

# Incidental findings on chest CT scan among cases of COVID-19 infection

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**ABSTRACT**— An incidentaloma is a radiological term refers to a lesion found incidentally and of possible clinical significance, previously unsuspected finding or abnormality that is not related to the indication for obtaining the CT examination. Although it can refer to any incidental lesion (e.g. retrosternal goiter, nodule, pleural thickening, effusion, fibrosis...etc). There is clear evidence that incidentaloma is quite variable among studies according to the part of the body that undergo imaging. Most incidental findings are asymptomatic [1].

**KEYWORDS:** COVID-19, Chest CT, Incidental findings, Pulmonary nodules, Bronchogenic carcinoma

## 1. INTRODUCTION

Coronavirus disease 2019 (COVID-19) is referred to an illness caused by a novel coronavirus; severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Presentations of COVID-19 range from asymptomatic/mild symptoms to severe illness and mortality.

The incubation period varies form 1 day to 14 days.

The most common serious manifestation of COVID-19 appears to be pneumonia.

COVID-19 should be proposed in patients with upper and lower respiratory tract symptoms and newly onset fever or in patients with severe lower respiratory tract symptoms with no apparent etiology. Suspicion is high if the patients have been in an area with high rate of transmission of SARS-CoV-2 or have been in close contact with an individual with confirmed or suspected COVID-19 in the preceding 14 days. Microbiologic (PCR or antigen) testing is required for definitive diagnosis.

Chest computed tomography (CT) scanning is frequently used modality in evaluation of new covid cases as well as in suggesting the diagnosis in cases with clinical compatible pictures but Reverse transcriptase-polymerase chain reaction (RT-PCR) was negative, in patients with COVID-19-associated pneumonia usually shows ground-glass opacities, with or without consolidation, usually bilateral, involve the lower zones, and have a tendency to peripheral distribution. Pleural effusion, pleural thickening, and lymphadenopathy have also been reported, although is very rare and may be related to an alternative pathology [2].

In one study the following was a common chest CT finding in positive RT-PCR results for COVID-19: [3]

- Peripheral distribution (80%)
- Ground-glass opacification (91%)
- Fine reticularation (56%)

- Vascular thickening (59%)

Less-common findings on chest CT scanning included the following:

- Central and peripheral distribution (14%)
- Pleural effusion (4.1%)
- Lymphadenopathy (2.7%)

The American College of Radiology (ACR) recommends against use CT scanning for screening or diagnosing new COVID-19 cases but instead reserving it for evaluation of hospitalized cases [4].

The aim of this article is to review how frequent these finding on chest CT scans, evaluate the potential clinical correlation of the findings, and to put a management plane for evaluation, and follow-up.

Incidental findings on chest CT scans may represent normal findings, normal variants, or abnormal findings.

The word 'incidentaloma' first appears in the literature in 1982 in a paper by Glenn W Geelhoed, a surgeon, and Edward M Druy, a radiologist [5].

The most serious finding that need to focus on is pulmonary nodules, effusion and features suggestive of underlying parenchymal lung diseases.

Abnormal findings may be of little or no clinical significance (e.g. a calcified lung granuloma), so no need for follow up, of great clinical significance, requiring urgent intervention (e.g. a pneumothorax), or of clinical significant but need long term follow up (e.g. pulmonary nodule) [6].

Previously screening for coronary artery diseases (CAD) or lung cancer studies made most of incidental findings on chest CT4, but now increasing use of chest CT in cases with diagnosed or presumed new COVID-19 cases make the majority of incidental finding [7].

## **2. MATERIALS AND METHODS**

The study involves 210 chest CT for cases with PCR positive or negative COVID-19 infection between March 2020 to September 2021.

Inclusion criteria: any case who had been confirmed to COVID-19 infection on RT-PCR or clinical picture suggest and CT finding suggest no alternative diagnoses.

Exclusion criteria: any case with COVID-19 infection with a recent bacterial pneumonia, lung abscess, past or recent history of thoracic surgery, pleural effusion, pneumothorax, or known history of underlying lung illnesses e, g. chronic obstructive pulmonary diseases (COPD), interstitial lung diseases, and bronchogenic carcinoma.

Most of the patients had been evaluated by High resolution CT scan of the chest.

## **3. RESULTS AND DISCUSSION**

The patient's chest CTs had been evaluated in association with local radiologist to detect any incidental findings that detected at time of image interpretation for COVID-19 pneumonia, and we detect incidental findings in 23 cases among 210 cases ~more than10% of cases.

Most changes detected among cases of 5<sup>th</sup> and 6<sup>th</sup> decade of life; 21% and 34% respectively. (Table 1)

Most of cases with incidental findings were smokers; P value 0.004 (Table 1); the majority of that related to smoking were presented with lung nodules (3 cases), bronchogenic carcinoma (3 cases), and pneumothorax/pneumomediastinum (3 cases).

**TABLE 1:** Distribution of incidental chest CT findings according to age, gender, and smoking history

		Detected findings		No findings		P value
		No	%	No	%	
Age (years)	<30years	2	8.7	27	14.4	0.173
	30---39	3	13.0	36	19.3	
	40---49	2	8.7	36	19.3	
	50---59	5	21.7	39	20.9	
	60---69	8	34.8	26	13.9	
	=>70years	3	13.0	23	12.3	
	Mean±SD (Range)	54.6±15.8 (24-73)	48.8±15.6 (20-89)	0.094		
Gender	Male	16	69.6	91	48.7	0.058
	Female	7	30.4	96	51.3	
Smoking	Non-smokers	9	39.1	129	69.0	0.004*
	Smokers	14	60.9	58	31.0	

\*Significant difference between percentages using Pearson Chi-square test ( $\chi^2$ -test) at 0.05 level.  
#Significant difference between two independent means using Students-t-test at 0.05 level.

Azygous fissure is the most common normal variant detected in chest CT (4) cases, while lung nodules is the most common abnormal findings (4) cases, pneumothorax/pneumomediastinum come in the second place (3) and bronchogenic carcinoma (3) cases, retrosternal goiter detected in (2) cases, and other findings was only one case for each: breast mass, emphysematous bullae, esophageal thickening, hamartoma, hydatid cyst, lymphangitic carcinomatosa, and thoracic aortic aneurysm (Table 2).

**TABLE 2:** Incidental chest CT findings frequency

Incidental findings	No	%
Azygous Lobe	4	17.4
Nodule(s)	4	17.4
Lung Ca	3	13.0
Pneumothorax/ Pneumomediastinum	3	13.0
Goiter	2	8.7
Breast Mass	1	4.3
Emphysematous Bullae	1	4.3
Esophageal Thickening	1	4.3
Hamartoma	1	4.3
Hydatid Cyst	1	4.3

Lymphangitis Carcionmatosa	1	4.3
Thoracic Aortic Aneurysm	1	4.3

The most serious presentations tend to be in higher in older age groups; nodules (59.8 years old mean age group), lung cancer (68.3years old), esophageal thickening (69 years old), thoracic aorta aneurysm (71 years old), and breast mass (69 years old); while other presentation tend to be seen in younger age groups; Azygous lobe (40.3 years old) and hamartoma (41 years old).

Only one case detected to be hydatid cyst which was 29 years old.

Tow case with retrosternal goiter with mean age of presentation is 61 years old.

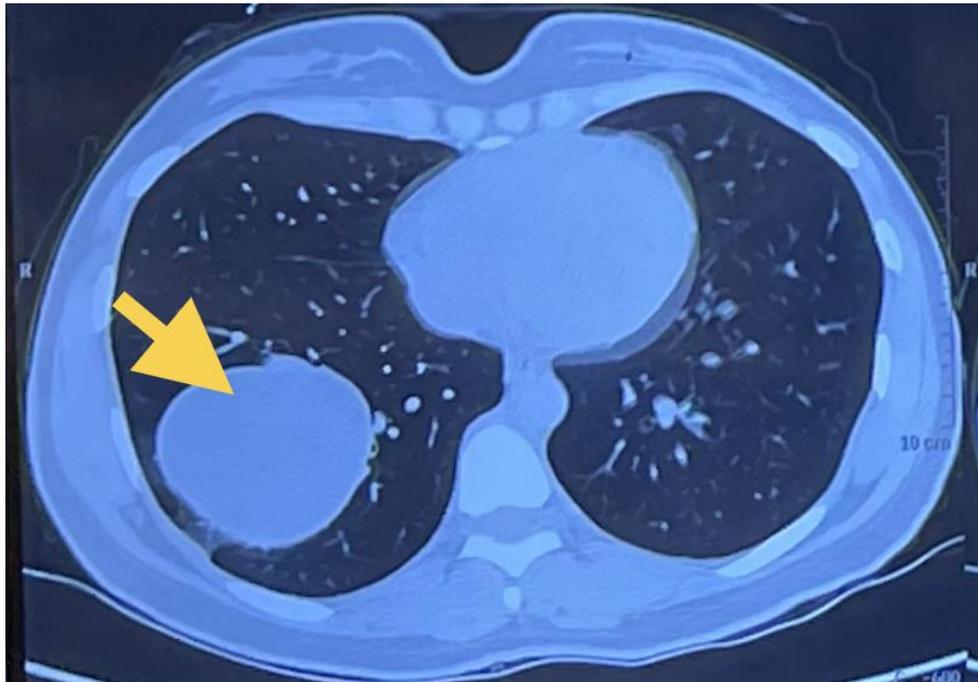
The three cases of pneumothorax/pneumomediastinum have wide variability of age presentations 24,32 and 66 years old. (Table 3)

**TABLE 3:** Correlation between incidental chest CT findings with gender and smoking history

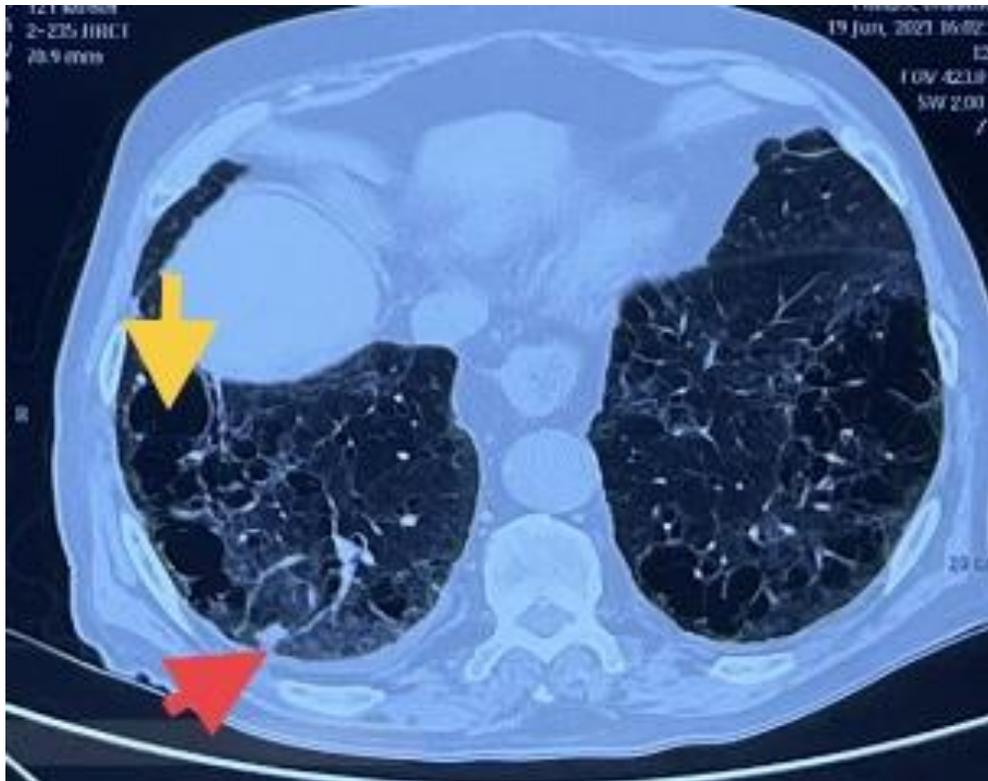
Incidental findings	Age (years)		Gender		Type	
	No	Mean±SD	Male	Female	Non-Smokers	Smokers
Azygous Lobe	4	40.3±11.1	4	-	3	1
Breast Mass	1	69.0±	-	1	1	-
Emphysematous Bullae	1	55.0±	1	-	-	1
Esophageal Thickening	1	69.0±	1	-	-	1
Goiter	2	61.0±8.5	-	2	2	-
Hamartoma	1	41.0±	-	1	1	-
Hydatid Cyst	1	29.0±	-	1	1	-
Lung Ca	3	68.3±5.0	3	-	-	3
Lymphangitis Carcionmatosa	1	72.0±	1	-	-	1
Nodule(s)	4	59.8±3.9	3	1	1	3
Pneumothorax/ Pneumomediastinum	3	40.7±22.3	2	1	-	3
Thoracic Aortic Aneurysm	1	71.0±	1	-	-	1



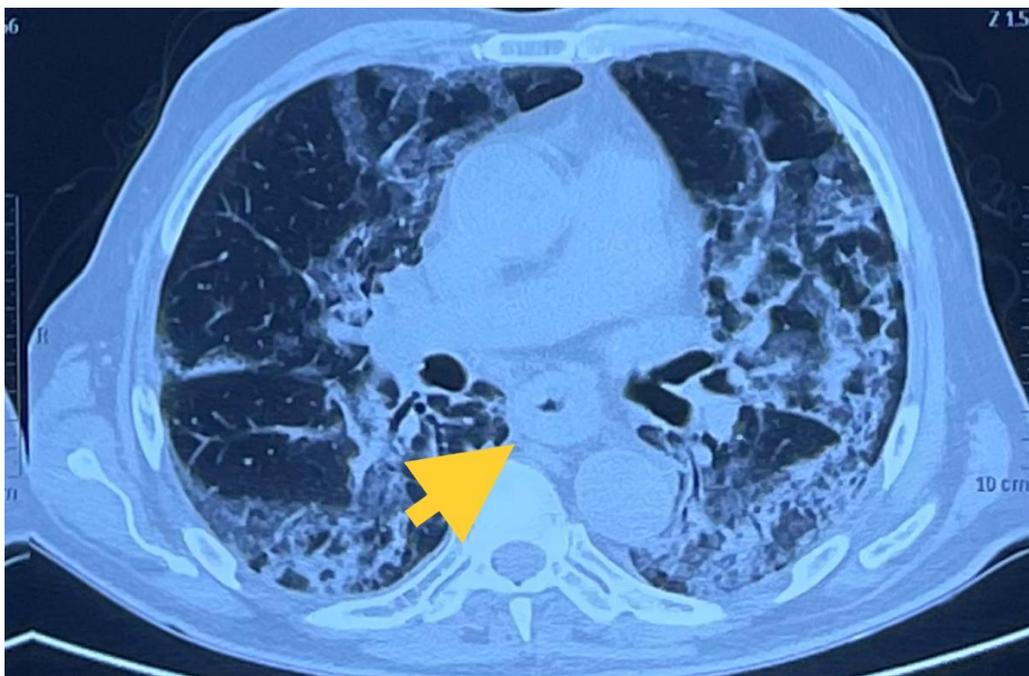
**IMAGE 1:** Middle-aged male with PCR positive mild COVID-19 infection. Chest CT show Right lower lobe mass with fat density and calcifications suggestive of Hamartoma.



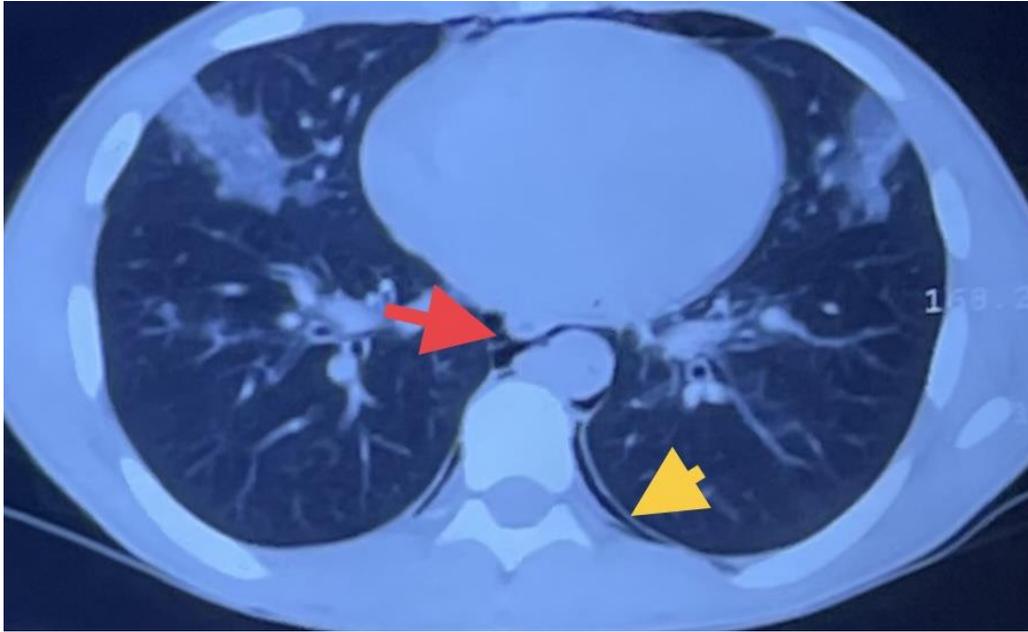
**IMAGE 2:** Chest CT of 25 years old lady with mild COVID-19 pneumonia, her chest CT show right sided well defined thin wall cystic lesion; picture suggestive of hydatid cyst.



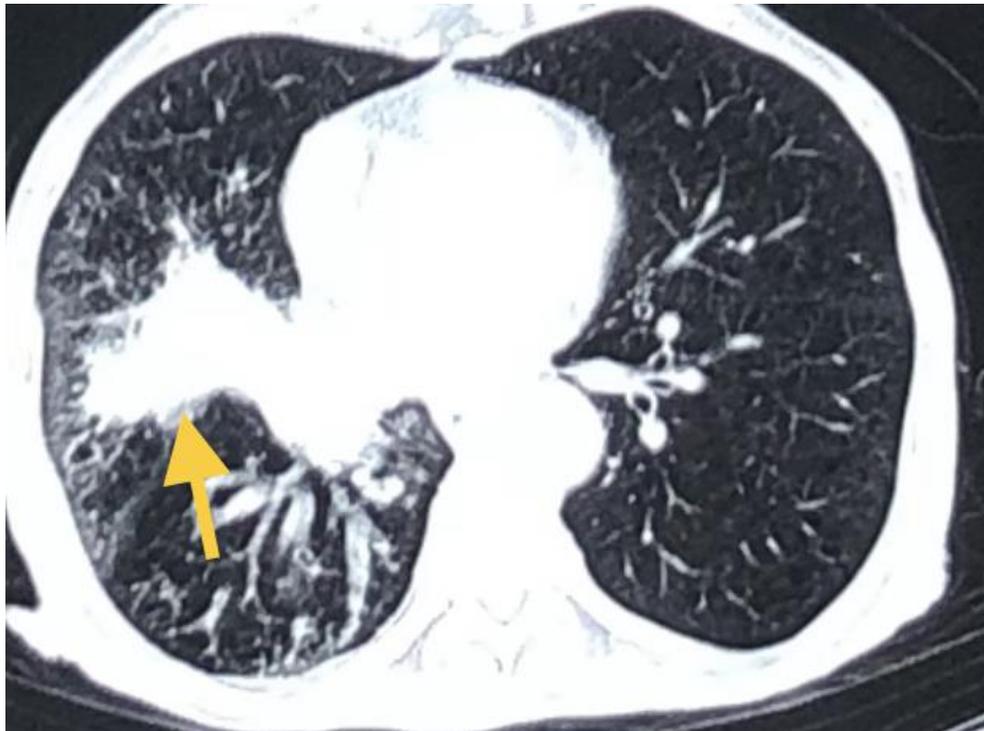
**IMAGE 3:** An elderly male with recent COVID-19 infection, chest CT reveals bilateral diffuse emphysematous changes (yellow arrow shows Right sided emphysematous bullae), and small Right sided subpleural nodule (red arrow) suggestive of malignant process.



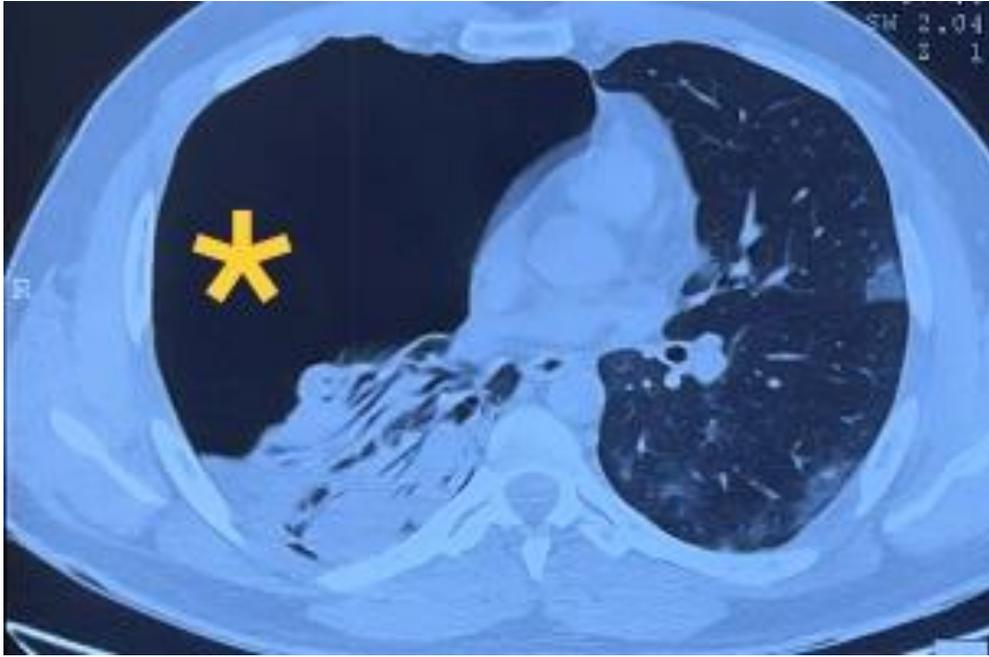
**IMAGE 4:** An elderly male with severe extensive COVID-19 infection, chest CT discloses diffuse esophageal thickening, follow up evaluation by endoscopy confirms the diagnosis of esophageal squamous cell carcinoma.



**IMAGE 5:** Young age smoker male with recent COVID-19 infection has severe retrosternal chest pain and discomfort, chest CT shows bilateral pneumothoraces (yellow arrow) and pneumomediastinum (red arrow).



**IMAGE 6:** Seventy-four years old male with moderate COVID-19 infection with right hilar mass (yellow arrow), bronchoscopy confirms bronchial squamous cell carcinoma.



**IMAGE 7:** Young smoker male with positive PCR COVID-19 presented with severe symptoms and absent air entry on chest examination, later chest CT scan confirms right tension pneumothorax (yellow asterisk) with collapsed underlying lung, chest tube introduced urgently.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

Chest CT scan is a good modality in evaluation of any lesion in the chest but should be done within the usual guidelines for every suspected pathology, chest CT is associated with high dose of radiation that may be associated with increase incidence of malignant tumors later in life, so alternative modalities can be a substitute in evaluation for may suspected chest pathology like chest x ray or chest ultrasound, a good correlation between history and examination and choosing an appropriate investigation modality is the only way of early diagnosis of any medical problem.

Despite the good result from chest CT in detection of several condition whither it's benign or serious but all medical societies recommend against use of chest CT as a screening tool because of high radiation doses, cost and even availability.

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