ORIGINAL RESEARCH

Transthoracic needle aspiration biopsy of benign and malignant lung lesions

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ABSTRACT

Background: The purpose of the present study is to evaluate the accuracy of TNAB for the diagnosis of benign and malignant lung lesions.

Methods: The present study included 50 patients from June 2020 to June 2021. Our retrograde study on CT- guided or ultrasound guided lung biopsy on tertiary care center of Bihar Indira Gandhi Institute of Medical Science.

Results: Out of malignant lesions, most were adenocarcinoma 71.87% followed by squamous cell carcinoma 15.63%, poorly differentiated carcinoma 9.38% and non-hodgkins lymphoma 3.12%. In the benign lesions, most of the cases were non-specific inflammatory lesion 44.45% followed by granulomatous lesion 27.78%, A-V malformation 11.12%, neurofibroma 5.55%, spindle cell lesion 5.55% and necrosis 5.55%.

Conclusion: The ability to diagnose only malignant lesions by TNAB would markedly limit the efficacy of that technique, since surgery would be performed on most malignant lesions diagnosed by TNAB as well as on the lesions not diagnosed by TNAB.

Keywords: lung biopsy, transthoracic needle biopsy, benign, malignant

INTRODUCTION

Transthoracic needle aspiration (TTNA) of lung lesions has been a valuable diagnostic tool since it was first described in 1965.[1] Integral to the evolution of the technique has been the type of image guidance used to direct the biopsy tool to the area of abnormality. As imaging technology has advanced, so has the type of guidance used: plain radiograph and fluoroscopy giving way to computed tomography (CT), ultrasound (US) guided procedures[2,3] and CT guided electromagnetic navigational-TTNA (E-TTNA).

CT-guided transthoracic needle biopsy is a safe technology that is easy to operate, with a diagnostic accuracy for pulmonary lesions that reaches 64–97%.[4-7]Therefore, this procedure has become one of the major methods for determining the nature of pulmonary lesions. The previous studies stated that 20- to 22-gauge needles were commonly used for transthoracic needle biopsy because of their good diagnostic yield and low complication rate.[8-10]

Transcutaneous needle aspiration biopsy is a reliable technique for obtaining cellular material from solitary pulmonary nodules.[11]The diagnostic accuracy of PTNBs has been reported to be high; the overall sensitivity and specificity of conventional CT-guided PTNBs was 90% and 95%, respectively.[12]Khouri et al. conducted study and focused on the performance of TTNA as a tool for diagnosing lung can cerand, as such, reported ranges of sensitivity from 72% to 98% and specificity from 93% to100%, false-positive rates from 0% to 18%,and false-negative rates from 5% to 100%.[13]

The purpose of the present study is to evaluate the accuracy of TNAB for the diagnosis of benign and malignant lung lesions.

MATERIALS AND METHODS

The present study included 50 patients from June 2020 to June 2021. Our retrograde study on CT- guided or ultrasound guided lung biopsy on tertiary care center of Bihar Indira Gandhi Institute of Medical Science. There were 62 % malignant cases which include:
23- adenocarcinoma
5 – squamous cell carcinoma
3 – poorly differentiated carcinoma
1 – non-hodgkins lymphoma
And 38% benign lesion which include:
8 – non-specific inflammatory lesion
5 – granulomatous lesion
2 – A-V malformation
1 – neurofibroma
1 - spindle cell lesion
1 - necrosis
All biopsies were performed for the diagnostic results of transbronchial examination were negative. The patients expected to obtain a definite diagnosis. The procedure was performed after informed consent was obtained.

INDICATIONS

An undiagnosed lung lesion is the basic indication for needle biopsy. This may occur in various clinical situations: symptoms of cough, fever, or hemoptysis; a previous malignancy or immunodeficiency in a patient who presents with one or more lung lesions; or a lung lesion discovered incidentally in a totally asymptomatic patient.

CONTRAINDICATIONS

Chronic obstructive or restrictive pulmonary disease (FEy1 <1.0 L), bullous disease in the immediate vicinity of the lesion, bleeding diathesis, suspected Echinococcus cyst, lack of cooperation, and very weak patients are contraindications for TNAB. A contralateral pneumonectomy and pulmonary hypertension usually are contraindications also.

TECHNIQUE

Computed tomography (CT) is almost always performed before the biopsy to measure the density of the lesion to accurately localize it, and to plan the approach. The biopsy is not performed if the prothrombin time is prolonged by more than 3 sec from the control or if the platelet count is less than 100,000/mm3. Informed consent is obtained, usually on the day before the biopsy. All of the biopsies have been performed using a Siemens Orbiskop (Iselin, NJ), a fluoroscope that allows monitoring of the procedure in the frontal and cross-tablelateral projections by rotating the tube and image intensifier similar to a C arm. The patient can also be rotated separately, since he is on a cradle. Nearly all of the patients have been biopsied using a Turner needle. Most biopsies were done with the 18 or 20 gauge needle; occasionally, 22 or 16 gauge needles are used. The biopsy is performed in the following way: The skin, at the selected site determined by preliminary fluoroscopy, is prepared with alcohol and iodine. After draping, the skin, subcutaneous tissue, muscle, and pleura are anesthetized using 2% Xylocaine. Breath-holding is limited to when the needle is crossing the pleura; shallow breathing is encouraged for the rest of the time. The biopsy needle is introduced through a small dermatotomy to the edge of the lesion using intermittent

anteroposterior and lateral fluoroscopy as needed to check proper advancement of the needle. When the lesion is reached the stylet is removed and the needle is then connected by plastic tubing to a 20 ml B-D syringe held by an assistant or hooked to a Cameco holder for constant suction during the biopsy.

At the end of the procedure, the patient is examined under fluoroscopy and by auscultation for the presence of a pneumothorax. If the patient develops a small pneumothorax, he is given oxygen intranasally and kept under observation. If the pneumothorax is significant either by its size of by its symptomatology, it is drained by 10 French, 9 inch (22.9 cm) Argyle Trochar Catheter with a Heimlich chest drainage valve, drainage are treated successfully, with complete disappearance of the pneumothorax within a few hours. The chest tube is removed about 12 hr later after confirmation of absence of air leak or persistent pneumothorax. If the pneumothorax and/or air leak persists more than 12-18 hr, the Trochar catheter is connected to suction and handled as a regular chest tube.

Fragments larger than 2 mm, if obtained are individually placed in formalin for histologic evaluation and prestained with eosin. The rest of the aspirate is submitted for cytologic evaluation. Cell blocks are stained with H and E and PAS. The fragments fixed in formalin are processed routinely and embedded in paraffin. Six step sections are cut from each block. Slides 2, 4, and 6 are stained with H and E. The slides of the specimen obtained are reviewed to correlate visual inspection of the specimen obtained from the biopsy with the material on the final slides.

RESULTS

Table 1: Gender distribution

Male	Female
35 (70%)	15 (30%)

Table 2: Results of TNAB in 200 patients

	TNAB	Accuracy
Benign(n=18, 38%)	non-specific inflammatory lesion	8 (44.45%)
	granulomatous lesion	
	A-V malformation	5 (27.78%)
	neurofibroma	2(11.12%)
	spindle cell lesion	1 (5.55%)
	Necrosis	1 (5.55%)
		1 (5.55%)
Malignant(n=32, 62%)	adenocarcinoma	23 (71.87%)
	squamous cell carcinoma	5 (15.63%)
	poorly differentiated carcinoma	3 (9.38%)
	non-hodgkins lymphoma	
		1 (3.12)
Total		50

There were 62% cases of malignant lesions and 38% cases of benign lesions. Out of malignant lesions, most were adenocarcinoma 71.87% followed by squamous cell carcinoma 15.63%, poorly differentiated carcinoma 9.38% andnon-hodgkins lymphoma 3.12%. In the benign lesions, most of the cases were non-specific inflammatory lesion 44.45% followed by granulomatous lesion 27.78%, A-V malformation 11.12%, neurofibroma 5.55%, spindle cell lesion 5.55% and necrosis 5.55%.

DISCUSSION

The purpose of the present study is to evaluate the accuracy of TNAB for the diagnosis of benign and malignant lung lesions. CT -guided needle biopsy could be used for the diagnosis of small pulmonary lesions in basal locations. Inoue et al analyzed 83 cases of lung lesions under CT -guided needle biopsy using a 20-gauge cutting needle and found that the overall sensitivity, specificity, and accuracy were 95% (56/81), 100% (5/5), and 95% (63/66), respectively.[14]

The diagnosis of benign disease is harder to establish by TNAB, because it requires obtaining more tissue than for malignant lesions. Therefore, we used 18 and 20 gauge needles whenever feasible. Histologic and cell-block cytologic preparations are extremely helpful in documenting the nature of the lesions. Special stains, when indicated, can identify a specific organism in what is otherwise nonspecific tissue. Absence of cancer cells alone in the aspirated specimen is not enough proof that the lesion is benign.

The study of Hiraki et al. showed that for 1,000 pulmonary lesions, the sensitivity, specificity, and accuracy of CT -guided needle biopsy using a 20-gauge cutting needle were 94.2% (741/787), 99.1% (211/213), and 95.2% (952/1,000), respectively.[15]

Benign lesions can be difficult to penetrate, occasionally causing the needle tip to slide around them. The use of fluoroscopy perpendicular or steeply oblique to the plane of biopsy allows documentation of biopsying the lesion rather than pushing it, thereby giving greater accuracy. In 20% of benign lung lesions, the biopsy showed CT guided needle biopsy allows the operating physician to continuously monitor the position of the biopsy needle during the procedure and to perform a timely adjustment based on the influences of respiratory motion. Lesions in basal regions of the lung are very difficult to biopsy because of the influence of respiratory motion. The coaxial needle must be adjusted to achieve the target site, which will increase the damage to normal lung tissue. The impact of respiratory motion on the upper and middle lobes is mild; therefore, the coaxial needle can be more accurately placed in those lesions. A lower lobe lesion is another independent risk factor for biopsy diagnostic failure, as also shown by Lee et al.[16]

TNAB, with its relatively low morbidity, is well tolerated by patients. A diagnosis of malignant disease by TNAB triggers appropriate surgical and/or nonsurgical staging and treatment procedures, while a diagnosis of benign disease eliminates the need for surgery. Outcome statistics for thoracic surgical procedures are well described in several series. In 1983, the Lung Cancer Study Group published mortality results of surgical resections for lung cancer: 1.5% for wedge resection, 3% for lobectomy, and 6% for pneumonectomy.[17]

Death rates from TNAB are reported to be up to 0.15%, although the majority of deaths were due to bleeding during cutting biopsy of diffuse lung disease.[18] For biopsy of focal disease, TNAB is an exceedingly safe procedure, with mortality closer to 0.02%.[19] TNAB can establish a specific benign diagnosis and thereby prevent unnecessary surgery.

CONCLUSION

Image guided TNAB remains an important modality in the diagnosis of thoracic diseases, particularly malignancies. Although the likelihood ratios corresponding to the “malignant” and “benign and specific” will generate definitive results, other findings may not. The ability to diagnose only malignant lesions by TNAB would markedly limit the efficacy of that technique, since surgery would be performed on most malignant lesions diagnosed by TNAB as well as on the lesions not diagnosed by TNAB. Technical aspects of the biopsy, clinical indications, and cost analysis are also important issues that remain to be addressed.

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