ISSN : 2309-3234

TMSS Medical College Journal (TMCJ)

Volume 14, No. 01, January 2020

Contents

An Official Publication of TMSS Medical College

TMSS Medical College Journal (TMCJ)

January 2020

An Offical Publication
of
TMSS Medical College, Bogura, Bangladesh

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Printed by

TMSS Printing Press
Bogura, Bangladesh
e-mail: tmssprintingpress@gmail.com

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Original Article

CT guided FNAC of chest: An institutional experience of 92 cases

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Abstract

Background: Computed tomography (CT)-guided fine needle aspiration cytology (FNAC) is regarded as a rapid, safe, and accurate diagnostic aid in lung lesions. **Aims:** To assess the role of CT-guided FNAC in thoracic mass lesions, to analyse the results, and to compare the results with other studies. **Materials and Methods:** ninety two patients were studied over two year (January 2018- December 2019) for their cytological diagnoses. **Results:** Out of 92 cases, 46(50%) cases are diagnosed as malignant. There were 41 parenchymal (lung) tumors and the remaining four tumor cases were mediastinal and one case involved chest wall. The most common tumor was adenocarcinoma (39.1%) followed by squamous cell carcinoma(28.3%) and small cell carcinoma(13%). Post procedural complications were minimal and were noted in only three cases (a little pulmonary hemorrhage in two and hemoptysis in one). **Conclusion:** CT-guided FNAC is an extremely valuable and fairly accurate diagnostic aid of intrathoracic mass lesions, with a reasonable rate of complication.

Key words: CT guided FNAC, Intrathoracic mass lesions

Introduction

Fine Needle Aspiration Cytology (FNAC) introduced first by Soderstrom in 1952, then it has become a well-established, outpatient procedure used worldwide in the primary diagnosis of any palpable swellings.[1] It is quick, cost-effective and minimally invasive technique distinguishes between benign and malignant lesions quite effectively.[2] However, its application is limited in cases with deep seated lumps, smaller sized lesions which are not readily palpable or if a small swelling is present in a crucial location, adjacent to major vessels. In such case scenarios, FNAC coupled with diagnostic imaging techniques such as ultrasound (USG) or computed tomography (CT) can improve the diagnostic yield and a definite diagnosis can be reached in most of the cases. Transthoracic percutaneous needle biopsy (PNB) is routinely used to diagnose parenchymal[3-7] and accessible mediastinal[8-13] neoplasms. Recognition of the high accuracy rate of FNAC along with the simpler methods to treat its complications like pneumothorax has increased its popularity among clinicians, radiologists and pathologists.[14,15] Even though FNAC has proven its role in the diagnosis of infections and other diffuse benign processes, the main indication remains the diagnoses of localized intrathoracic lesions suspected of being malignant, particularly when less-invasive investigations prove to be negative.[16] The presence of pathologist at the time of the procedure leads to a reduction in the number of needle passes and may increase the overall sensitivity and accuracy of tumor typing.[17,18] The purpose of this present study was to evaluate the effectiveness of Computerized Tomography (CT) guided FNAC in the diagnosis of pulmonary lesions and to analyze the age, sex, and topographic distribution, and cytopathological diagnosis of thoracic

mass lesions using CT-guided FNAC.

Materials and Methods

This observational descriptive study was conducted by the histopathology section in collaboration with the Department of Radiology of TMSS Medical College. A total 92 patients who underwent CT guided transthoracic fine needle aspiration from pulmonary mass lesions at the teaching hospital over a period of 2 years (January 2018- December 2019). The SIEMENS, SOMATOM Emotion 16 slice Multidetector CT scanner was used for CT guided FNAC.

The inclusion criteria of this study were all persons with mass lesion(s) and consolidation(s). Patient with history of chemotherapy or radiotherapy were excluded. Before FNAC, all lesions were scanned using routine CT performed at a thickness of 2.5 mm. FNAC was performed in the pulmonary lesions using a 22 gauge disposable lumbar puncture needle after obtaining proper informed consent. History of bleeding or coagulation disorder, arteriovenous malformation, aneurysm, pulmonary hypertension were also ruled out beforehand.

The aspirations were performed by a pathologist in conjunction with a radiologist. Proper aseptic care was taken by cleaning the skin surface with povidone iodine before every FNAC. Aspiration was done using 22G spinal needle through percutaneous and transthoracic approaches, identifying the lesion in the exact section by CT scan after the measurement of the site of entry of the needle, route of the needle, and the distance between the skin and lesion on the CT scan monitor. The patient's position was supine, prone, or lateral decubitus depending on the location of the thoracic mass lesions. Following placement of the needle, a CT scan slice was taken to ascertain whether the tip of the needle was within the mass. The aspirate was obtained by to and fro and rotatingmovements of the needle within the lesions and five to ten smears were prepared immediately from the sample in the CT scan room. 95% alcohol-fixed smears were stained with Papanicolaou and hematoxylin and eosin stains for rapid cytopathological evaluation of the lesions. The patients were kept in the radiology department for follow up for a period of 2 hours after fine needle aspiration to keep track of any complication. A repeat CT scan was performed if indicated in case any complication developed. Although all patients with postprocedural complications were observed carefully, no active treatment was required for any of these patients. The slides were studied and analyzed in terms of radiological, clinical and cytological data to reach a final diagnosis. Smears were correlated with findings of the cell block, wherever available. The lesions were divided into the following categories: inconclusive, non specific inflammatory, tuberculosis, benign tumors, and malignancy.

Results

Out of 92 cases involved in our present study, 49 (53%) were male and 43 (47%) were female. The youngest patient was a female of 20 years whereas the oldest was a male of 100 years; the overall mean age of all the patients was 58.1 years. A gender wise examination of the patients' ages revealed that the mean age was 59.2 years for the male and 52.1 years for the female. Out of 92 cases there were 46 (50%) parenchymal (lung) tumors: 29 were found in the right lung and 12 in the left lung field; only four cases were located in the anterior mediastinum and one case involves sternum.

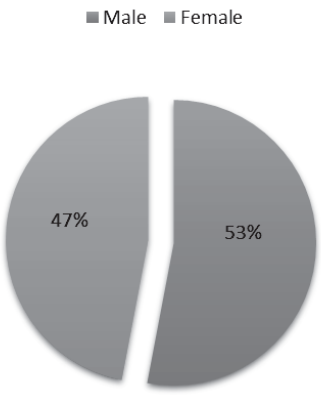

Figure 1: Pie chart showing gender distribution of study subjects.

Out of 92 cases of thoracic mass lesions, definitive cytological diagnosis was obtained in 83 cases and the rest nine cases were inconclusive and descriptive report was given to the patients. Among 83 cytologically diagnosed cases, 46 were malignant (including both lung, mediastinal tumor and chest wall tumor) and the remaining 37 cases were diagnosed as granulomatous inflammation that was consistent with tuberculosis, nonspecific inflammatory lesions (Table I). 13 cases are diagnosed as squamous cell carcinomas 18 cases are diagnosed as adenocarcinoma, 6 cases are diagnosed as small cell carcinoma, 3 cases are diagnosed as non-Hodgkin lymphoma, 4 cases are diagnosed as metastatic carcinoma, one case is diagnosed as plasmacytoma of sternum and one case is diagnosed as mesothelioma. Out of 4 metastatic carcinoma one is metastatic ductal carcinoma of breast, one is metastatic hepatocellular carcinoma, one is metastatic germ cell tumor of testis, and one is metastatic undifferentiated carcinoma of unknown origin.

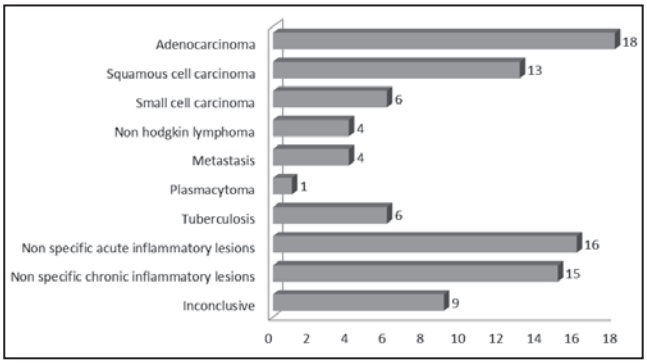

Table 1: Distribution and diagnosis of 92 cases of CT guided FNAC

Microscopically, both the squamous cell carcinomas, small cell carcinoma and the adenocarcinomas showed classical cytomorphological features. Most of the Squamous cell carcinomas show features of keratinization, adenocarcinoma shows gland formation and small cell carcinoma shows typical speckled chromation. (Figure 1).

Four cases of mediastinal non-Hodgkin's lymphoma were diagnosed, the cytological smears were highly cellular, consisting of discrete, monotonous populations of cells, having enlarged nuclei with immature chromatin and inconspicuous nucleoli (Figure 2).

Postprocedural complications were seen in three cases: post FNAC CT scans showed small amounts of pulmonary hemorrhage in two cases and one of the patients suffered from hemoptysis on one occasion just after the aspiration.

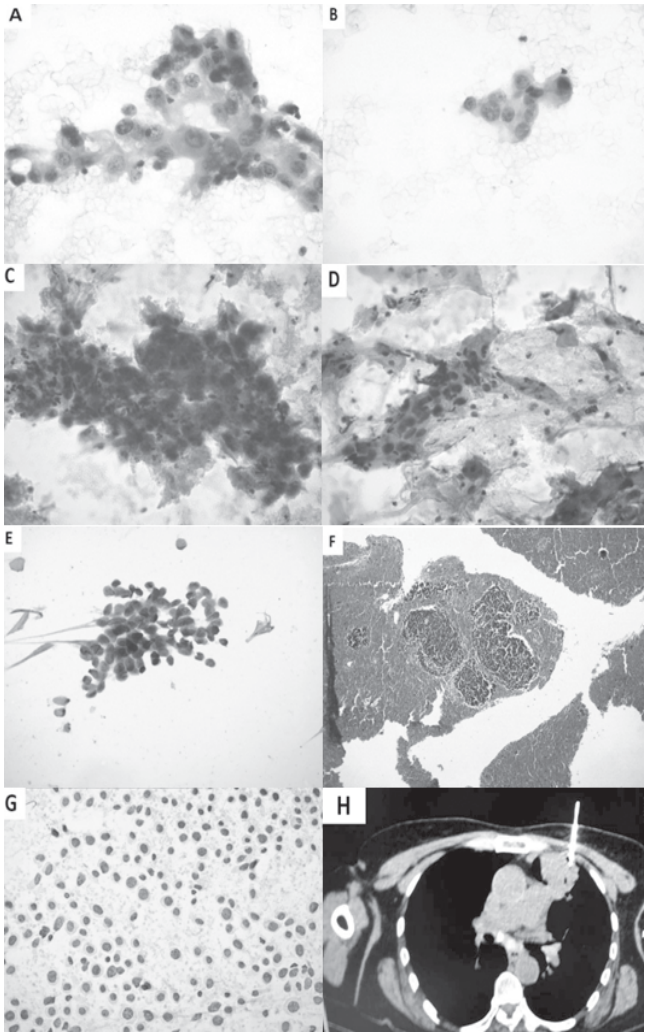

Figure 3: Photomicrograph of FNAC smears (obtained by CT guided FNAC) A,B: Adenocarcinoma (Pap x400), C: Squamous cell carcinoma(Pap X400), D: Squamous cell carcinoma(Pap X100), E: Small cell carcinoma(Pap x400), F: Small cell carcinoma cell block(H & E x100), G: non Hodgkin lymphoma(Pap x400), H: CT scan of a case after needle insertion.

Discussion

Fine needle aspiration is generally applied to localized lesions of lung, its use being limited to diffuse parenchymal disease. The main objective of guided FNAC is to diagnose malignancy although it can be used for definitive diagnosis of some benign neoplasms and infections such as tuberculosis.[19] Among the imaging modalities, CT is the most popular. Other modalities include fluoroscopy and ultrasonography.[20] In the present study, there was a male preponderance with a male (53%) and female (47%). Among the FNAC proven cases of malignancy, this difference was even more evident with a male (65%) and female (35%). This difference is explained on the basis of higher incidence of predisposing factors like smoking, chronic obstructive pulmonary disease (COPD) and alcoholism in males. the study conducted by Sing *et al*, Wallace *et al* and Tan *et al* also showed a higher incidence of male patients. The incidences are 52.0%, 55.7% and 71.1% respectively.[21, 22, 23]

Literature reveals that 70% of the primary lung cancers are diagnosed as non-small cell carcinomas, whereas small cell carcinomas are found to comprise around 20% of all primary lung tumors.[24] In this series, percentage of small cell carcinoma is 13%. In the non-small cell group of carcinomas, adenocarcinoma was the commonest comprising 39.1% of cases followed by squamous cell carcinoma (28.3%). Though squamous cell carcinoma was used to be considered the commonest lung tumor, studies indicate that adenocarcinomas may have overtaken it in incidence.[25] This order of frequency was also found in other studies.[26, 27] The incidence of adenocarcinoma was reported to be significantly higher than that of squamous cell carcinoma in a study by Tan et al.[23] All four mediastinal tumors (8.7%) were malignant which are non-Hodgkin's lymphoma. Four cases (8.7%) are diagnosed as metastatic carcinoma and one case (2.2%) is diagnosed as plasmacytoma.

There are no definite cytological criteria for distinguishing primary from secondary adenocarcinomas, although there may be features indicative of a particular organ of origin.[28] Out of 4 metastatic carcinoma in our series one is metastatic ductal carcinoma of breast, one is metastatic hepatocellular carcinoma, one is metastatic germ cell tumor of testis, and one is metastatic undifferentiated carcinoma of unknown origin. Definite clinical history and cell block histology prepared from the aspirated material helps us to diagnose the cases.

Benign non-neoplastic lesions were diagnosed as granulomatous inflammation consistent with tuberculosis (16.2%) and Nonspecific acute inflammatory lesion (43.3%), Nonspecific chronic inflammatory lesion (40.5%).

The incidence of inconclusive (unsatisfactory for diagnosis) cases (9.8%) in our series was similar than that in other studies.[21] The inconclusive results were due to scanty aspirate as well as scanty cellularity and in some cases only blood mixed material.

Perhaps the greatest advantage of fine needle aspiration is safety. However, pneumothorax remains the most common complication of CT guided lung FNAC. Review of the existing literature reveals variable rates of pneumothorax, ranging from 5 to 64%.[23] Location of the lesion, needle size, number of pleural passes and level of training were not correlated with pneumothorax rate. In the present study, no patient developed pneumothorax.

Conclusion

FNAC is of definite help in diagnosing chest lesions. It provides very early diagnosis and exact sub classification of various lung tumors on the basis of cytomorphology. Benign non neoplastic lesions like tuberculosis can also be diagnosed with certainty by this technique. The early and accurate diagnosis obtained by CT-guided FNAC helps to formulate immediate, effective management of thoracic mass lesions. It also avoids unnecessary thoracotomy for diagnostic purposes.

(TMSS Medical College Journal 2020;14:22-27)

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