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ORIGINAL ARTICLE

ULTRASOUND GUIDED TRANSTHORACIC FINE NEEDLE ASPIRATION CYTOLOGY IN DIAGNOSING PERIPHERAL PULMONARY LESIONS

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ABSTRACT: BACKGROUND: A non-resolving opacity on chest X-ray despite intensive pharmacotherapy poses a diagnostic problem for the clinician. Transthoracic Fine Needle Aspiration Cytology is regarded as the most effective of the cytological methods for diagnosing lung cancer, in particular peripherally-located lesions including lung nodules of infective etiology. In this study we evaluated the role of ultrasound guided percutaneous Fine Needle Aspiration Cytology in various peripheral pulmonary lesions. **MATERIALS AND METHODS:** Eighty one (81) Patients with peripheral lung lesions who were admitted in the Department of pulmonary medicine, Guntur Medical College/Government Fever Hospital, Guntur from January 2014 to March 2015. **RESULTS:** Out of 81 patients, diagnostic yield was obtained in 71 patients. In 71 patients, 45patients (55.5%) were with malignant and 26(32%) were with non-malignant lung lesions. Out of 45 malignant patients, Squamous cell carcinoma was seen in 27 patients (60%) followed by Adenocarcinoma in 10 (22.22%), Large cell carcinoma in 07(15.55%) and Metastatic carcinoma in 01 patient (2.22%). Out of 26 non-malignant lung lesions, 18 patients were with Tuberculosis (69.23%) and 08 patients were with pneumonia (30.76%). **CONCLUSION:** Ultrasound Guided Trans-thoracic FNAC of peripheral pulmonary lesion is, simple, safe, quick, acceptable, easily accessible, accurate and cost-effective procedure without radiation. It lessens the need of other procedures like BAL, FOB and cutting biopsy procedures etc.

KEYWORDS: FNAC, Lung Cancer, Peripheral Lung Lesion, Pneumonia, Tuberculosis, Ultrasound.

INTRODUCTION: A non-resolving opacity on chest X ray despite intensive pharmacotherapy poses a diagnostic problem for the clinician **(1)**. Radiographic features such as size, location of the lesion, margins, shape, growth rate and presence of calcification are helpful for the diagnosis, and are not confirmative. Fine Needle Aspiration Cytology (FNAC) is a well-established method of diagnosing both neoplastic and inflammatory conditions of the lung, has resulted in a decrease in the need of other procedures that are more invasive. Transthoracic Fine Needle Aspiration Cytology is regarded as the most effective of the cytological methods for diagnosing lung cancer, in particular peripherally-located lesions including lung nodules of infective etiology. Trans-bronchial lung biopsy or brushings via Fibre Optic Bronchoscope and Per–cutaneous transthoracic aspiration under fluoroscopic guidance are the other alternatives. Diagnostic methods which are time consuming and not available in all centers. In such cases Ultrasound guided Fine Needle Aspiration Cytology of peripheral pulmonary lung lesions using fine needle is the choice for establishing the diagnosis which is simple and safe. Real time B-mode ultra-sonography which is readily available in most centers is easy to perform and free from radiation, helps in the evaluation of pulmonary lesions and also the needle can be guided under vision and aspirates can be obtained from different sites of the lesion.

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AIMS AND OBJECTIVES: To evaluate the role of ultrasound guided percutaneous Fine Needle Aspiration Cytology of peripheral pulmonary lesions.

MATERIALS AND METHODS:

Study Design: Prospective study.

Study Population: 81 Patients admitted in the Department of pulmonary medicine, Guntur Medical College/Government Fever Hospital, Guntur.

Study Period: January 2014 to March 2015.

Inclusion Criteria: Patients having Pulmonary shadow abutting the chest wall on chest radiograph, Non-resolved opacity in chest x-ray, Sputum negative for Acid Fast Bacilli (AFB) and malignant cytology, solid lesion with acoustic window on ultrasound examination were included in the study.

Exclusion Criteria: Patients with Very poor general condition, emphysematous bullae, Bleeding diathesis, Cystic pulsatile lesions on ultrasound examination, Poor pulmonary function, Sputum for AFB positive patients and Patients not giving written consent were excluded from the study.

Procedure: Patients were scheduled for biopsy in the morning, so that follow-up care will be provided. FNAC procedure was explained to the patients. Then a informed written consent was obtained from the patient. Patient's coagulation profile was checked. The patient pulse, blood pressure and respiratory rate were recorded. Initially ultrasound localization and planning of the biopsy was done with 3.5 MHz sector transducer. Longitudinal and transverse scans were obtained with the patient in supine or in sitting posture to get good intercostals window and the exact site and depth of the lesion from the skin. The exact skin site was marked and the skin was prepared with aseptic precautions. In this study a disposable single pass 22 G needle attached to a 20cc syringe was used.

The patient was asked to hold breath and the needle inserted in to the lesion. Aspiration was accomplished by creating a vaccum in the needle by drawing back the plunger of the syringe. Vaccum was created by pulling the plunger to 1 ml mark after the tip of the needle was within the lesion, several in and out motions were made with the needle in the lesion, while suction was applied. Before the needle was withdrawn from the lesion suction was released. After the needle was removed from the patient the needle and syringe were separated and about 5 to 10ml of air was drawn into the syringe and reattached to the needle. The material from the needle was ejected on to the microscopic slide. The biopsy procedure was repeated with the same needle and syringe until satisfactory specimen was obtained. Aspirate was spread onto the pre labeled slides kept ready for smearing.

Few slides were air dried, while other slides were fixed for 20 minutes in a Coplin's jar containing methanol. Later the methanol fixed slides were dried and all the slides were sent for cytological examination. The air dried slides were stained by Leishman's stain and the methanol fixed slides were stained by Hematoxylin and Eosin stains. The slides were read in high power microscope. The aspirate was also examined for AFB and other organisms by staining, culture and sensitivity. The material was inadequate in the first instance. Blood pressure, Pulse was monitored for every 2 hours, for the first 24hours. Patients were kept for bed rest for 24 hours. Patient was assured. An analgesic was given if the patient complains of pain. Check X-ray was done after 4 hours.

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A repeat ultrasound scan was done to note the fluid collection if any, into the pleural cavity. If the Fine Needle Aspiration Cytology was not confirm the diagnosis in first attempt, the procedure was repeated. Even with repeated FNAC if the diagnosis was not confirmed, patients were subjected to other alternative methods of investigations.

RESULTS: The total number of patients in the study were 81, 61 patients (75.3%) were Males, while 20(24.6%) were Female. The Male: Female ratio was 3:1. The mean age of patients in this study was 48. The youngest patient was aged 26 years and oldest was aged 71 years giving an age range of 26 to 71 years. 54(66%) patients of this study were smokers. Only 3 female patients were smokers. In this study, cough (79.01%) was the commonest presenting symptom, followed by shortness of breath (SOB) (54.3%), chest pain (38.27%), loss of weight (34.56%), hemoptysis (30.86%), fever (18.51%), and hoarseness of voice (9.8%). Clinical signs such as pallor (68%), clubbing (40%), and cervical lymphadenopathy (14.8%) were observed. Chest x-ray findings suggested that lung lesions were more on left (64%) side than right side (36%). In this, left upper (22.2%), followed by combined left upper and mid zone (14.8%), left side mid zones (12.3%) were most affected zones as shown in table1. Other associated findings were rib erosion (2.4%), pleural effusion (7%), hilar adenopathy (7.4%). diaphragmatic elevation (4.9%). Out of 81 patients, diagnostic yield was obtained in 71 patients. Out of 71, 45 patients (55.5%) were with malignant lung lesions and 26(32%) were with non-malignant lung lesions, as shown in table 2. Out of 45 malignant patients, Squamous cell carcinoma was seen in 27 patients (60%) followed by Adenocarcinoma in 10 (22.22%), Large cell carcinoma in 07 (15.55%), and Metastatic carcinoma in 01 patient (2.22%). Out of 26 non-malignant patients, Tuberculosis were 18 (69.23%), and Pneumonia were 8 (30.76%) patients

DISCUSSION: This study of Ultrasound Guided Percutaneous Transthoracic Fine Needle Aspiration Cytology has demonstrated that the technique is useful in diagnosing a variety of intrathoracic lesions, including malignant and nonmalignant diseases.[2] The present study was designed to evaluate the safety of Ultrasound guided Percutaneous Transthoracic Fine Needle Aspiration Cytology and its efficacy to establish the diagnosis. In this study Male: Female ratio was 3:1 similar to the study of Knudsen et. al.[3] In most of the previous studies the ratio was between 5:1 and 2:1.54 (66%) patients of this study were smokers. Only 3 female patients were smokers. Pathological diagnosis of malignancy was more among smokers indicating the risk of smoking for the etiology of malignancy. Out of 27 nonsmokers, malignancy was confirmed in 4 patients, 3 out of four were adenocarcinoma and one was Squamous cell carcinoma.

In the present study, diagnostic yield of Percutaneous Transthoracic Fine Needle Aspiration Cytology was 87.6%, comparable with most published reports of Percutaneous Transthoracic Fine Needle Aspiration Biopsy done with ultra-guidance where the yield ranged from 80-97%. Diagnostic yield in Sinner study was 90.7 % and in Junpeiikezoe et. al (1989) study was 90%. Ang Yuan et. al in 1992 reported that confirmative diagnosis was obtained in 27 out if 30 patients.[4,5,6] The high success rate achieved in our study may be due to selection of cases as most of the cases had lesions of more than 3 cm diameter, while other studies included smaller lesions. The principal reason for failure to diagnose was inadequacy of the aspirate due to small size of the lesion and depth of the lesion. In this study, No conclusion was reached in 10 cases out of 81. Of the 10 patients, 1 (one) was later diagnosed as Brachial Plexus Schwannoma by excision biopsy and remaining cannot be followed up.

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Thus, a positive result by Percutaneous Transthoracic Fine Needle Aspiration Biopsy was of immense value, a negative result does not exclude the presence of disease. Major presenting symptom was cough in 64(80%) of the patients. Around 44% of patients presented with cough associated with nonspecific symptoms like weight loss and loss of appetite. Signs of Breathlessness, chest pain, Heamoptysis, fever and Hoarseness of voice were in decreasing order of frequency. In general examination, common findings were anemia in 68%, followed by clubbing in 40% patients. In the present study, Left side of the lung was involved in 64% of cases, and Right in 36% of patients. Associated radiological findings were presence of Hilaradenopathy, Diaphragmatic elevation and rib erosion. In the present with 81 patients of peripheral pulmonary lesions, 71 were diagnosed by Fine Needle Aspiration Cytology, reflecting high success rate of 87.6%. Similar results were reported in Afschrift M et. al study and in study done by Robert D. Tarver.[7,8]

Repeated needle aspiration from different parts of the lesion increased the cell yield. Among the 81 patients that were biopsied, repeat biopsies were performed in 16 patients. According to KhouriNagi et al (1995), repeat biopsies after primary negative biopsy procedures, may also increase the success rate considerably. [9]Repetition can be avoided by the presence of the cytologist during the session of by Fine Needle Aspiration Cytology in order to review the slides under the microscope. Definite diagnosis cannot be made in ten cases by Fine Needle Aspiration Cytology indicating the limitation of the procedure. Fine Needle Aspiration Cytology provides good sampling of cell. The main limitations were insufficient sampling rate and inability to diagnose invasion. In Fine Needle Aspiration Cytology diagnosed malignancies, cytopathological types encountered were Squamous cell carcinoma (27 patients), Adenocarcinoma (10 patients) and Large cell carcinoma (7 patients) and metastatic lesion in one patient. This was in concordance with previous studies, as Squamous cell carcinoma was the commonest malignancy in Indian sub-continent.

Adenocarcinomas were more often peripherally located and thus more amenable to diagnosis by transthoracic Fine Needle Aspiration Cytology. This study reaffirms the use of Fine Needle Aspiration Cytology in the diagnosis of Pulmonary Tuberculosis. Tuberculosis constituted 22.2 % of all Fine Needle Aspiration Cytology patients. In various studies reported in India, the corresponding figures range from 2.1% to 20%. Complications were observed in 6.1% of patient, similar to reports of other studies. In fact Chandrasekhar et.al observed no complications. [10] Pneumothorax occurred in three patients (3.7%), did not required intercostal drainage and managed conservatively. Minimal heamoptysis occurred in two patients (2.4%), shown in table 3. These complications were dependent on the bore of the needle used, duration of the procedure. The risk also increases if the patient was uncooperative or he or she coughs or cannot hold breath. Implantation of tumor cells in the path of needle tracts was experienced only in one patient in Sinner's series of 5300 patients. Mortality due to Fine Needle Aspiration Biopsy reported in the literature was because of intrapulmonary hemorrhage, air embolism, and untreated pneumothorax. In my study, these complications were not seen. Complications and yield of various studies were compared to the present study and shown in table 4. No mortality occured in present study.

CONCLUSIONS: Ultrasound Guided Transthoracic FNAC of peripheral pulmonary lesion is, simple, safe, quick, acceptable, easily accessible, accurate and cost-effective procedure without radiation. It lessens the need of other procedures like BAL, FOB and cutting biopsy procedures etc, which are expensive and not easily available in all places.

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Zone or Zones	Number of subjects	Percentage
Right Upper Zone	6	7.4%
Right Middle Zone	4	4.9%
Right lower Zone	7	8.6%
Right upper & middle zone	7	8.6%
Right middle & lower zone	5	6.1%
Left Upper Zone	18	22.2%
Left Middle Zone	10	12.3%
Left Lower Zone	7	8.6%
Left upper & middle zone	12	14.8%
Left middle & lower zone	5	6.1%

Table 1: Zone or Zones of Lung Involved

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TYPE	TOTAL CASES	%
Malignant	45	55.5%
Non-malignant	26	32%
Inconclusive	10	12. %

Table 2: Cytopathological Diagnosis of Various Peripheral Pulmonary Lesions

COMPLICATION	NO. OF CASES	%
Heamoptysis	2	2.4%
Pneumothorax	3	3.7%

Table 3: Complications of Needle Biopsy of Lung

Author	Year	No. of Patients	% of Pts with Results	Complications
Chadrasekhar et. Al.[10]	1976	4	75%	Nil
Sinner.[4]	1979	2726	90.7%	Pnuemothorax27.2% Hemoptysis 2.5%
Afschrift M. et. Al.[7]	1981	20	87.4%	Pnuemothorax 8%
Izumi et. al.[11]	1982	16	16%	Nil
Dorothycinti et. al.[12]	1983	12	12%	Pnuemothorax10%
Pan Chyr Yang.[13]	1985	25	84%	Pnuemothorax 8%
JonpeiIkezoe et. al.[5]	1989	124	90%	Pnuemothorax 4%
Ajay K. et. al.[14]	1991	57	80%	Pnuemothorax 4%
Chen et. al.[15]	1996	40	87.5%	Pnuemothorax 3.7%
Knudsen et. al.[3]	1996	268	93.2%	Pnuemothorax 3.7%
Present study	2014-15	81	94%	Pnuemothorax 3.7% Hemoptysis 2.4%

Table 4: Comparison of Present Study with Previous Studies

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