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Profile of Ultrasound Guided Core Biopsy in Peripheral Mass Lesions of the Lung.

Dr. P. Amarnath reddy[1], Dr. CH.R.N. Bhushana Rao[2], Hima Sanjana Perumalla[3], **Dr.**S.Lakshmi kumari[4], Dr. K. Rajendra kumar[5].
Dr. S. Lakshmi kumari (corresponding author)

Introduction:
Ultrasound guided biopsy of lung is useful to evaluate number of peripheral parenchymal mass lesions. It is a cost effective and safe technique, exhibits a number of advantages like absence of ionizing radiation, real-time assessment & portability as opposed to CT guided or surgical lung biopsy.
Materials & Methods: *After informed consent, 50 patients with peripheral mass like lesions with inconclusive diagnosis by routine tests were subjected to trucut gun biopsy using real time ultrasonography. The procedure includes BARD MAX trucut gun biopsy instrument, minor surgical equipment tray, ICD tray and emergency medications.*
RESULTS: *Of the 50 patients, 17 were females & 33 males, 96% have positive histopathology with Adenocarcinoma (36%) is the most common finding, followed by Squamous cell carcinoma (20%), rest are other malignancies & infectious etiology. 12% Complications include mild hemoptysis and Pneumothorax seen in 3 cases that warranted simple treatment.*
Conclusion: *Ultrasound guided core biopsy of lung is simple, very cost effective & safe procedure in diagnosing peripheral mass lesions and low complications rate with 18G size needle.*
Key words *Ultrasound, trucut gun biopsy, FNAC, malignancy, yield.*

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I. Introduction

Peripheral lung lesions are generally considered as lesions in the outer one-third of the lung, although exact definition not yet exist. A peripheral lung lesion is defined as a lesion that is not seen within the bronchial tree at fiber optic bronchoscopy [1]. These can range from nodules or masses or rounded atelectasis or non-resolving pneumonia or ground-glass opacities. An early and definitive diagnosis of these lesions is essential to prevent morbidity and mortality.

Among these peripheral lesions, Lung cancer is one of the commonest malignant neoplasms all over the world. Lung cancer accounts for more than a million cancer deaths worldwide as per WHO report [2], [3]. In a global scenario, it is the second most prevalent cancer after prostate cancer in men [4]. In India, the incidence of lung cancer is 5.9% of all the newly diagnosed cancer cases and 8.8% of the cancer-related mortality in both men and women. The incidence of lung cancer was 67,795 across all age groups of men and women as per GLOBOCAN 2018 report for India [4]. Lung cancer is the second most cancer in men and the fourth most common cause of cancer-related death after breast, oral cavity, and cervical cancers in both men and women.

When compared to developed countries where there is a declining trend, but in India, the incidence continues to rise for both males and females. In addition to smoking, environmental pollution, indoor air pollution, occupational exposure to carcinogens, and dietary factors have recently been associated with the causation of lung cancer. [5]

Lung cancer is the leading reported cancer in Andhra Pradesh followed by Stomach and cervical cancers. In metros, Delhi ranks the highest incidence of lung cancers, followed by Mumbai and Bangalore. [6]

A pathological review of 400 confirmed lung cancer cases by two teams, one from All India institute of medical sciences and one independent expert team, gave conflicting results with either adenocarcinoma or squamous cell carcinoma as predominant finding. Hence, accurate histopathological, immuno-histological, and molecular analysis is an essential step toward designing a personalized treatment regimen for lung cancer. [7], [8] This requires a consistent, reliable sample of sufficient yield that can be met by core needle biopsy.

The majority of patients present with advanced-stage(IIIB/IV) at the time of diagnosis and are managed non-surgically. Misdiagnosing, as tuberculosis and empirical treatment with anti-tubercular drugs before referral to higher centers are one of the critical causes of delayed diagnosis of this disease in India. [9]

Peripheral pulmonary lesions remain a diagnostic challenge. Sputum cytology and flexible bronchoscopy remain diagnostic modalities for central lesions. With Fiber Optic Bronchoscopy, we may not get a correct specimen, especially in peripherally located lesions.

Lung Ultrasound has a secondary role in diagnosing lung lesions as 99 % of ultrasound waves are attenuated by air due to high impedance. While computed tomography (CT) guided lung biopsy has been standard in histological diagnosis of pulmonary lesions, its use is limited to interventional radiologists only. Ultrasound (US) guided biopsy of pulmonary lesions, which can be performed in-clinic by the pulmonologists only, is becoming a more popular technique. It also has the advantages of real-time techniques, multi-planar imaging, and no radiation exposure to the patients. It is particularly suitable for persons who are more vulnerable to injury from radiation, such as pregnant women and children, and for ICU patients who cannot be moved. Evidence suggests that 40% of pulmonary malignancies appear as peripheral lung masses, and are easily accessible to the Ultrasound [10]. Despite these advantages, USG is rarely used in the study of lung lesions, and in most hospitals, the technique of choice is computed tomography (CT)-guided needle biopsy. In resource-limited settings, US-guided Biopsy is a boon in diagnosing various etiologies. With the development of automatic cutting needle biopsy instruments like TRUCUT GUN biopsy needles with the consistent size of a tissue sample is currently possible.

Aims & Objectives:

To evaluate the etiology, rate of complications from the procedure and to establish the safety and accuracy of peripheral lung lesions by Ultrasound Guided Trucut gun biopsy of the lung

II. Materials And Methods

The is a prospective study, comprises of 50 cases of peripheral lung lesions in chest X-ray, who attended to the Department of Pulmonary Medicine, Government Fever Hospital, Guntur Medical College, Guntur from JAN 2018 to JUNE 2019 are included in the study.

All cases selected were having non-resolving or homogenous or non-homogenous peripheral opacities in CXR were admitted and sent for routine investigations like haemogram, coagulation profile, USG, CT scan, sputum cytology, FNAC and gun Biopsy. Although it is not a comparative study, FNAC under USG guidance was also done along with BARD MAX GUN Biopsy needle 18G or 16G size used with ultrasound Machine (Toshiba) with 3.75 MHz Curvilinear Probe/Transducer used in all patients. Patients were placed in a comfortable position depending on the location of the lesion. Doppler scan was done to bypass the vessels from the biopsy path. Biopsy site was then disinfected with (2% chlorhexidine, 70% isopropyl alcohol) and local anesthesia (2% lidocaine hydrochloride injection) was given. After cleaning the area of skin a small nick with 11" blade given, then biopsy was performed using a trucut gun biopsy needle under ultrasound. The plunger of the instrument drawn in before penetration in to the lung tissue and withdrawn after reaching the correct distance from the core of the lesion and post procedure CXR taken. The biopsy sample was saved in a formalin jar and sent for histopathology.

To evaluate the Diagnostic yield, etiology, safety and accuracy and rate of complications of the procedure. Patients monitored and chest x ray done after 30 min of the procedure.

INCLUSION CRITERIA: Age group >18yrs – 75yrs, Peripheral lung lesions Size of 3 cm or >3 cm with or without abutting chest wall

EXCLUSION CRITERIA: Bleeding diathesis, Cardiovascular instability with Unstable angina, recent Myocardial infection or severe Hypotension. Intractable cough, Respiratory distress

III. Results

Of the 50 patients 52% patients are in the age group of 41-60 yrs. followed by 42% in 61-80%, least is below 40 yrs 6%. Males are 66% and females are 34%, M to F ratio is 2;1. BMI <18.5 are 3(6%) followed by 18.6 – 24.9 are 42(84%) and 25 – 29.9 are 5(10%), 60% are smokers and 40% are nonsmokers. 52% had alcoholic history 48% are non-alcoholics. Sputum cytology for 3 consecutive days shows only 2% positivity and 4% suspicious of malignancy rest all negative for malignancy. Radiologically most common site of lesions are in right upper lobe 44% followed by left upper lobe 36% and bilateral in 8% other 12% are in remaining lobes. Predominant lesion in chest X ray homogenous opacity in 90% followed by cannon ball appearance in 8% and reticulo nodular opacity in 2%.

Results Table: 1

Age in Yrs.	Percentage
<40	6%
41-60	42%
61-80	52%
Gender	
Males	66%
Females	34%
BMI	
<18.5	6%
18.6 – 24.9	84%
25.0 – 29.9	10%
Smoking	
Smokers	60%
Non Smokers	40%
Alcohol	
Alcoholic	52%
Non Alcoholic	48%
Site of lesion	
Rt Upper Lobe	44%
Lt Upper Lobe	36%
Bilateral	8%
other	12%
Lesion type	
Homogenous	90%
Cannon ball	8%
reticulonodular	2%

Table 2: Diagnostic Yield

Type	**Percent**
Malignant	
Adenocarcinoma	34%
Squamous cell carcinoma	18%
Epithelial malignancy	8%
Mucinous adenocarcinoma	6%
Small cell carcinoma	4%
Other malignancies	18%
Non malignant	
Tuberculosis	4%
Mucor mycosis	2%
Klebsiella Pneumonia	2%
Aspergillosis	2%

Table: 3 Complications:

Type	**Percent**
HEMOPTYSIS	6%
GIDDINESS	2%
NIL	88%
PNEUMOTHORAX	4%

IV. Discussion

Over the years, our understanding of lung cancer has evolved from Histological classification to Molecular classification. Identification of Newer Molecular targets and Driver mutations have led to newer interventions with tailored therapy for Individual patients. FNAC has a limitation with a low yield for further molecular studies. The transthoracic biopsy will overcome this limitation without the need for an open surgical lung biopsy. Gun biopsy has better yield Instead of manual TRUCUT lung biopsy and less manipulation of the patient.

This study shows that Ultrasound guided trucut gun biopsy performed in peripheral lung lesions of more than 3cm in diameter by a pulmonologist is safe and effective, with a rate of only 12% of mild complications like pneumothorax and mild hemoptysis 16G size needle and none with the 18 G size needle. Among 3(6%) patients who got mild pneumothorax one patient required intercostal drain tube other 2 patients required only oxygen therapy for 3 days. Sconfienza et al. suggested that fewer complications with US-guided biopsy as compared to CT-guided biopsy are attributed to real-time guidance which helps in accurate needle access and reduces the incidence of multiple punctures [11]. But most of the studies reported less than 7% complications compared to 12% in our study, this may be due to size of the needle and distance of the lesion chest wall.

USG is already widely used by pulmonologists as a bedside aid for placing chest tubes and performing pleural interventions in immobilized or ventilated patients [12]. In the dispute about the general relevance of USG for the pulmonologist, this report supports the growing body of evidence that USG is set to integrate with the pulmonologist's armamentarium in the future.

Most common age group is 41 to 60 years with male preponderance. 61.36% of patients are having smoking history, of which the majority are cigarette smokers than beedi smoker. The majority of smokers are males and adenocarcinoma is commonest histopathological finding. Kaur et al. and Singh et al study76% (13 , 14) study, 76% are smokers and adenocarcinoma is commonest histopathological finding which is comparable with our study. . They found that smoking-related histology has not changed much over three decades. The main reason attributed was that the majority of Indian smokers are Beedi smokers. The filtered Cigarette needs deep inhalation to get nicotine than the Beedi smokers hence more deposition in Periphery, leading to adenocarcinoma in cigarette smokers. [15]

Radiologically the most common lesion is homogenous opacity and abutting chest wall. Earlier studies of USG guided biopsy were done in lesions that are abutting the chest wall only. With the advancement of technology in Ultrasound machines, some of the lesions that are as far as 5cm from the chest wall are also visible nowadays. The majority of lesions are on the Right side (55%) in concurrence with other studies. Out of the 50 cases, 33 cases have lesions abutting the Pleura, and 12 cases have lesions less than 2cm from the pleura, 5 cases have 2-4 cm from pleura and the complications occurred the lesions more than 2 cm from the chest wall.

Out of 50 patients the diagnostic yield of USG guided Gun Biopsy in Peripheral lung lesions was 98%. Among these 88% were malignant, 10% were nonmalignant. Most of the studies have more than 90% yield. Among these malignant lesions Adenocarcinoma (34%) is more common than Squamous cell carcinoma (18%). Among the nonmalignant lesions Tuberculosis in 4% cases followed by Klebsiella, Mucor mycosis and Aspergillus in 2% of each. These benign lesions are better diagnosed by biopsy compared to FNAC and complications are seen in 12% cases (2 pneumothoraxes and 3 hemoptysis, 1 giddiness) with the 16 G needle and none with the 18G size needle. The yield is constant 3mm to 4mm, which is significant to sub-classify the type of malignancies using molecular studies. It is time saving procedure for both the patient and the clinician because procedure can be completed within 10 to 30 min. The technique and the equipment are simple can handled by a Pulmonologist alone as an outpatient procedure and relatively less expensive and absolutely no

radiation. No life threatening complications with lesser needle size (18G) without need for Surgical lung biopsy.

Many studies were done comparative FNAC and Biopsy in the past. In the diagnosis of Malignant lesions, FNAC and biopsy has similar efficacy, but diagnosing benign lesions are better in USG guided biopsy than FNAC and has similar efficacy for lesions that are ≥ 2cm and higher efficacy than CT, for lesions >4cm in some studies. [16,17] The mean procedure times were reasonably low for USG guided biopsies than CT guided ones with 15 min and 45 min, respectively. The high diagnostic yield in the current study can be attributed to the size of the lesions, as the majority are > 3cm. The one case where negative yield came as the patient is not cooperative during the study

V. Conclusion

Ultrasound Guided Transthoracic TRUCUT GUN biopsy in peripheral lung lesions near the chest wall is acceptable, simple, safe, quick, accurate and useful bed side test. The procedure is well tolerated with good yield with less morbidity and negligible mortality. Complications are minimal with 18G size needle than 16G size. Molecular studies and Benign lesions can be better diagnosed in biopsy compared to FNAC.

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