial brushing where as other researchers have failed to show any benefits [15-18]. In peripheral bronchogenic carcinoma (beyond the segmental Bronchus) the bronchial brushing provided the highest sensitivity 52%, followed by Trans bronchial biopsies 46% and BAL/washings 43%. Although TBNA showed a high sensitivity 67%, the data deserve cautious interpretation because of the limited number of studies and the large differences in sample size. The overall sensitivity for all modalities in the diagnosis of peripheral disease was 69% (12 studies) [19]. However further diagnostic tests like, transthoracic needle aspiration (TTNA), Trans bronchial needle aspiration (TBNA) and open lung biopsy used if the results of the above test are negative. Therefore even with a relatively low yield, washing may still be worthwhile. Therefore, we performed this prospective study to compare the diagnostic yield of various bronchoscopic procedures and overall diagnostic yield in the evaluation of bronchogenic carcinoma; also know the various cell type of bronchogenic carcinoma in central versus peripheral lesion.

Aims and objectives: To compare the diagnostic yield of various bronchoscopic procedures in the evaluation of bronchogenic carcinoma.

Materials and methods

The study was carried out in 50 randomly selected cases of lung malignancy proved either by Bronchial washing, bronchial brushing, endobronchial biopsy and other related procedures, who attended the Respiratory Medicine Department, RNT Medical College, Udaipur, Rajasthan. A detailed clinical history with complete physical examination was carried out in all the patients including the symptoms, duration of illness, smoking history. All patients were subjected to blood investigations including CBC, BT, CT, ESR, Liver Function Test, RBS, Blood Urea, Serum Creatinine, and Sputum for AFB etc. All patients were subjected to a standard Chest Radiograph P.A. view and other X-ray projections and CT scan of chest when needed. All the suspected patients were diagnosed on the basis of clinical, radiological and video fiber-optic bronchoscopic examination; and further diagnosis were confirmed on histopathological and/or cytological examination.

Video Fiber-optic bronchoscopy: All suspect patients were subjected to video bronchoscopy examination with the help of

Results

Table 1: Age, sex and smoking status wise distribution of study cases (n =50)

S. No.	Age in years	Male(%)	Female (%)	Total (%)
1	31-40	5(10%)	-	5(10%)
2	41-50	15 (30%)	-	15(30%)
3	51-60	12(24%)	2(4%)	14(28%)
4	61-70	11(22%)	3(6%)	14(28%)
5	71-80	2(4%)	-	2(4%)
Smoking status of study cases:				
1.	Smoker	40(97.5%)	1(2.5%)	41(82%)
2.	Non Smoker	5(55.5%)	4(44.5%)	9(18%)

(mean Age=54.98), majority of cases belong to 41-60 years of age group, (29 i.e. 58%). M.F. ratio among were 9:1 Majority of cases were smokers 41(82%) while 9(18%) were non-smoker. M: F ratio among smoker 40:1 whereas ratio among non-smoker was 1.25:1.

Table: 2 Type of lesion and Histological distribution in 50 proved cases of Bronchogenic carcinoma

S. No.	Type of lesion	No of Cases	Percentage
1	Central	40	80%
2	Peripheral	10	20%
	TOTAL	50	100
Histological distribution of lung cancer			
S. No.	Histological type	Total	Percentage
1	Squamous cell	17	34%
2	Small cell	10	20%
3	Adenocarcinoma	13	26%

flexible fiber optic video bronchoscope. An informed written consent was taken from all the patients.

Sample Collection: Following specimens were collected

Bronchial Washing: This was the first sample collected before endobronchial biopsy or bronchial brushing with instillation of normal saline (0.9% NaCl solution), when growth was visualized, the bronchoscope was fix in the close proximity and 10 to 15 ml normal saline was instilled through the internal channel of bronchoscope. The material was immediately suctioned out again and was collected in a specimen TRAP bottle placed in the suction pathway and bronchoscope. The bronchial washing was centrifuged and supernatant discarded. The sediment was smeared over 4 to 5 glass slides. Air dry slides were fixed in 70% alcohol; later on stained with M.G.G stain (May Grunwald and Giemsa stain) for malignant cells.

Bronchial brushing: The brushing was taken by Nylon brush-BC-9C, an area of suspected malignancy was brushed 4 to 5 times; and smeared directly on glass slide; smears were immediately fixed in 70 % alcohol and stained by Papanicolau's method.

Bronchial biopsy: when an endobronchial growth seen or any abnormal area seen on bronchoscopic examination, it was biopsied 3 to 4 times in order to provide an adequate material for histopathological examination with the help of biopsy forceps and place biopsy specimen in 10 % formalin vial and send for histopathological examination.

Other procedures: Inpatients, where there was peripheral mass, other diagnostic method like percutaneous trans-thoracic needle aspiration (TTNA), biopsies or percutaneous tru-cut biopsy was performed to diagnosed the lung cancer.

TBNA: Trans bronchial needle aspiration was done in cases of mediastinal widening, peri bronchial infiltrating masses in which no endobronchial growth present, and in highly vascular masses in which risk of bleeding was higher on taking biopsy. TBNA needle 21G and 19G were used as per requirement and the procedure was done by hub against the wall technique. samples directly transferred on glass slide, then fixed with formalin, after drying of slides send for cytology examination. The study investigated the relationship of lung cancer of different cell type with smoking habit, age, sex. The WHO international histological classification was used to classify the lung tumors. Comparative analysis of different features was made and analysed. Results of various specimens were compared.

4	Large cell	4	8%
5	Adenosquamous	6	12%
	TOTAL	50	100%

Out of cases 40 cases (80%) had endoscopically visible (Central Lesion), and 10 (20%) had endoscopically non-visible peripheral lesion. Among study cases squamous cell carcinoma (34%) more common in overall type of lung cancer followed by Adenocarcinoma (26%) and small cell carcinoma (20%).

Table: 3 Diagnostic yields of various bronchoscopic procedures in central lesion (no = 40)

S. No.	Procedures	Positive	Percentage yield
1	Bronchial washing (BW)	26/40	65%
2	Bronchial brushing (Bb)	30/40	75%
3	Bronchial biopsy (BB)	37/40	92.5%
4	TBNA	6/9	66.67%

Among 40 cases 65% (26) were positive by Bronchial washing, 75% (30) were positive by Bronchial brushing 92.5% (37) were positive by Bronchial Biopsy. Two cases were solely confirmed by TBNA (mediastinal widening), where tracheobronchial tree were normal endoscopically.

Table: 4 Diagnostic yields of various procedures in peripheral lesion (no = 10)

S. No.	Procedures	Positive	Percentage yield
1	Bronchial washing	4/10	40%
2	Bronchial brushing	5/10	50%
3	TTNA	2/4	50%
4	CT guided TTNA	2/2	100%

Diagnostic yield were 50% by bronchial brushing, 40% by bronchial washing. Four cases were confirmed by TTNA 50% (2/4) and by CT guided TTNA 100% (2/2).

Table: 5 Overall Diagnostic yields of various procedures in present study

S. No.	Procedures	No of examination	Positive	Percentage
1	Bronchial washing	50	30	60%
2	Bronchial brushing	50	35	70%
3	Bronchial biopsy	40	37	92.5%
4	TBNA	9	6	66.67%
5	Pleural fluid cytology	9	4	44.5%
6	TTNA	4	2	50%
7	CT guided transthoracic	2	2	100%
8	FNAC Lymph node	2	2	100%

In Peripheral Lesion: Two cases were solely diagnosed by CT guided transthoracic biopsy, and in four cases two was solely positive by Trans Thoracic Needle Aspiration.

In Central Lesion: Two cases were positive by FNAC of supraclavicular lymph node, were also positive by bronchial brushing, and bronchial biopsy.

Discussion

The Present study was carried out to determine related Comparison of Bronchial washing, brushing, biopsy, and other procedure in the evaluation of bronchogenic carcinoma. Among 50 proved cases of bronchogenic carcinoma, majority (86%) belonged to the age group of 41-70 years. The average age being 54.98 years in this study has been quite similar to most of the earlier studies. The male: female ratio in present study 9:1- is quite comparable to other studies [20,21]. Majority of cases were smoker 41 (82%), while 9 (18%) cases were Non-smoker, Male: Female ratio among smoker was 40:1. Whereas among Non-smoker were 1:25:1. Similar observation were made by Shankar et al 1967 Jha et al 1972 and Basu et al in 1977 [22-24]. Out of 50 proved cases of bronchogenic carcinoma, 40 (80%), were found to be having endoscopically visible central lesion; whereas 10 (20%) cases had endoscopically non visible peripheral lesion. Similar to Kvale PA et al 1976 [25], and Jindal S.K. et al 1982 [8]. This higher percentage of endoscopically visible central lesion in present study may be attributed to the smoking habit and advanced stage of disease at the time of presentation. For central lesion, the diagnostic yield was highest i.e. 92.5% with endobronchial biopsy followed by bronchial brushing, TBNA, and washing in 75%, 66.67%, and 65% respectively. These diagnostic yields are comparable to other studies i.e. Popp et al 1991 [26], Govert et al 1999 [27], Rosell A et al 1998 [28]. We found no statistically significant difference between BW, Bb and Bronchial biopsy (McNemar's test) ($p > 0.05$). For peripheral lesion bronchial brushing was diagnostic in 50% and bronchial washing were positive in 40% of cases. Similar

reports were found in studies of Buccheri et al 1991, Mak et al 1990 [29-31]. CT guided transthoracic lung biopsy is the investigation of choice for peripherally located lesions. Squamous cell carcinoma was the commonest cell type in 34% patients who were smokers and mostly above 40 years of age. Small cell carcinoma was present in 20% of studied cases, and this was the commonest cell type in the patients less than 40 years of age in whom the smoker had 25% of this type cancer. Adenocarcinoma was found in 22.6%, more common cell type in females and non smokers. This is in agreement with Garg et al 1973 [33], Jindal S.K. [31] and Behra D et al 1990 [32]

Conclusion

Bronchoscopic guided washings and brushings cytology are very effective, less expensive and can complement histological biopsy in early diagnosis as it gives good cytological yield. For central lesion, the diagnostic yield was highest with endobronchial biopsy followed by bronchial brushing, TBNA, and washing. For peripheral lesion bronchial brushing, bronchial washing and CT guided transthoracic lung biopsy was diagnostic.

References

1. Crofton and D Douglas: Lung cancer; Text book of Respiratory diseases 2010; 5: 1077-79
2. World health organizations. Cancer. http://www.who.int/mediacentre/factsheets/fs_297/en/index.html accessed on February 02, 2020
3. World health organizations. Global info base. **Error! Hyperlink reference not valid.** ?iso=I ND &rid=119&go Button= Go last accessed on February 02, 2020
4. Bhera D. Lung cancer in India. Indian Journal of Chest Diseases and Allied Sciences 1992; 34:91-101
5. Murrey JF and Nadal JA Bronchogenic carcinoma. Text Book of Respiratory Medicine 1994; 2: 1558-60

6. Arroliga AC, Matthay RA. The role of bronchoscopy in lung cancer. *Clin chest Med* 1993; 14: 87-98
7. Schreiber G, McCrory DC. Performance characteristics of different modalities for diagnosis of suspected lung cancer. *Chest* 2003; 123(suppl): 115S-128S.
8. Jindal SK, Malik SK, Dhand R, Gujral JS, Malik Ak, and Datta BN. Bronchogenic Carcinoma in Northern India. *Thorax* 1982; 37: 343-7
9. Jindal SK, Malik SK, Malik AK, Singh K, Gujral JS and Sodhi JS. Bronchogenic carcinoma review of 150 cases. *Ind J Chest Dis* 1979; 21: 59-64
10. Arroliga AC, Matthay RA. The role of bronchoscopy in lung cancer. *Clin Chest Med* 1993; 14: 87-98
11. Lundgren R, Bergman F, Angstrom T, comparison of transbronchial needle aspiration of bronchial secretion, bronchial washing, brush biopsy and forceps biopsy in the diagnosis of lung cancer. *Eur J Respir Dis* 1983; 64: 378-85
12. Lam Wk, So SY, HSU C. Fiberoptic bronchoscopy in the diagnosis of bronchial cancer: comparison of washing brushing and biopsies in central and peripheral tumors. *Clin Oncol* 1983; 9: 35-42
13. Schreiber G, McCrory DC. Performance characteristics of different modalities for diagnosis of suspected lung cancer. *Chest* 2003; 123(suppl): 115S-128S.
14. Mazzone P, Jain P, Arroliga AC, Matthay RA. Bronchoscopy and needle biopsy techniques for diagnosis and staging of lung cancer. *Clin Chest Med* 2002; 23: 137-58.
15. Chaudhary BA, Yoneda K, Burki NK. Fiberoptic bronchoscopy. Comparison of procedures used in the diagnosis of lung cancer. *J Thorac Cardiovasc Surg* 1978; 76: 33-7.
16. Solomon DA, Solliday NH, Gracey DR. Cytology in fiberoptic bronchoscopy: comparison of bronchial brushing, washing and postbronchoscopy sputum. *Chest* 1974; 65: 616-9.
17. Struve-Christensen E, Michaelsen M, Mossing N. The diagnostic value of bronchial washing in lung cancer. *J Thorac Cardiovasc Surg* 1974; 68: 313-7.
18. Chopra SK, Genovesi MG, Simmons DH, Gothe B. Fiberoptic bronchoscopy in the diagnosis of lung cancer: Comparison of pre- and post-bronchoscopy sputa, washing, brushing and biopsies. *Acta Cytol* 1977; 21: 524-7.
19. Gilbert Schreiber, Douglas C McCrory. Performance characteristics of Different Modalities for Diagnosis of suspected lung cancer. *Chest* 2003; 123: 115s-128s
20. Narang RK, Dubey AL, Gupta MC, Raju S. Primary bronchial carcinoma A clinical study. *Indian J Chest Dis Allied Sci* 1977; 19: 120-23
21. Malhotra V, Malik R, Beohar PC, Gondal R, Khanna SK, Narayanan PS. Tumors of the lung: Histomorphological study. *Indian J chest Dis Allied Sci* 1986; 2: 28-40
22. Shankar PS. Bronchogenic carcinoma *Indian J chest Dis* 1967; 9: 161-64
23. Jha VK, Roy DC, Ravindran P. bronchogenic carcinoma. *Indian J chest Dis* 1972; 14: 78-85
24. Basu BK, Ghosh TN. A study of bronchogenic carcinoma *Indian J chest Dis* 1971; 13: 1-9
25. Kvale PA, Bode FR, Kini S. Diagnostic accuracy in lung cancer: comparison of techniques used in association with flexible fiberoptic bronchoscopy. *Chest* 1976; 69: 752-727.
26. Popp W, Rauscher H, Ritschka L, et al. Diagnostic sensitivity of different techniques in the diagnosis of lung tumors with the flexible fiberoptic bronchoscope: comparison of brush biopsy, imprint cytology of forceps biopsy, and histology of forceps biopsy. *cancer* 1991; 67: 72-75.
27. Govert JA, Dodd LG, Kussin Ps, et al. A prospective comparison of fiberoptic transbronchial needle aspiration and bronchial biopsy for bronchoscopically visible lung carcinoma. *Cancer* 1999; 87: 129-134
28. Rosell A, Monso E, Lores L et al. Cytology of bronchial biopsy rinse fluid to improve the diagnostic yield for lung cancer. *Eur Resp J* 1998; 12: 1415-1418
29. Buccheri G, Barberis P, Delfino MS. Diagnostic, morphologic and histopathologic correlates in Bronchogenic carcinoma: A review of 1045 bronchoscopic examinations. *Chest* 1991; 99: 809-814
30. Mak VH, Johnston ID, Hetzel MR et al. Value of washing sand brushing at fiberoptic bronchoscopy in the diagnosis of lung cancer. *Thorax* 1990; 45: 373-376
31. Jindal SK, Behra D. clinical spectrum of lung cancer Review of Chandigarh experience of 10 years. *Lung India* 1990; 8: 94-98
32. Garg UK, Srivastava VK, Maheshwari BB. Carcinoma of lung: A correlative cytological and Histopathological study. *Indian J chest Dis Allied Sci* 1973; 10: 204-11

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