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CT GUIDED TRANSTHORACIC NEEDLE ASPIRATION BIOPSY;
EFFECT OF SIZE OF THE LESION ON THE RATE OF PNEUMOTHORAX

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ABSTRACT... Objectives: To analyze the rate of Pneumothorax after CT guided TNAB of lung masses , and correlating it with the size of the lesion. **Design:** Descriptive study. **Setting:** Department of Radiology Mayo Hospital, Lahore. **Period:** From June 2002 to April 2003, **Patients and method:** Seventy patients underwent CT guided FNA of the chest masses. **Results:** Out of Seventy, 18 patients i.e.; 26 % developed Pneumothorax. Lesion less than 1 cm , out of 6 patients 3 developed pneumothorax (50 %), lesions 1-2 cm 5 out of 11 developed pneumothorax(45%), lesions with size of 2-3 cm 5 out of 14 patients developed pneumothorax (35%), lesions between 3-4 cm 2 out of 8 developed pneumothorax (25%), lesion sized 4-5 cm 1 out of 15 developed pneumothorax (6%), and lesion with more than 5 cm size 1 out of 16 developed pneumothorax (6%) . **Conclusion:** The study shows that the rate of Pneumothorax after CT guided TNAB of Lung Masses increases as the size of the lesion decreases.

Key words: Pneumothorax, CT guided TNAB, Lesion Size.

INTRODUCTION

Transthoracic percutaneous biopsy of the lung masses is a long known and time proven invasive procedure. To get to a diagnosis, the clinicians rely heavily on the Radiological and Pathological findings. In previous days, open biopsy of the lung mass was done to reach a diagnosis but as the medicine is evolving the newer modalities are their to image the body and guide the invasive Radiologist, open lung biopsy has become almost obsolete now. Computed Tomography (CT) assisted Fine Needle Aspiration Biopsy (FNAB) of the lung masses is now used very frequently in cases where the diagnosis depends on histopathology. CT images guides the Radiologist towards the area of interest and then the procedure is done. Percutaneous transthoracic needle aspiration biopsy (TNAB) of the lung is a well-established method for obtaining pulmonary tissue for pathologic examination[1-6]. Accuracy for the diagnosis of benign and malignant diseases is greater than 80% and 90%, respectively[4-6].

Fatal complications due to systemic air embolism, hemorrhage, or pericardial tamponade have been described[3,7-10], but these complications are rare. Other serious complications, such as seeding of malignant cells into the needle track[11], lung torsion[12], and empyema[7], also are rare and should not alter indications for TNAB.

Pneumothorax is, by far, the most frequent complication of the procedure: Reported[2,8,13-23] rates range widely, from 5% to 61%. Most of these data pertain to fluoroscopically guided TNAB. Overall, TNAB performed with computed tomographic (CT) guidance may be associated with a higher frequency of pneumothorax than fluoroscopically guided TNAB, probably because CT requires more time, and the average size of the lesion is smaller. The reported rate of pneumothorax with CT-guided biopsy may also be slightly higher because CT is more sensitive for the

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detection of pneumothorax. The authors of several investigations[1,13,24] have reported a 22%–45% risk of pneumothorax for CT-guided TNAB

There are multiple factors or variables which effect the rate of Pneumothorax in CT guided FNAB of Chest masses [(25,26)]. Size of the needle, size of the lesion , depth of the lesion from the pleural surface and the number of punctures that are done through the pleura are perhaps some of the important ones which have been studied in quite detail[27]. Also the time for which the needle remains in the chest cavity , the dwell time and the angle of pleural puncture have been reported [(25,26)] as the factors which have some sort of influence on the development of Pneumothorax after CT guided FNAB of Chest masses.

PURPOSE OF STUDY

To analyze the rate of Pneumothorax after CT guided TNAB of lung masses , and correlating it with the size of the lesion.

PATIENTS AND METHODS

Study Design

This was a Descriptive study.

Sample Population

Patients having a chest mass who required a biopsy to reach the definitive diagnosis. These patients were referred from Chest Medicine, Chest Surgery and Medical departments. Convenient sampling was done.

Sample Size

Seventy patients

Place of Study

Department of Radiology Mayo Hospital , Lahore.

Duration of Study

This study was conducted over a period of 10 months from June 2002 to April 2003 , in which 70 cases will be evaluated.

INCLUSION CRITERION

1. Patients between 15- 75 years age group.
2. The patients had a control X ray Chest and CT chest with them before the FNA.
3. All patients had PT/ APTT done for bleeding and clotting control.

EXCLUSION CRITERION

1. Because of the complications that may arise from the procedure, only indoor patients were included in the study.
2. Already diagnosed cases were not considered.
3. Patients who were not having proper advice form from the respective consultant also were not considered.

METHODOLOGY

The Fine Needle Aspirations (FNA) were carried out under the guidance of CT scan machine of Toshiba Spiral CT Xvision/Ex. The FNA was conducted via 18G, 20G or 22G. Size of the lesion, distance of the lesion from the pleura and the number of punctures through the pleura recorded and documented in the form of a proper proforma. Immediate post procedure CT slices of chest and 6 hours delayed Chest X rays were taken to analyze Pneumothorax.

DATA ANALYSIS

In this descriptive study the data, i.e.; the effect of Size of lesion on the rate of Pneumothorax after CT guided FNA of Chest masses, were evaluated using Proportions , Frequencies (%).

RESULTS

Total numbers of patients included in the study were 70. Eighteen out of these 70 patients developed pneumothorax after the procedure.

Lesion less than 1 cm , out of 6 patients 3 developed pneumothorax (50 %), lesions 1-2 cm 5 out of 11 developed pneumothorax(45%), lesions with size of 2-3

cm 5 out of 14 patients developed pneumothorax (35%), lesions between 3-4 cm 2 out of 8 developed pneumothorax (25%), lesion sized 4-5 cm 1 out of 15 developed pneumothorax (6%), and lesion with more than 5 cm size 1 out of 16 developed pneumothorax (6%).

Size of lesion	No. of pts	Pneumothorax	Frequency
<1cm	06	03	50%
1-2 cm	11	05	45.4%
2-3 cm	14	05	35%
3-4 cm	08	02	25%
4-5 cm	15	01	6%
>5 cm	16	01	6%
-	70	18	25.7%

DISCUSSION

The rate of pneumothorax has been studied very extensively using multiple variables, the size of the lesion being one. Also the needle size, depth of the lesion, number of punctures required to obtain adequate samples , the dwell time and the angle of the needle in relation to the pleura should be studied[16-18].

The strong correlation between pneumothorax rate and lesion size is difficult to explain, although this correlation has previously been reported[15,24]. It could be argued that larger lesions are more likely to contact the pleural surface and, hence, not require needle passage through aerated lung. However, the correlation of increasing frequency of pneumothorax with decreasing lesion size persists, even if lesions with pleural contact are eliminated from consideration. Another possible explanation for this finding is that the up-and-down movement of the needle tip during aspiration biopsy results in more tearing of adjacent lung parenchyma when the lesion is relatively small.

All the cases we took were not attached to the pleura and the lesions were of the lungs so the pleura had to be punctured.

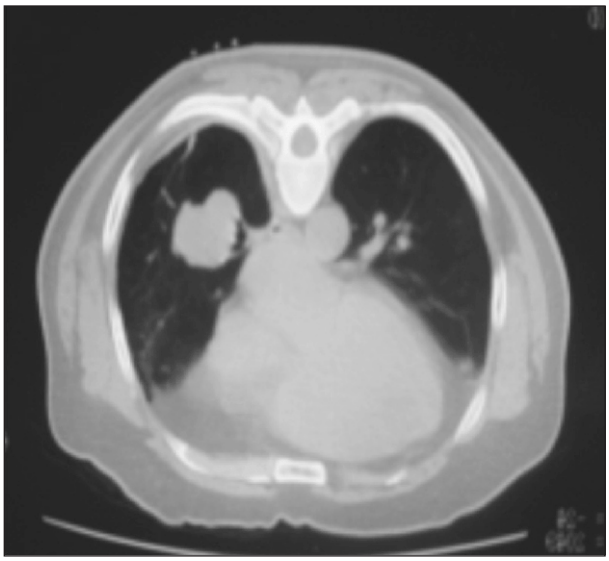


Fig-1. Marking of the lesion and localization before biopsy

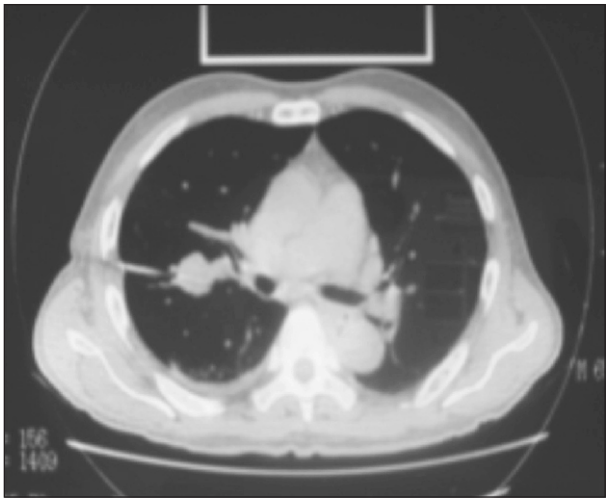


Fig-2. Needle insertion into the lesion close to hole,

CONCLUSION

The study shows that the rate of Pneumothorax after CT guided TNAB of Lung Masses increases as the size of the lesion decreases.

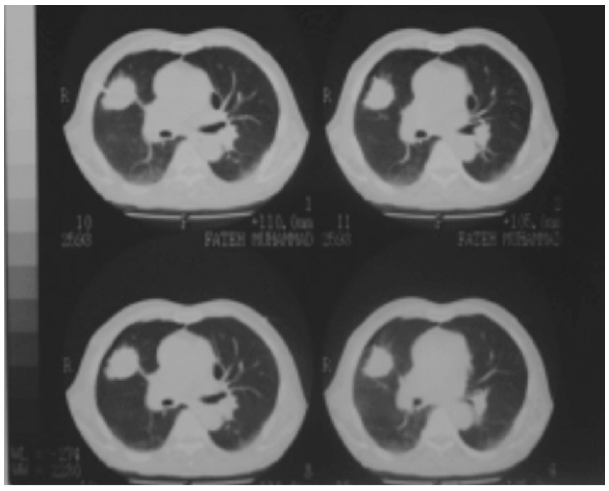
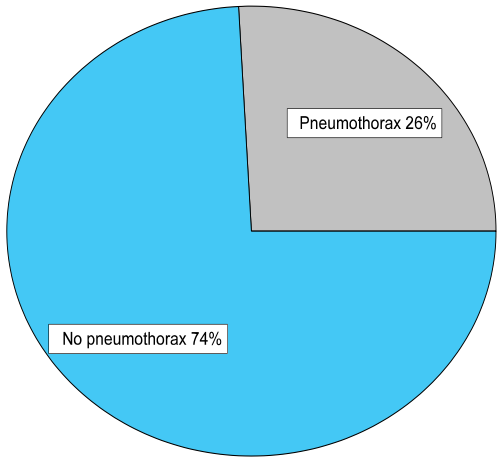


Fig-3. Pneumothorax during the procedure of TNAB



REFERENCES

1. Li H, Boiselle PM, Shepard JO, Trotman-Dickenson B, McCloud TC. **Diagnostic accuracy and safety of CT-guided percutaneous needle aspiration biopsy of the lung: comparison of small and large pulmonary nodules.** AJR 1996; 167:105-9.
2. Harter LP, Moss AA, Goldberg HI, Gross BH. **CT-guided fine-needle aspirations for diagnosis of benign and malignant disease.** AJR 1983; 140:363-7.
3. Perlmutt LM, Johnston WW, Dunnick NR. **Percutaneous transthoracic needle aspiration: a review.** AJR 1989; 152:451-5.
4. Stanley JH, Fish GD, Andriole JG. **Lung lesions: cytologic diagnosis by fine-needle biopsy.** Radiology 1987; 162:389-91.
5. Westcott JL. **Percutaneous transthoracic needle biopsy.** Radiology 1988; 169:593-601.
6. Khouri N F, Stitik F P, Erozan Y S. **Transthoracic needle aspiration biopsy of benign and malignant lung lesions.** AJR 1985; 144:281-8.
7. Sinner WN. **Complications of percutaneous transthoracic needle aspiration biopsy.** Acta Radiol 1976; 17:813-28.
8. Herman PG, Hessel SJ. **The diagnostic accuracy and complications of closed lung biopsies.** Radiology 1977; 125:11-4.
9. Tolly TL, Feldmeier JE, Czcernecki D. **Air embolism complicating percutaneous lung biopsy.** AJR 1988; 150:555-6.
10. Aberle DR, Gamsu G, Golden JA. **Fatal systemic arterial air embolism following lung needle aspiration.** Radiology 1987; 165:351-3.
11. Müller NL, Bergin CJ, Miller RR, Ostrow DN. **Seeding of malignant cells into the needle track after lung and pleural biopsy.** Can Assoc Radiol J 1986; 37:192-4.
12. Graham RJ, Heyd RL, Raval VA, Barrett TF. **Lung torsion after percutaneous needle biopsy of lung.** AJR 1992; 159:35-7.
13. vanSonnenberg E, Casola G, Ho M. **Difficult thoracic lesions: CT-guided biopsy experience in 150 cases.** Radiology 1988; 167:457-61.
14. Poe RH, Kallay MC, Wicks CM, Odoroff CL. **Predicting risk of pneumothorax in needle biopsy of the lung.** Chest 1984; 85:232-5.
15. Fish GD, Stanley JH, Miller KS, Schabel SI, Sutherland SE. **Postbiiopsy pneumothorax: estimating the risk by chest radiography and pulmonary function tests.** AJR 1988; 150:71-4.
16. Miller KS, Fish GB, Stanley JH, Schabel SI. **Prediction of pneumothorax rate in percutaneous needle aspiration of the lung.** Chest 1988; 93:742-5.
17. Anderson CLV, Crespo JCA, Lie TH. **Risk of**

pneumothorax not increased by obstructive lung disease. Chest 1994; 105:1705-8

18. Haramati LB, Austin JHM. **Complications after CT-guided needle biopsy through aerated versus nonaerated lung.** Radiology 1991; 181:778.

19. Fontana RS, Miller WE, Beabout JW, Payne WS, Harrison EG, Jr. **Transthoracic needle aspiration of discrete pulmonary lesions: experience in 100 cases.** Med Clin North Am 1970; 54:961-71.

20. Coleman R, Driver M, Gishen P. **Percutaneous lung biopsy: experiences during the first 54 biopsies.** Cardiovasc Intervent Radiol 1982; 5:61-3.

21. Jereb M. **The usefulness of needle biopsy in chest lesions of different sizes and locations.** Radiology 1980; 134:13-5.

22. Jackson R, Coffin LH, DeMeules JE, Miller DB, Dietrich P, Fairbank J. **Percutaneous needle biopsy of pulmonary lesions.** Am J Surg 1980; 139:586-90.

23. Gibney RTN, Man GCW, King EG, leRiche J. **Aspiration biopsy in the diagnosis of pulmonary disease.** Chest 1981; 80:300-3.

24. Kazerooni EA, Lim FT, Mikhail A, Martinez FJ. **Risk of pneumothorax in CT-guided transthoracic needle aspiration biopsy of the lung.** Radiology 1996; 198:371-5.

25. Laurent F, Philippe M, Latrabe V, Tunon de Lara M, Marthan R. **Pneumothoraces and chest tube placement after CT-guided transthoracic lung biopsy using a coaxial technique: incidence and risk factors.** AJR Am J Roentgenol 1999; 172:1049-53.

26. Jane P. Ko, Jo-Anne O,Shepard, Elizabeth A, Suzanne L, Aquino S, ,Theresa C. **Factors Influencing Pneumothorax Rate at Lung Biopsy: Are Dwell Time and Angle of Pleural Puncture Contributing Factors.** Radiology 2001;218: 491-6.