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Pathology

Role of CT Guided FNAC in Diagnosing Lung Carcinoma and It's Correlation with the Socio-demographic Profile in a Tertiary Health Care Center in the Kumaon Region of Uttarakhand

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Abstract: In remote regions like hills of Uttarakhand, the health care facilities are still in preliminary phase. Most of the cases, even the treatable once, are lost due to lack of awareness and meager diagnostic modalities. The study was conducted to evaluate the usefulness of the procedure in a minimally equipped set up so that the district level health centers can be provided with such facilities. It can overcome the problem of patients presenting late to the health care facilities. Also the pattern of the lung carcinoma is required to be studied so that it is possible to correlate it with the various socio-demographic factors. After the selection of patients, FNAC was done under CT guidance in the presence of a qualified radiologist as an outpatient procedure after explaining the risks and benefits and obtaining informed consent. A 22or 23 gauge needle or a spinal needle was used depending on the depth and site of the lesion, attached to a 10ml syringe. FNAC smears were prepared and fixed immediately in 90% ethanol for routine staining with hematoxylin and eosin (H&E) stain and Papanicolaou (PAP) stain. The procedure of Fine needle aspiration cytology under the guidance of computed tomography is proved to be very useful in making the diagnosis of lung masses. The procedure is easy to perform, minimally invasive and gives quick results. The cytological examination of the aspirate is sufficient to differentiate between benign and malignant lesions and also makes the sub typing of the malignant lesions possible.

Keywords: Lung cancers, CT guided FNAC, grading of lung cancers, Kumaon region.

INTRODUCTION

Lung cancer is one of the commonest cancers and cause of cancer related deaths all over the world. It accounts for 13 per cent of all new cancer cases and 19 per cent of cancer related deaths worldwide. In India, lung cancer constitutes 6.9 per cent of all new cancer cases and 9.3 per cent of all cancer related deaths in both sexes; it is the commonest cancer and cause of cancer related mortality in men, with the highest reported incidences from Mizoram in both males and females. Unfortunately, the time trends of lung cancer show a significant rise in Delhi, Chennai and Bengaluru in both sexes. The incidence and pattern of lung cancer differ as per geographic region and ethnicity and largely reflect the prevalence and pattern of smoking.

The link between lung cancer and cigarette smoking was emphasized half a century ago by Wynder and Graham [23] and became officially recognized in 1957 when the Surgeon General of the United States, Leroy E. Burney, issued a statement declaring, "Excessive smoking is one of the causative factors in lung cancer." This was followed by a Public Health Service Monograph, "Smoking and Health" published in 1964 that clearly established the relationship between cigarette smoking and lung cancer. The relationship between cigarette smoking and lung cancer is complex and individuals differ in their susceptibility to the carcinogenic effects of cigarette smoking and probably other environmental agents [24]. The challenge in the future will be to identify those who are constitutionally at risk.

New developments in the field of thoracic pathology have challenged the way pathologists approach the diagnosis of pulmonary lesions, specially the malignant lesions. For example Non small cell carcinoma is no longer an adequate diagnostic category. Pathologists are required to further classify tumors into adenocarcinoma and squamous cell carcinoma since specific therapies are now recommended depending on the type of the tumor. This change occurred following the discovery of specific molecular alterations that predict response to certain drugs and now molecular testing of tumor cells is often requested to direct therapy. The vast majority of lung cancer is diagnosed in advanced clinical stages, where cytological or small biopsy material is the only form of tissue diagnosis, thus placing cytology, especially fine needle aspiration cytology in the front line for management of patients with lung cancer.

Conventionally the method of FNAC is applicable to lesions that are easily palpable superficially. Modern imaging techniques like ultrasound and CT applied to organs and lesions not easily accessible to surgical biopsy, offer vast opportunities for percutaneous, transthoracic and trans-peritoneal fine needle aspiration for deeper structures.

The technique is relatively painless, produces a speedy result and is inexpensive. FNAC is less demanding technology than surgical biopsy. In this respect it is eminently suitable for practice in countries with scant resources, which are unable to fund teams of surgeons, anesthetists, nurses etc. The low risk of complications is an additional advantage which follows FNAC to be performed as an office procedure.

Regarding the imaging techniques in our set up, USG and CT are being used. CT guidance allows the doctor to obtain material of interest and helps them to differentiate between the necrotic material and true tumor mass. The advantage of CT over ultrasound guidance is the ability of the needle to swing freely with respiratory or involuntary movement, whereas US guided produce a fixed system which may cause trauma to underlying tissues. Localization of needle tip within a lesion is very accurate with CT; it provides detailed cross sectional images of the body which are not limited by physical properties as are ultrasound images, such as interference from bowel gas and bone. With modern spiral scanners the images are produced in virtual real time this further increases the diagnostic accuracy. With CT guidance the occurrence of serious complications also decreases significantly like major hemorrhages, septicemia, bile peritonitis, acute pancreatitis, pneumothorax and dissemination of cancer cells along the track etc.

The prevalence of lung carcinoma is significant in our state. The study was conducted to evaluate the usefulness of the procedure in a minimally equipped set up so that the district level health centers can be provided with such facilities. It can overcome the problem of patients presenting late to the health care facilities. Also the pattern of the lung carcinoma is required to be studied so that it is possible to correlate it with the various sociodemographic factors.

MATERIALS AND METHODS

A prospective cross sectional study was conducted for a period of two years (July 2011-July 2013) following the permission of the institutional ethical committee and proper patient consent in collaboration with the Department of Radio-diagnosis and Department of TB and Chest, at Govt. medical college Haldwani and associated Susheela Tiwari Hospital. All patients with clinically suspected lung tumour were included in the study.

The criteria for patient selection are as follows

- Patients with lung mass not approachable by ultrasound i.e. either it was not abutting the chest wall or was located behind the thoracic bones.
- Patients giving written informed consent for the procedure

The criteria for patient exclusion are as follows

- Patients with bleeding tendency or any coagulopathy.
- Patients with bleeding disorders and severe thrombocytopenia
- Local abscess and cellulitis

Each patient was interviewed to collect information on age, area of residence, occupation, religion, education, socio-economic status, smoking habits (active or passive), history regarding tuberculosis, tuberculosis contact history, presenting complain, duration of symptoms and family history. A detailed general physical examination was carried out. Each recruited patient underwent following investigations:

- Routine: Blood group, Hemoglobin, HIV, HbsAg, Urine routine and microscopy.
- Coagulation profile: BT, CT, APTT
- Other: Sputum cytology for tuberculosis, X ray, Monteux test

FNAC was done under CT guidance in the presence of a qualified radiologist as an outpatient procedure after explaining the risks and benefits and obtaining informed consent. A 22or 23 gauge needle or a spinal needle was used depending on the depth and site of the lesion, attached to a 10ml syringe. FNAC smears were prepared and fixed immediately in 90%

ethanol for routine staining with hematoxylin and eosin (H&E) stain and Papanicolaou (PAP) stain.

RESULTS

A total of 92 cases were included in the study and in 88 cases we obtained adequate FNAC aspirate. Out of these 88 cases with adequate aspirate, 84(91.30%) cases were diagnosed as malignant and 4(4.34%) cases were diagnosed as benign in cytology as given in (figure 1). In 4 cases (4.34%) the aspirate was not adequate thus the cytological diagnosis could not be made. Smears of the aspirated material of malignant lesions were assessed for cellularity using the criteria given by Bhatia *et al*.(b) which is shown in Table1.

Table-1: Grading of cellularity

Cellularity	Grade
No cells	0
Low (Tumor cells<10% of cells present)	1+
Moderate Cellularity(tumor cells 10-50% of cells present)	2+
High cellularity(tumor cells>50% of cells present	3+

The cytological diagnosis showed maximum number of cases belonged to squamous cell carcinoma (41.30%). Other malignant lesions include adenocarcinoma/ bronchogenic carcinoma (20.65%), small cell carcinoma (15.21%) large cell carcinoma/ undifferentiated carcinoma (11.95%). There were two cases of tubercular origin and one case each of lymphoma, low grade myxoid spindle cell sarcoma, lipoma and lung abscess (Table 2).

Table-2: **Distribution of cases according to type of the lesion**

Total cases	92	100
Squamous cell carcinoma	38	41.30%
Small cell carcinoma	14	15.21%
Adenocarcinoma/ bronchogenic Ca	19	20.65%
Large cell carcinoma	11	11.95%
Lymphoma	01	1.08%
Myxoid spindle cell Sarcoma	01	1.08%
Tubercular	02	2.17%
Lipoma	01	1.08%
Abscess	01	1.08%
No opinion	04	4.34%

In our study we found that right lung was affected more commonly than left or bilateral involvement. In 42.39 % of the cases there was collapse/ consolidation associated with the mass were male and 11 (13.58 %) were female, male: female ratio is 7.36: 1

Table-3: Distribution of lesions according to gender

Gender	Total Number of cases	SCC	SCLC	ADC/BAC	LCLC	Lymphoma	Lipoma	Sarcoma	Tuberculoma	Abscess	No opinion
		38	14	19	11	01	01	01	02	01	04
Male	81	35	14	12	10	01	01	01	02	01	04
Female	11	03	-	07	1	-	-	-	-	-	-

(SCC: Squamous cell carcinoma, SCLC: Small cell lung carcinoma, ADC: Adenocarcinoma, LCLC: Large Cell Lung Carcinoma)

We also found that the most common tumor among males is squamous cell carcinoma whereas adenocarcinoma is the commonest in females (Table 2).

When we analyzed the correlation between age groups and type of the lesion we found that in less than 40 years of age, SCLC was the commonest type while SCC was common after 60 years of age. Most common lesion among all age groups is Squamous cell carcinoma (Fig 1).

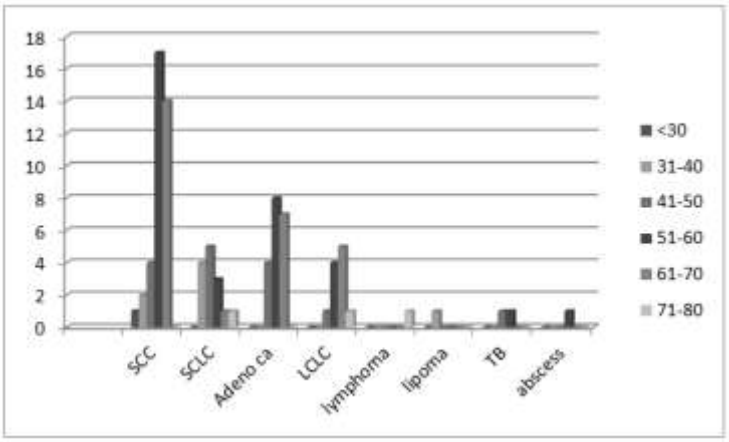

Fig-1: Distribution of type of lesion according to age groups

Maximum numbers of malignant lesions were seen in the age group of 51-60 yrs. Among the patients included in our study, 77 cases out of 92 (83.69%) were active smokers, and out of these 77 smokers 73 were males and 4 were females. Smoking material included cigarettes and beedis. Bulk of the patients was bidi smokers. Similar observation has been reported by other Indian studies also [8-11]. Majority of the patients had started smoking relatively early in life, at the age of 13-14 yrs. Regarding the socioeconomic status, almost all the patients (85.86%) belonged to the lower class. Occupationally they were laborers, farmers or people engaged in unskilled work .The association of malignant lesions with age, gender and smoking is depicted in Table 3.

Table-4: Association of malignant lesions with sociodemographic variables

Age group	Number	Percentage (%)
>30 yrs	01	1.08%
31- 40 yrs	06	6.52%
41- 50 yrs	14	15.21%
51- 60 yrs	33	35.86%
61- 70 yrs	27	29.34%
71- 80 yrs	03	3.26%
Sex		
Male	73	79.34%
Female	11	11.95%
Smoking		
Smoker	77	83.69%
Non Smoker	15	16.30%

DISCUSSIONS

FNAC is an accurate and safe method for evaluation of pulmonary mass. It enables categorization of malignant lesions in the vast majority of cases. In our present study, 92 FNAC from pulmonary mass lesions were evaluated over a period of 3 years, out of which 88 cases (95.65%) showed adequate cells in FNA smears. In a hospital set up like ours where lung biopsies are not routinely performed, radiological guided FNAC is the sole procedure which can diagnose and type lung masses effectively.

All cases enrolled were adults. In our study most of the patients were above 40 years of age with maximum patient load among 51-60 years age group. Most common type among all lesions is Squamous cell carcinoma .In less than 40 years of age; SCLC was the commonest type, while SCC was common after 60 years of age. In our study only one case belonged to< 30 years age group as neoplastic lung masses are relatively rare in the younger age group. Three cases belonged to 71-80 years age group. The reason for getting lesser patients in this particular age group could be explained by the fact that most of the patients suffering from this malignancy unfortunately do not have a life expectancy stretching till this age group. Apart from this, a delay in consulting a specialist regarding their illness both due to ignorance and sheer negligence is another contributing factor for this.

The mean age of the patients in our study was 55.43 years, which is almost similar to 56.4 years and 56.8 years in the studies conducted by Singh *et al*. [2] and Saha *et al*. [1] respectively. Power *et al*. [18] also

showed an increased prevalence of thoracic neoplasm after the age of 50 years, with an average age of 54 years. The prevalence of respiratory system malignancies is quite variable in different parts of India. In most studies, including reports of National Cancer Registry Program (NCRP) [12,13] from Bhopal, Delhi, and Mumbai; and other studies [12, 14] larynx was the was the most common site. In contrast the present study showed lung was the topmost site for malignancy in males not the larynx.

As explained earlier, most of the patients presented in our hospital clinically are with advanced disease. This delay in presentation can be contributed to medical ignorance among the people of the region and psychological reasons such as, denial of illness, fear of cancer, fear of its treatment, and domestic difficulties. Majority of the cases were misdiagnosed as tuberculosis and treated at various other centers mostly in peripheral remote areas, thereby causing a delay in diagnosis. The delay in seeking treatment was observed to vary from 4-6 months in our patients, which is similar to another study [15]. A team from Tata Memorial Hospital, Mumbai [16], found that 89% of the patients used denial as a mental defense mechanism, leading to delay in seeking medical help for the confirmation and treatment of cancer.

We found a significant male predominance in our study. Out of 92 cases studied, 81(86.41%) were males and 11(13.58%) were females (M: F ratio 7.36: 1) same as that documented in most of recent studies [3, 4] but little higher in three recent studies i.e. 71.1%, [19] 78.9% [4], and 80.6% [20], respectively.

Majority of the malignant lesions were in smokers. The most common tumor among smokers is Squamous cell carcinoma (42.85 %) followed by adenocarcinoma (19.48 %). Cytological diagnosis was made in 88 out of 92 cases (95.65%) and the high incidence of malignancy (91.30%) was comparable with that found in other studies [4, 20, 21] The malignant cases formed the largest category. Our results were not corresponding with the incidence of adenocarcinoma reported in recent studies by Tan *et al*. [19] and Madan *et al.* [6] which says incidence of Adenocarcinoma to be significantly higher. On the contrary it is similar to other national studies, according to which prevalence of squamous cell carcinoma was more than adenocarcinoma [3, 5, 20] and SCC was still the commonest cell type seen, followed by adenocarcinoma and SLCC. This is similar to reports from other part of India [7-11, 17]. A comparison with similar study has been shown in Table 4.

Table-4: Comparison of the results with other study

Age	Jagdish *et al*	Our study
< 40 yrs	9.86%	8.68%
41-60 yrs	53.20%	56.51%
>60 yrs	36.94%	34.76%
Gender		
Male	89.16%	86.41%
Female	10.84%	15.58%
Smokers	166	77
Non Smokers	37	15
Malignant lesion		
Squamous cell arcinoma	44.83%	41.30%
Adeno carcinoma	19.70%	20.65%
Small cell carcinoma	16.75%	15.21%
Large cell carcinoma	8.37%	11.95%
Presentation		
Bilateral	2.96%	6.5%
Right Lung	57.64%	61.95%
Left Lung	39.41%	31.52%

There is no dearth of evidence regarding the relationship between cigarette smoking and lung cancer risk. The years of cigarette smoking and the number of cigarettes smoked per day (cumulative cigarette consumption) is useful in predicting the risk for lung cancer. In our study, maximum cases were in the 51-60 yr age group therefore the duration of smoking was more than 30 yrs.

In India bidi is smoking is very common especially in rural areas and among the lower socio-economic class as it is cheaper. India accounts for more than 85% of the world's bidi production. The tobacco used in bidis is different from that used in cigarettes. Bidis deliver 3-5 times as much nicotine, tar and carbon mono oxide and 1.5 times more carcinogenic hydrocarbons than conventional cigarettes. The relatively low combustibility and non porous nature of

the tendu leaves used to make bidi requires more frequent and deep puffs by the smokers to keep the bidi lit and is therefore harder on the lungs. Bidi being cheaper has a much higher sale compared to cigarettes; roughly eight bidis are sold for every cigarette.

CONCLUSION

The procedure of Fine needle aspiration cytology under the guidance of computed tomography is proved to be very useful in making the diagnosis of lung masses. The procedure is easy to perform, minimally invasive and gives quick results. The cytological examination of the aspirate is sufficient to differentiate between benign and malignant lesions and also makes the sub typing of the malignant lesions possible. A specific diagnosis of benign lesion such as tuberculosis helps to avoid any surgical intervention. FNAC is a cost effective diagnostic method that can lead to shorter hospitalization.

The tobacco control programs in our country are more or less focused on reducing cigarette consumption. We need to extent this to all types of tobacco use including bidis. Apart from this certain policies need to be framed by the government, which involves the participation of non government organizations and the social media for their effective implementation, to bring down the prevalence of smoking in all forms.

LIMITATIONS OF THE STUDY

Histopathological examination, which is the gold standard diagnostic procedure, is not currently done in lung lesions in our institute. The number of patients included is less due to fear among the patients, of being diagnosed as a cancer patient. Our institute being the only government hospital in this region offering affordable health care, there is a long waiting period in getting a date for CT scan. This result in delay in the diagnostic procedure due to which a large number of patients who do not have financial limitations opt for alternatives in the form of private diagnostic centers, this further reduce the number of patients.

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