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DIAGNOSTIC UTILITY OF USG GUIDED TRANSTHORACIC NEEDLE ASPIRATION IN PATIENTS WITH PERIPHERAL LUNG LESION

Respiratory Medicine

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ABSTRACT

Introduction: Peripheral pulmonary lesions (PPL) are lesions in the peripheral one third of the lung distal to segmental bronchi and are difficult to access by regular flexible bronchoscope. Widespread use of imaging techniques has led to frequent detection of peripheral pulmonary lesions. Ultrasound guided transthoracic FNAC is a simple and easily available method to establish the diagnosis of PPL. **Objectives:** This study was conducted to assess diagnostic yield and complications of USG guided transthoracic FNAC in peripheral lung lesions. **Methodology:** It is a hospital based cross sectional observational study conducted on 61 patients with PPL in chest radiography after obtaining the approval of ethical committee of the institution and written informed consent. USG guided transthoracic FNAC was performed, and patient was monitored for complications. Clinical, radiological and cytopathological reports were analyzed. **Results:** Among 61 patients, 53 (86.9%) were males and 8 (13.1%) were females. Most were smokers (n=38, 62.3%) and aged more than 60 years (n=37, 60.7%). Out of 61, in 56 lesions FNAC was able to make conclusive diagnosis with diagnostic yield of 91.8%. 47(83.9%) were malignant lesions and 9(16.1%) benign. Among 5 patients with inconclusive report in FNAC, 1 each diagnosed with adenocarcinoma and squamous cell carcinoma, 2 patients with TB granuloma, and 1 patient with non-TB infection by other modalities of sampling. Diagnostic yield of USG guided transthoracic FNAC was 75% in benign lesions compared to 95.90% in malignant lesions. Adenocarcinoma(n=22) was the most common malignancy followed by squamous cell carcinoma (n=15). Complications observed in 6 patients (9.8%). **Conclusion:** USG guided transthoracic FNAC is a simple, less expensive, easily accessible method with good yield and low risk of complications for the diagnosis of PPL.

KEYWORDS

PPL, USG, FNAC, Diagnostic yield.

INTRODUCTION

Peripheral pulmonary lesions are lesions in the peripheral one third of the lung located distal to lobar and segmental bronchi and not visualised by regular flexible bronchoscope. PPLs are identified more frequently at the present days due to widespread use of imaging techniques and screening. PPL can be malignant or benign. The etiologic diagnosis of peripheral lung lesions is a challenge faced by pulmonologist. Diagnosing lung cancer at early stage has role in better survival of the patient.[1,2]

Trans-bronchial lung biopsy or transbronchial needle aspiration via fibre optic bronchoscope with or without assistance of various image guidance technologies (Radial Probe EBUS, virtual bronchoscopic navigation, Electromagnetic navigation, fluoroscopy, cone beam CT etc), transthoracic aspiration or core needle biopsy under fluoroscopic or CT or ultrasonography guidance are the various methods available for diagnosis of PPLs. CT guided transthoracic biopsy has the highest diagnostic yield at the risk of pneumothorax and radiation exposure. Bronchoscopic sampling supported with combination of multiple image guidance technologies has good diagnostic yield which is comparable but less than that of transthoracic procedures. It has advantage of diagnosis and staging of lung cancer during single procedure with much less risk of pneumothorax. But these equipments are expensive with need of considerable training and not available at all tertiary care centres.[1,2,3]

Transthoracic FNAC is one of the simple methods for diagnosing lung lesions, particularly peripherally located. Differentiation between small cell lung carcinoma and non-small cell lung carcinoma is made accurately with FNAC and this differentiation is important for the subsequent management.[4]Ultrasonography which is readily available in most centres, portable, radiation free and with shorter learning curve can be used to guide the FNAC.[5,6] This study was conducted to determine the diagnostic yield and safety of ultrasound guided transthoracic FNAC in patients with PPLs.

MATERIALS AND METHODS

Study Design And Sample Size

It was a hospital based cross sectional observational study. Study was conducted after obtaining institutional ethical committee approval on 61 patients admitted in the Department of Respiratory medicine, TB and Chest Hospital, Badi, R.N.T medical college, Udaipur.

Inclusion Criteria

- Patients having pulmonary shadow abutting the chest wall in chest X-ray or CT scan.
- Nonvascular lesion on ultrasound.
- Patients who can hold breath for at least 30 seconds.
- Patients with sputum Acid Fast Bacilli negative.
- Patients with age more than 15 yrs.

Exclusion Criteria

- Patients with bleeding diathesis.
- Patients with highly vascular lesions on ultrasound.
- Patients having COPD with bullous lung disease.
- Suspected hydatid cyst.
- Patients who did not give consent.
- Patients requiring assisted ventilation due to poor pulmonary function.
- Severe pulmonary hypertension.

Study Method

After history taking, clinico-physical examination, investigations, and written informed consent, procedure was done in the morning. USG scan was done placing patient in most suitable position based on site of lesion. Lesion was localized and the features of the lesion noted. After marking exact location, under strict aseptic precaution and 2% xylocaine local anaesthesia, 22 gauge spinal needle was inserted. Position was confirmed by real time USG. Trocar was removed and 20cc disposable plastic syringe was attached. Several in and out motions were done with needle in the lesion and suction applied. After removing the needle sample was pushed to dry clean glass slide. At least 2 needle passes were done with different angulation to sample different areas in the lesion. Sample with creamy consistency due to high cellularity was considered as adequate sample. Few of the slides were air dried and other slides were fixed with methanol. Slides were sent to Pathology department. Hematoxylin & Eosin, May Grunwald Giemsa or Papanicolaou stain was used for the staining. Special stains like Ziehl Neelson stain for Acid fast bacilli were done whenever indicated. Immediately after procedure, USG was performed to exclude pneumothorax. Patient was asked to inform the pulmonologist if sudden onset chest pain, breathlessness or haemoptysis develops. An expiratory chest X-ray was taken 4 hours after the procedure.

Results were classified into 3 categories- benign, malignant and

inconclusive. Inconclusive category included samples not having sufficient material in quantity or quality for a reliable diagnosis and samples with considerable benign material which suspected to be not representative of the lesion found on imaging. Repeat FNAC was done in all cases with inconclusive reports. When repeat procedure also failed to provide a diagnosis, alternative methods were attempted.

Data were entered and analysed by MS Excel version 10 and SPSS version 16. Appropriate tables were prepared, statistical tests applied and inferences made. P value < 0.05 was considered as statistically significant.

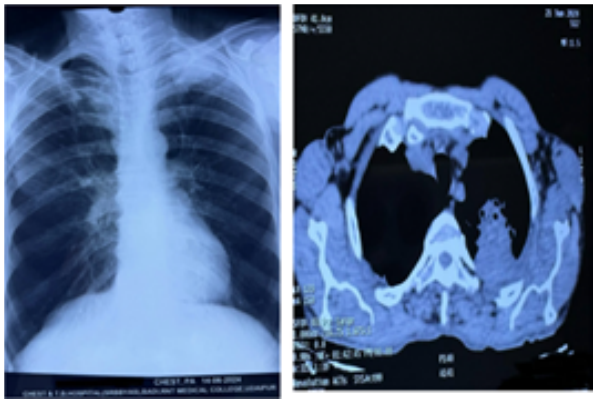

Fig 2: CXR and CT scan showing left upper lobe PPL

RESULTS

In this study, 37(60.7%) of respondents were aged more than 60 years. Mean age of respondents was 62.6±11.1 years with a range of 24 -85 years. 53 (86.9%) patients were males and 8 (13.1%) were females. Male to female ratio was 6.6:1. Majority of the patients (70.5%) were having BMI less than 18.5kg/m^2 (underweight). Most were smokers(n=38, 62.3%). Commonest symptom was cough (n=51 , 83.6%). 48(78.7%) patients had chest pain and 35(57.4%) patients had dyspnoea. Commonest sign was clubbing seen in 29 patients(47.5%), followed by pallor seen in 16(26.2%).

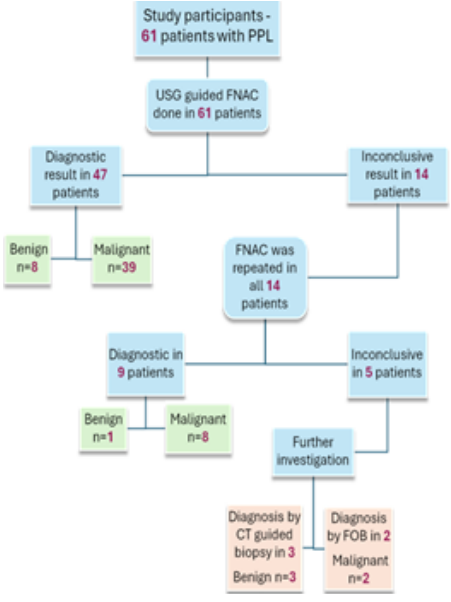

Fig 2: Serial investigations performed in 61 patients

Table No. 1 - Diagnostic yield of USG guided FNAC in benign and malignant lesions

Type of lesion	Diagnosis in FNAC	Final diagnosis	Diagnostic yield
Benign	9	12	75%
Malignancy	47	49	95.90%

Table No. 2 - CT scan findings in malignant and benign lesions

CT finding	Malignant (n=49)	Benign (n=12)	Total (n=61)	P value
Spiculation	42 (85.7%)	1 (8.3%)	43 (70.5%)	<0.001
Ground glass opacity	16 (32.6%)	2 (16.7%)	18 (29.5%)	0.27
Pleural effusion	15 (30.6%)	7 (58.3%)	22 (36.1%)	0.07
Mediastinal LNAP	31 (63.3%)	2 (16.7%)	33 (54.1%)	0.003
Thrombosis	7 (14.3%)	0	7 (11.5%)	0.16
Chest wall infiltration	16 (32.6%)	0	16 (26.2%)	0.02

Table no. 3 - USG findings in malignant and benign lesions

USG findings	Malignant (n=49)	Benign (n=12)	Total (n=61)	P value
Necrosis	13 (26.5%)	2 (16.7%)	15 (27.9%)	0.48
Air bronchogram	7 (14.3%)	11 (91.7%)	18 (29.5%)	<0.001
Pleural effusion	18 (36.7%)	6 (50%)	24 (39.3%)	0.39
Diaphragmatic paralysis	6 (12.2%)	0	6 (9.8%)	0.20
Chest wall infiltration	18(36.7%)	0	18 (29.5%)	0.01

Table no. 4 - Distribution of respondents according to type of malignancy

Malignancy	FNAC	Final diagnosis
Adenocarcinoma	22(46.8%)	23(46.9%)
Squamous cell carcinoma	15(31.9%)	16(32.7%)
Large cell carcinoma	1(2.1%)	1(2%)
Small cell carcinoma	5(10.6%)	5(10.3%)
Anaplastic carcinoma	1(2.1%)	1(2%)
Malignant mesothelioma	2(4.3%)	2(4.1%)
NHL	1(2.1%)	1(2%)
Total	47(100%)	49(100%)

Out of 9 benign lesions diagnosed by FNAC, 8(88.9%) were infections and 1 (11.1%) was inflammatory. 6 (66.7%) patients had granulomas in FNAC suggestive of TB and 2(22.2%) had non-TB infection. 2 patients found to have TB granuloma and 1 patient found to have non-TB infection by CT guided biopsy. Out of 61, 21(34.4%) patients underwent histopathological correlation. Among 16 patients diagnosed with malignancy by FNAC, 14 found to be malignancy of same type by endobronchial biopsy or BAL cell block. 2 small cell carcinoma diagnosed by FNAC gave unsatisfactory report as no atypical cells or granuloma is seen in histopathological examination.

Total 6 patients had complication with a complication rate of 9.8%. Pain was the complication in 3 patients (4.9%). Haemoptysis occurred in 2(3.3%). Pneumothorax was seen in 1 patient (1.6%).

DISCUSSION

FNAC is widely used as a diagnostic procedure for various malignant and inflammatory lesions. It was first used as a diagnostic tool by Martin and Ellis. Leyden and Manbriel introduced FNAC for the lung pathology diagnosis.[5] USG guided transthoracic FNAC have the advantage of real time visualisation of needle throughout the procedure. Diagnostic yield can be increased by multiple needle aspiration from different part of the lesion.[2] If the primary cytology report is inconclusive or negative, repeat FNAC may increase the success rate. Studies also stated the importance of repeat aspiration when there is strong suspicion of malignancy as it is radiation free.[7] Molecular profiling required for the personalised therapeutic decisions in Adenocarcinoma lung, can be done using cell blocks prepared from FNA.[8]

A basic two-dimensional black and white ultrasound system is enough for thoracic ultrasonography. When aerated lung tissue is replaced by consolidated or solid lung tissue and is in contact with pleura, it can be visualised well. Air bronchogram in USG is seen as hyperechoic linear or lenticular spots within a consolidation. Necrosis is visualised as focal anechoic areas within a lesion.[9] USG visualises only the lesions that in direct contact with pleura, with no air between lesion and pleura and it serves as an inherent mechanism of safety.[10]

In our study, majority of the patients (70.5%) were underweight. Similar findings were observed by Gour P et al [11] and Bhargava A et al [12]. In our study, on USG examination, difference in proportion of air bronchogram ($p<0.001$) and chest wall infiltration ($p=0.01$) in malignant and benign patients were statistically significant. This finding was in concordance with Wei H et al[13], as they also found that statistically significant difference in air bronchogram sign between benign(48.4%) and malignant (19.9%) group.

In our study, first attempt of FNAC provided conclusive result in 47(77%) patients, inconclusive in 14(23.0%) patients. Repeat FNAC provided conclusive results in 9 patients. Hence, the diagnostic yield of USG guided transthoracic FNAC was 91.8% (56 patients) in the present study. Diagnostic yield of USG guided transthoracic FNAC was less in benign lesions (75%) compared to malignant lesions (95.9%). Similar to our study, Modini VR et al[2] had diagnostic yield of 87.6%. Out of 81 patients included in their study, 16(19.7%) patients underwent repeat FNAC due to initial inconclusive results. Madan M et al[7] reported 95% diagnostic yield.

In 56 patients with conclusive results, 47(83.9%) were malignant lesions and 9(16.1%) were benign. Adenocarcinoma (n=22, 46.8%) was the most common malignancy followed by squamous cell carcinoma (n=15, 31.9%). Sheikh et al[5] reported similar rates of Malignancy (78.57%) with adenocarcinoma being commonest type. The higher incidence of Adenocarcinoma in the present study suggests a shift from squamous cell predominance seen in the past, which could be due to changes in smoking practices and use of filter cigarettes promoting deeper inhalation. Ramani V et al[14] reported that peripheral location of mass is more common in Adenocarcinoma i.e., 61% compared to 27.8% in Squamous cell carcinoma and 16.4% in Small cell carcinoma. This also contributes to the finding of adenocarcinoma as the commonest subtype of cancer presenting as peripheral pulmonary lesion in this study.

Commonest benign lesion in our study was Tuberculosis. Satya Prakash S et al[6] (75%) and Modini VR et al[2] (69.23%) also found that majority of benign cases were tuberculosis. This could be explained by disproportionately high burden of tuberculosis is in developing countries including India.

Complications occurred in 6 patients(9.8%) which included post procedure pain in 2 patients, haemoptysis in 2 and minimal pneumothorax in one patient which resolved with Oxygen. Results are comparable with study by Shailaja S et al[3].

CONCLUSIONS

Peripheral pulmonary lesions are frequently detected in recent years due to wide use of imaging and screening. Etiological diagnosis of these lesions by fibreoptic bronchoscopy and biopsy is not possible most of the time due to its peripheral location. This study concludes that USG guided transthoracic needle aspiration cytology has good yield for the diagnosis of peripheral pulmonary lesion. Diagnostic yield is found to be higher in malignant lesions compared to benign lesions. It is a less expensive, easily available, repeatable procedure with less rate of complications. This procedure provides early diagnosis of lung malignancy and contributes to better survival of lung cancer patients.

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