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Research Article

Diagnostic Efficacy of Ultrasound and CT-Guided Percutaneous Fine Needle Aspiration Cytology for Intrathoracic Masses

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ABSTRACT

Introduction: Image guided percutaneous fine needle aspiration cytology (FNAC) performed under ultrasonographic and Computed tomography (CT) guidance is a fast, acceptable and accurate diagnostic investigation for diagnosing intrathoracic masses. It helps in confirming suspected malignancy and in characterizing inflammatory, benign and malignant lesions. The choice between the use of ultrasonography or CT as guidance method depends largely upon size, visibility and location of the lesion to be sampled, the patient's body type and cost of guidance methods. **Material and methods:** The study consisted of 30 cases of ultrasonographic and CT guided FNAC of intrathoracic masses over a period of two years. **Results:** Out of the total 30 cases of intrathoracic lesions, a specific cytodiagnosis was made in 26 lesions thereby giving a diagnostic yield of 86.7%. In 4 cases, no definite cyto-diagnosis could be made as either the material was unsatisfactory or non-representative of the lesion. Histopathological correlation could be done in 7 cases. Out of the 7 cases, cytology diagnosis was concordant with histopathological examination in 6 cases, thereby giving an overall sensitivity and specificity of the ultrasound and CT guided FNAC in diagnosing intrathoracic masses as 85.7% and 100% respectively. **Conclusion:** The present study thus demonstrates that percutaneous FNAC under Ultrasound or CT guidance is a quick, reliable and convenient method and should be considered as a primary investigative method for diagnosis of intrathoracic masses as it is cost effective, safe and well tolerated by the patients. It also allows an early diagnosis which provides an opportunity for the expeditious treatment of patients.

INTRODUCTION

Percutaneous fine needle aspiration cytology (FNAC) is performed under ultrasonographic and Computed tomography (CT) guidance, is one of the most important and widely accepted diagnostic tools for obtaining cells for cytological examination from masses in any region of the body. It can be used to render fast and accurate diagnosis of impalpable, inaccessible and deeply located intrathoracic masses, especially pulmonary and mediastinal masses. FNAC is mostly performed to confirm a suspected malignancy; in addition it also allows to characterise many inflammatory, benign and malignant lesions [1].

Image-guided percutaneous FNAC is defined as placing a needle into a suspected abnormal mass using radiologic imaging techniques for the purpose of obtaining cellular aspirates for diagnosing the lesion. It is a safe, non-surgical, minimally invasive, reliable and accurate diagnostic procedure requiring little time to complete and diagnosis can be made rapidly having many advantages over excision biopsy. These procedures are performed under local anesthesia and conscious sedation. The main aim is to help the surgeons in the management of patients presenting with an abnormal mass. Prior knowledge of whether a mass is most likely benign or malignant will help to plan surgical intervention and additional treatment. Clinical and radiological correlation and cytological features of cellular aspirates obtained from image-guided FNAC helps in making a diagnosis which may prevent the use of more invasive diagnostic procedures [1,2].

The choice between the use of ultrasonography or CT as a guidance method depends largely upon size, visibility and location of the

lesion, the patient's body type and cost of guidance methods. The final decision, however, must be taken considering the guidance technique available and the expertise of the radiologist. Ultrasonographic guidance is usually considered in case of large sized and peripherally located pulmonary lesions, particularly the ones near the pleura and also in pleural, mediastinal and thoracic wall masses. For smaller and less superficially located masses and the lesions that lie near other structures and for many solid lesions, CT guidance is preferred technique of choice [3-5].

The main limitations of image-guided fine needle aspiration cytology are inability to diagnose unusual tumor. It is also contraindicated in patients with uncontrolled bleeding disorder significantly abnormal coagulation profile or thrombocytopenia, uncooperative patients where uncontrolled motion of the patient may lead to hemorrhage, those patients with thoracic masses who have intractable coughing, respiratory failure or pulmonary hypertension. Absence of a safe pathway from the skin to the lesion is also a contraindication.

AIMS & OBJECTIVES

This study was undertaken to evaluate the role of ultrasound and CT guided FNAC as a diagnostic investigation for intrathoracic masses, to study the pathological spectrum of intrathoracic lesions, to correlate the cytological findings with histopathology wherever possible and also to evaluate procedural risks and complications.

MATERIAL & METHODS

This study was a retrospective study of one year comprising of collection of 12 cases of Ultrasound and CT guided FNAC of patients with intrathoracic masses from May 1st, 2022 to 30th April, 2023. All the cytological reports maintained in the cytopathology section of the department were reviewed and stained slides of every case were re-examined. Also, the clinical information provided in the requisition forms were taken into consideration and recorded in the pre-structured proforma.

A Prospective study comprising of 18 fresh cases of Ultrasound and CT guided FNAC of patients with intrathoracic masses presented in the course of one year with effect from May 1st, 2023 to April 30th, 2024. The clinical information of the patients was obtained from the requisition forms and any deficient relevant information was procured from the clinical case sheets.

Most radiologically guided needle FNACs were performed with local anesthetic and on an outpatient basis. Premedication with parenteral sedatives or analgesics generally was not required unless the patient was unduly apprehensive. The patients were evaluated clinically, and the history was taken according to the proforma attached. Basic investigations like Hemoglobin, bleeding time, clotting time and partial thromboplastin time and activated partial thromboplastin time were done to rule out any coagulopathy. Other relevant hematological and biochemical investigations done were also recorded. The consent of the patient for the procedure was taken. In general, the patient was monitored for an observation period of 1 hour post FNAC to evaluate any complication occurring in the immediate post procedure period. The aspirated material was spread on the glass slides and 4-6 slides were prepared in each case. For Hematoxylin and Eosin (H & E) and Pap staining, smears were wet fixed in 95% isopropyl alcohol or ethyl alcohol. For May Grunwald Giemsa (MGG) staining, smears were air dried. Special stains such as Ziehl Neelson stain for acid fast bacilli was done wherever required. The stained smears were examined microscopically and were reported accordingly.

Out of 30 cases, 7 patients underwent biopsy or surgical intervention. The surgical specimen obtained was fixed in 10 % neutral formalin and subjected to gross examination, processing, paraffin embedding, section cutting, dewaxing, staining by haematoxylin and eosin and mounting by Dibutylphthalate Polystyrene Xylene (DPX). The stained sections were examined and histopathological features of various diseases were studied.

The FNAC report and histopathological examination of the same lesion were compared wherever available and the findings were correlated. The sensitivity of FNAC in diagnosing intrathoracic masses in the study was calculated. The specificity of the ultrasound and CT guided FNAC in diagnosing intrathoracic masses in the study was also calculated.

RESULT

Thirty cases of intrathoracic masses were included in the present study. Fine Needle Aspiration Cytology was done in all the cases using ultrasound or CT guidance. Histopathological correlation could be done in seven cases where either biopsy or surgical treatment was undertaken. The observations are as follows:

Age distribution: The youngest patient in the study was 4 years old child and the oldest was 87 years old. The mean age for the patients in the study was around 55 years.

Sex distribution: In the present study males predominated the study comprising of 22 (73.3%) patients while female patients were 8 (26.6%) with a male to female sex ratio of 2.75:1

Distribution of Ultrasound Guided and CT Guided FNACs: Out of the total 30 cases of fine needle aspiration cytology, 1 case was ultrasound guided and 29 cases were CT guided

Anatomical sites of intrathoracic lesions: Out of the total 30 cases of intrathoracic masses, pulmonary masses formed the largest group with 22 (73.3%) cases followed by 5 (16.7%) cases of mediastinal masses, 1 (3.3%) case each of pleural, paraspinal and hilar mass.

Presenting Symptoms: The main presenting symptom in the patient with intrathoracic masses was chest pain which was present in 28 (93.3%) patients. This was followed by breathlessness which was present in 25 (83.3%) patients. Other presenting symptoms were cough, hemoptysis, fever and weight loss which were present in 10 (33.3%), 3 (10%), 12 (40%) and 23 (76.6%) respectively. Other symptoms constituted 33.3% and included loss of appetite, night sweats, swelling and altered sensorium.

Quality of aspirate and definitive cytological diagnosis: The quality of aspirate was divided into two groups depending upon the material obtained, whether satisfactory or unsatisfactory. Smears with 5 or more clusters of epithelial cells were taken as satisfactory. Among intrathoracic masses, cytodiagnosis was made in 26/30 cases giving a cytodiagnostic yield of 86.7%.

Disease groups diagnosed by FNAC of intrathoracic lesions: In the present study of 30 cases of intrathoracic lesions, there were 11 (13.75%) inflammatory and non-neoplastic lesions, 1 (1.25%) benign lesion, 14 (17.5%) malignant lesions and 4 (5%) inconclusive cases.

Spectrum of cytological diagnosis of intrathoracic lesions: Is described in table 1. Among malignant lesions, there were 2 (6.6%) cases of metastatic carcinoma, one case of a paraspinal mass which was diagnosed as metastatic adenocarcinoma and the other of a mediastinal mass which was diagnosed as metastatic squamous cell carcinoma.

Table 1: Spectrum of cytological diagnosis of intrathoracic lesions in the study

Cytological Diagnosis	Lesion Types	Number of Cases	Percentage %
Malignant Tumors (14 cases) Nil – by Ultrasound Guidance	Squamous cell carcinoma lung	6	20%
	Adenocarcinoma lung	3	10%
	Small cell carcinoma lung	1	3.3%
	Large cell undifferentiated carcinoma lung	1	3.3%
	Metastatic tumor	2	6.7%
	Hodgkin lymphoma	1	3.3%
	Neurofibroma	1	3.3%
Benign Tumor (1 case) Nil – by Ultrasound Guidance	Pulmonary tuberculosis	5	16.7%
	Lung abscess	1	3.3%
Inflammatory and Non-neoplastic lesions (11 cases) 01 - by Ultrasound Guidance	**Fungal aspergilloma**	1	**3.3%**
	Actinomycosis	1	3.3%
	Tubercular lymphadenitis	1	3.3%
	Epidermal inclusion cyst	1	3.3%
	Pleural empyema	1	3.3%
		4	13.3%
		30	100%
Inconclusive cases			
TOTAL			

Site specific cytological diagnosis of intrathoracic lesions in the study: Is described in table 2.

Table 2: Site specific cytological diagnosis of intrathoracic lesions in the study

Site of Lesion	Cytological Diagnosis	Number of Cases	Percentage
Pulmonary (22 cases)	Squamous cell carcinoma lung	6	20%
	Pulmonary tuberculosis	5	16.7%
	Adenocarcinoma lung	3	10%
	Small cell carcinoma lung	1	3.3%
	Large cell undifferentiated carcinoma lung	1	3.3%
	Lung abscess	1	3.3%
	Fungal aspergilloma	1	3.3%
	Actinomycosis	1	3.3%
	Inconclusive	3	10%
Mediastinal (5 cases)	Hodgkin lymphoma	1	3.3%
	Neurofibroma	1	3.3%
	Tubercular lymphadenitis	1	3.3%
	Epidermal inclusion cyst	1	3.3%
	Metastatic squamous cell carcinoma	1	3.3%
Pleural (1 case)	Empyema	1	3.3%
Paraspinal (1 case)	Metastatic adenocarcinoma	1	3.3%
Hilar (1 case)	Inconclusive	1	3.3%
TOTAL		30	100%

Comparison of cytological diagnosis with histopathological diagnosis: Is described in table 3.

Table 3: Comparison of cytological diagnosis with histopathological diagnosis where biopsy/surgical treatment was undertaken in the study

Organ of Origin	Cytological Diagnosis	Number of Cases (Cytological)	Histopathological Diagnosis	Number of Cases (Histopathological)	Correlation
Mediastinal mass	Neurofibroma	1	Neurofibroma	1	Concordant
Mediastinal mass	Epidermal inclusion cyst	1	Immature teratoma	1	Disconcordant
Pulmonary mass	Squamous cell carcinoma	2	Squamous cell carcinoma	2	Concordant
Pulmonary mass	Small cell carcinoma	1	Small cell carcinoma	1	Concordant
Para spinal mass	Metastatic adenocarcinoma	1	Metastatic adenocarcinoma	1	Concordant
Mediastinal mass	Hodgkin lymphoma	1	Hodgkin lymphoma	1	Concordant

Diagnostic accuracy: In 7 patients where surgical intervention was performed, histopathological examination was carried out. Out of the total 7 cases, FNAC diagnosis was concordant with histopathological examination (HPE) in 6 cases, thereby giving an overall diagnostic accuracy of the ultrasound and CT guided FNAC in diagnosing intrathoracic masses as 85.7%.

Sensitivity: Out of the total 7 cases, FNAC diagnosis was concordant with HPE in 6 cases and there was one false negative case which was reported as epidermal inclusion cyst on FNAC but later found to be immature teratoma, thereby giving an overall sensitivity of the ultrasound and CT guided FNAC in diagnosing malignant intrathoracic masses as 85.7% **(Table 4).**

Table 4: Sensitivity of Ultrasound and CT guided FNAC in diagnosis of intrathoracic masses in the study

Organ of origin	FNAC Diagnosis			Histopathological Diagnosis			Discordant FNAC Diagnosis	No. of concordant FNAC/ Total no. of HPE
	Inflammatory and Non-neoplastic	Benign	Malignant	Inconclusive	Benign	Malignant		
Intrathoracic masses	1	1	5	-	1	6	1	6/7
Sensitivity in case of Intrathoracic masses – 85.7%								

Complication rate of Ultrasound and CT guided Fine Needle Aspiration Cytology: In the present study of 30 cases of intrathoracic masses, there were only 2 (6.7%) cases of complications, one of pneumothorax and other of bleeding.

Specificity: Since there was no false positive case in the present study, the specificity of the ultrasound and CT guided FNAC in diagnosing intrathoracic masses was 100%.

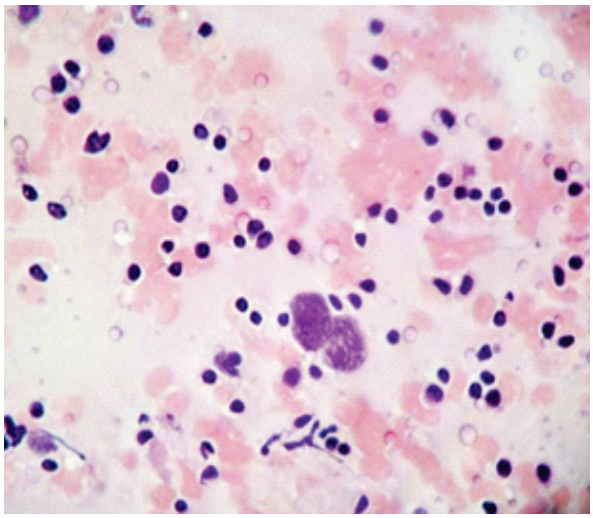

Figure 1: Hodgkin Lymphoma showing a binucleated Reed-Sternberg cell in a background of lymphocytes (MGGX 400).

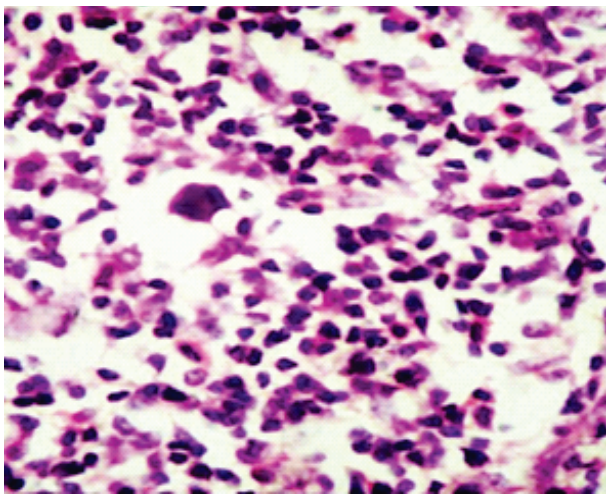

Figure 2: Hodgkin Lymphoma: corresponding tissue section showing a Reed-Sternberg cell with a mixed population of cells in the background (H&EX 100).

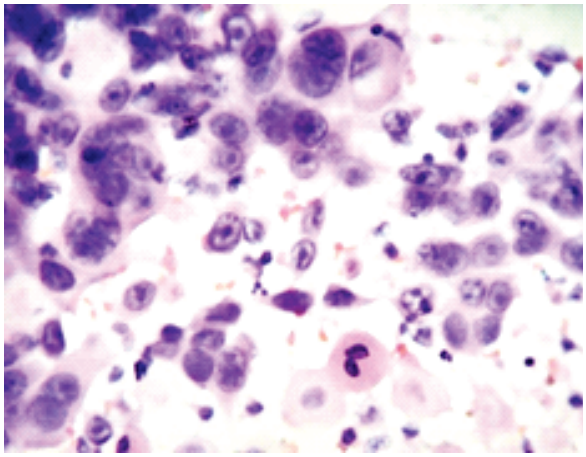

Figure 3: Keratinising Squamous Cell Carcinoma, lung showing pleomorphic cells. Cytoplasmic keratinization is also seen (H&E X400).

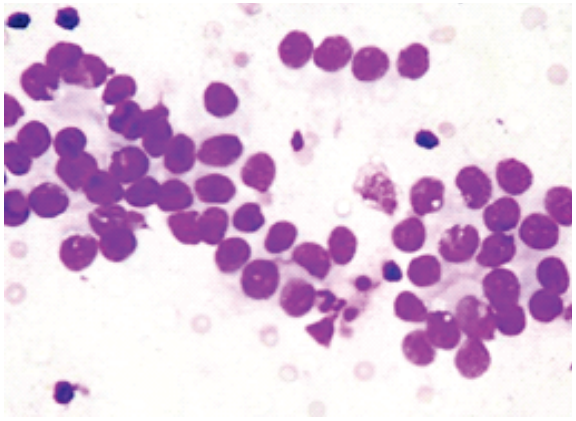

Figure 4: Adenocarcinoma, lung 'Bronchogenic' showing glandular differentiation (MGG X 400).

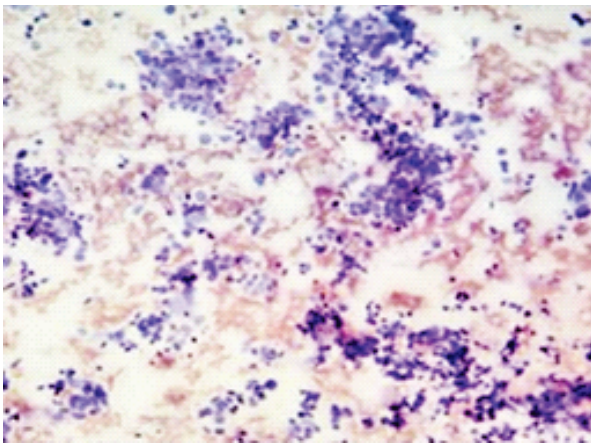

Figure 5: Small Cell Carcinoma, lung showing scattered and clusters of small sized cells with scanty cytoplasm and nuclear moulding. (MGG X 100)

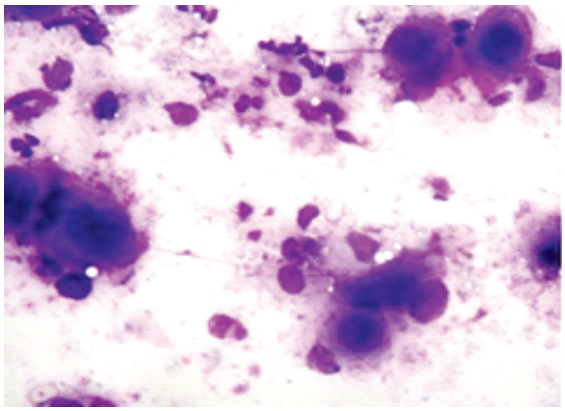

Figure 6: Large Cell Undiffentiated Carcinoma, lung showing highly pleomorphic large cells with high nuclear to cytoplasmic ratio (MGGX 400).

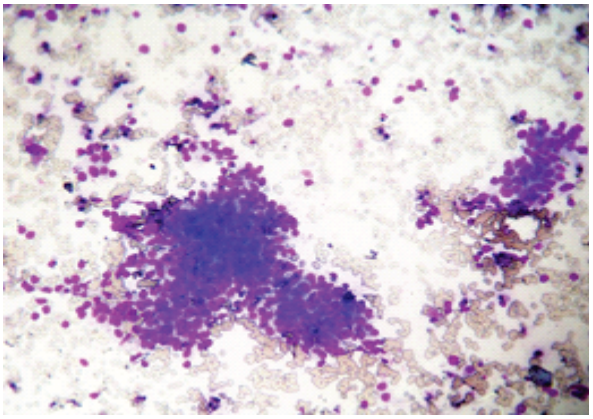

Figure 7: Metastatic Adenocarcinoma, paravertebral mass showing glands and clusters of pleomorphic cells (MGG X 100).

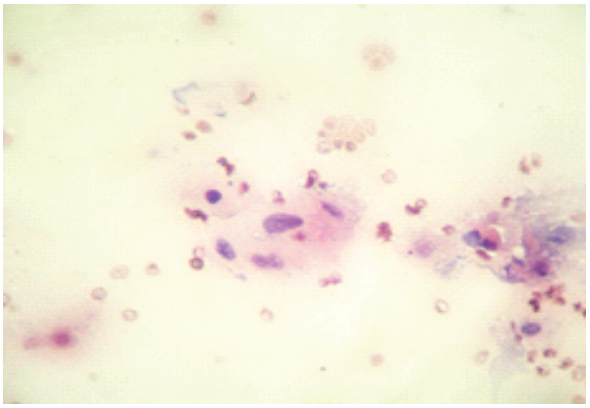

Figure 8: Metastatic Squamous Cell Carcinoma, mediastinum showing keratinised cells with brightly eosinophilic cytoplasm (H&EX400).

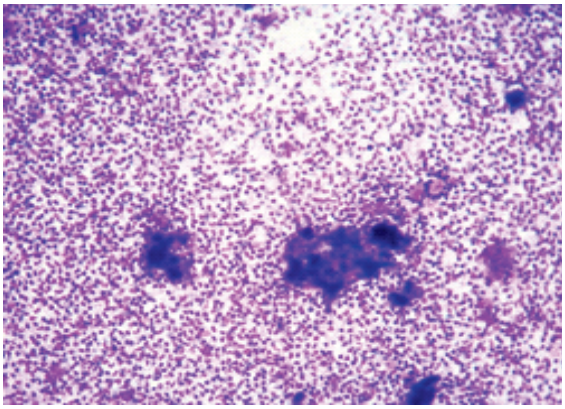

Figure 9: Actinomycosis, lung showing clumps of finely fibrillar organisms in a background of neutrophils (MGGX 100).

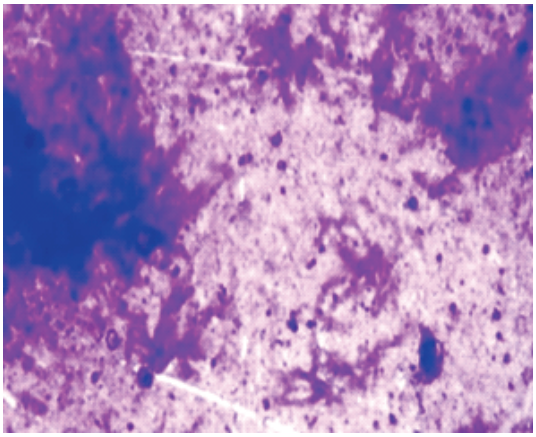

Figure10: Fungal aspergilloma, lung showing septate hyphae with acute angle branching (MGGX 100).

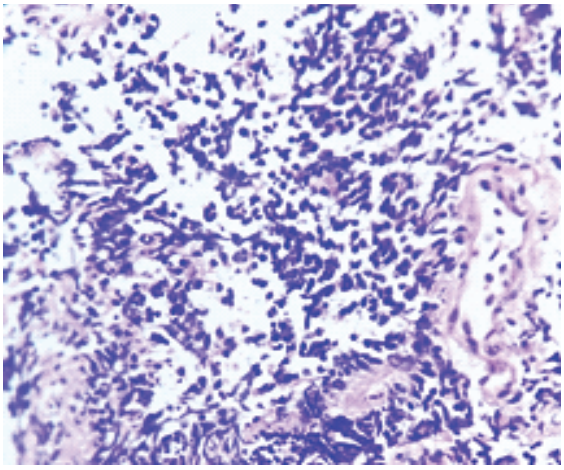

Figure 11: Small cell carcinoma Lung showing round to oval small blue cells with finely dispersed chromatin, indistinct nucleoli and scanty cytoplasm among a background of spare delicate stroma (H&EX400).

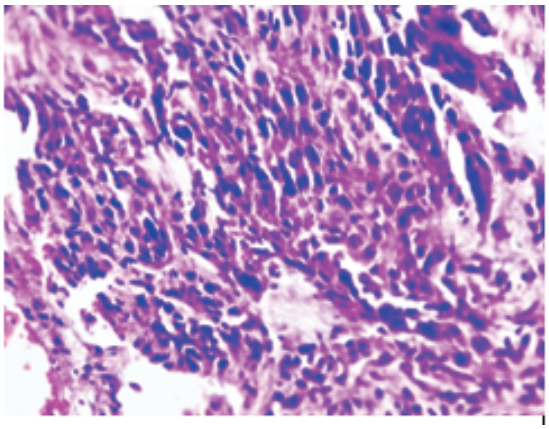

Figure 12: Squamous cell carcinoma Lung showing sheets of squamous cell exhibiting cellular and nuclearatypia (H&EX400).

DISCUSSION

Percutaneous fine needle aspiration cytology of intrathoracic masses under CT and ultrasound guidance in the present study was aimed at evaluating the role of ultrasound/CT guided FNAC in diagnosis of intrathoracic masses and assessing the reliability of the technique in establishing the diagnosis of malignant as well as the benign intrathoracic mass lesions especially unresectable lesions or lesions with difficult surgical access, and for confirmation of metastases. "It was also aimed at assessing the safety of the procedure by evaluating the procedural risks and complications. Other main objective was to correlate the cytological findings with histopathology wherever follow up of the patient and histopathological examination was possible to study the sensitivity and specificity of ultrasound and CT guided fine needle aspiration cytology as a diagnostic technique."

In the present study, the age range varied from 4 years to 87 years with a mean age around 55 years. Singh et al reported an age range of 35 to 75 years with a mean age of 56.4 years in their study of CT guided FNAC of thoracic masses while Bandyopadhyay et al reported an age range of 6 to 83 years in a similar study [2,3]. Saha et al reported an age range of 34 to 79 years in their study of CT guided FNAC of thoracic mass lesions with the peak age in the fifth decade [4]. Begum et al reported an age range of 28 to 78 years with a mean age of 43.6 years in their study of ultrasound and CT guided FNAC of intrathoracic lesions [5]. Pandey et al reported age range of 30-80 years in their study of CT guided FNAC of thoracic mass lesions[6]. Abraham et al reported age range of 29 to 86 years with mean age of 60.5 years[7]. Rodriguez et al reported mean age of 62.8 years in their study [8]. Males predominated the study with male: female ratio of 2.75:1. The male predominance was also seen in similar studies done by Singh et al., Bandyopadhyay et al., Saha et al. and Begum et al, Gangopadhyay et al and Pandey et al [2-7,9].

After the FNAC, depending upon the material obtained the aspirate was labeled as satisfactory in 26 cases and unsatisfactory in 4 cases. Smears with 5 or more clusters of epithelial cells were taken as satisfactory. In the present study 13.3% FNACs were unsatisfactory. The possible causes of failure identified in our series are failure due to sampling error due to a small or necrotic tumour and inadequate samples due to tumour vascularity or fibrosis.

In the present study of intrathoracic lesions comprising of 30 (37.5%) cases, pulmonary masses formed the largest group accounting for 22 (73.3%) cases followed by 5 (16.7 %) cases

of mediastinal masses, 1 (3.3 %) case each of pleural, paraspinal and hilar mass. In the present study of intrathoracic masses, pulmonary and mediastinal masses formed the majority of cases. This is comparable to the studies by various authors [2-3,5-8,10] (Table 5)

Table 5: Anatomic sites of various intrathoracic lesions in different studies

Various Authors	Reference	Anatomic sites of various intrathoracic lesions				
		Pulmonary lesions	Mediastinal lesions	Pleural Lesions	Hilar lesions	Paraspinal Lesions
Singh et al (2004)	2	64.7%	17.6%	8.8%	8.8%	-
Bandyopadhyay et al (2007)	3	85.8%	11.6%	2.6%	-	-
Begum et al (2007)	5	77%	8.6%	7%	7%	-
Basnet et al (2008)	10	91.4%	6%	-	-	2.4%
Pandey et al (2018)	6	68.4%	18.42%	-	13.16%	-
Abraham et al (2019)	7	94.4%	5.6%	-	-	-
Rodriguez et al (2020)	8	56.3%	-	27.8%	-	-
Present study	-	73.3%	16.7%	3.3%	3.3%	3.3%

Table 6: Disease specific cytodiagnosis of various intrathoracic masses in different studies

Authors	Reference	Benign diseases	Malignant diseases	Inconclusive
Singh et al (2004)	2	6 (17.6%)	27 (79.5%)	1 (2.9%)
Begum et al (2007)	5	28 (22%)	91 (71.7%)	8 (6.3%)
Basnet et al (2008)	10	31 (31%)	51 (51%)	18 (18%)
Saha et al (2009)	4	2 (3.5%)	52 (91.2%)	3 (5.3%)
Gangopadhyay M (2011)	9	27 (21.2%)	96 (75.6%)	-
Pandey et al (2018)	6	12 (31.58%)	24 (63.16%)	-
Abraham et al (2019)	7	27 (28.5%)	68 (71.5%)	-
Rodriguez et al (2020)	8	-	64.9%	-
Present study	-	12 (40%)	14 (46.7%)	4 (13.3%)

Out of the total 30 cases of intrathoracic lesions, a specific cytodiagnosis was made in 26 lesions thereby giving a diagnostic yield of 86.7%. In remaining 4 (13.3%) cases of the lesions, no definite cyto-diagnosis could be made on FNAC, as either the material was unsatisfactory or nonrepresentative of the lesion. Such a high diagnostic yield is comparable to that reported by various authors. Gobien et al Yang et al, Zhai and Targhetta et al reported a high diagnostic yield of 85%, 84%, 90% and 88% respectively in their study of intrathoracic masses[11-14]. Dash and Tripathy, Begum et al and Saha et al however reported a higher diagnostic yield of 96%, 95.2%, 93.7% and 94.7% respectively in their study of intrathoracic masses which is higher as compared to the present study[4,5,15].

"After the FNAC of various intrathoracic masses, the disease specific cytodiagnosis was 11 (36.7%) inflammatory and non-neoplastic lesions and 1 (3.3%) benign tumor, thus benign diseases comprised of 12 (40%) cases". Malignant tumor comprised of 14 (46.7%) cases. In 4 (13.3%) cases, no definite opinion could be given. Various authors have reported varying incidence of intrathoracic pathology in their series as compared to the present study.[2,4-10] (Table 6)

Malignant lesions constituted the commonest cytologic diagnostic category with 46.7% cases, which is in accordance to that seen by various authors in their studies. Among the malignant lesions, maximum cases were of primary pulmonary tumor, of which squamous cell carcinoma formed the largest group with 20% cases followed by adenocarcinoma with 10% cases. Among the non-neoplastic lesions maximum cases were of pulmonary lesions of which tuberculosis formed the largest group with 16.7% cases. This is comparable to that reported by various authors in their studies. Singh et al also reported maximum number of 6 (17.6%) cases each of squamous cell carcinoma lung and adenocarcinoma lung followed by other tumors[2].

Among the non-neoplastic lesion also pulmonary tuberculosis formed the maximum cases. Saha et al also reported in their study, maximum number of 23 (40.3%) cases of squamous cell carcinoma lung followed by 16 (28%) cases of adenocarcinoma lung followed by other tumors. Among the non-neoplastic lesion also both the cases were of pulmonary tuberculosis[4]. Bajantri et al also reported squamous cell carcinoma of lung as the most common diagnosis followed by non-small cell lung carcinoma[17].

While study done by Abraham et al reported adenocarcinoma (25%) as the most common diagnosis followed by Squamous cell carcinoma (11%), small cell carcinoma (5%), poorly differentiated carcinoma (3%), and metastatic carcinoma (4%)[7]**.** Similarly, Gangopadhyay et al, Pandey et al and Rodriguez et al reported adenocarcinoma as the most common diagnosis[6,8-9]**.** Gangopadhyay et al reported maximum cases of tuberculosis (12 cases) among non neoplastic category[9].

In the present study among intrathoracic lesions, in 7 patients where biopsy or surgical intervention was performed and histopathological examination was carried out, FNAC diagnosis was concordant with HPE in 6 cases, thereby giving a sensitivity of 85.7% in the study. Such a high sensitivity rate is comparable to that reported by various authors[10,16,18]. Stewart and Stewart , Dash and Tripathy , Begum et al , Bandyopadhyay et al and Khosla et al however reported a sensitivity rate of 96.6%, 90.6%, 91.2%, 97.7% and 94.7% respectively in their series which is higher as compared to the present study[3,5,15,19-20] **(Table 7**). This may be attributed to less number of cases where the biopsy or surgical intervention was done in the present study.

Out of 30 cases of intrathoracic masses, only 2 patients had complications giving a complication rate of 6.7%. One patient had pneumothorax and one patient had bleeding. This rate is comparable with that reported by various authors in their study. Bandyopadhyay et al evaluated the role of CT guided FNAC in the diagnosis of thoracic lesions in 190 patients and reported complications in 13 cases (6.8%), pneumothorax in 12 patients (6.3%) and hemoptysis in one patient[3]. Saha et al reported post procedural complications in three cases (5.2%), a little pulmonary hemorrhage in two and hemoptysis in one in their study[4]. Yang et al studied ultrasonically guided aspiration biopsy in 25 patients with peripheral intrathoracic lesions and reported two cases (8%) of minimal pneumothorax[12]. Pandey et al studied 38 cases of CT guided transthoracic FNAC reported 7 cases (18.42%) of pain at puncture site, 3 cases (7.89%) of pneumothorax and 1 case (2.63%) of hemoptysis[6]. Some authors like Pedersen et al, Zhai, Knox et al (1991), Tikkakoski et al and Gouliamos et al however reported a lower complication rate of 2.2%, 2%, 3.4%, 4% and 4.7% respectively in their series[13,21-24]. While some authors like Gobien et al, Di Donna et al, Arslan et al, Singh et al, Begum et al and Uskul et al reported a higher complication rate of 12.5%, 25.4%, 10.44%, 26.5%, 16.5% and 16 % respectively in their series[2,5,11,18,25-26]. Gulati et al and Khosla et al reported no complication in their series[20,27].

CONCLUSION

The present study demonstrates that percutaneous FNAC under Ultrasound or CT guidance is a quick, reliable and convenient method and should be considered as a primary investigative method for diagnosis of intrathoracic masses as it is cost effective, safe and well tolerated by the patients.

It also allows an early diagnosis which provides an opportunity for the expeditious treatment of patients. Efficient sampling, experience and expertise in interpreting the aspirate obtained, and a close coordination between surgeons, radiologists and pathologists is essential for its success.

Table 7: Sensitivity in various studies

Authors	Reference	Sensitivity
Stewart and Stewart (1996)	19	96.6%
Dash and Tripathy(2001)	15	90.6%
Wallace et al (2002)	16	82.0%
Begum et al (2007)	5	91.2%
Bandyopadhyay et al (2007)	3	97.7%
Basnet et al (2008)	10	88.0%
Khosla et al (2009)	20	94.7%
Uskul et al (2009)	18	83.0%
Present study	-	85.7%

ETHICS APPROVAL

All necessary approval including ethical approval has been taken from the Institutional Human Ethics Committee before conducting this study.

CONFLICT OF INTERESTS

Authors declared that there is no conflict of interest.

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CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

ABBREVIATION

CT: Computed tomography; DPX: Dibutylphthalate Polystyrene Xylene; FNAC: Fine needle aspiration cytology; H&E: Hematoxylin and Eosin; HPE: Histopathological examination; MGG: May Grunwald Giemsa.

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