

Study of Safety and Efficacy of Ultrasound Guided Transthoracic Tru-Cut Biopsy of Lung Mass

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Abstract :

Introduction: Lung cancer is the most common cause of cancer-related death worldwide, responsible for over 1 million deaths annually. A lung biopsy is a procedure in which samples of lung tissue are removed to determine if lung disease or cancer is present. USG guided tru cut biopsy allows for a single pleural puncture and also contains enough cellular material for molecular analysis. **Methods:** A study was done in 75 patients whom peripheral lesion was found on chest x-ray PA view, and in whom USG guided tru cut biopsy was done. **Results:** The histopathological examination of biopsy revealed malignancy in 58 (77.33%) patients, benign tumor in 2(2.66%), granuloma formation in 13(17.33%). Negative biopsy was seen in 2(2.66) patients. Adenocarcinoma was found to be the commonest lung cancer in 28 patients (48.27%), followed by squamous cell carcinoma in 14(24.13%), small cell carcinoma in 10 (17.24%), and poorly differentiated carcinoma in 6 (10.34%) patients. 10(13.33%) patients developed complication after procedure. Biopsy was histologically deemed adequate in 96%.

Key Words : Lung mass, Transthoracic, Ultrasound

Introduction :

Lung cancer is the most common cause of cancer-related death in men and women worldwide, responsible for over 1 million deaths annually. The two main types are: ⁽¹⁾ Small cell lung carcinoma: About 12 out of every 100 lung cancers diagnosed are this type (12%). It is usually caused by smoking. These cancers tend to spread quite early on. ⁽²⁾ Non-small cell lung carcinoma: About 87 out of every 100 lung cancers (87%) are non-small cell lung cancer (NSCLC). ⁽¹⁾ A lung biopsy is a procedure in which samples of lung tissue are removed (with a special biopsy needle or during surgery) to determine if lung disease or cancer is present. ⁽²⁾

The definitive diagnosis of lung cancer is based on the examination of the suspicious tissue. USG guided tru cut biopsy allows for a single pleural puncture, so chance of pneumothorax is reduced, also tru cut needle biopsy

contains enough cellular material for molecular analysis. Sensitivity of this procedure is 90% for peripheral bronchogenic carcinoma. Efforts for early detection by usg guided biopsy have shown mortality reduction.

Types of lung biopsy

1. Percutaneous transthoracic lung biopsy

PTLB is performed with imaging guidance. Imaging modalities are fluoroscopy, computed tomography (CT), and ultrasound.

2. Bronchoscopic lung biopsy

Biopsy via a bronchoscope is useful for proximal endobronchial lesions but is unable to access more peripheral lesions.

3. Open lung biopsy and video assisted thoracoscopic surgery (VATS)

Although these surgical procedures are able to provide larger samples of tissue with improved accuracy and specificity, the morbidity and length of stay are greater than with the other two methods of biopsy. ⁽²⁾

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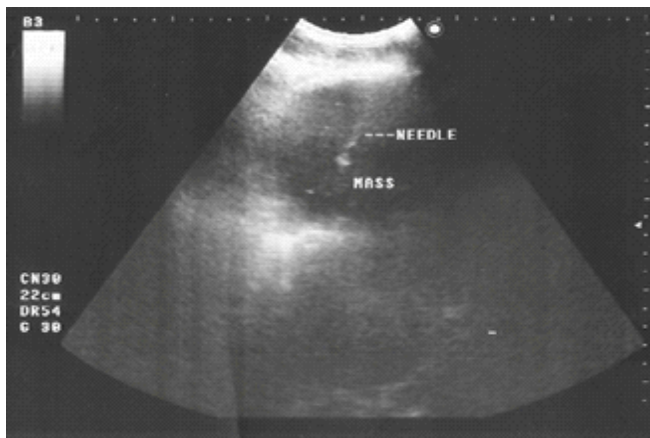
Objectives:

- To assess the efficacy of USG guided biopsy of mass lesion on chest x-ray pa view.
- To know safety of USG guided biopsy
- To know various complication due to USG guided biopsy

Methods:

This was a retrospective study done at The Department of Respiratory Medicine at tertiary care hospital at Maninagar for the duration of one year (May 2018 to May 2019). We enrolled 75 patients in whom peripheral lesion was found on chest x-ray PA view, and in whom USG guided tru cut biopsy was done. Patients` demographics data, previous medical and surgical illness history were taken from medical record section (indoor case record form, procedure book, Histopathology report book etc.).

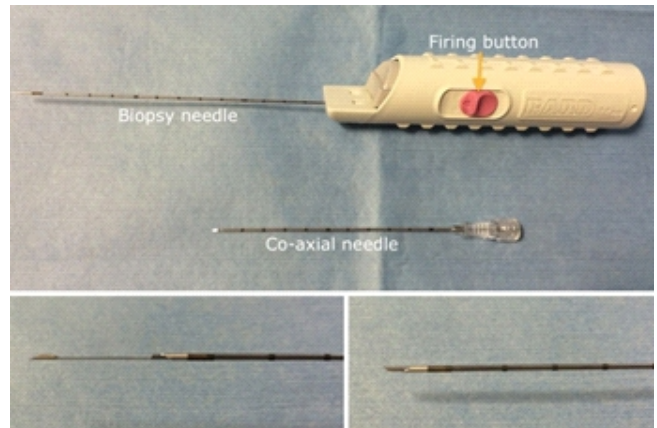
Figure 1: The procedure of ultrasound-guided core-needle biopsy



The procedure of ultrasound-guided core-needle biopsy was done in our department:

1. The affected region was scanned using USG with a 3.5-MHz convex probe parallel to the ribs in the intercostal spaces. Local anesthesia was used in every case using local subcutaneous injection of 10-20 ml xylocaine 2%. Patients were taught not to take shallow breaths and not to cough during procedure.
2. A spring-loaded 'Tru cut' biopsy needle was used to obtain a core of tissue. The needle (18G) was placed into the biopsy gun. The puncture was performed

Figure 2: A spring-loaded 'Tru cut' biopsy needle



using continuous visual control on the monitor. The needle was penetrated just to the nearest border of the lesion. The biopsy was performed by firing the gun.

3. The needle was removed and dressing with tincture iodine was applied at the puncture site.
4. The sample was placed in a tube containing Normal saline and then sent to the pathological department.⁽³⁾

Results:

Transthoracic biopsy was done in 75 patients. Mean age of patients was 53.2 ± 7 years. Age ranges from 35-75 years. Mean tumor size was 69.8 ± 25.3 mm.

The majority of 26 patients (34.66%) were in age group of 56-65 years followed by 25 patients (33.33%) in 46-55 years group, 15 patients (20%) in 35-45 age group and 9 patients (12%) in 66-75 age group. Of the 75 cases 52 (69.33%) were males and 23 (30.66%) were female.

On studying the histopathological examination of biopsy, malignancy seen in 58 (77.33%) patients, benign tumor in 2 (2.66%), granuloma formation seen in 13 (17.33%), and organizing pneumonia seen in 0 patients. Negative biopsy was seen in 2 (2.66%) patients, which was diagnosed further by bronchoscopy.

Amongst the malignancy cases, lung cancer was detected in 58 cases, Adenocarcinoma was found to be the commonest lung cancer in 28 patients (48.27%), followed by squamous cell carcinoma in 14 (24.13%), small cell carcinoma in 10 (17.24%), and poorly differentiated carcinoma in 6 (10.34%) patients.

Table 1: Age – Gender Wise Distribution

Age group (in years)	Female	Male	Total(%)
35-45	6	9	15(20)
46-55	7	18	20(33.33)
56-65	6	20	26(34.66)
66-75	4	5	9(12)

Table 2 : Results of Histo-pathological Examination

Histopathology	N= No of patients (%)
Malignancy	58(77.33)
Benign tumor	2(2.66)
Granuloma	13(17.33)
Organizing pneumonia	0(0)
Negative biopsy	2(2.66)

Table 3: Histo-pathological findings In Malignancy cases

Malignancy	No of patients (%) n=58
Adenocarcinoma	28(48.27)
Squamous cell carcinoma	14(24.13)
Small cell carcinoma	10(17.24)
Mesothelioma	6(10.34)

Table 4: Complications Occurred After Biopsy

Complication	Immediate complication n= 6 (%)	Late complication n= 4 (%)
Pneumothorax	2(2.66)	4(5.33)
Hemoptysis	3(4)	-
Subcutaneous emphysema	1(1.33)	-

In present study, 10 (13.33%) patients had developed complications after procedure.

Complications included:

1. Immediate complication: (Occur within 24 hour) Pneumothorax occurred in 2 patients (2.66%) in which one patients required tube thoracostomy, mild hemoptysis in 3 (4.00%), and subcutaneous emphysema in 1 (1.33%) patient.
2. Late complication: (Occur after 24 hour) Pneumothorax occurred in 4 (5.33%) patients, in which two patients required tube thoracostomy.

Biopsy was histologically deemed adequate in 96%, with overall efficacy of 96%, efficacy for malignancy was 77.33% and safety for procedure was 82.75%.

Discussion:

Transthoracic ultrasound (TUS) permits visualization of these lesions, their structural characterization, and with the aid of color Doppler, the internal echo texture of the lesion can be evaluated allowing precise targeting of central necrosis in large masses.⁽³⁾ Furthermore, USG allow percutaneous-guided biopsies with lower risks compared with the radiological guiding methods (as CT). USG have numerous advantages: accessibility (including bedside exams), real-time monitoring, lower costs, no radiation exposure, and shorter biopsy time. In addition, the biopsy route is selected to avoid puncturing aerated lung or great vessels; the tip of the needle and, occasionally, the needle shaft can be monitored throughout the procedure; the depth of penetration can be determined minimizing the risk of complications and improving safety.⁽⁴⁾ However, there are some limiting factors that prohibit sonographic evaluation of the chest, which are based on physical limitations of the USG beam.⁽⁵⁾

In present study, biopsy were histopathologically deemed adequate in 96%, overall yield 97% and yield for malignancy 90%, in study by Georgios Tsanknis 48 patients had USG guided biopsy of lung tumor, which shows that biopsy were adequately deemed in 97.9%, with overall yield 97.9%, and yield for malignancy 91.6%.⁽⁶⁾ Another study by Norio Yamamoto showed 93.4% yield for USG guided biopsy,⁽⁷⁾ a study done by Coskun Dogan shows that transthoracic lung biopsies

was diagnostic in 81.2 % from 150 patients. ⁽⁸⁾ In my study mean tumor size was 69.8 ± 25.3 mm, a study done by Dibajiyoti Bhattacharyya et al ⁽⁹⁾ mean tumor size was 71.2 ± 28.4 mm. In my study, 58 (77.33%) patients were diagnosed as carcinoma, in which Adenocarcinoma was found in 28 patients (48.27%), followed by squamous cell carcinoma in 14 (24.13%), small cell carcinoma in 10 (17.24%), and poorly differentiated carcinoma in 6 (10.34%) patients, a study done by Dibajiyoti Bhattacharyya et al ⁽⁹⁾ malignancy was diagnosed in 44 (77.7%) in which adenocarcinoma was found in 16(40%) followed by squamous cell carcinoma in 14(35%), small cell carcinoma in 7 (17.5%), and poorly differentiated carcinoma in 3 (7.5%). Adenocarcinoma was found most commonly in India.

Overall diagnostic accuracy was 93.7%, a study done by Wafaa S El-Shimy showed 90% accuracy with USG guided transthoracic biopsy. ⁽¹⁰⁾

In present study, only 13.33% patients had encountered complications. With 6 patients having pneumothorax, 3 patients had hemoptysis and 1 patient had subcutaneous emphysema. In study done by Georgios Tsankins (n=48) complications were minimal with one case of minor hemoptysis (2%), one case of subcutaneous emphysema (2%), no case of pneumothorax. ⁽⁶⁾ In study by Matthew H Lee significantly fewer complication were seen for US-guided biopsy 7% (10/150). ⁽¹¹⁾ It may be because USG guidance can avoid normal lung through visualization of the lesion with respiratory movement, as well as vessels through color Doppler imaging.

Conclusion:

USG guided transthoracic lung biopsy can be performed by trained pulmonologist with excellent yield and very low complication rate.

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