PERCUTANEOUS CT GUIDED CUTTING NEEDLE BIOPSY OF LUNG LESIONS

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ABSTRACT

Objective: *To evaluate the diagnostic yield of CT guided percutaneous cutting needle biopsy (CNB) of lung lesions.*

Material and Methods: *Our study was a descriptive study including 63 patients who underwent CT guided percutaneous core needle (cutting needle) biopsy of lung lesions. Of the total sampling, only 53 cases were followed up. Samples taken were preserved in formalin bottle and sent for histopathology. CT scan at the level of the biopsy was taken immediately after the procedure when patient was still on CT table. X-ray chest in erect position was taken after 04 hours to look for development of pneumothorax. Hemoptysis and pneumothorax were recorded. Other complications were also noted.*

Results: *Out of these 53 cases, histopathology showed 32 (60.4%) cases to be malignant, 17 (32.1%) cases benign and 4 (7.5%) cases being non-representative. The histological diagnostic yield (number of correct diagnosis obtained at CNB/number of definitive diagnosis) of this procedure was found to be 92.45% (49/53). Pneumothorax occurred in 1 out 53 (1.9%) and hemoptysis in 4 of 53 (7.45%). There was no major complication like hemodynamic instability or death.*

Conclusion: *CT guided percutaneous CNB of the lung lesions is an accurate procedure for a specific histological diagnosis and has a low rate of complications.*

Key words: *CT , Percutaneous Biopsy, Lung Lesion, Pneumothorax, Hemoptysis.*

INTRODUCTION

Percutaneous imaging guided thoracic biopsy has become a common procedure. Biopsy includes fine needle aspiration biopsy (FNAB) and core needle biopsy (CNB). FNAB provides aspirates for cytological analysis, whereas CNB provides cores for histopathologic analysis. FNAB usually requires an on-site cytopathologist to evaluate the adequacy of the aspirates. The role of FNAB is predominantly to separate clearly benign from clearly malignant processes. A negative result for malignancy without a specific diagnosis of a benign lesion does not exclude the possibility of malignancy. The specific diagnosis of benign lesion or metastatic malignant lesion usually requires histologic specimens, which are inconsistently obtained via aspiration needles.

CNB with large needles usually provides cores of good quality that allow tumor architecture evaluation, numerous immuno-histochemical staining, and the performance of molecular biology in some circumstances. A coaxial biopsy system allows a multi sampling procedure. Easy-to-use coaxial automated CNB systems are now available. A cannula is first inserted through the skin and towards the lesion with a single pleural passage, and then the CNB system is passed through the cannula. The cannula remains in position during the sampling procedure, thus decreasing the potential risk of complications. When the direction of cannula is slightly modified, multiple representative samples can be obtained in different portions of the lesions. CT Guided Transthoracic needle biopsy of pulmonary lesions is an accurate, safe and sensitive procedure often obviating surgical diagnosis. This is traditionally performed as an out patient procedure. CT guided lung biopsy using small caliber (18-20 Gauge) coaxial automated cutting needle technique was found to have high diagnostic yield for both malignant (8895%) and benign diseases (71-97%)[1,2] as

HISTOLOGICAL DIAGNOSIS BASED ON CT-GUIDED TRANSTHORACIC COAXIAL CUTTING NEEDLE BIOPSIES

Histological Diagnosis	Frequency (n=53)	Percentage
MALIGNANT	**32**	**60.4**
Squamous cell carcinoma	13	24.5
Small cell carcinoma	5	9.4
Bronchogenic adenocarcinoma	4	7.5
Broncho alveolar cell carcinoma	3	5.7
Metastatic adenocarcinoma	3	5.7
Fibro histiocytic malignancy	1	1.9
Lymphoma	1	1.9
Large cell bronchogenic carcinoma	1	1.9
Poorly differentiated carcinoma	1	1.9
BENIGN	**17**	**32.1**
Non specific inflammation	5	9.4
Chronic caseating granulomatous inflammation	3	5.7
Chronic granulomatous inflammation	3	5.7
Anthracosis	2	3.8
Fibrosing alveolitis	1	1.9
Benign fibrous tumor	1	1.9
Histiocytosis	1	1.9
Paraganglioma	1	1.9
INADEQUATE/NORMAL LUNG TISSUE	**4**	**7.5**

Table 1

compared to the percutaneous fine needle aspiration biopsy (FNAB) which has a diagnostic yield up to 83% for malignant lesions and lower than 50% for benign lung lesions.[3] Cutting needle lung biopsy has an extra advantage over FNAB in that the prior one can be used as a stand alone procedure without the need for onsite cytopathologist. However chances of complications like hemoptysis and pneumothorax are more when lung biopsy is performed using cutting needle than with FNAB. Hemoptysis rate is 4-10% in cutting needle lung biopsies as compared to 2.45% using fine needle biopsy technique.[2,4] Bleeding complications are the most common cause of death in lung needle biopsies.[5] The aim of this study was to evaluate the diagnostic yield of CT guided percutaneous cutting needle biopsy (CNB) of lung lesions.

MATERIAL AND METHODS

This study was conducted at Department of Radiology Lady Reading Hospital Peshawar, where CT guided transthoracic needle biopsy is performed routinely using coaxial cutting needle technique. CT guided transthoracic lung biopsies were performed from August 2004 to June 2005. Intra pulmonary lesion was defined as a lung lesion surrounded by aerated lung or lung lesion whose epicenter was within the lung, with its edges abutted to, but not invading the visceral pleural surface. All these patients had normal platelet count, Prothrombin time, activated partial thromboplastin time and with no evidence of bleeding tendency. Before the procedure, informed consent was obtained in each case. Every CT guided biopsy was performed by a Radiologist accompanied by one Resident and two Radiographers. Only Dr. J Fine Core Disposable Semi-automatic 18-Gauge biopsy needles were used. No sedation was used during biopsy procedure. Biopsies were performed either in supine or prone position according to the location of lesions. A biopsy needle pathway was selected to avoid fissures, bullae and visible vessels. The needle was directed away from the heart and great vessels. A small incision was made after local anesthesia was given. The needle was then introduced and pleura was punctured. Localization CT was performed to successfully penetrate the needle into the lesion. Once the needle was in the lesion, a 2cm long tissue core was obtained by firing the spring-loaded cutting needle (figure). Four samples were taken in each case. (Figure. Biopsy from left hilar mass of 18 years old patient). Specimens were preserved in 10% formalin solution and sent for histological

COMPLICATIONS OF CT-GUIDED TRANSTHORACIC COAXIAL CUTTING NEEDLE BIOPSIES

Complications	Frequency n = 53	%age
Hemoptysis	4	7.54
Pneumothorax	1	1.9
Total	5	9.43

Table 2

diagnosis. Post-biopsy CT centered around the biopsy site was then performed to look for pneumothorax. Patient was also observed for hemoptysis, chest tightness, shortness of breath and chest pain during and after the biopsy. Any associated hemodynamic instability was recorded. All patients were placed in a puncture side down position and transferred to a holding unit. X-ray chest in erect position was done 04 hours after the procedure to look for pneumothorax. If no pneumothorax was present, patient was sent home with instructions to report to nearest hospital if breathlessness, chest tightness or pain is felt and to report to the X-ray department of our hospital as soon as possible. All these patients were referred from pulmonology department.

RESULTS

Our study included 63 patients who underwent CT guided percutaneous core needle (cutting needle) biopsy of lung lesions. Of the total sampling, only 53 cases, where clinical outcome was known, were finally included for analysis.

A CNB specimen was considered adequate when histopathology made a specific malignant or an unequivocal specific benign diagnosis. A CNB specimen was considered inadequate when histopathology could not make a specific diagnosis. The histologic finding of an adequate CNB specimen was taken as the true nature of the lesion. Nevertheless, CNB findings of specific benign non-neoplastic conditions were correlated with response to relevant therapy, or findings at the 12 month clinical follow-up. The "true nature" of the lesion that was taken as the criterion standard for evaluation of the diagnostic yield of CNB was therefore established according to the histologic finding of typical features of a benign or malignant tumor in the CNB specimen, or according to surgical findings, response to relevant therapy, or findings at 12 month clinical follow up for lesions with a histologic findings of a benign non-neoplastic condition.

Patients in the false-negative group included those in whom the histologic finding of the CNB specimen was a specific benign non-neoplastic condition and subsequent surgery or follow up did not support that finding.

(Figure. Biopsy from left hilar mass of 18 years old patient).

Our study included patients from both sexes i.e. 26 male (49%) and 27 female (51%) patients, with age ranging from 60-80 years. In this study, biopsy needle traversed the aerated part of lung in 14 of 53 cases (26.4%). In 39 of 53 (73.6%) cases, the lung lesions abutted the pleural surface and CT did not reveal any pleural involvement. CNB specimens were considered adequate for specific diagnosis by the histopathology staff in 92.45% (49/53) of lesions. Diagnostic yield was 92.45% (49/53 lesions) i.e. number of correct diagnoses obtained at CNB. Thirty two of 53 (60.4%) cases were reported malignant, 17 (32.1%) were benign. CNB specimens considered inadequate for a specific diagnosis by the histopathology staff occurred in 7.5% (4/53) of lesions. No false negative results occurred when CNB was considered adequate for specific diagnosis. No evaluation of possible false-positive biopsy results was performed because the true nature of the lesion, which was taken as the criterion for evaluation of the diagnostic yield of CNB, was established according to the histological findings of typical features of a benign or malignant tumor in cutting needle biopsy specimen. The detail of histological diagnoses is shown in Table 1. Pneumothorax occurred in 1 of 53(1.9%) patients which was detected by CT (table 2). Patients did not develop shortness of breath. No chest intubation was needed. Hemoptysis occurred in 4 of 53 (7.45%) cases. However no hemodynamic instability occurred. There was no need of blood transfusion, oxygen or suction.

DISCUSSION

Percutaneous thoracic biopsy includes both fine needle aspiration biopsy and core needle biopsy. FNAB provides aspirates for cytologic analysis. It usually requires an on-site

cytopathologist to evaluate the adequacy of aspirates. Moreover, a negative result for malignancy without a specific diagnosis of benign lesion does not exclude the possibility of malignancy. The specific diagnosis of benign lesions usually requires histologic specimens.

In a study by Loubeyre P et al, core needle biopsies of thoracic lesions were done in 75 cases using 18 gauge needle. The diagnostic yield was found to be 97%, hemoptysis 1%, pneumothorax 19%.[6]

In another study, core needle biopsies were found to be more diagnostic than fine needle aspiration biopsies (93% versus 78%) with no difference in frequency of pneumothorax between these two procedures.[7]

In a study by Mullan CP et al CT guided coaxial and non-coaxial fine needle aspiration biopsies were performed in 36 and 17 patients respectively. Provisional cytological diagnosis was recorded in 74% cases[3], frequency of pneumothorax while using coaxial and non-coaxial fine needles was 17% and 24% respectively.

In a study by Wallace MJ et al, the diagnostic yield of CT guided fine needle aspiration biopsy of lung lesions was 77%,[8] which is less than the diagnostic yield for coaxial transthoracic cutting needle biopsy (88 to 97%).[6,9] In a study by Li H et al the diagnostic accuracy of CT-guided percutaneous needle aspiration biopsy of large pulmonary nodules was 96% and for small nodules was 74%.[10]

In our study of 53 cases, the diagnostic yield of CT guided CNB was 92.45%, with low frequency of hemoptysis (7.54%) and pneumothorax (1.9%).

Our hemoptysis rate of 7.54% is slightly higher than the reported rates of 01 to 04%.[6,11,12] This may be due to less experience of the operator and 4 samples.

Pneumothorax rate ranges from 9% to 23%[6,11-14] and chest tube insertion rate 3%. Pneumothorax in our cases is less because large number of cases with lung lesions were abutting the pleural surface.

In our study 60.4% cases were diagnosed as malignant and 32.1% as benign cases on histopathology while inadequate results were seen in 7.5% cases. Wallace MJ et al[8] in their study on pulmonary lesions of 1.0 cm or smaller found malignancy or suspected malignancy in 52%, benign or atypical findings in 25% and nondiagnostic findings in 23%. A study from Jinnah Postgraduate Medical Center, Karachi showed 94% primary malignant lesions, 6% metastatic malignant lesions and 8% benign lesions on CT-guided percutaneous transthoracic needle lung biopsy.[15]

CONCLUSION

It is concluded that CT guided CNB has a high diagnostic yield for both malignant and benign lung lesions with no remarkable increase in frequency of complications and so this procedure may be practiced as an initial method for lung biopsies.

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