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A study ofGuided Fine-Needle AspirationCytology of Solitary PulmonaryNodule

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ABSTRACT

Objective: To evaluate the immediate cytologic assessment during CT-guided fine-needle Aspirationcytology (FNAC) in the diagnosis of operable indeterminate solitary pulmonary nodules (SPNs).

Material and methods: CT and USG guided FNAC were done by pathologist in patients of SPN. 107 patients are included in this study , adequacy of the sample assessed immediately and when the sample was considered inadequate, fine-needle aspiration (FNA) was repeated.Of the 107 FNACs, 96 were USG guided and 11 were CT guided. Out of 107 aspirations, 8 aspirations were inadequate. So the overall success rate of aspirating diagnostic material was 92.5%.

Result: In this study cases of neoplastic lesions (90) were more thannon neoplastic lesions (9) and most of the neoplastic lesions were malignant. 8 aspirations were inadequate, so could not reach up to provisional diagnosis cytologically. Majority of lung lesions were of squamous cell carcinoma comprising 27.5% of all cases and 40.2% of all lung cases. This was followed by adenocarcinoma comprising 36.5% of all lung cases.

Conclusions: Immediate cytologic study significantly increased the adequacy and diagnostic accuracy of CT-guided FNAC of indeterminate SPNs without causing a significant increase ofcomplications.

Abbreviations: FNA=fine-needle aspiration; FNAC=fine-needle aspiration cytology; MTC= malignant tumor cells; SPN = solitary pulmonary nodule

KEYWORDS biopsies, technology; lung, biopsy; lung, neoplasm; lung, nodule

INTRODUCTION

At the onset of the 21st century, cancer of the lung remains the most common cause of cancer deaths in men and women alike, as it has been for many years (Landis et al, 1999). The link between lung cancer and cigarette smoking was emphasized half a century ago by Wynder and Graham (1950) 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 (PHS monograph 1103) that exhaustively reviewed the health effects of cigarette smoking and clearly established the relationship between cigarette smoking and lung cancer.It must be emphasized that cytology is a method of choice in the diagnosis of radiologically detected lung lesions suspected of being malignant. Thus, it is appropriate to analyze briefly the existing methods of diagnosis of lung cancer with attention to the role of cytology.We performed a study to evaluate the usefulness of CT-guided FNAC in our centre in the diagnosis of lung nodules suspicious of bronchogenic carcinoma as this minimally invasive procedure could be a basis for treatment.

Lung cancer is usually suspected on the basis of an abnormal radiographic imaging study, often in conjunction with symptoms caused by either local or systemic effects of the tumor. The modality selected to diagnose a suspected lung cancer is based on the size and location of the primary tumor in the lung, the presence of potential metastatic spread and the anticipated treatment plan.[1] Computed tomography (CT)-guided fine needle aspiration cytology (FNAC) of suspicious lung masses is a widely accepted and simple diagnostic method of relatively low cost. In patients with lung cancer that is inoperable owing to local factors or the patient's general condition, FNAC confirms the diagnosis and reveals the tumor type. This is useful in deciding the therapeutic approach in patients in whom results of bronchoscopy and sputum cytological study are not diagnostic. In candidates for surgery with indeterminate solitary pulmonary nodule (SPN) without clear radiologic signs of malignancy or benignity, findings from FNAC may be diagnostic.[2] We performed a study to evaluate the usefulness of CT-guided FNAC in our centre in the diagnosis of lung nodules suspicious of bronchogenic carcinoma as this minimally invasive procedure could be a basis for treatment.

MATERIAL AND METHOD

A SPN, suspected to be bronchogenic carcinoma, was defined as a solid, roundish, peripheral (outer half of parenchyma) lung mass in a subject who was more than 20 years of age, with strong clinical suspicion of lung cancer, normal sputum cytology, normal bronchoscopy and sputum for acid fast bacilli negative for three consecutive days. All cases were thoroughly evaluated radiologically to exclude primary malignancy in any site other than lung.

The present study comprises of 107 cases of various body organs in whom fine needle aspiration cytology was carried out at the Pathology department, P.D.U. Medical college-Rajkot and Radiology Department, P.D.U. Hospital- Rajkot during the period from October 2011 to August-2013.

Relevant details of clinical history, physical examination and radiological findings were obtained in each case . If the lesion is well visualized aspiration is performed. Otherwise CT was chosen for image guidance.

Patients were explained about the procedure and written consent was taken. They were informed about simplicity of the procedure and assured about safety and usefulness of the procedure. Intramuscular analgesic and intravenous atropine was given to prevent pain and vasovagal shock.

The patient was positioned prone or supine depending on the skin entry site chosen.In most of the cases anterior approach was carried out in supine position. Posterior approach was carried out in some cases of kidney and lung.

The procedure was carried out in USG section of radiology department. The skin puncture site proposed by radiologist was cleaned to remove coupling media (jelly) and local sterilization with betadine and spirit was done. Patient was asked to hold breath and 22G lumbar puncture needle with stellate was introduced in the direction proposed by the radiologist.

OBSERVATIONS AND RESULTS

A total of 107 cases of guided FNACs of pulmonary nodule have been included in this study, aspirated by Department of Pathology and Radiology, between October 2011 to August-2013, P.D.U. Medical College, Rajkot and Hospitals, Rajkot.

Of the 107 FNACs, 96 were USG guided and 11 were CT guided. Out of 107 aspirations, 8 aspirations were inadequate. So the overall success rate of aspirating diagnostic material was 92.5%.

The following observations were seen in the present study.

TABLE-1
AGE DISTRIBUTION OF PATIENTS (107 CASES

Age (Years)	No. Of Cases	Percentages (%)
0-10	0	0
11-20	0	0
21-30	4	3.74
31-40	11	10.28
41-50	21	19.63
51-60	24	22.43
61-70	35	32.71
71-80	10	9.35
81-90	02	1.87

Wide range of age has been observed, youngest patient being 22 years of age and oldest 90 years of age. Mean age was 50 years. Highest no. of patients were noted in 6th decade, followed by 5th decade of life.

TABLE-2
GENDER DISTRIBUTION OF PATIENTS (107 CASES)

Gender	No. of patients	Percentage (%)
Male	93	86.92
Female	14	13.08

The male:female ratio was 6.6 : 1, thus overall male predominance is noted.

TABLE-3
NATURE OF LESION (107 CASES)

Nature of lesion	No. of patients	Percentage (%)
Non Neoplastic	09	12.1
Benign	02	2.9
Malignant	88	78.6
Inconclusive	08	8.5

Above table indicates that the incidence of neoplastic lesions (90) were higher thannon neoplastic lesions (9) and most neoplastic lesions were malignant. 8 aspirations were inadequate, so could not be diagnosed Cytologically .

TABLE-4
VARIOUS LESIONS DIAGNOSED IN LUNG.

Organ	Lesion	Cases	Percentage%
Lung	Squamous cell ca.	43	40.3
	Adeno ca.	39	36.6
	Small cell ca.	03	2.9
	Anaplastic large cell carcinoma	01	0.9
	Tuberculoma	04	3.4
	Inflammation and abscess	10	9.4
	Inadequate material	07	6.5

Above table indicates that majority of lung lesions were of squamous cell carcinoma comprising 27.5% of all cases and 40.2% of all lung cases. This was followed by adenocarcinoma comprising 36.5% of all lung cases.

DISCUSSION

FNAC is a method where a, fluid and/or cells are aspirated from a lesion for cytological examination. Although needle aspiration cytology had been performed intermittently in the second half of the last century, it was popularized by Martin, Ellis and Stewart at Memorial Hospital for Cancer and Allied Diseases, New York in the 1930.

Of the 107 FNACs, 96 were USG guided and 11 were CT guided. Out of 107 aspirations, 8 aspirations were inadequate. So the overall success rate of aspirating diagnostic material was 92.5%.

LUNG:

Out of 103 cases of lung FNAC, Diagnostic material was adequate in 96 cases (93.2%) , while 7 cases (6.7%) aspirates yielded inadequate material.

Comparison of percentage of positive diagnostic yield for lung lesions.

Sr. No.	Author	Year	Diagnostic Yield %
1.	R.A.Halloush et al[73]	2007	92.0%
2.	Purajuli S et al[76]	2011	84.91%
3.	Arnab Ghosh et al[77]	2012	91.7%
4.	Levy MJ et al[78]	2013	97.7%
5.	Buqulho A et al[79]	2013	93.1%
6.	Present study	2013	93.2 %

In the present study out of 103 cases ,96 yield adequate material, while 7 yield inadequate material. So the diagnostic yield in the present study was 93.2%, which was in accordance with Buqulho A et al(93.1%). Higher diagnostic yield was obtained by Levy MJ et al which was 97.7%. Others yield more or less similar diagnostic accuracy. However lowest diagnostic yield was achieved by Purajuli S et al(84.91%.)

Gender correlation :

Sr.No.	Author	Year	M:F ratio
1.	Kashyap et al[80]	2003	6.7:1
2.	Uppal et al[81]	2004	6.8:1
3.	K. B. Gupta et al[74]	2007	6.5:1
4.	Nagarth SP et al[74]	2007	4:1
5.	Purajul S et al[76]	2011	6.1:1
6.	Levy MJ et al[78]	2013	4.8:1
7.	Present study	2013	3.9:1

In the present study significant male predominance (ratio- 3.9:1) was observed which is very much similar to Nagrth SP et al(4:1). Other studies also show similar ratio. The highest M:Fratio was observed by Uppal et al (6.8:1). The high M:F ration can be explained by much higher incidence of smoking in male patients, which has got a proved role in causation of both squamous cell and small cell carcinoma.

Incidence of Lesions of Lung:

Sr. No.	Author	Year	SCC %	Adeno ca. %	Large cell anaplastic ca. %	Non small cell carcinoma	Small cell ca. %	Benign / non neoplastic %	Inconclusive
1.	K.B.Tan et al82	2002	10.6	32.5	7.1	-	6.2	4.4	-
2.	J. P. Singh et al83	2004	18.1	18.1	3.1	-	3.1	18.1	-
3.	Uppal et al81	2004	49.4	34.5	-	3.5	10.3	7.2	2.8
4.	Dipti et al87	2006	14.3	14.3	14.3	-	14.3	28.6	-
5.	Khan et al84	2006	77.3	5.3	0.3	4.8	17.1	-	15.2
6.	R.A.Halloush et al64	2007	24.2	27.3	12.9	-	6.8	-	-
7.	K.B.Gupta et al74	2007	34.0	5.7	52.8	-	5.7	1.8	-
8.	Basnet et al85	2008	50.0	28.0	9.0	-	11.0	-	5.8
9.	QT Islam et al23	2010	8.6	18.9	0.8	-	7.1	8.6	8.2
10	Ritughosh et al58	2010	7.4	42.6	7.4	-	7.4	4.3	-
11.	R.B.Basnetet al97	2011	10.7	31.9	8.6	-	14.8	2.2	-
12	Van Domsela armel at78	2013	27.4	48.4	3.2	-	12.9	1.6	-
13	Present study	2013	40.3	36.6	0.9	7.5	2.9	12.9	6.5

In the present study incidence of squamous cell carcinoma was 40.3%, adenocarcinoma 36.%, small cell carcinoma 2.9% and

Large cell Anaplastic carcinoma was 0.9%. These data is more or less comparable to Uppal et alwho noted 49.4% squamous cell carcinoma, 34.5% adenocarcinoma, 10.3 % small cell carcinoma and 7.2% benign lesions. However highest incidence of Squamous cell carcinoma was noted by Khan et al (77.3%). As there is a strong correlation between habit of smoking and both squamous cell carcinoma and small cell carcinoma, the high incidence of both can be easily explained in the study group Rosai and Ackerman's[108]

CONCLUSION

Radiologically guided FNAC is a much useful tool in the lung lesions. Fine needle aspiration cytology is an OPD based, simple, inexpensive, safe, repeatable and rapid diagnostic procedure that has application in the evaluation of deep seated masses. The accuracy of diagnosis can be enhanced and problems encountered regarding classification of tumours can be minimized by using tumours markers.

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