Ultrasound Guided Fine Needle Aspiration Cytology of Lung Lesions

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Abstract

Background: This study was aimed to evaluate the role of transthoracic ultrasound guided FNAC in diagnosis of peripheral lung lesion. It is an important and useful investigation to differentiate between benign and malignant lesions of lung. USG guided FNAC of lung lesion is a safe, radiation free, and cost effective method. Besides, the procedure is simple and complications if occur, can be managed conservatively.

Methods: This was a cross-sectional study conducted at the department of Pathology, Rajshahi Medical College. Some samples were also collected from a private diagnostic centre, Rajshahi over a period of one year from January 2021 to December 2021. 150 patients who fulfilled inclusion criteria were included in this study. After properly explaining the procedure and taking informed consent, USG guided FNAC was done in all the patients. Radiological and cytological data of enrolled patients was collected prospectively and analyzed.

Results: Among the 150 patients, this study comprising of 120 male and 30 female in age range of 21 to 90 years. Malignancy was the most common cytological diagnosis (76%) while as benign diagnosis was reached in 22.66%. In 1.33% of patients, FNAC was inconclusive. Squamous cell carcinoma was the most common malignancy diagnosed in 46(30.66%) patients, followed by adonocarcinoma 31(20.66%), 19(12.66%) patients had undifferentiated carcinoma, metastatic carcinoma 09(06%), small cell carcinoma 07(4.66%), and Non Hodgkin lymphoma was diagnosed in 02(1.33%) patients. Among the benign group, nonspecific chronic inflammation was diagnosed in 18(18%) patients, tuberculous granuloma 07(4.66%), while the smear was inconclusive in 02(1.33%) patients.

Conclusion: Ultrasound guided fine needle aspiration cytology is safe, less expensive, less time consuming, less invasive diagnostic tool with high degree of accuracy and no radiation toxicity to lung lesions.

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Introduction

Lung cancer is the major cause of cancer related deaths all over the world.[1] Fine needle aspiration cytology (FNAC) is a diagnostic procedure which is widely used in the diagnosis of various malignant and inflammatory disorders. It was first used by Martin and Ellis as a diagnostic tool.[2] Ultrasound guided transthoracic fine needle aspiration cytology is an effective method of obtaining material for cytological diagnosis of lung lesions of various etiologies. In view of its high accuracy and lesser complication rate, it has gained popularity among clinicians and radiologist.[3] Transthoracic Fine needle aspiration cytology (FNAC) is regarded as the most effective of the cytological methods for diagnosing lung cancer, including lung nodules of infective etiology.[4] During transthoracic ultrasonography needle can be guided into the lesion under direct vision and material can be aspirated from different sites of interest within the lesion.[5]

Cytopathological evaluation has contributed a lot to the diagnosis even in the presence of minimal sample tissue. Ultrasonography provide documentation of the needle in the mass lesion.[5,6] Moreover the main complication of this procedure, pneumothorax can be properly managed locally.

Methods

This was a cross-sectional study conducted at the department of Pathology, Rajshahi Medical College. Some samples were also collected from a private diagnostic centre, Rajshahi over a period of one year from January 2021 to December 2021. A total 150 patients were included in the study who fulfilled the inclusion criteria. Participants were properly explained about nature of the procedure and possible outcomes in their native language and written consent was taken.

Inclusion criteria

- Lung lesions found on ultrasound.
- Nonvascular lesion on ultrasound.
- Adequate pulmonary reserve.
- Age greater than18years.
- Both sexes.

Exclusion criteria

- Lung lesions that are not found on ultrasound.
- Highly vascular lesion on ultrasound.
- Suspected hydatid disease.
- COPD with bullae as depicted on Radiograph.
- Patients requiring assisted ventilation.

Detailed history was taken from all patients followed by thorough clinical examination. All the routine investigations including X-ray chest, CBC and relevant biochemical tests were done. Lesions were initially localized with postero-anterior and lateral chest radiographs followed by ultrasonography (USG) with a 3.5 MHz phased array transducer. Depending upon the lesion location and patient preference, patients were placed in a comfortable position which included supine, lateral decubitus or sitting upright with arms resting on a table.

The lesion was located by scanning the intercostal spaces, and Doppler was used to verify the absence of blood vessels in the expected needle path. For superficial lesions 21 gauge, 3 cm long needle was used. For deep seated lesions 8cm spinal needle was used. Under strict aseptic precautions, needle was inserted into lesion and aspiration was done under continuous real time USG visualization. In case of large lesions periphery of lesions which appeared to be less necrotic was targeted. Usually 5-6 needle passes were performed per lesion in order to get adequate sample.

The material aspirated was poured on 2-4 air dried glass slides. Alcohol fixed slides were stained with hematoxylin and eosin. Post procedure patients were kept in observation for 2 hours. Overall mild to moderate complications occurred in 07 (4.6%) patients.

Pneumothorax occurred in 4(2.66%) patients while hemoptysis in 3(2%) both complications were managed conservatively. Among the pneumothorax, 01 patient developed severe respiratory distress who was referred to hospital for admission. After treatment the patient returned to home safely.

Results

Out of the 150 patients included in the study, 120 (80%) were male and 30 (20%) were female.

Age distribution of 150 patients in respect of male and female were divided into 7 groups as 21-30, 31-40,41 – 50, 51 – 60, 61 – 70, 71 – 80 and 81 -90 years (Table I).

Table I: Distribution of patients in various age groups

Age group	Males	Females	Total
21-30	06	02	08
31-40	08	05	13
41-50	17	08	25
51-60	31	07	38
61-70	37	07	44
71-80	18	01	19
81-90	03	00	03
Total	120	30	150

Out of 150 patients, transthoracic ultra sound guided FNAC was diagnostic in 148(98.6%) patients while it was inconclusive in 02(1.33%) patients. Age group ranges from 21 to 90 years with mean age of 55.5 years. In 89 cases, lesion was in right lung while in 61 cases, it was in left lung. Among 89 right lung lesion, 72 were male and 17 were female. Among 61 left lung lesion, 48 were male while 13 were female.

Out of the 150 patients diagnosed with this investigation, 114(76%) had malignancy and 36(24%) had benign disease. Squamous cell carcinoma was the most common malignancy in 46(30.66%) patients followed by adonocarcinoma 31(20.66%) and 19(12.66%) had undifferentiated carcinoma. Metastatic carcinoma in 09(06%) patients, Small cell carcinoma 07(4.66%), and Non Hodgkin lymphoma was diagnosed in 02(1.33%) patients. Among the benign group, nonspecific chronic inflammation was diagnosed in 18(18%) patients, tuberculous granuloma in 07(4.66%), while the smear was inadequate in 02(1.33%) patients (Table II).

Table II: Frequency of various pathologies in the patients

Diagnosis	Frequency	%
Tuberculosis	07	4.66
Inflammatory	27	18
Squamous cell carcinoma	46	30.66
Adenocarcinoma	31	20.66
Undifferentiated Carcinoma	19	12.66
Metastatic carcinoma	09	06
Small cell carcinoma	07	4.66
Non Hodgkin lymphoma	02	1.33
Adequate	148	98.6
Inconclusive	02	1.33
Total	150	100

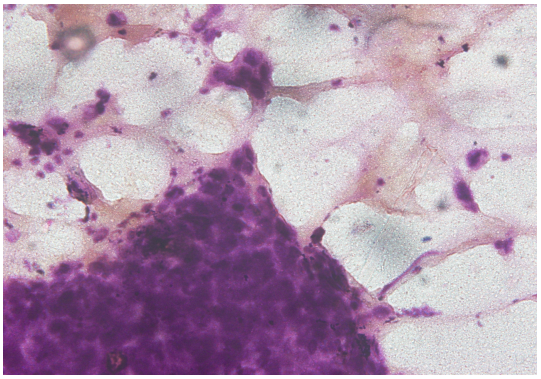

Figure 1. Squamous cell carcinoma, sheets of large tumor cells with abundant cytoplasm (Hematoxilin & Eosin stain, 40x)

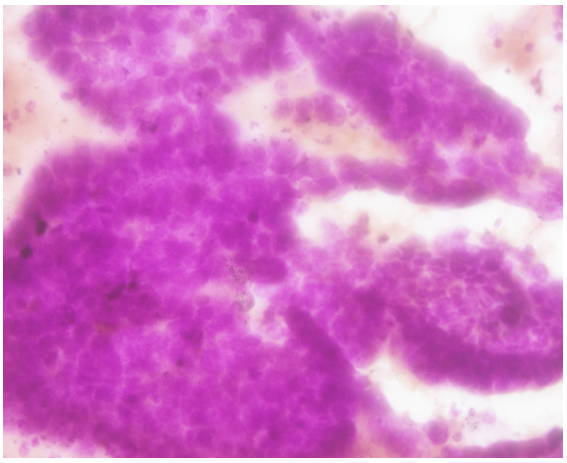

Figure 2. Adenocarcinoma (Hematoxilin & Eosin stain, 40x)

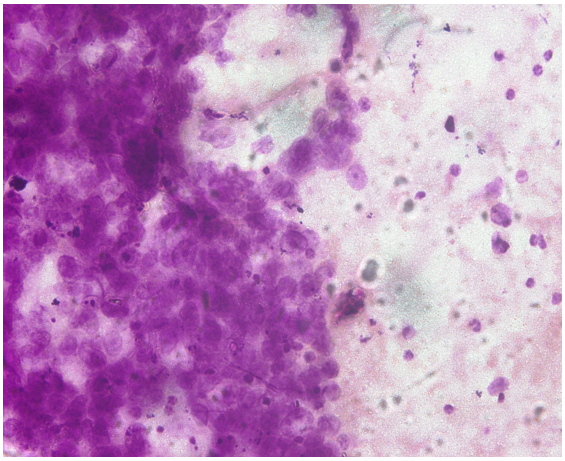

Figure 3. Metastatic invasive ductal carcinoma (Hematoxilin & Eosin stain, 40x)

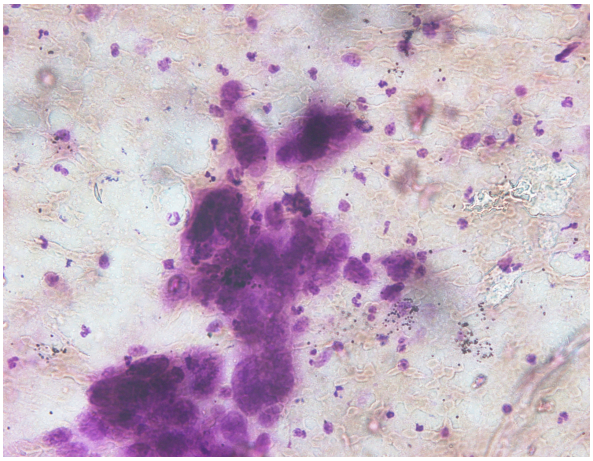

Figure 4. Metastatic Malignant mesenchymal tumor (Hematoxilin & Eosin stain, 40x)

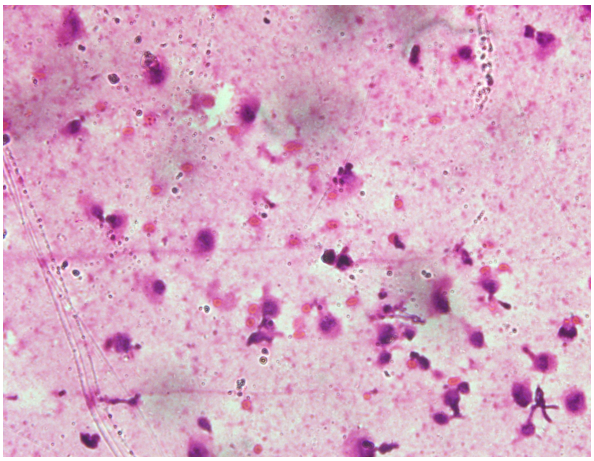

Figure 5. Non Hodgkin lymphoma (Hematoxilin & Eosin stain, 40x)

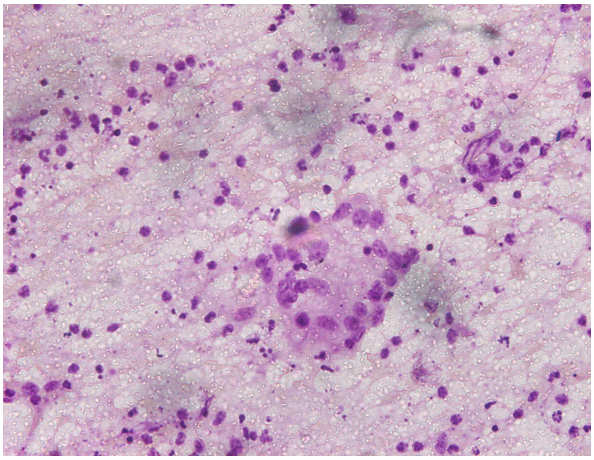

Figure 6. Granulomatous inflammation consistent with tuberculosis (Hematoxilin & Eosin stain, 40x)

While comparing the diagnosis in various age group, it was found that malignancy was the most common diagnosis as the age advances. Above the age of 50 years, malignancy was found in 84 out of 104 patients (80.76%) while as in below 50 age group, malignancy was found in 30 out of 46 patients (65.21%) (Table III).

Table III: Age wise nature of cytological diagnosis.

Age group	Benign	Malignant	Inconclusive
21-30	04(2.66%)	04(2.66%)	
31-40	06(4%)	07(18%)	
41-50	06(4%)	19(12.66%)	
51-60	07(18%)	30(20%)	01 (0.66%)
61-70	07(18%)	36(24%)	01 (0.66%)
71-80	04(2.66%)	15(10%)	
81-90		03(2.0%)	
Total	34	114	2

Discussion

The present study was designed to assess the safety and diagnostic efficacy of transthoracic USG guided FNAC of peripheral lung lesions. For confirmation of primary as well as secondary metastatic lesions, it has become an important diagnostic tool.[7] In this study out of 150 patients 80% were male, 20% were female. Male predominance has been seen in other studies around the globe. Von Sonnenberg[6] in his study of 150 patients had male preponderance of greater than 65%. Nachiappan et al[8] in their study of 100 patients had male preponderance of 74%. In this study, age group ranges from 21 to 90 years with mean age of 55.5 years which is similar to other studies. Ahmed Z et al[1] in their study found mean age 54.34 years. Mondal et al[9] and Singh et al[10] in their study found mean age 56.6 and 56.4 years respectively. These findings show that lung lesion especially malignant lung tumor come to clinical attention at middle to old age. About location in this study, 89(59.33%) were in the right lung and 61(40.66%) were in the left lung. In the study by Alam M A et al,[11] lesion in right lung was 122(73.49%), in the left lung 44(26.50%). Frequency of right lung lesion was more in both the study.

Malignancy was the most common (76%) cytological diagnosis in this study. Similar to this study, Ahmad M et al[7] reported malignancy in 78% of patients, Shailja S et al[4] 68.7%, and Sheikh TS et al[12] reported 78.5%. In this study, out of 150 patients, squamous cell carcinoma was the most common malignancy in 46(30.66%) patients followed by adenocarcinoma 31(20.66%), undifferentiated carcinoma 19 (12.66%), metastatic carcinoma 09(06%), small cell carcinoma 07(4.66%), Non Hodgkin lymphoma 02(1.33%). Similar to our results, Ahmed Z et al,[1] Shailja et al,[4] Alam MA et al[11] reported higher incidence of squamous cell carcinoma in their studies. In contrast to our study, Madan et al,[13] Tan et al[14] and Pathak et al[15] found adenocarcinoma as most common malignancy in their study. Similarly in a study by Senthilvelmurugan V et al[16] poorly differentiated carcinoma (31.2%) was the most common malignant diagnosis followed by squamous cell carcinoma 25% and adenocarcinoma in 16.3% of patients. These variations may be due to different study populations. The rate of malignancy in age less than 50 years in our study was 65.21% and above the age of 50 years, malignancy was most common diagnosis in 80.76% of patients. These findings are comparable with findings by Sheikh TS et al[12] and Shailja S et al.[4] They showed that incidence of malignancy is higher in older age group. In the present study, benign lesion was diagnosed in 34(22.66%) and inconclusive in 2(1.33%) of patients. Sheikh TS et al[12] showed benign lesion 12(19.67%) and inconclusive 05(8.19%). The benign lesions in this study correlated with his study but it differed in case of inconclusive patients. In the present study, there were no major complications. Overall mild to moderate complications occurred in 07(4.6%) patients.

Pneumothorax occurred in 04(2.66%) while hemoptysis in 03(2%) both complications were managed conservatively. Such complication rates are comparable with other studies across the globe. Junpeilkezoe[17] in a study of 124 patients observed pneumothorax in 4% of patients. Similarly Chen et al,[18] Modini Venkata Rao et al,[19] Knudsen et al,[20] and

Shailja S et al,[4] also found rate of pneumothorax between 3-4%. In contrast in a study by Sinner et al[21] rate of pneumothorax was 27.2% while hemoptysis was seen in 2.5%.

Conclusion

Ultrasound guided FNAC of peripheral lung lesion is simple, safe, quick, acceptable, easily accessible, accurate and cost-effective procedure without radiation. Such procedure can be adopted safely by the physicians and the coordination of pulmonologist, radiologist and pathologist is highly essential for better yield.

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