

FACTORS DETERMINING THE DIAGNOSTIC YIELD OF CT-GUIDED CORE NEEDLE BIOPSY OF LUNG NODULES

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ABSTRACT

OBJECTIVE: The purpose of the study is to identify the factors determining the diagnostic yield of CT guided core needle biopsy of lung nodules.

MATERIALS AND METHODS: This study was conducted on 46 patients (from January to October 2013), who underwent CT guided core needle biopsy in the department of Radiology. All the patients were referred from Pulmonology, Medicine, and Cardiothoracic units of Lady Reading Hospital Peshawar that is a 1400 bedded tertiary care hospital of the province.

RESULTS: Amongst 46 patients, final diagnoses were twenty-three malignant lesions and fifteen benign lesions. The size of the mass was a significant factor contributing to diagnostic yield. Greater the size of the mass, the higher was the chances of yield. Lesions with a size between 1-2 cm., the yield were 87.9%, for lesions with a size between 2.1-3 cm., the yield was 86.7%, and beyond 3 cm., the yield was 100%. Ten patients developed small pneumothorax after the procedure.

CONCLUSION: Lesion size was a determining factor in diagnostic yield of CT guided core needle biopsy. Diagnostic yield increases with the increase in the lesion's size.

KEY WORDS: Lung nodules, CT guided core needle biopsy

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INTRODUCTION

Transthoracic CT-guided percutaneous fine-needle biopsy has been a reliable means of differentiating benign and malignant pulmonary lesions. Success rates have been well documented, with diagnostic accuracy rates in excess of 93% and sensitivity rates in excess of 95%.^{1,2} Aside from pneumothorax (16.0%–44.6%), reported complications are uncommon for image-guided fine needle aspiration biopsy.³ Successful biopsy of lesions as small as 3 mm in diameter has been reported.⁴

As imaging techniques and technology advance our ability to detect smaller lesions, our definition of small pulmonary nodules continues to change. This results in increased demand for sampling lesions 1.0 cm or smaller. These lesions are usually difficult to detect with fluoroscopy and typically require computed tomography (CT) to guide any biopsy attempt. On rare occasions, pleural-based lesions can be identified and biopsy performed with ultrasonographic guidance.⁵ Investigators in several studies have reported a decline in the accuracy of percutaneous biopsy to less than 75% for lesions 1.0 cm or smaller.⁶ Newer techniques

with respiratory gating and CT fluoroscopy have been used to improve success rates.⁷ This study is intended to identify the factors determining the diagnostic yield of such lesions in the department of Radiology of Lady Reading Hospital Peshawar with special emphasis over the size of lesion whether benign or malignant.

MATERIAL & METHODS

Forty-six CT guided core needle biopsies were performed in patients referred from Pulmonology, Medical and Cardiothoracic units of Lady Reading Hospital Peshawar from January to October 2013.

Toshiba Astion CT scanner scanned all the lesions and measurements were taken with the help of pulmonary windows. Depth of the lesion from the nearest skin surface was also measured. All biopsies were performed by consultant radiologists assisted by senior resident or another radiologist. The patient was placed in such a position to allow penetration of the lesion from the position closest to the skin surface. Laser lights were used for localization of lesions on the skin surface. All biopsies were done using 18 gauge core needle biopsy systems. The position of the needle tip

Table 1: (Age-wise distribution of participants in the study)

S. No	Ages (in years)	Number of participants	Percentage
1	28-45	6	13
2	46-65	25	54
3	66-83	15	33
Total		46	100

Table 2: (size of lesion and accuracy rate in the CT guided core needle biopsy)

Size of lesion	Success group	Failure group	Yield rate
1-2 cm	15	4	78.9 %
2.1-3 cm	13	2	86.7%
3.1-5 cm	5	0	100 %
5.1-7 cm	2	0	100 %

in the lesion was checked again on CT. All 46 biopsies were sent for histological examination. Upright postero-anterior expiratory chest radiographs were obtained immediately after biopsy in all patients.

RESULTS

The study included 28 men and 18 women. Mean age was 66 years (Ranging from 28-83 years and SD+_{8.3}). More than 50% of patients were in the age range of 46-65 years (Table-1). Regarding the size of lesions on CT scan, there were 7 lesions of 1-2 cm, 15 lesions 2.1-3cm, 17 lesions of 3.1-5cm, 07 lesions of 5.1-7cm. Final diagnoses were twenty-three malignant lesions and fifteen benign lesions. The size of the mass was a significant factor contributing to diagnostic yield. Greater the size of the mass, the higher was the chances of yield. Lesions with a size between 1-2 cm., the yield were 87.9%, for lesions with a size between 2.1-3 cm., the yield was 86.7%, and beyond 3 cm., the yield was 100% (Table-2). Post biopsy small pneumothorax occurred in 10 cases (22%) and post biopsy hemoptysis occurred in 01 case (2.2 %).

DISCUSSION

Computed Tomography is better than plan X-ray for detecting small pulmonary nodules. Once a nodule is detected the most important is to determine whether the lesion is malignant or benign. In this regards CT guided core needle biopsy is the best modality for conforming the diagnosis of pulmonary nodules. There are various factors determining the diagnostic yield of CT guided core needle biopsies of the lung nodules whether these are benign or malignant. In this study, nodule size was significant criteria (factor) for diagnostic yield in CT guided core needle biopsy of the lung. Diagnostic yield is increased with an increase in size⁸. In a series of CT guided aspiration biopsies, Van Son-

nesberg reported diagnostic yield of 90% for lesion 3-4cm in size, 89.3% for lesion 2.1-3cm in size, 83.9% for lesions 1.1-2cm in size and 73.9% for lesion 0.3-1cm in diameter recognizing a decrease in diagnostic accuracy with decrease in size.⁹

Kazirooni reported that the presence of pneumothorax before the biopsy decreases diagnostic yield. It is due to the fact that pneumothorax with partial lung collapse displaces the lesion from the point of initial localization.¹⁰

Pulmonary lesion changes position with respiration. Thus patient's cooperation is very crucial for core needle biopsy. Minimal movement or unstable respiration during biopsy causes the initial localization of the lesion inaccurate. If the lesion is under a rib, then patient cooperation is very important as reported by Moore.¹¹

The experience of the physician performing the procedure must also be included when success rates are compared. Similarly, sub-pleural pulmonary nodules are often more challenging than deeper lesions. In the literature, factors discussed in relation to increased risk of pneumothorax include smaller lesion size, increasing lesion depth, number of passes, pleural surfaces crossed, and underlying lung disease.¹² Rizo et al. described a higher incidence of pneumothorax in smaller and deeper lesions on which biopsies were performed in 121 procedures, with a mean lesion diameter of 1.7 cm.¹³ Our study revealed pneumothorax in 22% of cases, and are possibly the result of these factors described.

CONCLUSION

The most important factors in predicting the diagnostic yield in pulmonary nodules are tumor size, pre-existing pneumothorax, preprocedural pulmonary

function tests and location of lesions. Our study is a small one but the first of its kind in the country to identify the factors, which will predict the success of the procedure. Similar studies are needed in other centers to increase the reliability of this procedure and identify some other yet unknown factors predicting the diagnostic yield of pulmonary lesions.

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