IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 2 Ser.5 (February. 2021), PP 32-37
www.iosrjournals.org

Role of Ultrasonography in Evaluation of Peripheral Intrathoracic Mass Lesions: A Viable Alternative of Computed Tomography.

Dr. Arnab Sit[1], Dr. Samir Kumar Sarkar[2], Dr. Pulak Kumar Jana[3], Dr. Ira Das[4]
1: Tutor (Department of Pulmonary Medicine, Bankura Sammilani Medical college, Bankura,W.B., India)
2: Assistant Professor (Department of Pulmonary Medicine, Murshidabad Medical College & Hospital, Berhampore, W.B., India)
3 : Professor (Pulmonary Medicine, Nilratan Sircar Medical College, Kolkata, W.B., India)
4: Tutor (Department of Paediatric Medicine, Chittaranjan Seba Sadan & Sishu Sadan Hospital, Kolkata, W.B., India)
**Corresponding Author: Dr. Ira Das*

Abstruct: *Ultrasonography and computed tomography as the diagnostic tools have been evaluated with respect to visualisation, localisation, classification and intervention. A study was conducted on 46 patients attending the Department of Chest Medicine, Bankura Sammilani Medical College, Bankura. Fine needle aspiration cytology (FNAC) was done by lumber puncture needle (Spinocan® 22G) and biopsy by biopsy needle (Bard®, 16G). Forty six lesions (34 parenchymal, 9 mediastinal, 2 pleural, 1 chest wall lesions) were studied. Among them, 36 cases were evaluated by both imaging and 10 patients by USG only. USG guided intervention was done in 33 patients. Positive diagnostic yield was 96.96% (32/33). Pneumothorax was encountered as a complication in one (3%) case. Mean procedure time was 30 min. CT guided intervention was done in 21 patients, pathological diagnostic yield was 80.9% (17/21). Complication included pneumothorax in one case (5%), mean procedure time was 70 min. USG clearly demonstrated peripheral lung masses particularly those in contact with chest wall, mediastinal lesion and peridiaphragmatic lesion. Doppler study helped in assessment of vascular structure. USG has a shorter procedure time, it is real time procedure, can be performed in debilitated patients, has no radiation hazard, is cheap and has less complication rate. Biopsy is possible in USG. USG is viable alternative of CT in peripheral intrathoracic mass lesions.*

Key words: *Ultrasonography, Peripheral Intrathoracic Mass, Computed tomography, FNAC*

Date of Submission: 29-01-2021 Date of Acceptance: 14-02-2021

I. Introduction:

Intrathoracic mass lesions are many a time a nightmare for the chest physician for its diagnostic dilemma. At present, the scenario is not much altered without modern imaging guided intervention. Chest radiograph is a time tested modality since the time of Roentgen. CT scan with or without FNAC is well popular among physician in evaluation of thoracic masses since the 8th decade of last century. But CT scan has high radiation hazards and has a high cost. Ultrasonography with real time invasive facility emerges as a valuable alternative. Our present study throws some light upon the scenario of ultrasonograpy in peripheral intrathoracic mass lesions.

II. Material and methods:

Study was done on 46 indoor patients in the Department of Chest medicine, Bankura Sammilani Medical College, Bankura, from Feb 2017 to Nov 2018 in collaboration with the Department of Radiodiagnosis. FNAC was done by lumber puncture needle (Spinocan® 22G) and biopsy by trucut biopsy needle (Bard®, 16G). In no patients was there a conclusive diagnosis by conventional diagnostic modalities such as sputum cytology and/or diagnostic bronchoscopy. Then the patients were evaluated by ultrasonography and / or CT with or without intervention. After preliminary evaluations the skin was prepared and infiltrated with 2ml of 2% lignocaine. Needle was inserted and real time image of the needle tip was assessed and tracked on the monitor seen in USG. Needle tip, seen as a white spot, could be precisely advanced to the lesion [Figure 1]. In CT scan, lesion was measured from midline and depth of the lesion also measured. Spinocan® needle was then introduced. A 20 ml syringe was attached to the Spinocan® and aspiration was performed. Biopsy was done by Bard® trucut biopsy needle. Biopsy samples were sent for histopathology examinations. The patients were observed for one day and chest X-ray was done to assess the complications.

III. Result and analysis:

There were 29 male patients (63%) and 17 female patients (37%). Age distribution ranged from 6 year to 80 years. Commonest age group was in 50 – 60 years in both sexes.

CT scan was done in 36 cases and was successful in all cases (36/36) to visualise the lesion. Among them, CT guided intervention was done in 21 patients. USG visualisation was possible in 97% cases (45/46). One case which could not be visualised by USG was a female aged 30 years. Later she was diagnosed as having an inflammatory lesion. Out of 46 patients, 36 cases were evaluated by both imaging while 10 patients were evaluated by USG only. Pathological diagnostic yield was 100% (9/9) among these cases where intervention was performed. Total Positive pathological diagnostic yield in USG intervention was 95.8% (23/24) and that in CT was 80.9% (17/21).

[Table: 1]

Sonographic appearance of Lesions:

Appearance	Frequency out of 45	Percentage(%)
Hyper echoic homogenous	17	37.78
Hyper echoic heterogenous	9	20.00
Hyperechoic with superior vena cava obstruction	3	6.67
Hyperechoic with bone destruction	3	6.67
Hypoechoic	4	8.89
Echogenic with calcification	2	4.44
Echogenic with airbronchogram	4	8.89
Pure cystic anechoic lesion	2	4.44
Heterogenous cystic	1	2.22

[Table: 2]

Computated tomographic appearance of lesions are :

CT appearance	Frequence out of 34	Percentage(%)
Homogenous	18	52.94
Heterogeneous	14	41.18
Homogenous cystic	2	5.88
Associated with: Mediastinal Lymphadenopathy	6	17.65
Associated with: Rib destruction	1	2.94
Associated with: Calcification	1	2.94

Anatomical distribution of Lesions:

Parenchymal 74% (34), Mediastinal 19% (9), Pleural deposit 5% (2), Chest wall 2% (1).

Pneumothorax as the only complication occurred in 1 case in both imaging guided intervention. However, no intercostals drainage was required. So, complications encountered was less in USG i.e. 3% (1/33) in contrast to 5% (1/21) in CT guided procedures, though biopsy was performed. Cost of USG intervention was 1/10th of that of the CT guided ones. Mean procedure time was 30 minutes in USG and 70 minutes under CT.

IV. Discussion:

Intrathoracic mass lesions prove to be a diagnostic challenge for the clinicians. An attempt has been made in this study to evaluate the role of ultrasonography compared to CT scan in the understanding of intrathoracic mass lesions. The study involved forty six patients attending the Chest Medicine Department, BSMC, Bankura, with intrathoracic mass 5 cm or more in diameter on chest roentgenogram without any fluid level or cavitation. The major focuses of this study are:

Case selection:

The terminology of pulmonary nodules and mass has not yet fully been resolved. The present trend is to restrict the terminology of nodules to lesions not exceeding 3 cm. in diameter. For the present study intrathoracic lesions of 5 cm. or more in diameter has been considered. The reason for the 5 cm cut off value is to case in intervention procedure from the intrathoracic mass lesions.

Etiology and its correlates:

[Table: 3]

The etiologic distribution of cases are as mentioned in the following table:

Lesion	Percentage(%)
Malignant lesion:	82.60
Bronchogenic Carcinoma	71.05
Non Hodgkins Lymphoma	13.15
Other mediastinal tumors	7.89
Neuroblastoma	5.26
Thymoma	2.63
Chest wall tumors	
Multiple myeloma	2.63
Benign lesion:	17.40
Pneumonic consolidation	8.69
Tubercular consolidation	2.17
Cystic lesion	6.52
Hydatic cyst	4.34
Dermoid cyst	2.17

The study reveals 82.6% cases of intrathoracic mass lesions are of malignant etiology and among the malignancy cases 71.05% are due to bronchogenic carcinoma. This is an concordance to the observation of Sigelman [1] 1986, Zerhouri[2] 1986 that vast majority of intrathoracic lesions more than 3 cm in diameter are malignant.

Bronchogenic carcinoma is seen in 71.05% cases in the present series of which squamous cell carcinoma is 28.94%, small cell carcinoma is 15.7%, adenocarcinoma is 13.1% and undifferentiated carcinoma is 10.5%.

Clinical presentation:

In this present study, most common symptom is chest pain (63.04%), followed by cough (60.86%), shortness of breath (41.30%). As all the lesions are in contact with chest wall, so chest pain is the most common symptom in this study.

In a North Indian study [3,4] over 1000 patients of lung cancer major symptoms were as follows: weight loss (90%), cough (88%), Hemoptysis (69.2%), chest pain (52.2%).

Ultrasonography and CT evaluation of Intrathoracic mass:

The basic purpose of the study is to evaluate the role of ultrasonography in the work up of intrathoracic mass and to compare the efficiency of ultrasonography vis a vis CT scan, which has been regarded as the gold standard for the study of intrathoracic mass.

USG and CT as the two imaging modalities have been evaluated with respect to the following broad parameters.

Visualisation:

USG visualisation is possible in 97.82% but CT visualise all the cases i.e. 100%.

Anatomical localisation: Both USG and CT scan localise the lesion in all cases where the lesion is visible.

Characterisation of lesion:

From [Table 1] in USG hyperechoic lesion are in 71.11%, pure cystic anechoic lesions are in 4.44%, heterogeneous cystic lesion is in 2.22%, air bronchogram is seen in 8.89%, bone destruction is seen in 6.67%, calcification is seen in 4.44%, SVC obstruction is seen in 6.67%.

From Table 2 in CT homogeneous solid lesion is in 52.94%, homogeneous cystic lesion is 4.34%, associated mediastinal lymphadenopalhy is in 17.64%, rib destruction in 2.94%, calcification is in 2.94%.

From this study it is seen that USG differentiate cystic and solid lesion and also heterogeneity of lesion better than CT. This was also observed by Helio A, 1993[8]. USG also clearly demonstrate associated SVC obstruction and vascularity far better than CT Noninvasive Doppler USG is superior to invasive contrast CT, to demonstrate lesion with SVC obstruction. This nature of vascularity of lesion is very much helpful during intervention.

This was also observed by Peter E Petre, et al, 1997, Murphy DJ, et al, 1997, Yard PC 2000, Swhney s, et al, 1991 39. Rubens DJ, et al, 1997, Hero A, 1993[5,6,7,8,9,10].

USG also identify consolidation by sonographic air bronchogram which is especially useful during intervention to choose the site of the actual mass versus post obstructive consolidated area, intervention to be done. Weinberg B, et al, 1986, Targhetta, en al, 1992 as also observed this[5,6].

To note associated calcification CT is better than USG, But USG also demonstrate calcification easily. Rosenberg H. K.et al also observed this finding in 1986[13].

To note associated bone destruction, CT is superior than USG. This finding is comparable with the observation of Hagga JR et al in 1979[14]. But USG also demonstrate rib destruction as is evident in this study.
Intervention

Imaging technique		Total cases	Intervention done (n)	Intervention not done (n)	Pathological positive (n)	Diagnostic yield
USG+ CT	USG	34	23	11	22	95.65%
	CT		21	13	15	71.42%
Only USG		12	10	2	10	100%

Among 34 patients where both USG and CT is done, positive pathological diagnostic yield is 95.65%. that in CT guided intervention is 71.42%. Among 10 cases where only USG was done positive diagnostic yield and sensitivity was 100%. In the present study, positive diagnostic yield in USG intervention (95.65%, 100%) was higher than CT (71.42%).

In previous studies the yield of USG guided intervention is 84% to 100%. The finding is comparable to our study. The yield in CT guided interventions is 60% - 95% in previous studies and this finding is comparable to our study[17,18].

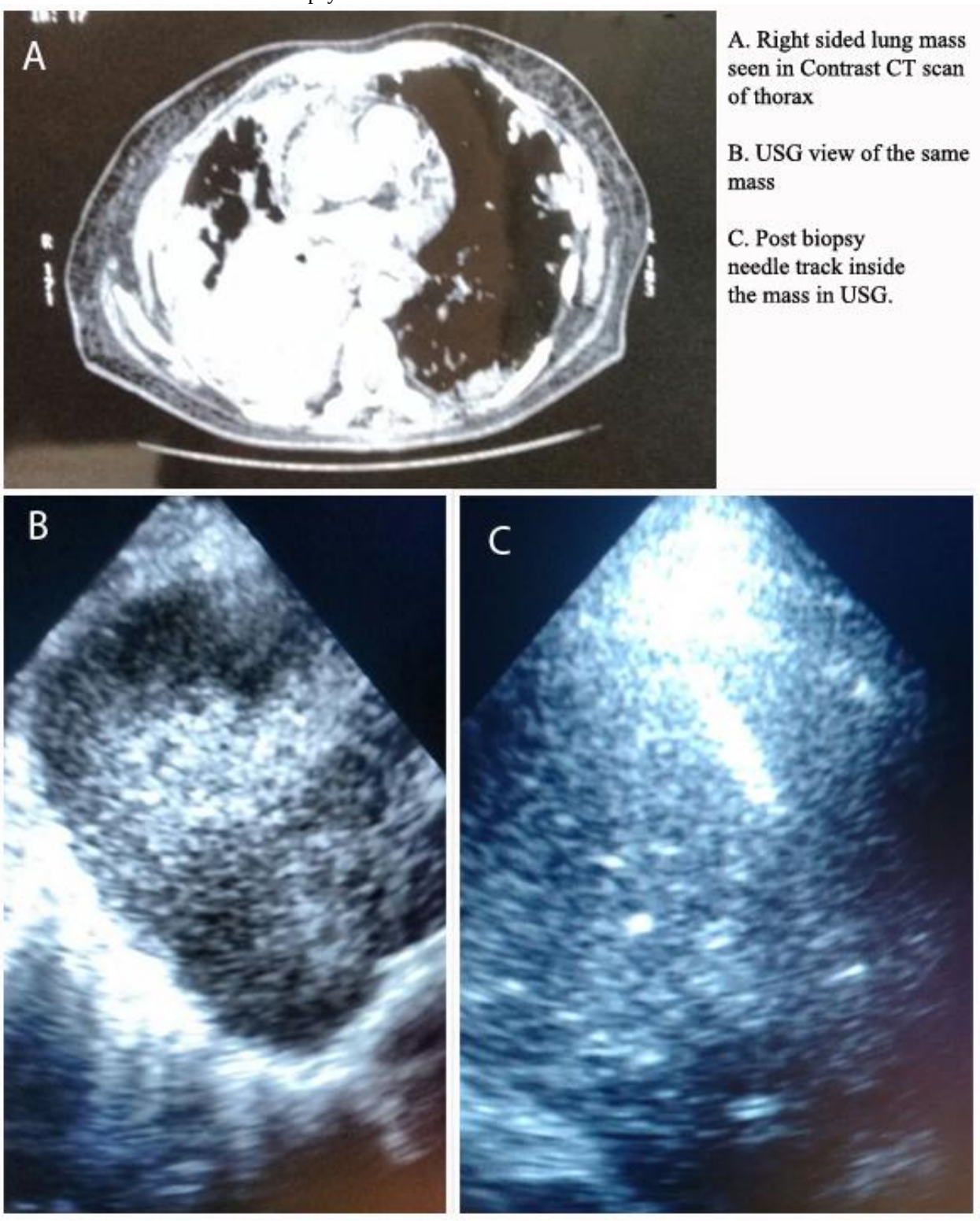
The relatively small sample size does not enable us to draw a general conclusion. However, real time tracing the needle during the actual aspiration is a unique advantage in USG and may be the reason of higher yield of USG guided procedures over the CT guided ones. Similar results were noted in the study conducted by Sheth et al in 1999 and Beckhs et al in 1997.

Pneumothorax was the only complication observed during the study after the intervention. The incidence was 3.03% in USG guided procedures and 4.76% in CT guided procedures. It was managed conservatively and no intercostals tube drainage was necessary. This finding was also comparable to the previous studies where the complication rates were 1% - 8% in USG procedures and 0.7% - 32% in CT guided procedures [15,16]. Other complications includes haemoptysis, hemothorax, pericarditis etc as encountered in other studies although we did not face any of these[15,16].

V. Conclusion:

Both USG guided and CT guided FNAC and biopsy are efficient diagnostic procedures for the approach of intra-thoracic lesions.
Diagnostic yield of USG guided procedures and CT guided procedures are very much comparable.
USG guided procedure have the advantage of real time guidance. On the other hand, with the facility of 3D imaging modality, CT has the access to the central lesions. USG guidance is helpful in peripheral lesions.
Complication rate in both the CT and USG guided procedure are very low and within acceptable range.
Low cost and no radiation hazard is the advantage in USG guided procedure.
Therefore, USG guided FNAC or Tru-cut biopsy is a viable alternative of CT guided those procedures.

Figure 1: A. Right sided lung mass seen in Contrast CT scan of thorax, B. USG view of the same mass, C. Post biopsy needle track inside the mass in USG.



Reference:

[1]. Siegelman SS, Khouri NF, Leo FP et al. Solitary Pulmonary nodules: CT assessment Radiology 160: 307, 1986.
[2]. Zerhouri EA, Stitik FP, Siegelmen SS et al: CT of pulmonary nodule – a cooperative study. Radiology 160: 319, 1986.
[3]. Behra D Lung cancer in India – A reprisal Ind J Chest Dis: 1992, 34:91.
[4]. Notani P, Sanghvi LD. A retrospective study of lung cancer in Bombay. Brit J. Cancer 1974: 29:477.
[5]. Weiberg B, Diakou makis EE, Kass EG et al: The air bronchogram: sonographic demonstration. AJR 1986: 147: 593-595.

[6]. Targhetta R, Clavag Neux R et al: Sonographic approach to diagnosing pulmonary consolidation J ultrasound Med 1992, 11: 667-672.
[7]. Sawhney S, JainR, Berry M: Tru-cut biopsy of mediastinal masses guided by real time sonography clin Radiol, 44:16.9, 1991, Jul.
[8]. Heilo A. Tumors in mediastinum. US guided histologic core-needle biopsy, Radkilogy 1993: 183: 143-146.
[9]. Otani Y, Yashida I Ishikawa S et al: Use of ultrasound guided percutaneous biopsy in the diagnosis of mediastinal tumors. Surg Today 1996: 26(12) 990-2.
[10]. Seth s, Hamper UM, Stanley DB, Wheeler JH, US guidance for thoracic biopsy: an effective alternative to CT guidance.
[11]. Junpei Ikezoe, Shizuo Merimoto, Jun Arisawa et al. Percutaneous biopsy of thoracic lesions: value of sonography for needle guidance. AJR, 154: 1181-1185, June 1990.
[12]. K Wernecke, P Vassallo, R Pötter, H G Lückener, P E Peters: Mediastinal tunmors: Sensitivity of detected with sonography compared with CT and Radiography. Radiology 1990, 175, 137-143.
[13]. Rosenberg HK. The complementary roles of ultrasound and plain film radiography in differentiating pediatric chest abnormalities, Radiographics 1986 May;6(3):427-45.
[14]. Haaga JR: New techniques for CT guided biopsies, AJR Am J Roentgenol. 1979 Oct;133(4):633-41.
[15]. E vanSonnenberg E, Casola G, Ho M, et al. Difficult thoracic lesions: CT-guided biopsy experience in 150 cases. Radiology. 1988;167(2):457-461. doi:10.1148/radiology.167.2.3357956
[16]. Khosla, Rahul MD; Rohatgi, Prashant Kumar MD; Seam, Nitin MD Ultrasound-guided Fine Needle Aspiration Biopsy of Pleural-based Intrathoracic Lesions, Journal of Bronchology& Interventional Pulmonology: April 2009 - Volume 16 - Issue 2 - p 87-90 doi: 10.1097/LBR.0b013e31819b2dee
[17]. Khosla R, McLean AW, Smith JA. Ultrasound-guided versus computed tomography-scan guided biopsy of pleural-based lung lesions. Lung India. 2016;33(5):487-492. doi:10.4103/0970-2113.188961
[18]. Al-Damegh SA. Ultrasound guided fine needle aspiration using 25G needle as a new technique for a wide range of pathological conditions. Saudi Med J. 2004;25(10):1374-1377.

Dr. Ira Das, et. al. "Role of Ultrasonography in Evaluation of Peripheral Intrathoracic Mass Lesions: A Viable Alternative of Computed Tomography." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(02), 2021, pp. 32-37.