

## Extra cardiac Findings on CT Coronary Angiography

Majed Dwaik<sup>1</sup>, Majd Bsharat<sup>2</sup>, Ahmad Sandoka<sup>3</sup> and Sami Smerat<sup>4</sup>

<sup>1</sup>Dean Medical College and Health Science, Palestine Polytechnic University, Hebron, Palestine.

<sup>2</sup>Radiology Resident, Ibn Sina Hospital, Jenin, Palestine.

<sup>3</sup>Internal Medicine Resident, Al Bayan Medical Center Ramallah, Palestine.

<sup>4</sup>Istishari Arab Hospital, Radiologic Technologist, Ramallah, Palestine.

**\*Correspondence:**

Sami Smerat, Istshari Arab Hospital, Radiologic Technologist, Ramallah, Palestine.

**Received:** 01 Apr 2023; **Accepted:** 24 Apr 2023; **Published:** 28 Apr 2023

**Citation:** Dwaik M, Bsharat M, Sandoka A, et al. Extra cardiac Findings on CT Coronary Angiography. *Cardiol Vasc Res.* 2023; 7(2): 1-4.

**ABSTRACT**

*Incidental extracardiac findings are frequently seen on coronary computed tomography angiography (CCTA) which is increasingly used as an important tool of investigating stable chest pain. Incidental extracardiac findings are noted during or after the procedure. Some of these findings are important to note and the patient need to be referred for further investigations or at least to be noted as a critical result to his or her referring physician.*

*The objective of this retrospective study was to review, to analyze, and to quantify the spectrum and the prevalence of extracardiac findings in CCTA done in our hospital. These findings were categorized into clinically significant and clinically non-significant findings. The prevalence of the incidental extracardiac findings was calculated. Also, the life-threatening potential findings out of the total was calculated with their prevalence. A total of 486 exams were done in the period between March 2018 and Oct 2022. The average prevalence of overall Incidental extracardiac findings was 26.0% (92% confidence interval;  $P < .0001$ ) and 12.0% ( $P < .0001$ ) for clinically significant findings. Clinically significant ones of these findings were most commonly detected in the lungs (65.2%), the abdomen (16.7%), the vessels (8.1%), the mediastinum (10.6%), and in other adjacent anatomical territories (6.4%). The prevalence of acutely life-threatening and malignant cases accounted for 4% ( $P < .0001$ ). In conclusion, clinically significant and acutely life-threatening ECF are not that common.*

**Conclusion:** *Incidental extracardiac findings on CT coronary angiogram are may be detected with some of them are critically important. Prompt supervision and early reading will detect these findings with early dealing with them is an important task.*

**Keywords**

Coronary computed tomography angiography, Extracardiac findings.

**Patient Demographics**

A retrospective study reviewing the files of 486 cases of Coronary CT Angiograms done in Al Istishari Arab Hospital in the period between March 2018 and Oct 2022. The incidental findings of extracardiac findings were reviewed and categorized according to their clinically importance; life threatening or non-life threatening ones. In the broad approach the small field of view pictures were reviewed including the soft tissue and lung windows. As most of

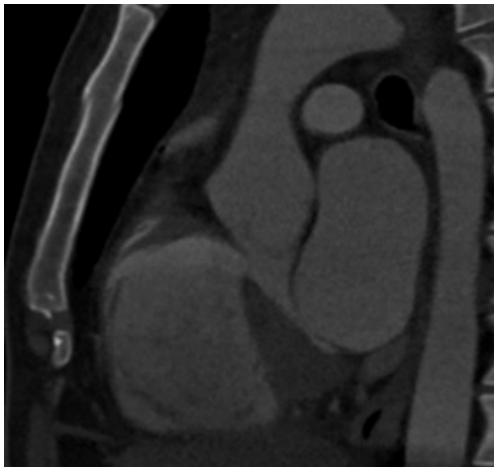
the cases were supervised by a well-trained resident large field of view were done when an important finding was identified. In the focused approach, attention was centered on the great vessels, lung and bronchial tree structures adjacent to the heart and then the structures away from the heart including the bones, liver and upper abdomen.

**Incidental Findings and Recommendations**

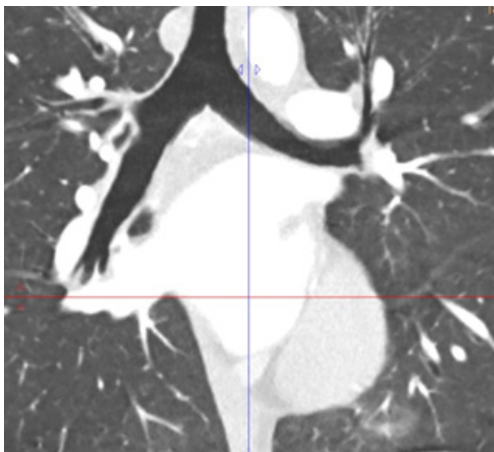
The extracardiac findings were found in 4.2% of the total cases reviewed. The life-threatening findings were found in 0.26% of the total extracardiac incidental findings where the majority were non-life threatening. The life-threatening cases were categorized

into pulmonary embolism, suspected lung carcinoma and mediastinal lymph node enlargement. The non-life threatening was also categorized into pulmonary infection, pleural effusion, bronchiectasis, lung nodules, emphysema, hiatus hernia and liver lesion such as hemangioma and liver simple cysts. Although some previous studies attempted to differentiate clinically significant from indeterminate from benign findings, we divided incidental findings only into those that required either clinical or imaging follow-up and those that did not require follow-up. This simplified categorization of incidental findings is similar to those used in previous studies [1,2]. The Fleischner Society criteria for indeterminate pulmonary nodules and recommendations for follow-up were used to separate benign from potentially clinically significant pulmonary nodules [3].

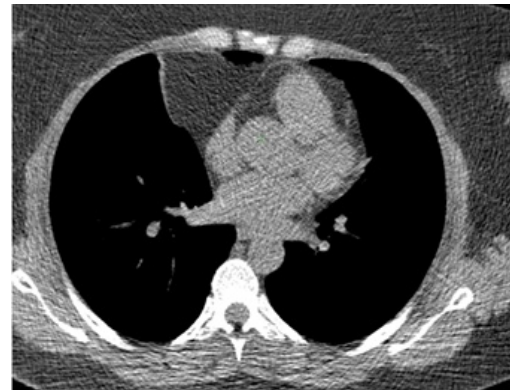
Particularly in CT angiograms most of the nodules seen in this review were benign ones; solitary, smooth outline and some of them have calcium. The other findings were previously unknown pulmonary emphysema. It is known that there is an overlap between coronary artery disease and chronic obstructive pulmonary disease and the discovery of lung parenchymal changes is important to the patient and chest physician as well.



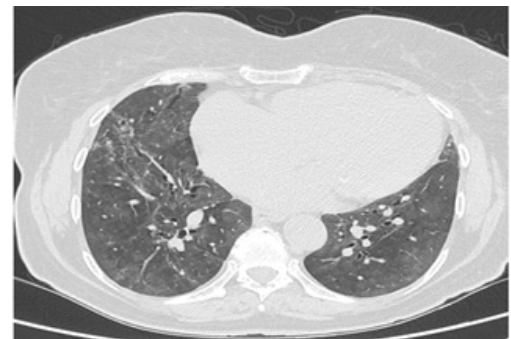
**Figure 1:** Sternal fracture.



**Figure 2:** Lung contusion.



**Figure 3:** Pericardial effusion.



**Figure 4:** Bronchiectasis with pneumonia.

## Results

Even though extracardiac findings on CCTA are fairly uncommon, only about a quarter of them have any real impact on patient care [2,4]. Rarely do these findings indicate a treatable cause of the patient's chest pain; rather, they are significant incidental findings, especially lung nodules that require surveillance [5-9]. New guidelines for lung nodule assessment are expected to significantly reduce the cost of follow-up imaging without increasing the risk of missing malignancy detected during screening [10-14]. Depending on the nature of the extra cardiac findings and the patient population as a whole, CCTA patients may have a high or low incidence of extra cardiac findings (e.g., age and smoking history). Extracardiac findings were found to be quite common (41%) in a systematic review, but only 16% of them were considered to be clinically significant. In our study the extra cardiac findings were 38% and clinically significant ones were 10%, similar to but slightly lower than the national average. The study's emphasis on a narrow detector range, which reduced radiation dose and the scanned body volume, may have played a role in this finding. Sometimes the cause of chest pain is hard to pinpoint. Angina pectoris due to coronary heart disease was the reason for referral to the CCTA. Finally, 486 CCTA file were reviewed and only 4.2% were to have extracardiac findings with only 0.26% were life threatening. Cardiac findings identified in patients undergoing CCTA. Extracardiac causes of chest pain appear to be uncommon in this study. Some of these non-cardiac causes of chest pain, however, can be extremely harmful or even fatal, highlighting the significance of reporting all structures seen on a scan, not just the heart. Shared risk factors,

---

such as smoking and chronic inflammation [14], contribute to the complicated relationship between cardiovascular disease and respiratory diseases like emphysema [14].

## Discussion

Patients with stable chest discomfort and an intermediate risk of underlying coronary artery disease (CAD), according to international standards, should have a first exercise ECG or stress coronary functional MRI [15,16]. The European guidelines are in favor of imaging. In low-risk patients, coronary computed tomography angiography (CCTA) is seen as a viable option.

Kevin M. Johnson et al. reported that in the broad viewing scheme, 1,642 (23.7%) of the 6,920 patients had one or more extracardiac abnormalities, for a total of 1,901 findings. 16.2% of the 6,920 patients had a finding that required therapy, workup, or follow-up. The focused viewing technique missed 90.9% of the findings that required therapy, 64.1% that required workup, and 51.2% that required follow-up. The concentrated strategy resulted in fewer false-positive diagnoses, but it missed five malignant breast tumors, 88 lung infiltrates, 43 cases of adenopathy, two cases of polycystic kidney disease, one breast abscess, and one case of splenic flexure diverticulitis [17]. Although, Jonathan Hudson et al. reported that a total of 652 scans were done, with 202 (26.2%) individuals having incidental extra-cardiac abnormalities, 106 (16.3%) of which were deemed clinically significant and necessitating further evaluation or referral to a specialist clinic. Extra-cardiac observations included abdominal (45), thoracic (42), cardiac (14), and breast tissue (5) involvement. Liver cysts (36) and pulmonary nodules (22) were the most prevalent extra-cardiac findings. Two lung cancers were discovered [18]. Although, in our study, Extracardiac findings were discovered in 4.2% of the total cases examined. The bulk of the extracardiac incidental findings were non-life threatening, accounting for 0.26% of the total. The potentially fatal cases were classified as pulmonary embolism, probable lung cancer, and mediastinal lymph node enlargement. Non-life threatening conditions included pulmonary infection, pleural effusion, bronchiectasis, lung nodules, emphysema, hiatus hernia, and liver lesions such as hemangioma and simple cysts in the liver. The difficulty presented by extracardiac abnormalities on cardiac CT scans is that a few critical illnesses are mixed in with a large number of insignificant ones. Any strategy based on limited viewing should include an evaluation of the lung window images inside the small field of view to detect infiltrates and the odd pneumothorax. The observer must also search for pulmonary emboli, whether or not they are suspected. The decision on which findings to investigate must be made with care [19].

The goal of this retrospective study was to look over, analyze, and quantify the spectrum and prevalence of extracardiac abnormalities in CCTA performed at our institution. Incidental extracardiac abnormalities on a CT coronary angiography can be discovered, and some of them are crucial. Prompt supervision and reading will detect and address these issues early.

## Conclusion

Patients with atypical angina or chest pain and a low to intermediate risk of CAD may benefit from CTA; extracardiac findings although not very common but some of them are clinically important. Prompt supervision by an experienced radiologist is important to have a quick idea and to interfere by opening the window if needed and to give an opinion to the referring physician as critical result when needed. Reporting on the cases radiological is also of great importance for the referring physician to interfere or to investigate appropriately.

## References

1. Jacobs PC, Willem PTM, Grobbee DE, et al. Prevalence of incidental findings in computed tomographic screening of the chest: a systematic review. *Journal of computer assisted tomography*. 2008; 32: 214-221.
2. Smerat S, Adwan S, Khatib M, et al. Pulmonary AVM and Stroke: Case Report from Istishari Arab Hospital. *European Journal of Medical and Health Sciences*. 2023; 5: 24-26.
3. Macmahon H, Austin JH, Gamsu G, et al. Guidelines for management of small pulmonary nodules detected on CT scans: a statement from the Fleischner Society. *Radiology*. 2005; 237: 395-400.
4. Wexler L, Brundage B, Crouse J, et al. Coronary artery calcification: pathophysiology, epidemiology, imaging methods, and clinical implications: a statement for health professionals from the American Heart Association. *Circulation*. 1996; 94: 1175-1192.
5. Raggi P, Callister TQ, Cooil B, et al. Identification of patients at increased risk of first unheralded acute myocardial infarction by electron-beam computed tomography. *Circulation*. 2000; 101: 850-855.
6. Moselewski F, O'donnell CJ, Achenbach S, et al. Calcium concentration of individual coronary calcified plaques as measured by multidetector row computed tomography. *Circulation*. 2005; 111: 3236-3241.
7. Schroeder S, Achenbach S, Bengel F, et al. Cardiac computed tomography: indications, applications, limitations, and training requirements: report of a Writing Group deployed by the Working Group Nuclear Cardiology and Cardiac CT of the European Society of Cardiology and the European Council of Nuclear Cardiology. *European heart journal*. 2008; 29: 531-556.
8. Min JK, Wann S. Indications for coronary and cardiac computed tomographic angiography. *Cardiology in Review*. 2007; 15: 87-96.
9. Burt JR, Iribarren C, Fair JM, et al. Incidental findings on cardiac multidetector row computed tomography among healthy older adults: prevalence and clinical correlates. *Archives of internal medicine*. 2008; 168: 756-761.
10. Dewey M, Schnapauff D, Teige F, et al. Non-cardiac findings on coronary computed tomography and magnetic resonance imaging. *European radiology*. 2007; 17: 2038-2043.

- 
11. Elgin EE, O'malley PG, Feuerstein I, et al. Frequency and severity of "incidentalomas" encountered during electron beam computed tomography for coronary calcium in middle-aged army personnel. *American Journal of Cardiology*. 2002; 90: 543-545.
  12. Hunold P, Schmermund A, Seibel R, et al. Prevalence and clinical significance of accidental findings in electron-beam tomographic scans for coronary artery calcification. *European heart journal*. 2001; 22: 1748-1758.
  13. Horton KM, Post WS, Blumenthal RS, et al. Prevalence of significant noncardiac findings on electron-beam computed tomography coronary artery calcium screening examinations. *Circulation*. 2002; 106: 532-534.
  14. Schragin JG, Weissfeld JL, Edmundowicz D, et al. Non-cardiac findings on coronary electron beam computed tomography scanning. *Journal of thoracic imaging*. 2004; 19: 82-86.
  15. Members TF, Montalesco TG, Sechtem U, et al. 2013 ESC guidelines on the management of stable coronary artery disease: the Task Force on the management of stable coronary artery disease of the European Society of Cardiology. *European Heart Journal*. 2013; 34: 2949-3003.
  16. Patel MR, Bailey SR, Bonow RO, et al. CCF/SCAI/AATS/AHA/ASE/ASNC/HFSA/HRS/SCCM/SCCT/SCMR/STS 2012 appropriate use criteria for diagnostic catheterization: American college of cardiology foundation appropriate use criteria task force society for cardiovascular angiography and interventions American association for thoracic surgery American heart association, American society of echocardiography American society of nuclear cardiology heart failure society of America heart rhythm society, society of critical care medicine society of cardiovascular computed tomography society for cardiovascular magnetic resonance society of thoracic surgeons. *Catheterization and Cardiovascular Interventions*. 2012; 80: E50-E81.
  17. Johnson KM, Dennis JM, Dowe DA. Extracardiac findings on coronary CT angiograms: limited versus complete image review. *American Journal of Roentgenology*. 2010; 195: 143-148.
  18. Hudson J, Fyyaz S, David S, et al. 8 An analysis of extra cardiac findings generated by the expansion of ct coronary angiography at a district general hospital. *BMJ Publishing Group Ltd and British Cardiovascular Society*. 2019.
  19. Sosnouski D, Bonsall RP, Mayer FB, et al. Extracardiac findings at cardiac CT: a practical approach. *Journal of Thoracic Imaging*. 2007; 22: 77-85.