

CT-Guided Percutaneous Fine Needle Aspiration Cytology of Pulmonary Mass.

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ABSTRACT

Introduction: Following the first study of Computed tomography guided trans thoracic biopsy of lung lesion by Haaga and Alfidi in 1976, CT guided transthoracic biopsy has been widely used for confirming the diagnosis of suspicious lung lesions. This study is aimed to assess the effectiveness of Transthoracic percutaneous fine needle aspiration cytology and frequency of associated complications.

Methods: A retrospective, hospital based study was performed between 11/06/2008 and 1/12/2009 at Department of Radiology, Shree Birendra Hospital, Kathmandu, Nepal. Thirty nine consecutive cases of lung lesions who underwent Trans Thoracic Percutaneous Fine Needle Aspiration Cytology (TTFNAC) under CT guidance were analysed. Smears of the aspirated material were evaluated by the pathology consultant (cytopathological evaluation) for adequacy

Results: There was adequate material for a cytopathological diagnosis in thirty four (87.18 %) cases. Two cases were hemorrhagic while three cases revealed only reactive cells thus inadequate and non representative case constituted (12.8 %). Eight cases were reported as benign (23.53 %). Twenty three samples (67.65%) were reported as definite malignant cases and three cases (8.82%) showed atypical cells, suggestive of malignancy. Squamous cell carcinoma was the single most frequent histological diagnosis (12 cases).

Conclusions: The FNAC of lung is useful, safe and economical technique providing 87% diagnostic accuracy for lung mass without significant increase in complications.

Keywords: cytology, CT guided, fine needle aspiration cytology, lung mass.

INTRODUCTION

Both neoplastic (benign and malignant) and non-neoplastic lung parenchymal lesions are common pathological lung findings. There are many diagnostic tools and tests available including the simple sputum examination to broncho-alveolar lavage and endoscopic bronchial biopsies. Ultrasound guided, fluroscopy guided, MRI guided and open lung biopsies remain the other invasive options available.

The first aspiration biopsy (puncture of lung) was performed by Leyden, for the diagnosis of pneumonia in 1883¹. Dahlgren and Nordenstorm² published a study concluding 87% diagnostic accuracy in 1966 following which, trans-thoracic FNAC gained wider acceptance. Haaga and Alfidi reported the first Computed Tomography (CT)-guided lung biopsy in 1976³.

CT-guided percutaneous fine-needle aspiration cytology (FNAC) of suspicious lung lesions is a widely accepted diagnostic method with relatively low cost and negligible mortality and limited morbidity. FNAC is helpful in

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confirming the diagnosis (benign or malignant nature) which would help the clinicians in deciding the therapeutic management⁴.

Objective of this study was to determine the accuracy and complications of CT-guided FNAC at our center and evaluate the pathological spectrum of the lung nodules/masses. Chest pain at FNAC site, haemorrhage, haemoptysis and pneumothorax are some of the common complications associated with trans-thoracic FNAC of the lung nodule. The more serious complications include pericardial tamponade, systemic air embolism and seeding of malignant cells in the needle tract.

METHODS

Case records of thirty nine patients with lung lesions on plain CXR and CECT chest who underwent CT guided FNAC of thoracic lesions between 11/06/2008 and 1/12/2009 was reviewed after seeking institutional consent. Pre procedure investigations and informed consent was obtained as per the institution protocol.

All patients underwent prior CECT of the chest to characterize the lung lesion. Patients with severe COPD who could not hold breath for a long time, patients having bleeding disorders and patients with contralateral pneumonectomy were excluded from the study. A fine spinal needle (23 gauge chiba needle) was used for the FNAC. If the specimen sample obtained during the FNAC was inadequate for cytology, the procedure was repeated. If that provided a negative yield, the patient was referred for more invasive procedures such as tru cut biopsy and open biopsy thoracotomy.

Diagnostic accuracy was measured on basis of adequacy of sample for definite cytopathological diagnosis. Safety was measured in terms of complication rates. Feasibility in terms of the duration of post procedure hospital stay and total attempts required. We assumed age, sex and presence of emphysema as patient related variables. Size, depth of the lesion and location as the tumour related variables.

The procedure was conducted in the Radiology department at Shree Birendra Hospital. CT scan was performed to localize the lesion and skin entry point was marked with skin marker. Lidocaine (2%) was used as local anesthesia and the same needle was left in place for reference as a single axial scan was obtained for tumour localization. A spinal needle (23 gauge Chiba needle) was used for the procedure. Needle tip position was confirmed with additional limited CT scans before the sample for cytology was obtained. A syringe (10 ml) was attached to the needle's hub and the plunger pulled back to provide continuous suction. The needle point within the lesion was jiggled to free material from the lesion into the needle's

lumen. Aspirates were obtained and smeared on slides, fixed in 95 % alcohol before being sent to the pathology department for cytological evaluation along with relevant history and radiological findings.

A limited CT scan was performed immediately at the site of the FNAC to exclude pneumothorax and other FNAC related complications. The patients who developed pneumothorax, were kept under strict observation to monitor further deterioration. A repeat chest radiograph was performed next morning to assess progression of disease.

RESULTS

Thirty-nine cases were included in the study. Out of these, twenty four patients (61.54%), were male and fifteen (38.46 %) were female in the age group 25-82 years. Out of thirty-nine patients, twenty eight were smokers or had smoked in the past (71.79%).

Diagnostic accuracy was calculated based on the final cytopathological report. There was adequate material in thirty four (87.18 %) cases while five cases (12.82%) represented inadequate and non representative material (Two cases were hemorrhagic while three cases revealed only reactive cells).

Out of the thirty four patients where a final diagnosis was available, eight cases were reported as benign (23.53 %), twenty three samples were reported as definite malignant cases (67.65 %) and three cases showed atypical cells (8.82%), suggestive of malignancy. The spectrum of the final diagnosis of all the patients is given below in table 1.

Of the twenty three cases of confirmed malignancies, twelve were squamous cell carcinoma, three were small cell anaplastic carcinoma, three were metastatic lesions , two were adenocarcinoma, one was bronchioalveolar carcinoma , one was lymphoma and one was thymoma.

Out of the eight benign cases, four cases were reported as tuberculosis, two cases as benign adenoma and two cases as non tubercular infection. Six (17.65 %) of the patients were under 40 yrs and none had malignancy in cytodagnosis.

Pneumothorax was the commonest complication following the TTFNAC. Minimal pneumothorax was noted in four cases (10.26%) but none required active management (placement of chest tube). Pain at the puncture site was observed with two patients (5.13 %) requiring oral NSAID and reassurance. Two patients (5.13%) experienced minimal hemoptysis immediately following the procedure (both patients had also developed pneumothorax). A total of six patients who underwent CT guided FNAC developed complications (15.38%)

Table 1.Spectrum of final diagnosis(39 cases)

Cytopathologica diagnosis	Number of cases
Malignant(n=26)	
Squamous cell carcinoma	12
Small cell anaplastic cancer	3
Metastases	3
Adenocarcinoma	2
Bronchoalveolar carcinoma	1
Lymphoma	1
Thymoma	1
Non specific malignancy	3
Beningn (n=8)	
Benign adenoma	2
Tuberculosis	4
Non tubercular infection	2
Inadequate sample (n=5)	
Haemorrhagic tissue	2
Only reactive tissue	3

Table 2.Summary of results of reported series.

References	No. of Cases	Diagnostic Accuracy	Pneumothorax	Haemorrhage
Stanley et al 1987 ⁹	458	96.6%	133(29%)	-
Vansonnenberg et al 1988 ⁵	150	82.7%	64(42.7%)	2
Haramati et al 1995 ¹⁰	32	81%	3(9.4%)	-
Santambrogio et al 1997 ⁴	110	81%	23(20.9%)	-
Gouliamos et al 2000 ¹¹	64	98.4%	2(3.1%)	1
Mohammad et al 2001 ¹²	184	97%	2(1.1%)	-
Gupta et al 2002 ¹³	37	91%	1(2.7%)	1
Sing et al 2004 ¹⁴	34	85.3%	4(11.8%)	4
Present study	39	87.18%	4(10.26%)	-

Fig 1.CT Procedure

a. Localization of needle tip within the lesion

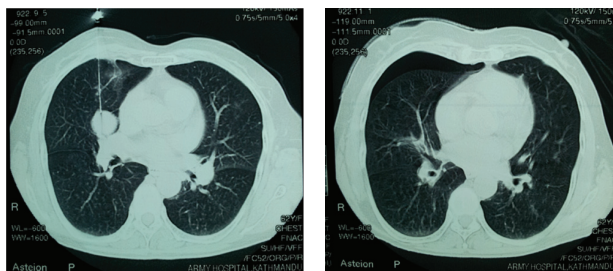


Figure 2. Malignant tumors

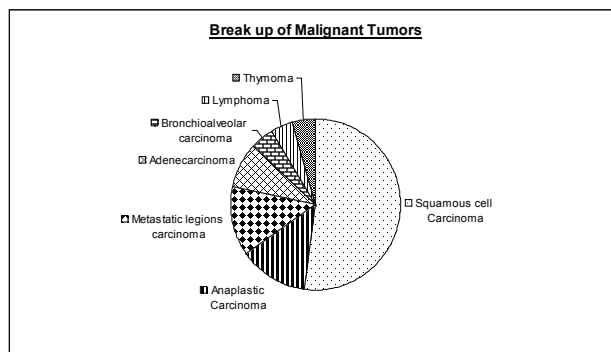


Figure 3. Benign cases

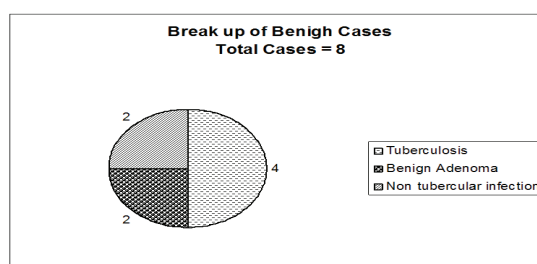
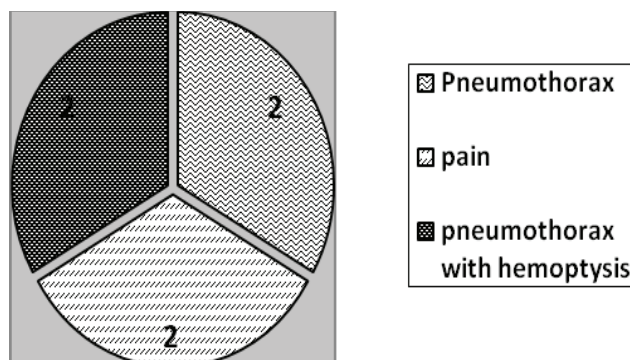


Figure 4. Complications



DISCUSSION

CT guided Percutaneous Transthoracic Fine Needle Lung Biopsy offers the opportunity to visualize the tip of the spinal needle within the lung lesion and perform immediate limited CT scan to prohibit immediate complication. FNAC performed under ultrasound guidance or fluoroscopy lack both these advantages.

Literature reports diagnostic accuracy (adequate yield for cytopathological diagnosis) ranging from 65% to 97% for CT guided percutaneous FNAC of lung nodules. A positive cytodagnosis (diagnostic yield of FNAC) was made in 87.18 % in our study. (3-10)

Vansonnenberg et al⁵ in 1988 performed Computed tomography (CT) was used to guide percutaneous fine-needle biopsy in 150 cases of difficult thoracic lesions. A diagnosis was made in 124 of 150 cases (82.7%) (107 of 124 malignant and 17 of 26 benign lesions). Complications included pneumothorax (64 cases), hemoptysis (5 cases), hemothorax (2 cases), and pericarditis (1 case). As compared to this study our diagnostic yield was comparable with much less complications.

In a study done by Manhire et al⁶ in 2003 using trucut biopsy for lung lesions, a diagnostic yield (cytopathological diagnosis) of about 92 % and high complication rate (pneumothorax of about 62 %) was reported. The study demonstrates diagnostic yield of trucut biopsy sample at 90%. The article reports a wide variation in reported diagnostic accuracies of FNAB between different institutions, ranging from 64% to 97%.

In another study using trucut biopsy for lung lesions by Morgenroth et al⁷ in 1988 reported a diagnostic yield of 89% for accurate cytopathological diagnosis. This study reported a complication rate of 15% and cited a complication rate of 10% to 60% from other studies. Şerife et al⁸ in 2010 reports a cytopathological yield of trucut biopsy of lung lesions of more than 95% and a complication rate of more than 25%.

We conclude that Transthoracic fine needle aspiration cytology (FNAC) of lung lesion using CT guidance is a relatively safe and accurate means of diagnosing benign and malignant lesions of the chest with negligible mortality and limited morbidity. All the patients tolerated the procedure well. The most common complication following procedure was pneumothorax. Pneumothorax occurred in 4 (10.26%) cases and haemoptysis in two cases (5.13 %) case. In all 4 cases, the pneumothorax was noted within 10 minutes of the procedure and it was mild in amount. 2 patient complaint of pain at site of puncture lasting 4-8 hours, however no medication was needed. These patients were kept under strict observation for any deterioration. A chest radiograph was done after 4 hours and it was observed that the amount of pneumothorax was mild to moderate (<1/3rd of chest) in all the case. None of these patients required chest tube insertion. No evidence of intra-parenchymal haematoma was noted. The more serious complications such as pericardial tamponade, systemic air embolism and seeding of malignant cells in the needle tract were not encountered in our study.

The results of the diagnostic accuracy and complication of CT-guide aspiration cytology are comparable to other published studies Table 2.

CONCLUSIONS

Transthoracic Fine Needle Aspiration Cytology is a relatively safe, convenient, quick and economical procedure. We conclude that FNAC of lung lesion provides a high yield resulting in good diagnostic accuracy.

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