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ORIGINAL ARTICLE

COMPARATIVE ANALYSIS OF CT GUIDED AND UNGUIDED TRANSTHORACIC FNAC

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ABSTRACT: Unguided transthoracic FNAC was done in 71 patients while CT guided transthroacic FNAC was done in 49 cases. We divided our cases according to site (central/peripheral) and size [less than 2 cm (small)/more than 2 cm (large)]. Unguided transthoracic FNAC diagnosed 56/71 i.e. 78.87% of cases (83.33% large central, 30.76% small central, 100% large peripheral and 57.14% small peripheral lesions). CT guided transthoracic FNAC diagnosed 47/49 i.e. 95.9% cases (100% large central, 87.5% small central, 100% large peripheral and 80% small peripheral). We observed complications in 18.3% cases by unguided (minor chest pain 39.3% was most common) while 8.2% in CT guided transthoracic FNAC. All these complications responded to symptomatic and conservative treatment. We diagnosed 66/71 patients by both unguided and CT guided transthoracic FNAC. Sensitivity of unguided FNAC was 85.11% specificity 100% and predictive value for negative test 22.22% with no false positive case. Percentage of false negatives was 14.9%. So considering its simplicity, safety, rapidity and high diagnostic yield unguided transthoracic FNAC should be performed routinely in properly selected patients by experienced people. CT guided transthoracic FNAC is option and useful in difficult to approach lesions and in small central lesions.

KEYWORDS: CT guided, Lung lesion, Transthoracic.

INTRODUCTION: Unguided transthoracic fine needle aspiration cytology is a diagnostic procedure for various difficult to diagnose lung lesions which can be done very safely and it enjoys simplicity, good diagnostic yield, safety and economy on part of the patient. If this procedure is CT guided then it enjoys very high degree of accuracy and safety specially for small central and difficult to approach lesions.

Since the days of Leyden (1883) who aspirated organisms causing pneumonia by thick needle biopsy, many scientists used different type of needles and various techniques for the biopsy. But because of fear of serious complications, it could not get widespread popularity. But Nordenstrom's study with this procedure caused widespread interest. As there was high degree of accuracy with low incidence of complications.[1] In these years various techniques were used to increase yield and safety of this procedure viz. biplane fluoroscopy, ultrasonography, image intensification and CT guidance. CT guidance became popular due to easy localization of needle and accuracy of the procedure. But CT guidance is not available everywhere and is costly.[2]

The aim of the study was to establish comparative efficacy and safety of unguided transthoracic FNAC in comparison of CT guided transthoracic FNAC in diagnosis of various lung lesions of different sizes and locations.

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MATERIALS & METHODS: The study group comprised of patients attending Department of Tuberculosis and Chest Diseases. Our study group contained 71 patients of all ages (62 males and 9 females, mean age 57.27 years). Selection criteria were all the lung masses and suspicious shadows not responding to treatment or where the diagnosis was suspicious.

Following Patients were excluded from the Study: Severe pulmonary emphysema in the vicinity of lesion, Suspicion of vascular lesion, Uncontrolled bleeding disorders. Contralateral pneumonectomy, Uncooperative patients, Intractable cough, Possible hydatid cyst, Severe pulmonary hypertension, Patients on positive end expiratory pressure ventilation (PEEP).

These patients were undergone general examination and chest X-ray PA view/lateral view besides CT thorax and fibreoptic bronchoscopy. An informed consent was taken prior to the procedure.

We divided our patients on the basis of site and size of lesion in chest roentgenogram.[3] Lesion was considered central when it was towards hilum or mediastinum and there was intervening lung parenchyma between lesion and chest wall. Lesion was considered peripheral when there was no intervening lung parenchyma. Lesion was called small when its greatest diameter was less than 2cms.

OPERATIVE PROCEDURES: The only premedication given was 0.6 mg of Atropine intramuscularly thirty minutes before the procedure. In apprehensive patients, 10 mg diazepam was given orally thirty minutes before the procedure.

The point and depth of procedure was decided by help of chest X-ray PA and lateral views. CT guided biopsy was done after making a plan for CT. Plain and contrast CT thorax were done. For contrast 76% trazograph was used. Repeated scans were taken and shortest and safest paths were chosen. Angulation of CT gantry assisted in gaining access to the best biopsy path. The position of needle tip was checked by doing two or three repeated scans.[4]

After preparation of the site 5-10 ml of 2% xylocaine was infiltrated into the skin, subcutaneous tissue, muscle plane, up to parietal pleura. Needle aspiration was done in a comfortable position during shallow respiration with 23G (0.65 mm) eight cm long lumbar puncture needle. The needle was inserted perpendicularly into the lesion close to the upper border of the rib to avoid damage to neurovascular bundle. Following the insertion of the needle's point into the lesion, a disposable 20 ml syringe was attached to it. After retraction of the piston, the needle was moved to and fro and in various directions within the lesion. Then the piston was released and needle was withdrawn.[5] The aspirated material was put on glass slides and smears were made. The wet smears were fixed immediately in 95% alcohol for 30-40 minutes. The aspirated material was also inoculated on to culture tubes. In the event of inadequacy of the aspirate, the aspiration procedure was repeated up to maximum number of three times from different parts of lesion until apparently adequate material had been obtained. After the procedure, each patient was reexamined and X-rayed to rule out pneumothorax and kept under observation for 24 hrs. The aspirate was examined for AFB and other organisms by staining, culture and sensitivity and other cytological examinations.

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OBSERVATION AND RESULTS: In our study out of 71 cases in which unguided transthoracic FNAC done we got diagnosis in 56 cases (i.e. 78.87%) with no false positive results. We distributed these results according to site and size of lesion, and we diagnosed 15/18 (i.e. 83.33%) of large central lesions, 4/13 (i.e. 30.76) small central lesions, 33/33 (i.e. 100%) large peripheral lesions, 4/7 (57.14%) small peripheral lesions. In total unguided transthoracic FNAC diagnosed 61.3% of central lesions and 92.5% of peripheral lesions.

The CT guided transthoracic FNAC done in 49 cases and diagnosed 47 cases (95.9%). It diagnosed 100% of large central, 87.5% of small central, 100% of large peripheral and 80% of small peripheral lesions. CT guided biopsy diagnosed 20/21 (95.2%) central lesions and 27/28 (96.4%) peripheral lesions.

Complications occurred in 13/71 cases in which unguided transthoracic FNAC was done (i.e. 18.3%). These included minor chest pain (7.0%), pneumothorax (5.6%), haemoptysis (4.2%), fever (1.4%). All cases of pnemuthorax responded with conservative treatment while other complications responded to symptomatic treatment.

In comparison, complications occurred in 4/49 (i.e. 8.2%) cases of CT guided transthoracic FNAC. These included hemoptysis (4.1%) and minor chest pain (4.1%) which responded to symptomatic treatment.

By using both unguided and CT guided transthoracic FNAC we diagnosed 66 out of 71 cases (i.e. 93%). These 66 cases included squamous cell carcinoma (35), small cell carcinoma (14), adenocarcinoma (7), pulmonary tuberculosis (4), large cell carcinoma (2), lymphoma (1), positive for malignant cell (2), cryptococcosis (1). So total cases of malignancy were 61 out of 66. Sensitivity of unguided transthoracic FNAC was 85.11% while specificity (100%). Predictive value for positive test was 100% and for negative test 22.22%. Predictive value of false negative was 14.9% and for false positive it was 0.00% (i.e. no case).

Total Number of cases	=	71.
Unguided FNAC done in	=	71.
Positive results in	=	56.
Percentage	=	78.87%.

	Large Central (c)	**Small Central (d)**	**Large Peripheral (e)**	**Small Peripheral (f)**	**Total**
Total	18	13	33	7	71
Cases diagnosed	15	4	33	4	56
Percentage	83.33	30.76	100.00	57.14	78.87

Table 1: Distribution of cases according to yield by unguided transthoracic fine needle aspiration cytology (FNAC)

Central (a) Vs Peripheral (b); $p<0.01$ (S).

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	Large Central	Small Central	Large Peripheral	Small Peripheral	Total
Total	18	13	33	7	71
Cases in which CT guided FNAC done	13	8	23	5	49
Results positive in	13(c)	7(d)	23(e)	4(f)	47
Percentage	100.0%	87.5%	100.0%	80.0%	95.9%

Table 2: Distribution of cases according to yield by CT guided transthoracic fine needle aspiration cytology (FNAC)

c+d = a and e+f = b.

(a) vs (b)

Central versus peripheral: Z = 0.3440, p = N.S., there is no significant statistical difference, but slightly higher in peripheral than central.

(c) vs (d)

Small versus Large: Central Z = 1.5866, p = N.S., there is no statistically significant difference of size in central group but number of large cases diagnosed was higher.

Peripheral (e) versus (f): Z = 5.074, p<0.001 (S), large peripheral cases were higher significantly from small peripheral.

Total Number of cases = 71
Both procedures done in = 49

	Large Central		Small Central		Large Peripheral		Small Peripheral		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Unguided FNAC (c)	11	84.6	3	37.5	24	100.0	2	50.0	40	81.63
CT guided FNAC (d)	13	100.0	7	87.5	24	100.0	3	75.0	47	95.9
Total cases	13		8		24		4		49	

Table 3: Comparison of diagnostic yield of unguided and CT guided transthoracic fine needle aspiration cytology (FNAC)

Total Number of cases = 71.
Complications occurred in = 13.
Percentage = 18.3.

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Complication	Number	% of Complications	% of Total FNAC
Minor chest pain	5	38.5	7.0
Pneumothorax	4	30.8	5.6
Hemoptysis	3	23.0	4.2
Fever	1	7.7	1.4

Total 4: Distribution of cases according to complications occurred. During unguided transthoracic FNAC

Total Number of cases	71
CT guided FNAC done in	49
Complications occurred in	4
Percentage	8.2%
Complications – Hemoptysis	2(4.1%)
Chest Pain	2(4.1%)

Table 5: Distribution of cases according to the complications occurred during CT guided transthoracic FNAC

Complications	Unguided FNAC (a) [n=71]		CT guided FNAC (b) [n=49]	
	Number	%	Number	%
Fever	1	1.4	0	-
Chest pain	5	7.0	2	4.1
Hemoptysis	3	4.2	2	4.1
Pneumothorax	4	5.6	0	-
Total	**13**	**18.3**	**4**	**8.2**

Table 6: Distribution of cases according to the complications occurred during unguided & CT guided transthoracic FNAC

a versus b: $X^2 = 2.391$, $p > 0.05$ (NS) = P = 0.49.

Total Number of cases = 71.
Cases with final diagnosis known = 66(a).
Percentage = 93.0.
Cases with final diagnosis unknown = 7.0.

Diagnosis	Number	Percentage
Squamous cell carcinoma	24	51.0
Small cell carcinoma	11	23.4

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Adenocarcinoma	5	10.6
Pulmonary tuberculosis	2	4.2
Large cell carcinoma	1	2.1
Positive for malignant cells	2	4.2
Lymphoma	1	2.1
Cryptococcosis	1	2.1
a versus b Total	**47**	**100.00**

Table 7: Distribution of cases according to final diagnosis by both unguided and CT guided transthoracic FNAC

$Z = 10.238$, $p < 0.001$ (v.s.).

	CT guided transthoracic FNAC positive	**CT guided transthoracic FNAC negative**
Unguided transthoracic FNAC positive	40(a)	0 (b)
Unguided transthoracic FNAC negative	7(c)	2 (d)

Table 8: Sensitivity and specificity of unguided transthoracic FNAC in comparison of CT guided transthoracic FNAC

Sensitivity of unguided FNAC	=	85.11%
Specificity of unguided FNAC	=	100.00%
Predictive value of positive Test	=	100.00%
Predictive value of negative Test	=	22.22%
Predictive value of false positive Test	=	14.90%
Predictive value of false negative Test	=	0.00%

DISCUSSION: This study was done to see whether this simple procedure unguided transthoracic FNAC is effective and safe. So it was compared with CT guided transthoracic FNAC which is a favourite of physicians because of high degree of diagnostic yield and very less complications[6]. But to get a CT guided biopsy is a costly affair and also it is unavailable in many poor countries and also in many parts of our country.

In our study unguided transthoracic FNAC gave diagnosis in 78.87% of cases. It was best for large peripherals (100%) then large central (83.33%) then small peripheral (57.14%) and small central (30.76%). So it was most useful in large peripheral lesions and least helpful in small central lesions. Various workers described diagnostic yield in the range of 58% to 96%.[7,8,9,10] Poorer results were due to poor procedure technique, more number of small or central lesions and poor cytopathological techniques while in our study large lesions predominate in addition to good technique and good cytopathologic facilities.[11,12] We diagnosed 92.5% of peripheral lesions because most peripheral lesions were large and easily accessible.

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There was diagnostic yield of 95.9% in CT guided transthoracic FNAC. There was no significant difference in diagnosis in central and peripheral lesions. This may be due to CT is more precise to diagnose central lesions. Because these type of lesions are difficult to reach by unguided transthoracic FNAC and diagnostic yield by central lesion is better than peripheral if adequate material is obtained by both.

We compared 49 cases in which both procedures, unguided and CT guided transthoracic FNAC were performed. Diagnostic yield of unguided transthoracic FNAC was 78.87% in comparison of 95.9% of CT guided transthoracic FNAC. This difference was mainly due to better yield in central lesions by CT guided transthoracic FNAC. So CT guided transthoracic FNAC is a better procedure for central lesions and more precisely small central lesions.[13] While there was no significant difference in peripheral group. Complications occurred in 18.3% of cases by unguided transthoracic FNAC. These were trivial in nature and responded to symptomatic treatment pneumothorax which was most feared complication occurred in only 5.6% of cases and responded to conservative treatment. This may be due to lesser number of smaller lesions and lesser number of attempts and also due to use of smaller 23G needles.

Complications occurred in only 8.2% cases of CT guided transthoracic FNAC and they also responded to symptomatic treatment with no case of pneumothorax.

There was no case in which tumor cell implantation occurred in needle track.

Cases of malignancy outnumbered benign cases in our study and this was due to the fact that benign cases were diagnosed easily by other methods.

So, overall sensitivity of 85.11%, specificity 100%, false negatives 14.9% and false positives 0% are comparable to the results of other workers and complications were few and of trivial nature.[14]

So, we conclude that there is not much difference in diagnostic yields of unguided and CT guided transthoracic FNAC lesions. Only small central lesions and deep seated lesions are better approached by CT guided transthoracic FNAC[15]. Unguided transhtoracic FNAC is best for large peripheral lesions and a good diagnostic tool for small peripheral and large central lesions.[16,17] There was no major complications seen during the procedure and no death occurred. All the complications were minor and easily managed by symptomatic and conservative treatment. So we strongly recommend that unguided transthoracic FNAC can be performed routinely, accurately, quickly and safely in OPDs and in areas where CT facility is not available without any undue fear and especially in large peripheral lesions by experienced workers.

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