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Diagnostic Accuracy of CT-Guided FNAC in Evaluation of Various Thoracic Mass Lesions, in Patients Attending Tertiary Care Hospital, At P.M.C.H., Patna

Authors
Dr Uday Shanker Pandey[1], Dr Satyendu Sagar[2]
[1]Associate Professor, Department of Pathology, Patna Medical College, Patna
[2]Assistant Professor, Department of Microbiolology, Nalanda Medical College, Patna
Corresponding Author
Dr Satyendu Sagar
Assistant Professor, Department of Microbiolology, Nalanda Medical College, Patna, India

Abstract

Objective: *The aim of Present study was to establish the utility of CT –guided FNAC in delineating various caused of intrathoracic mass or lesions with cytomorphological features and providing statistical data in documenting their demographic profile.*

Materials and Methods: *A total of 38 patients Referred to our department for CT guided FNAC with suspected thoracic mass lesion admitted through medical OPD and emergency. After detailed medical and surgical history, clinical examination was done, Routine investigations (CBC, BT, CT, PT and aPTT) were done before the procedure. Recent Plain and contrast CT of chest made available prior to CT guided FNAC. Written consent was taken from each patient. All scans were done using fourth generation spiral CT scanner (16 slices). FNAC was done and five to seven smears were prepared, fixed and stained with May-Grunewald Giemsa stain/papanicolaou, and H&E stain also.*

Result: *Out of 38 patients with intrathoracic mass 28(73.68%) were male and 10(26.32%) female. Male to female ratio was 2.8:1. Intrathoracic mass lesions were more common in the 51-70 years of age. Lungs was the most common site (68.42%) of the masses. 71.05% patients had cough, 6.52% had weight loss, 34.21% had dyspnea, 28.94% had hemoptysis and 26.31% patients had chest pain. 36.82% patients had elevated total count of WBC and ESR was raised in 50% of cases. Chest radiograph revealed an abnormality in 100% of cases. 63.15% patients had mediastinal lymphadenopathy, 15.78% had subcarinal and 2.63% had peribronchial lymphadenopathy. Out of 38 patients under went CT guided FNAC, 24 (63.16%) patients had malignant intrathrocic mass, 12 (31.58%) cases had benign lesion and 2 (5.26%) patient was undiagnosed due to inadequate tissue materials. Out of 24 cases of malignant lesion Adenocarcinoma (31.58%) was the most prevalent among the cytological diagnosis, followed by Squamous cell carcinoma 15.79%, Small cell carcinoma 7.89%, Large cell carcinoma 5.26% and Metastatic carcinoma was 2.63%.According to location of lesion, 83.33% patients with central lesion had Squamous cell carcinoma and 16.67% had Adenocarcinoma. 83.33% patients with peripheral lesions had Adenocarcinoma and 16.67% patients had Squamous cell carcinoma. In gender distribution 16.67% female patients had squamous cell carcinoma and 75% had Adenocarcinoma. In male patients 83.33% had squamous cell carcinoma and 25% had Adenocarcinoma.*

Among the smokers, squamous cell carcinoma was present in 83.33% cases and Adenocarcinoma was 16.67%. In Non-smoker 16.67% had squamous cell carcinoma and 83.33% cases had Adenoncarcinoma. The Sensitivity, specificity, accuracy, positive predictive value and negative predictive value of CT guided transthoroacic FNAC were 94%, 98.5% ,95.8%,98.5% and 90.67% respectively for malignant lesion and 95%, 99%, 98%,97% and 97% respectively for benign intrathoracic lesion.

Conclusion: *Computed Tomography Guided Fine Needle Aspiration cytology is a simple, safe, highly sensitive and specific procedure with high diagnostic accuracy for diagnosis of intrathoracic mass lesions.*

Keywords: *CT guided, FNAC, Intrathoracic mass, malignant, sensitivity, specificity.*

Introduction

Intrathoracic mass is a common problem encountered by the clinicians worldwide, but it is difficult to diagnose correctly. Many techniques have been used in the diagnosis of the intrathoracic masses by obtaining tissue materials. Although the mediastinum is a relatively small anatomic compartment, the diversity of pathologic processes that may reside in it is impressive and a large variety of histological lesions may be found. Such lesions are both non-neoplastic and neoplastic, and they include proliferation of somatic epithelial, lymphoid, mesenchymal and germ cell types. With vast spectrum of pathological lesions in the intrathoracic cavity, it is a challenging task to diagnose these lesions, especially those which are deep seated, mediastinal and hilar regions, with high accuracy, safety and minimal morbidity to patients. Imaging techniques are very helpful for detection and diagnosing these lesions but no imaging features are entirely specific for lung carcinomas and other primary malignant lesions.

Except for fewcases, it would not be wise to do thoracotomy for diagnosis of intrathoracic lesions and there are many hazards associated with Thoracotomy is contraindicated for small cell anaplastic carcinoma, metastatic tumors and infections. A confident diagnosis of benign lesions such as tuberculosis and chondroid hamartoma helps, avoiding unnecessary surgical intervention.

Percutaneous, transthoracic fine needle aspiration cytology (FNAC) was first used about 100 years ago. Mentrier in 1886 used the FNAC technique for the first time to diagnose lung cancer but the procedure has become established in 1963 by Nordstrom. Fine needle aspiration (FNA) is a method of taking cytology sample by means of a fine needle attached with a syringe. It is an outpatient method used for the evaluation of palpable masses. Fine needle aspiration cytology (FNAC) is a diagnostic technique which involves study of the cell smears prepared from FNA material. It is much easier and less traumatic technique than excision biopsy and widely employed in cytological diagnosis with good diagnostic accuracy. FNAC of deep organs needs the aid of Ultrasonography or computed tomography as a guidance to perform it. Ultrasound guided FNAC has been used as a diagnostic procedure of peripheral lung masses but deep intrathoracic masses cannot be imaged by ultrasonography.

CT guidance permits fine needle aspiration of nearly all lesions that are visible on CT scans, regardless of size or position. The vast majority of lung malignancies can be confidently diagnosed with cytomorphological characterization in right clinical context. It can accurately sub-classify the type of bronchogenic carcinoma and suggest a possible primary site of metastatic lung tumor's.

Contrast enhancement differentiates the low-density center from those regions more likely containing viable tumor cells. An extra-pleural approach to mediastinal lesions can also be achieved. This can be invaluable in patients whose clinical condition would make a small pneumothorax life threatening Moreover, CT guided transthoracic FNAC can be used safely as an outdoor procedure. So, some investigators recommend CT guided FNAC as the initial method of diagnosis of deep intrathoracic masses.

With CT guidance it is possible to perform a biopsy on almost any portion of chest with high degree of safety and minimal morbidity because of ability to plan a needle path such that the major blood vessels are avoided. It has become the first line diagnostic procedure in diagnosing lung malignancies and confirming metastasis. Itis also especially helpful in diagnosing mediastinal and hilar masses where major great vessels are present and deep seated in position. Limited Indian studies are available regarding the diagnostic yield and safety profile of this procedure. So this study was done to evaluate the type of tumor and its prognosis using CT guided FNAC as diagnostic tool.

Materials and Methods

Present study was carried out in the Department of Pathology, Patna Medical College, Patna, during the period of January 2016 to December 2017.A total of 38 patients referred to our department for CT guided FNAC with suspected thoracic mass lesion admitted through medical OPD and emergency. After detailed medical and surgical history clinical examination was done, Routine investigations (CBC, BT, CT, PT, and aPTT) were done before the procedure. Recent Plain and contrast CT of chest made available prior to CT guided FNAC written consent were taken from each patients. All the scan were done using fourth generation spiral CT scanner (16 slice). Then an axial scan of area of interest only was done to locate the lesion. The best approach was judged and the skin puncture site was marked with a radio opaque marker. After cleaning and draping, local anesthetic (2% xylocaine) was infiltrated at the puncture site deep to pleura. Then a 22 gauge spinal needle was inserted during suspended respiration, directing its tip towards the lesion. With the tip of the needle located within, a repeat slice of the area of interest was taken to check the exact position of its tip. The stylet was then withdrawn 2-3 cm and the needle advanced into the mass with a rotating motion during suspended respiration, so that its tip lies within the target lesion. Now after removal of stylet 10-ml syringe was attached to the Needles's hub and the plunger pulled back, and during continued hard suction, the needle was jiggled to free material from the lesion to the needle's lumen. Five to seven smears were prepared from the sample. Three to four slides were stained with May-Grunewald Giemsa stain whereas alcohol-fixed smears were stained with Papanicolaou and hematoxylin and eosin stains for rapid cytopathological evaluation of the lesions. A follow-up CT scan was done in every patient immediately after the procedure to rule out pneumothorax.

Results

Out of 38 patients with intrathoracic mass, 28(73.6%) patients were male and 10(26.32%) patients were female. Male to Female ratio was 2:8:1 (Table-1).

Table-1

Sex	Total No. of patients with Intrathoracic mass lesion	Percentage
Male	28	73.68
Female	10	26.32
Total No. of Patients	38	100%

Table-2

Age group in Year	Total No. of Patients with Intrathoracic mass	Percentage
30-50	10	26.32
51-70	23	60.52
71-80	5	13.16

Table-2, shows total number of patients with intrathoracic mass in different age group.

Table-3

Location of Intrathoracic Lesion	Total No. of Patients	Percentage
Pulmonary (Lungs)	26	68..42%
Hilar	5	13.16%
Mediastinal	7	18.42%

Table-3, shows location of Intrathoracic Lesion.

Table-4

Symptoms of Patients	of Patients with intrathoracic Lesion	Percentage
Cough	27	71.05
Weight loss	23	60.52
Loss of Appetite	24	63.15
Hemoptysis	11	28.94
Chest Pain	10	26.31
Fever	12	31.57
Dyspnea	13	34.21
Asymptomatic	2	5.26

Table-4 Shows most common Presenting Symptoms of Patients with inrathoracic Lesion.

Table-5

Tests done of patients with Intrathoracic Lesion prior to CT guided FNAC	Finding	No. Patients with Percentage.
Chest X-ray	Abnormal Chest X-ray in all the patient	38 (100%)
Total WBC Count	Increase	14 (36.82)
ESR	Increase	19 (50%

Table- 5 Shows Findings of Routine tests done in patients with intrathoracic Lesion

Table-6

Site of Lymphadenopathy in patients with Intrathoracic Lesion	No. of patients with Intrathoracic lesion	Percentage
Hilar	5	13.15
Peribronchial	1	2.63
Mediastinal	24	63.15
Subcarinal	6	15.78
Supraclavicular	2	5.26

Table-6 Shows Lymph Node involvement in patients with Intrathoracic mass

Table-7

Total No. of Patients underwent CT-guided FNA	Type of Lesion Diagnosed	Cytological finding	No. of Patients	Percentage
n = 38	Malignant n=24 (63.16%)	Adenocarcinoma	12	31.58
		Squamous Cell carcinoma	06	15.79
		Small Cell carcinoma	03	7.89
		Large Cell carcinoma	02	5.26
		Metastatic carcinoma	01	2.63
	Benign Lesions	12	31.58	
	Undiagnosed due to inadequate tissue.	02	5.26	

Table-7 Shows CT-Guided FNAC diagnosis of Patient with Intrathoracic Lesion.

Out of 38 Patients who underwent CT-guided FNAC, 24 cases were diagnosed as malignant lesions and 02 cases were undiagnosed due to inadequate tissue materials. Adenocarcinoma was the most common cytological finding followed by squamous cell carcinoma.

Table – 8

Location of Lesion	Squamous ell Carcinoma (n=6)	Adenocarcinoma (n=12)
Central Lesion	05 (83.33%)	02 (16.67)
Peripheral Lesion	01 (16.67)	10 (83.33)

Table – 8 shows comparison according to site of Lesion present.

Table-9

Sex	Squamous Cell Carcinoma	Adenocarcinoma
Male	5 (88.33%)	3 (25%)
Female	1 (16.67%)	9 (75%)

Table-9 shows Adenocarcinoma was prevalent in female, whereas squamous cell Carcinoma was more common in male patients.

Table-10

Smoking	Squamous Cell Carcinoma	Adenocarcinoma
Non-Smoker	1 (16.67%)	10 (83.33%)
Smoker	5 (83.33%)	2 (16.67%)

Table-10, Shows Adenocarcinoma was common among Non-smoker, whereas smokers had squamous cell carcinoma

Table-11

Complication	No. of Patients under went CT-guided FNAC	Percentage.
Pain at puncture site	7	18.42
Small pneumothorax	3	7.89
Hemoptysis	01	2.63
No complication	27	71.05

Table-11 shows Complication during or after of CT-guided FNAC in patients with intrathoracic Lesion or Mass.

Specificity, accuracy, positive predictive value and negative predictive value of CT guided transthoracic FNAC were 94%, 98.5%, 95.8%, 98.5% and 90.67% respectively for malignant intrathoracic masses ad 95%, 99%, 98%, 97% and 97% respectively for benign masses.

Discussion

Intrathoracic mass lesions are common radiological findings that poses relatively frequent clinical problem. An early, accurate diagnosis is of paramount importance for initiating specific therapy for malignant lesions, and for avoiding unnecessary procedures for benign conditions. CT guided transthoracic FNAC is an accurate means of diagnosing benign and malignant intrathoracic lesions. This technique is now useful not only for

diagnosis and classification but also for investigation of prognostic and predictive biomarkers, and use of ancillary techniques by proper retrieval of aspirated materials.

Intrathoracic mass lesions are seen to be more common in the age group 51 - 70 years. This is in concordance with studies done by Jagdish R et al Karuna RK et al and others. The mean age in our study was 55 years which is similar to that found in a study done by Krishnamurthy et al. On the contrary it is slightly less than the mean age seen in studies done by CM Shetty.

Out of 38 patients of intra-thoracic mass, there were 28 patients were male (73.68%) and 10 patients were female (26.32%). Male to female ratio is 2.8:1 in our study which is similar to the study of Jagdish R et al and others.

In our study adenocarcinoma is seen more commonly in females and squamous cell carcinoma is more commonlyseen in males. This is in concordance other studies. Cigarette smoking which is a significant etiological factor is probably responsible for the high incidence of bronchogenic carcinoma especially the subtype squamous cell carcinoma in male patients in concordance with the study by Shetty CM and coworkers.

In our study there is evidence of a strong association between the occurrence of smoking and squamous cell carcinoma. 83.33% of the smokers were found to have squamous cell carcinoma. Similar results were obtained in study by Krishnamurthy A and Arora VK et al.

Our study showed that adenocarcinoma is commonly seen in non smokers (83.33). This is in agreement with the study by Dey A, Behera Detailand others.

Cough is the most common presenting complaint among patients in our study (71.05%) followed by loss of weighs (60.52%) loss of appetite (63.15%) and dyspnea (34.21%). This is in agreement with study by Arora VK et al and others.

All of our patients (100%) revealed an abnormality on chest radiograph based on which CT guided FNAC was suggested for further evaluation. Similar findings were seen in study by Yousef and Qaumrul et al. Hence it can be concluded that chest radiograph is the simplest and most effective tool in the earliest diagnosis of intrathoracic mass lesions.

The locations of the lesions were as follows, pulmonary 26 (68.42%), hilar 5 (13.67%) andmediastinal7 (18.42%),In the final diagnosis, adenocarcinoma was the commonest malignant tumor followed by squamous cell carcinoma, metastatic carcinoma and small cell carcinoma. These findings are similar to the findings of the study done by Mostafa.

In this study, the sensitivity, specificity, accuracy, positive predictive value and negative predictive value of CT guided transthoracic FNAC were 94%, 98.5%, 95.8%, 98.5% and90.67% respectively for malignant intrathoracic masses and 95%, 99%,98%, 97. %, and 97%, respectively for benign masses. These findings are comparable to that of the past studies byStanely et al, Haramati et al, Mohammad et al, van Sonnenburg et al and Singh et al.

Conclusion

FNAC is simple, safe, reliable and inexpensive method in early detection of lesions. Use of FNAC has become an acceptable and widely practiced minimally invasive technique, which is rapid and relatively pain free. FNAC is highly cost effective and accurate as a first line investigative technique for differential diagnosis of reactive hyperplasia, inflammatory conditions, granulomatous disorders, malignancy and in stratifying cases requiring further investigations, surgical intervention and clinical follow up. The procedure is all the more valuable in resource poor economics like ours, because of its simplicity, low cost of operation and early availability of results.

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