

## Original Research Article

# Transthoracic ultrasound guided fine needle aspiration cytology of peripheral lung lesions: an experience of a pulmonologist

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## ABSTRACT

**Background:** Ultrasound (USG) guided fine needle aspiration cytology (FNAC) is a simple and cost-effective method for the diagnosis of various peripheral lung lesions. Being radiation free and easily available in most of centres, it has become an important diagnostic modality for early diagnosis of peripheral lung lesions. Besides procedure is simple and complications if occur, can be managed by a pulmonologist effectively. This study was aimed to evaluate the role of Transthoracic ultrasound guided FNAC in diagnosis of peripheral lung lesion.

**Methods:** This prospective observational study was conducted at Government Chest Diseases Hospital Srinagar over a period of one year from January 2018-December 2018. 61 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 patients with peripheral lung lesions under local anaesthesia. Radiological and cytological data of enrolled patients was collected prospectively and analysed.

**Result:** About 61 patients were included in this study comprising of 39 males and 22 females in age range of 17- 90 years. Malignancy was the most common cytological diagnosis (78.57%). while as benign diagnosis was reached in 21.43%. In 8.19% of patients, FNAC was inconclusive. Among the malignant group, adenocarcinoma (47.72%) was most common cytological diagnosis. The overall diagnostic yield of USG guided FNAC in this study was 91.8%.

**Conclusion:** USG guided FNAC of peripheral lung lesions is a simple procedure with high accuracy and less complication rate which can be performed by a pulmonologist for diagnosis.

**Key Words:** Malignancy, Tuberculosis, USG guided Fine needle aspiration cytology.

## INTRODUCTION

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.<sup>1</sup> Leyden in 1833 and Manbriel in 1986 introduced the technique for the diagnosis of lung pathologies.<sup>2</sup> Ultrasound guided transthoracic fine needle aspiration

cytology is an effective method of obtaining material for cytological diagnosis of peripherally located lung lesions of various etiologies. In view of its high accuracy and lesser complication rates, it has gained popularity among clinicians and radiologist.<sup>3</sup> 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.<sup>4</sup> Moreover the main complication of this procedure, pneumothorax can

be properly managed by a pulmonologist. As the learning curve is easy and the complications are very less, this procedure has gained popularity among the respiratory physicians.

**METHODS**

This was a prospective observational study was conducted at government chest diseases hospital Srinagar over a period of one year from January 2018-December 2018. 61 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. This study was approved by the ethical committee.

**Inclusion criteria**

- Peripheral lung lesions less than 8cm from skin surface on ultrasound
- Nonvascular lesion on ultrasound
- Adequate pulmonary reserve
- Age greater than 15 years.

**Exclusion criteria**

- Lesions more than 8cm from skin surface
- Highly vascular lesion on ultrasound
- Suspected hydatid disease
- Bleeding diathesis
- COPD with bullae as depicted on radiograph
- Severe pulmonary hypertension
- Patients requiring assisted ventilation.

Detailed history was taken from all patients followed by thorough clinical examination. All routine investigations were done including coagulation profile and virological markers. Lesions were initially localized with postero-anterior and lateral chest radiographs followed by ultrasonography (USG) with a 1–5-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 22/23 gauge, 1.5 cm long needle was used. For deep seated lesions 8cm spinal needle was used. Under strict aseptic precautions, skin, subcutaneous tissue intercostal muscles were properly anaesthetized with 2% xylocaine. Under suspended animation 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. Aspiration was carried out with suction using 10 ml dispovan. Usually 3-4 needle passes

were performed per lesion in order to get adequate sample.

The material aspirated was alcohol fixed on glass slides. 1-2 air dried slides were also made and samples were sent to pathology department for cytological analysis. May Grunewald Giemsa stain was done on air dried smears while alcohol fixed slides were stained with haematoxylin and eosin.

Whenever required, special stains like Ziehl Neelson stain for acid fast bacilli and periodic acid Schiff for fungus were done. Post procedure patients were kept in observation for 4 hours followed by chest x ray to rule out any pneumothorax.

**RESULTS**

Out of the 61 patients included in the study, 39 (63.93%) were males and 22(36.06%) were females (Table 1).

**Table 1: Gender distribution of cases.**

Gender	Frequency	Percentage (%)
Males	39	63.93%
Females	22	36.06
Total	61	

**Table 2: Distribution of patients in various age groups.**

Age group	Males	Females	Total
10-20	2		2
21-30	3	2	5
31-40	2	2	4
41- 50	5	3	8
51-60	8	3	11
61-70	9	5	14
71-80	5	4	9
81-90	5	3	8
Total	39	22	61

Out of 61 patients, transthoracic ultrasound guided FNAC was diagnostic in 56 (91.8%) patients while as it was inconclusive in 5 patients. So, the diagnostic accuracy of the procedure was 91.8%. Out of the 56 patients diagnosed with this investigation, 44 (78.57%) had malignancy and 12(21.43%) had benign disease.

Adenocarcinoma was the most common malignancy in 21 patients (34.43%), followed by squamous cell carcinoma and 5 (8.19%) patients had poorly differentiated carcinoma. Small cell carcinoma, round cell tumor and metastasis were diagnosed in 1 patient each. Among the benign group, tuberculous granuloma was diagnosed in 6 patients while as fungal lesion was diagnosed in 2 patients (Table 3).

**Table 3: Frequency of various pathologies in the patients.**

Diagnosis	Frequency	%
Benign	12	21.43
Tuberculosis	6	9.84
Inflammatory/Infections	4	6.56
Fungal	2	3.28
Malignant Adenocarcinoma	44	78.57
Squamous cell carcinoma	21	34.43
Poorly differentiated	15	24.59
Carcinoma	5	8.19
Small cell carcinoma	1	1.64
Round cell tumor	1	1.64
Metastatic	1	1.64
Adequate	56	91.8
Inconclusive	5	8.2

While comparing the diagnosis in various age groups, it was found that malignancy was the most common diagnosis as the age advances. Above the age of 50 years, malignancy was found in 35 out of 41 patients (85.37%) while as in below 50 age group, malignancy was found in 9 out of 20 patients (45%) (Table 4).

**Table 4 :Age wise nature of cytological diagnosis.**

Age group	Benign	Malignant	Inconclusive
10-20	1 (50%)	1 (50%)	
21-30	3 (60%)	1 (20%)	1(20%)
31-40	2 (50%)	2 (50%)	
41-50	2 (22.22%)	5 (55.56%)	2 (22.22%)
51-60	1 (9.09%)	9 (81.82%)	1 (9.09%)
61-70	2 (14.29%)	11 (78.51%)	1 (7.14%)
71-80	1 (12.50%)	7 (87.50%)	
81-90		8 (100%)	
Total	12	44	5

In the present study, there was no major complication. 2 patients developed pneumothorax, while as 1 patient developed mild hemoptysis and were managed conservatively.

## DISCUSSION

The present study was designed to assess the safety and diagnostic efficacy of transthoracic USG guided FNAC of peripheral lung lesions. It is a simple procedure which can be done by a pulmonologist with basic knowledge of ultrasound. For confirmation of primary as well as secondary metastatic lesions, it has become an important diagnostic tool.<sup>5</sup> In our study out of 61 patients 63.93% were males 36.61% were females. Male predominance has been seen in other studies around the globe. Von Sonnenberg in his study of 150 patients had male

preponderance of greater than 65%.<sup>6</sup> Nachiappan et al in their study of 100 patients had male preponderance of 74%.<sup>7</sup> Senthilmurugan V et al, in their study of 69 patients had 68.1% males and 31.8% were females.<sup>8</sup> Shailja et al in a study of 32 patients had 65.6% males.<sup>9</sup>

In the present study, the diagnostic yield was 91.8%. Diagnostic accuracy of transthoracic USG guided FNAC has been reported from 80-98% in various studies. Clee et al reported diagnostic accuracy 90%.<sup>10</sup> Hollings and Shaw, Behera and Balamugesh, also reported diagnostic yield of more than 90%.<sup>11, 12</sup> Malignancy was the most common cytological diagnosis in our study (78.57%) followed by tuberculosis (Tb) granuloma in 9.84% of patients. Similar to our study, Ahmad et al reported malignancy in 78% of patients and Tb in 12% of cases.<sup>13</sup> Rate of malignancy was higher in our study as compared to Dahlstrom et al and Gouliamos et al. who reported malignancy in 64.6% and 61% respectively.<sup>14,15</sup> Out of 44 patients with malignancy, adenocarcinoma was the most common malignancy in 21(47.72%) of patients followed by squamous cell carcinoma in 15 (34.09%) of patients. Similar to our results, Madan et al.<sup>16</sup>, Tan et al.<sup>17</sup> and Pathak et al<sup>18</sup> reported higher incidence of adenocarcinoma in their studies. In contrast to our study, Srivastava et al. found squamous cell carcinoma (50%) as most common malignancy in their study of 32 patients.<sup>19</sup> Similarly in a study by Senthilmurugan V et al poorly differentiated carcinoma (31.2%) was the most common malignant diagnosis followed by squamous cell carcinoma (25%) and adenocarcinoma in 16.3% of patients.<sup>8</sup> These variations may be due to different study populations. The rate of malignancy in age less than 50 years in our study was 45% and above the age of 50 years, malignancy was most common diagnosis in 85.37% of patients. These findings are comparable with findings by Behera and Balamugesh who reviewed ICMR national research registry program; in which malignancy was seen in around 40% of patients below age of 50 years.<sup>12</sup> In the present study tuberculosis was diagnosed in 9.84% of patients and inflammatory lesions in 6.56% of patients. Bandyopadhyay et al reported TB granuloma in 7.8% of patients and inflammatory in 19.5% of patients.<sup>20</sup> Similar results were reported by Tan et al<sup>17</sup>, in which TB granuloma was found in 5.3% of patients. In the present study, there were no major complications. Overall mild complications occurred in 3 (4.92%) patients.

Pneumothorax occurred in 3.28% while hemoptysis was seen in 1.64% both complications were managed conservatively. Such complication rates are comparable with other studies across the globe. Jonpeilkezo in a study of 124 patients observed pneumothorax in 4% of patients.<sup>21</sup> Similarly Ajay et al,<sup>22</sup> Chen et al,<sup>23</sup> Modini Venkata Rao et al,<sup>24</sup> Knudsen et al,<sup>25</sup> and Shailja Srivastava et al, also found rate of pneumothorax between 3-4%. In contrast in a study by Sinner et al rate of pneumothorax was 27.2% while hemoptysis was seen in 2.5%.<sup>9,26</sup>

## CONCLUSION

USG guided FNAC of peripheral lung lesion is a simple procedure with high accuracy which can be performed by a pulmonologist for early diagnosis. Besides procedure is cost effective, less invasive and radiation free. It should be implied in diagnosis of peripheral lung lesion.

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