Original Research Article

Utility of various diagnostic methods for early detection of lung cancer

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Abstract

Background: Lung cancer is the leading cause of cancer-related deaths. The overall 5 year survival rate of lung cancer is 15% in developed countries and 5% in developing countries An early, accurate diagnosis is of paramount importance for initiating specific therapy. **Aim and objective:** To study the various diagnostic methods for early detection of lung cancer **Methodology:** The study was carried out in 58 indoor patients during the period of January 2000 to March 2002 at tertiary care center. All patient underwent routine investigations and sputum, USG. Selected cases were investigated by Fibre Optic Bronchoscopy, Fine needle aspiration cytology (FNAC), pleural fluid, pleural biopsy, Percutaneous lymphnode FNAC, Lymphnode biopsy **Results:** Sputum was positive in 4 (6.89%). cases only. Radio graphically right lung (62.06%) was more often affected than the left (37.93%) with the preponderance of upper lobes. Bronchoscopic aspirate was positive in 61.53% and bronchoscopic biopsy was positive in 76.92%, combined yield by both procedure was 69.22%. Fine needle aspiration cytology was positive in 91.66% of cases, where FNAC was done. Pleural fluid cytology was positive in 62.96% where as pleural biopsy was positive in 37.03%. **Conclusion:** Chest radiography has found to be have high sensitivity, low cost and negligible risk and hence it should be the starting point in detection of lung carcinoma. Sputum has low sensitivity in diagnosis of lung cancer. Pleural fluid aspiration has higher diagnostic yield.

Key Words: lung cancer.

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INTRODUCTION

Cancer is a major public health problem worldwide. The past few years have witnessed a spike in numbers of lung cancer patients in India. The incidence has risen at an alarming rate of up to 15 per cent over the past decade. the data from the population based cancer registry of Indian Cancer Society from Maharashtra which covers Mumbai, Pune, Nagpur and Aurangabad. This covers a population of 24,270,077 Indians (in the year 2011). The incidence of lung cancer in Maharashtra as documented in 2011 by these four population based cancer registries. They collectively recorded 3170 new cases[1.] Lung cancer is usually suspected in individuals who have an abnormal chest radiograph or have symptoms caused by either local or systemic effects of the tumor. The method of diagnosis of lung cancer depends on the type of lung cancer,the size and location of the primary tumor, the presence of metastasis, and the overall clinical status of the patient. Diagnosis and stage of lung cancer is important for best possible treatment hence this study was conducted to find out utility of various diagnostic methods for detection of lung cancer.

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MATERIAL AND METHODS

It was a cross sectional study of 58 patients diagnosed as lung carcinoma by histopathology. Study was carried out in a tertiary care hospital during period of January 2000 to March 2002. Consent was taken from the patients before starting the study. Patients diagnosed as primary lung cancer were included, those with presentation of secondary cancer and not willing to participate were excluded. Data collection was done with predesigned questionnaire. It includes sociodemographic information like age, sex, residence, occupation etc. History related to lung cancer includes h/o cough, its duration, haemoptysis, loss of appetite, loss of weight etc. All patient underwent routine investigations like CBC, BSL, BUL, LFT, KFT etc. Chest x-ry and USG were done. For diagnosis of lung cancer we used non invasive procedures like sputum and invasive like Fibre Optic Bronchoscopy, Fine needle aspiration cytology (FNAC), pleural fluid,pleural biopsy, Percutaneous lymphnode FNAC, Lymphnode biopsy The early morning expectorated sputum was collected, Smears were prepared from the expectorated material and fixed in 95% ethyl alcohol and send to laboratory. In this study pleural biopsy was done by Cope's needle.

RESULTS

Table 1: Distribution of patients according to sputum positivity for malignant cells

Sr. No	Sputum smear for malignant cell	No. of patients	%
1	positive	4	6.89%
2	negative	54	93.10%

All patients were investigated for sputum for malignant cells. It was found that only 4 cases (6.89%) showed positivity for malignant cell. Remaining (93.10%) showed negativity for malignant cell. It was observed that right side involvement was seen in 36 (62.06%) patients while 22(37.93%) patients showed involvement of left side. out of 58 patients, 31(53.44%) were showing mass lesion on X-ray chest; and 27(46.55%) presented with pleural effusion which on USG showed underlying lung lesion. Metasis to liver was confirmed by USG in 10 (17.24%) cases. Mediastinal widening was seen in 10(17.24%) cases. Radiologically central lesions were seen in 7 cases (12.06%) peripheral lesions were found in 24 (41.37%) and 46.55% patients presented with pleural effusion with underlying lung lesion. Mass lesions were predominant in upper zone. (25.86%), while effusion with underlying lung lesion was seen in lower zone.

Table 2: Distribution of patients according to frequency of bronchoscopic findings

Sr. no	Bronchoscopic findings	No.of patients	Percentage of total
1	Growth	4	12.5%
2	Rigidity and fixation of bronchus	6	18.75%
3	Distortion and narrowing of Trachea or bronchi	6	18.75%
4	Blunting of Carina	6	18.75%
5	Ulceration of Mucosa	4	12.5%
6	Normal	6	18.75%

32 patients were subjected for bronchoscopy. A blunting of carinal angle was seen in 6 (18.75%). Distortion and narrowing of trachea or bronchi were seen in 6(18.75%). Endo bronchial growth was seen in 4(12.5%) patients. Rigidity and fixation of bronchus due to growth out side the bronchus was seen in 6(18.75%) cases. In 6 cases, the lesions were beyond the reach of bronchoscope so findings were normal.

Table 3: Yield of bronchoscopic aspirate and bronchoscopic biopsy in lung cancer patients

Sr. No	Procedure	No.of patients under went	Positivity	Percentage
1	Bronchoscopic aspirate	26	16	61.53%
2	Bronchoscopic biopsy	26	20	76.92%

Bronchoscopic aspirate and bronchoscopic biopsy was taken in 26 cases and it was observed that, bronchoscopic aspirate was positive in 16 (61.53%) cases, while bronchoscopic biopsy was positive in 20 (76.92%) cases. 6 patients were not undergone these procedures, as the lesions were beyond the reach of bronchoscope and findings were normal.

Table 4: Yield of FNAC of mass lesion

Sr. No	Procedure	No.of patients under went	Positivity	Percentage
1	FNAC	36	33	91.66%

It was performed in 36 cases and it was observed that 33(91.66%) showed positive yield by this procedure. In remaining 22 cases FNAC was not performed as the mass lesions were far close to the mediastinum and deeply situated.

Table 5: Results of pleural fluid cytology and pleural biopsy

Sr. No	Name of diagnostic procedure	No.of patients undergone procedure	Total No. of Positive cases	%
1	Pleural fluid cytology for malignant cell	27	17	62.96%
2	Pleural biopsy for malignancy	27	10	37.03%
3	Both pleural fluid and biopsy positive for malignancy	27	5	18.51%

Pleural fluid cytology and biopsy was done in 27 patients, it was observed that pleural fluid cytology for malignant cell was positive in 62.96% and pleural biopsy for malignant cell was positive 37.03% cases. Only 5 patients showed positivity for both cases. It was observed that 22 patients, had palpable lymphnodes. Out of which 17 patients undergone FNAC procedure and positive results for malignant cells were seen in 13 patients (positivity 76.47%). In remaining 5 patients procedure could not be performed as the size of L.N. were too small to do the procedure, so L.N. Biopsy were done in 5 patients which showed positivity in only two cases (40%).

Table 6: Frequency of patients in whom each ofthe diagnostic procedures showed evidence of malignancy

Sr. No	Name of diagnostic procedure	No.of patients undergone procedure	Total No. of Positive cases	Percentage
1	*Sputum*	58	4	6.89%
2	Bronchoscopic aspirate	26	16	61.53%
3	Bronchoscopic biopsy	26	20	76.92%
4	Pleural fluid cytology	27	17	62.96%
5	Pleural biopsy	27	10	37.03%
6	FNAC (mass lesion)	36	33	91.66%
7	Lymph node biopsy	5	2	40.00%
8	L. N. FNAC	17	13	76.47%

Many of the patients had undergone more than one procedures. It was observed that FNAC mass showed positive resultsin 33 (91.66%). Bronchoscopy was performed in 32 cases. It showed positive results 76.92% and 61.53% in bronchoscopic biopsy and bronchial aspirate respectively. Pleural fluid cytology and pleural biopsy was performed in 26 cases. Pleural fluid cytology was positive in 62.96% cases while

Table 7: Histological classification of lung malignancies

Type	No. of patients	Percentage
Squamous cell carcinoma	24	41.37%
Adenocarcinoma	15	25.86%
Small cell carcinoma	9	15.51%
Unclassified carcinoma	9	15.51%
Others	1	1.72%

Pleural biopsy was positive in 37.03% cases. L.N.FNAC was significant and showed 76.47% positive result. While biopsy showed 40.00% positivity. Sputum examination was not significant showed very poor positive response (6.89%) only. It was observed that out of 58 patients, squamous cell carcinoma was predominent in 41.37% cases; followed by adenocarcinoma in 25.86% cases, small cell carcinoma in 15.51% cases, and unclassified carcinoma in 15.51% cases. Non hodgekin's lymphoma was seen in one (1.72%) case.

Table 8: Complications while performing various diagnostic procedures

Complications	Broncho-scopy	Pleural fluid	Pleural biopsy	FNAC mass	FNAC L.N.	LN biopsy
Pneumothorax	0	0	0	1	0	0
Hydropneumothorax	0	1	3	0	0	0
Haemoptysis	1	0	0	1	0	0
Broncho spasm	6	0	0	2	0	0
Infection	0	0	0	0	0	1

Haemoptysis, pneumothrax, hydropneumothorax and pneumothorax were common complications. All the complications were mild and the patients settled with conservative management. One case required intercostal tube drainage for large hydropneumothrax, developed after pleural biopsy. None of the patients had complications like cancer spread along biopsy tract, vagal shock or death.

DISCUSSION

Sputum cytology for malignant cells was positive in 4 cases (6.89%) only, which is very low as compared to other studies. C. Roy *et al* (Rkhemp 1971)[2] in their study found 6.2% positivity of sputum cytology and these suspicious reports serve no purpose. Vishwanathan R. *et al* (1975)[3] reported atelactasis, abscess due to obstruction of peripheral bronchi and solitary mass, and do present difficulty in sputum cytology. According to Anderson (Boyed)[4], sputum cytology is 98% accurate in skilled hands. W.D.Umikar (1960)[5] found 62.5% sputum positivity in central radiological lesion. Goel M.K. Prasad (1996)[6] found that prebronchoscopic sputum, bronchial aspirate and post bronchoscopic sputum are complementary to each other and are likely to enhance the total diagnostic yield. Fiberoptic bronchoscopy was done in 32 patients. Rigidity and fixation of bronchus, distortion and narrowing of trachea or bronchi, and blunting of carina were the common findings found in 18 patients, 6 cases (18.75%) in each respectively. Ulceration and growth was seen in 8 (24.5%), 12.05% in each respectively. Normal findings were present in 6 (18.75%) cases. Bronchoscopicapirates were positive in 61.53% and bronchoscopic biopsy in 76.92%, combined yield by both procedure was 69.22%. In D.D.S.Kulpati *et al* (1985)[7] and P. N. Chhajed *et al* (1999)[8] bronchoscopic aspirates were positive in 68.5% and 53.7% respectively and bronchoscopic biopsy in 85.7% and 59% respectively. Peter F. Fedullo (1991)[9] found that the yield of bronchoscopy increases with increase in diameter of lesions. G. Fraser (1978)[10] and his co-workers found that if the size of the tumour is more than 2 cm the yield of biopsy is 87%. Percutaneous lung FNAC showed a diagnostic yield of 91.66% out of the total number of patients in whom the procedure was carried out. Diagnostic yield in Peter F. Fedullo (1991)[9] was90%, All patients with pleural effusion, had undergone the pleural fluid cytology and pleural biopsy.Positivity by pleural fluid cytology and pleural biopsy was 62.96% and 37.03% respectively and both pleural fluid cytology and pleural biopsy was positive in 5 (18.51%) cases only. According to Richard W. Light (1990)[84], pleural biopsy has a lower diagnostic yield than pleural fluid cytological examination, because in about 50% of patients with malignant pleural disease, the costal parietal pleura is not involved. Success rate of Pleural fluid diagnostic study inSalyer *et al* (1975)[11] is 73% 56%and in P.N.Chhajed *et al* 1999)[8] is 61% and 46.2%. Percutaneous lymph node FNAC showed a yield of 76.47 Diagnostic yield of lymph node biopsy in Jha *et al* (1972)[12] is 100%. In the present study, none of the patients had negative chest radiograph. A mass or prominence in or about the hilum was found to be rather characteristic of the radiographic pattern of squamous cell carcinoma (57.14%) and small cell carcinoma (28.57%). Only one case of adeno carcinoma presented as central tumour (14.28%). A peripheral mass on chest radiography was found to occur often in association with squamous cell carcinoma (50%) followed by adenocarcinoma (41.66%). Of the patients with adenocarcinoma, 10 (66.66%) were found to have peripheral masses while 4 (26.66%) presented with massive pleural effusion with underlying lung lesion and one case presented with central mass lesion (6.66%). These findings are similar, to those of Byrd R.B. *et al* (May Richard Byrd 1967)[13]. Robert T. Heelan *et al* (1980)[14], found that radiographic presentation of small cell carcinoma was typical of bulky, usually in the hilus, with frequent involvement of the mediastinum. Secondary features like peripheral nodules, infiltrates and lobar collapse are also seen.

CONCLUSION

Chest radiography has found to be have high sensitivity, low cost and negligible risk and hence it should be the starting point in detection of lung carcinoma. Sputum has low sensitivity in diagnosis of lung cancer. The yield of bronchoscopy depends on site and size of the lesion and the experience of the bronchoscopist. Pleural fluid aspiration has higher diagnostic yield and less complications than pleural biopsy. The detection of carcinoma lung could be early if patients with suspicious lesions in X-ray are investigated before starting the empirical treatment and the decision for proper invasive procedure are taken early.

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