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Original research article

A STUDY OF THORACIC LESIONS AND COMPARISON OF IMAGING DIAGNOSIS BY COMPUTED TOMOGRAPHY (CT) WITH FINAL DIAGNOSIS BASED ON HISTOPATHOLOGY/CYTOLOGY

[1]Dr. Guruprasad Bhat, [2]Dr. Shobitha

[1]Associate Professor, Department of Medical Oncology, Kanachur Institute of Medical Science and Research Centre, Derlakatte, Mangalore, Karnataka, India

[2]Associate Professor, Department of Respiratory Medicine, Srinivas Institute of Medical Science and Research, Mukka, Surathkal, Karnataka, India

Corresponding Author:
Dr. Shobitha

Abstract

The invention of CT has been a remarkable achievement of the 21st century. When used by a skilled practitioner, it has the potential to greatly benefit a patient who is experiencing distress. In the near future, CT diagnosis is expected to be widely recognised as the most reliable method for diagnosing thoracic lesions. Currently, it is generally advisable to confirm the final diagnosis with histological examination. This study aims to comprehensively investigate and comprehend the indicators of thoracic lesions, and subsequently compare this data with the histological confirmation.

Keywords: Imaging signs, thoracic malignancy, histopathology, cytology

Introduction

Due to the rapid rate of advancement in lung malignancy, it is crucial to diagnose pulmonary lesions at an early stage. The majority of pulmonary nodules are comprised of granulomas and bronchogenic malignancies. The prevalence of malignant disease varies from 10 to 70%, with an average of 40% [1]. Other prevalent causes of pulmonary nodules are hamartomas, metastases, infarcts, vascular malformations, localised inflammatory masses and lipoid pneumonia, etc. in decreasing order of frequency [2].

A Solitary Pulmonary Nodule (SPN) is a round or oval abnormality, measuring less than 3 cm in diameter, that is fully enclosed by lung tissue and is not accompanied by lymphadenopathy, atelectasis, or pneumonia. Lung lesions with a size over 3 cm are classified as lung masses [3]. A solitary pulmonary nodule (SPN) is observed in around 0.2% of chest radiographs. Three Bronchogenic carcinoma is the most prevalent cancer among males, and among women it ranks below breast, colon, and skin cancers in terms of frequency. Cigarette smoking is the primary cause of this condition.

Metastatic lung illness in adults typically originates from malignancies of the breast, gastrointestinal tract, kidney, testes, head and neck tumours, or a range of bone and soft

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tissue sarcomas. Haematogenous pulmonary metastases manifest as solitary or several distinct pulmonary nodules, typically found in the peripheral regions of the lungs. This distribution is particularly noticeable on CT scans [4]. The nodules often have a spherical shape and clear boundaries, however they may assume various shapes and occasionally possess an uneven perimeter. Irregular edges are commonly observed, especially in cases of metastases originating from adenocarcinomas. Pulmonary metastases can exhibit cavitation, a distinctive characteristic of squamous cell carcinoma. Calcification is rare, except in cases of osteosarcoma and chondrosarcoma [5]. While calcification is commonly observed in original tumours such as those in the breast and colon, it is infrequently seen in pulmonary metastases. The metastases in certain choriocarcinomas and osteosarcomas exhibit a very varied development rate. In some cases, the growth can be quite rapid, with the lesions doubling in volume in less than 30 days [6]. This study aims to accurately document and establish a connection between the tissue obtained by CT-guided interventional techniques and the cytopathological and histological findings in diagnosing thoracic diseases. The purpose of this study is to assist radiologists in promptly identifying and diagnosing the condition, enabling them to implement urgent and proactive steps to halt its natural course.

Materials and Methods

Prior to the interventional procedure, the patient or their relative was provided with a detailed explanation of the intended treatment and the potential consequences that may occur. Informed consent was obtained thereafter.

This study is an observational investigation conducted in a hospital setting, focusing on CT-guided interventional procedures performed on patients with thoracic lesions that were diagnosed by imaging techniques such as chest radiograph, CT, or MRI scans. The patients were referred to the Department of Radiodiagnosis for CT-guided thoracic procedures by the Chest Medicine Department and other clinical departments within our institution. The research was conducted at the Kanachur Institute of Medical Sciences in Mangalore. The study will span 12 months, commencing in June 2022 and concluding in May 2023.

Inclusion criteria

- Patients with thoracic lesions who have been referred for CT-guided core biopsy, fine needle aspiration cytology, or drainage.

Exclusion criteria

- Patients who are uncooperative and unable to hold their breath adequately.
- Untreated blood clotting disorders.
- Patients who are at a heightened risk for pneumothorax or haemothorax due to challenging accessibility to the lesions.

The study involves patients with thoracic lesions located in the lung parenchyma, mediastinum, pleura, bony thoracic cage, and soft tissues of the thorax. These lesions are being examined for diagnostic cytology or biopsy, which will be performed under CT guidance. Participants were chosen based on preprocedural imaging diagnostic

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utilising chest radiography, computed tomography, magnetic resonance imaging, or sonography. All patients underwent assessment of bleeding and clotting parameters, including clotting time, bleeding time, prothrombin time, and Activated Partial Thromboplastin Time (APTT). The study included subjects who had normal bleeding and clotting parameters, while excluding those who did not. Comprehensive patient histories were obtained, encompassing medical history, occupation, and personal background.

Results

Table 1: CT evaluation

Total Number	Benign	Malignant	Indeterminate
21	4	16	1

Table 2: Histopathological Report

Tissue	Number
Benign	4
Malignant	14
Inadequate	0
Normal	2
Total	**21**

Report 1: Sensitivity and Specificity for benign lesion

- CT sensitivity for benign lesions-75%.
- CT specificity for benign lesions-93.75%.
- Positive predictive value of CT-75%.
- Negative predictive value of CT-93.75%.

Report 2: Sensitivity and Specificity for malignant lesion

- CT sensitivity for malignant lesions-100%.
- CT specificity for malignant lesions-77.78%.
- Positive predictive value of CT-87.50%.
- Negative predictive value of CT-100%.

Discussion

Focal inflammatory lesions are a distinct type of lung abnormalities, and CT scans are crucial for precisely identifying the location of these lesions for the purpose of performing TTFNAC and biopsy procedures. The majority of them do not exhibit distinctive characteristics. CT imaging may reveal the presence of an air bronchogram, indicating a potential inflammatory cause. Tuberculosis and actinomycosis are examples of inflammatory tumours that can invade the chest wall. In these cases, a diagnosis can be confirmed through aspiration. One The diagnosis of lung abscess is challenging when there is no air-fluid level seen on plain x-ray or CT scans. A core

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area of reduced density within a circular or oval bulk is commonly observed. Administering contrast intravenously can reveal increased intensity around the outer edge, while the abscess wall typically appears thick and uneven. Pathological assessment is necessary to distinguish between a cavitating primary or secondary tumour. Thymoma is the prevailing neoplasm originating in the anterior mediastinum. This condition often manifests in individuals who are at least 20 years old and affects both males and females at an equal rate. Invasive thymoma can exhibit eggshell calcification. Benign thymomas often exhibit consistent attenuation, whereas invasive thymomas may display more varied attenuation.

Hodgkin's Lymphoma (HL), Non-Hodgkin Lymphoma (NHL), sarcoidosis, inflammatory diseases, infection, and metastases are potential causes of lymphadenopathy in the anterior mediastinum. Hair loss (HL) affects individuals of both genders, typically occurring in individuals between the ages of 20 and 30, as well as those who are 50 years old or beyond. Malignant lymphoma typically presents as mediastinal lymphadenopathy in the thorax. Germ cell tumours of the mediastinum are thought to originate from residual primitive germ cell elements following embryonal cell migration. These cancers typically originate in the thymus or in close proximity to it, specifically in the anterior mediastinum, making it the most frequent extragonadal location for such tumours. confined pleural tumours are rather rare, with the most prevalent being a confined fibrous tumour. Malignant variants typically exceed a size of 10 cm and have the potential to infiltrate the chest wall. One pleural metastases represent the prevailing form of pleural neoplasms. Typically, these are adenocarcinomas that commonly originate in the ovary, stomach, breast and lung [5]. Malignant mesothelioma or pleural metastases can produce diffuse thickening of the pleura. A lipoma is the most frequently encountered noncancerous tumour of the chest wall. However, there are various other types of mesenchymal tumours that can also arise, such as neurofibromas (either focal or plexiform), neurilemmomas, haemangiomas, and lymphangiomas (also known as cystic hygromas). Soft tissue malignancies originating in the chest wall are uncommon, with the most prevalent types being liposarcoma or fibrosarcoma. The occurrence of secondary tumours in the chest wall is frequent, especially when they result from the local spread of cancer in the breast, lung, or lymphoma. Both inflammatory and neoplastic illnesses can impact the bony thoracic structures mentioned above. Rib lesions that cause destruction are most frequently seen in cases of osteomyelitis or neoplastic conditions.

Ribs can be affected by a variety of primary and secondary tumours, resulting in localised lesions. Non-neoplastic conditions that can impact the sternum include osteomyelitis, histiocytosis X, Paget's disease, fibrous dysplasia, and osteitis fibrosa. cystica. Clavicle neoplasms typically exhibit malignancy, such as myeloma or metastasis. Other primary cancers and tumour-like lesions include osteosarcoma, Ewing's sarcoma, post-radiation sarcoma, aneurysmal bone cyst and histiocytosis.

The diagnostic performance of CT in identifying benign thoracic lesions was as follows: sensitivity of 75%, specificity of 93.75%, positive predictive value of 75%, and negative predictive value of 93.75%. CT demonstrated a sensitivity of 100%, specificity of 77.78%, positive predictive value of 87.5%, and negative predictive value of 100% in identifying malignant thoracic lesions correspondingly. According to the literature study, CT scans have lower sensitivity in diagnosing benign lesions in the

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thorax compared to their sensitivity in diagnosing other conditions. The diagnosis of malignant thoracic lesions can be accurately determined by CT, but CT has a greater ability to accurately diagnose benign thoracic lesions compared to its ability to diagnose malignant thoracic lesions [8, 9]. Image-guided thoracic procedures have been made possible by the progress in cross-sectional imaging techniques. Computed tomography (CT) is the predominant imaging technique used for thoracic procedures. Minimally-invasive thoracic procedures, such as CT-guided transthoracic lung biopsy and transthoracic fine needle aspiration cytology, have gained popularity for diagnosing and treating thoracic lesions. As a result, more invasive procedures like thoracoscopy, mediastinoscopy, and thoracotomy can be avoided.

Conclusion

CT examination and CT-guided therapies are efficient methods for diagnosing and treating patients with thoracic abnormalities.

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