

**Role of MDCT in diagnosis of pulmonary nodules**Nadia Abdelsater Metwally¹, Hoda Mahmoud Abdelwahab¹, Amal Rashad Abdelasttar²¹Professor of Radiodiagnosis Faculty of Medicine for Girls Al-Azhar University, Egypt²M.B.B.CH Faculty of Medicine for Girls Al-Azhar University, Egyptpharma_20102002@yahoo.com

Abstract: Objective: This study aims to evaluate role of MDCT in diagnosis of pulmonary nodules. **Methods:** The prospective study was carried out on 20 patients which presented by pulmonary nodules and some of patients were accidentally discovered pulmonary nodules. The patients were referred from chest, Internal medicine department and out patient clinic of Al Zahraa University hospital to MDCT unit of radiology department. The study will be conducted for a period of one year from October 2018 to October 2019 after getting approval from the ethical committee of the institute. Informed consent from all patients was taken before inclusion in the study. **Results:** The total number of cases in this study were 20 cases, 12 (60%) cases were male and 8 (40%) cases were female. Multiple pulmonary nodules were the commonest noted in 15 (75%) patients while solitary nodules seen in 5 (25%) patients. The commonest type of pulmonary nodules is secondary from other malignancy presented in 11 (55%) cases while Primary malignancy was presented in 5 (25%) cases. **Conclusion:** MDCT is more sensitive than single-detector CT in evaluating morphologic characteristics, growth and follow-up of pulmonary nodules.

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Keywords: MDCT, Pulmonary nodule diagnosis.

1. Introduction:

Pulmonary nodule by definition is a round and focal opacity in the lung parenchyma with diameter of less than 3 cm, (1).

The majority of pulmonary nodules are asymptomatic and are detected by C T in the course of a lung cancer screening or as an occasional finding when performing chest C.T for other clinical problems, they are classified into solid, partially solid or non-solid ground-glass opacities, (2).

The pulmonary nodules may be of Congenital origin, Inflammatory related to infection (T.B), Auto immune (collagen disease), Industrial disease, Benign tumor, Malignant tumor, (3).

-High risk patients who have history of heavy smoking, family history, lung carcinoma or history of exposure to radon or uranium, (4).

-Usually there are no complain of patients with pulmonary nodules. If present it may be: Chest pain, Coughing of blood or Loss of Weight and heamoptysis, (5).

-CT scan of the chest in adults should be reconstructed and achieved with contiguous thin section about 1 mm to enable accurate characterized and measurement of small pulmonary nodules with respect to solid morphology, fat or calcium content which can affect management (5).

Most persons with pulmonary nodules do not experience symptoms. Generally, pulmonary nodules is detected as an incidental finding.

Lung cancer can often appear as Pulmonary nodules on chest X-ray. Therefore, the goal of investigating an Solitary Pulmonary Nodule is to differentiate a benign growth from a malignant growth as soon and as accurately as possible.

Pulmonary nodules should be considered potentially cancerous until proven otherwise People should always communicate openly and honestly with their health care provider about their history and risk factors. (6).

The pulmonary nodules may be solitary or multiple.

Causes of Solitary Pulmonary Nodules**Congenital:**

Arteriovenous malformation -Sequestration - Lung cyst.

Inflammatory (infectious OR Non infectious)

A-Inflammatory infectious: Caused by (Tuberculosis, fungi, Histoplasmosis) Other causes:

Lung abscess -Round pneumonia -Hydatid cyst.

B_Inflammatory noninfectious: Caused by (Rheumatoid arthritis - Granulomatosis with polyangiitis -Sarcoidosis Lipoid pneumonia).

Neoplastic (Primary or secondary):

A-Primary: (Lymphoma -Carcinoid - Hamartoma-Fibroma -Neurofibroma -Blastoma).

B-Secondary: Metastasis from cancer in other body parts.

Miscellaneous

-Pulmonary infarct -Round atelectasis -Mucoid impaction-Progressive massive fibrosis, (6).

Causes of Multiple Lung Nodules

1-**Metastatic** are the major cause.

2-**Lymph nodes** are located along the lining of the lung (the pleura)

3-**Benign tumors**, the most common are (hamartomas, fibromas)

4-**Autoimmune disorders** Causes include rheumatoid arthritis, sarcoidosis, and eosinophilia.

5-**Infections** include bacterial infections such as (tuberculosis, fungal, histoplasmosis, cryptococcosis) and parasitic infections such as (echinococcosis).

6-**Pneumoconiosis**, occurs in around 2% of coal miners.

1. 7-Post infection scar (7).

Value of CT in Nodular lung lesion assessment.

1-Detection of pulmonary nodules.

2-Assesment of pulmonary nodules distribution.

3-Assesment of pulmonary nodules characteristics.

4-Assesment of pulmonary nodular growth rate and follow up.

5-Staging of lung cancer.

6-C T guided biopsy.

2. Patients and methods:

The prospective study was carried out on 20 patients, 12 male (60%) & 8 female (40%). The patients were referred from chest, Internal medicine department and outpatient clinic of Al Zahraa University hospital to MDCT unit of radiology department.

The study will be conducted for a period of one year from October 2018 to October 2019 after getting approval from the ethical committee of the institute. Informed consent from all patients was taken before inclusion in the study.

Technical protocol parameters of multidetector CT:

This study was applied using 160 slice MDCT, Toshiba, Aquilion PRIME, (made in Japan).

1-Scannogram: Covering the area from lower neck to upper abdomen.

2-Pre contrast scan of the chest in craniocaudal direction during breath hold to screen for lung nodule.

3-Reconstructed interval:0.5 mm, Slice thickness:5mm with, K V: 140, m As: 200, Pitch:1.5, and Scan time:10-20 second.

4-IV contrast material injection is non ionic iodinated contrast media in a dose 1-2 ml /Kg BW. The contrast media is was injected at a flow rate of 4ml/sec in a total volume of 80-120 ml with a powerful automatic injector through a catheter or a cannula via the antecubitalvien before the scanning.

Image Interpretation

All the raw data were sent to CT workstation and axial image viewed at the mediastinal and pulmonary window settings. Then, multi-planar reconstructions were performed to display the morphological features and the relationship of the nodule with adjacent bronchi and vessels.

Obtained images were evaluated for presence or absence of pulmonary nodules which then assessed as regard its morphology and internal characteristics including (size, margin, calcification, fat content, attenuation and density of enhancement). Features are important to differentiate benign from malignant nodules observed in the examination.

Data analysis

Radiographic features of the nodule such as nodule size, margin, calcification, fat content, attenuation and density of enhancement that are important to differentiate benign from malignant are observed in the examination.



Figure (1): Distribution of study cases according to sex groups

This table show that 5(25%) cases were under the age of 40 years, 9(45%) cases were from the age from 40 to 60 years and 6(30%) cases were older than 60 years, as shown in table (6).

Table (1): Age group of patient included in the study

This study showed that, 5(25%) patients had no risk of malignancy,11(55%) patients had risk factors as positive history of malignancy,3(15%) patients had positive family history,7(35%) patients were old age and 9(45%) patients were smokers. Table (8).

Table (2): Risk factors for malignancy among studied patients.

Multiple pulmonary nodules were the commonest noted in 15(75%) patient while solitary nodules seen in 5(25%) patients. Table (10).

Table (3): Show type of nodules.

Most type of nodules in our studied patients were well defined margin presented in 17 (85%) cases and 3(15%) cases presented by ill defined margin of nodule. Regards to attenuation of nodule 16 (80%) cases presented by solid nodules,3(15%) cases presented by ground glass nodules and the least type were part-solid nodules presented in one (5%). case Table (4).

The commonest type of pulmonary nodules is secondary from other malignancy presented in 11 (55%) cases and the breast cancer was the commonest one presented in 4 (20%). cases.

Primary malignancy was presented in 5 (25%) cases and adenocarcinoma and large cell carcinoma was presented in 2 (10%) cases for each and one (5%) case in squamous cell carcinoma, while benign nodules were the least type presented in 4(20%) cases as 2 (10%) cases for septic embolism and 1(5%) case for each of T B and silicosis. Table (5).

Table (4): CT characterization of pulmonary nodules.

Character	No of cases	Percentage
Margin		
Well defined	17	85%
Ill defined	3	15%
Nodule attenuation		
Solid	16	80%
Part-solid	1	5%
Ground glass	3	15%
Cavitation	2	10%
Calcification	1	5%

Table (5): This table shows types of pulmonary nodules.

Type	No of Cases	Percentage
Secondary malignancy from		
Breast cancer	4	20%
Ovarian cancer	2	10%
Cancer colon	3	15%
Leukemia	2	10%
Primary malignancy		
Adenocarcinoma	2	10%
Large cell carcinoma	2	10%
Squamous cell carcinoma	1	5%
Benign nodules		
Tuberculosis	1	5%
Septic embolism	2	10%
Silicosis	1	5%

4. Discussion

The aim of study is to evaluate role of MDCT in diagnosis and characterization of pulmonary nodules.

The age of the studied group in this study was ranged from 20-80 years and 60% (12 cases) of patients were male and 40% (8 cases) of patients were female.

This agree with (Toghiani A, et al. 2015) (8) study, on 50 patients, who found that 60% of cases were male and 40% were female.

In our study we found that most patients with pulmonary nodules is accidentally discovered, This agree with (Xu et al., 2013) (9), that reported most cases of pulmonary nodules had no experience symptoms and were detected accidentally.

This disagree with (Jiang S, et al., 2018) (10) that reported the patients experienced two or three symptoms on average, the most common symptom was cough and systemic symptoms, followed by dyspnea, chest pain and bloody sputum.

In our study there were 5 patients (25%) had no risk for malignancy, 3 patients (15%) had positive family history, 7 (35%) patients were old age, 9 (45%) patients were smokers and 11 cases (55%) had past history of other malignancy (4 breast, 2 ovary, 3 colon, 2 leukemia).

This agree with (Goo, 2011) (11) as they analyzed many of the characteristic used in the model and found that three clinical factors (age, smoking history, and history of previous malignancy).

In our study we found that most of cases were asymptomatic and were follow up after known malignancy about 11 cases (55%) and the least clinical presentation were fever and weight loss.

This in agreement with, (Phua CK., 2016) (12) who reported that most of the studied patients were asymptomatic.

This in disagreement with, (Jiang, et al.2018) (10), who reported that most symptoms of the studied patients were cough and bloody sputum.

In our study we found that most of pulmonary nodules presented by well defined margin in 17 cases (85%), 4 cases of them had benign nodules and 13 of them were malignant nodules.

This in agreement with, (Choromanska & Macura, 2012) (13) who stated that Benign lesions are more likely to have smooth, well marginated borders, while malignant nodules may have ill defined borders but the other may have well defined marginated borders.

This in disagreement with, (Gould et al, 2013) (14) in lung cancer screening trial ill defined nodules had a higher like hood for malignancy compared with smooth nodules.

In our study regards to nodule attenuation we found that solid nodules presented in 16 cases (80%), part solid nodules presented in 1 case (5%) and pure ground glass nodules presented in 3 cases (15%).

This in agreement with, **(Heuvelmans & Oudkerk, 2015) (15)** showed that increasing solid components compared to part solid and ground glass nodules.

This in disagreement with, **(Gloud, et al., 2013) (14)**, who stated that a higher rate of malignancy was a mixed pulmonary nodules compared with solid and ground glass nodules.

In our study, patients with pulmonary nodules in size up to 7mm were 5 cases (25%) while 10 cases (50%) were from 1 cm to 2 cm and 5 cases (25%) were had nodules ranging from 2 cm to 3 cm.

This in agreement with, **(Larici AR, 2017) (16)** who reported that most of the founded nodules were more than 7mm and the least founded were less than 7mm in diameter.

This in disagreement with, **(Henschke et al., 2016) (17)**, who found that non of the detected malignancies were less than 7mm in diameter.

In our study we found that the most common type of primary malignant pulmonary nodules were adenocarcinoma and large cell carcinoma (10% for each) and squamous cell carcinoma is the least type (5%).

It was found that the histological classification in the studied patients with a definitive diagnosis of cancer of pulmonary nodules as: Squamous cell carcinoma in (50%) was the most common type, large cell carcinoma, adenocarcinoma were (10%) and the least was small cell carcinoma (5%) **(Marrer et al., 2017) (18)**.

In our study we found that malignant etiology for pulmonary nodules were pulmonary metastases from secondary malignancy about 11 cases (55%) and primary malignancy were 5 cases (25%).

This in disagreement with, **(Gould et al., 2013) (11)** who noted that the malignant etiology for pulmonary nodules were primary lung cancer the most common (84%) and metastasis were (8%).

In our study we found that benign nodules were T.B in 1 case (5%), septic embolism in 2 cases (10%) and silicosis in 1 case (5%).

This in disagreement with, **(Brandman & Ko, 2011) (19)** who found that benign nodules results primarily from infection. Infection granulomas account for more than 80% of benign pulmonary nodules with a mycobacterial infection was the most common cause, followed by fungal organism, while hamartoma represent 10% of benign pulmonary nodules.

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