

# Systematic Approach to Non-Cardiac CT Findings

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# Goals

- Recognize the importance of detecting non-cardiac abnormalities.
- Apply strategies to identify non-cardiac abnormalities.

# Approaches to Non-cardiac Findings

- Neglect
- Incidental observation
  - Including selective referral to specialist
- Systematic overview
  - Expanding FOV?
- Referral to radiologist

# Why Review Non-Cardiac Findings?

- **Improved medical outcome**
  - Some data in different populations
- **Decrease medico-legal risk**
  - No data

# Systematic Review: Non-Coronary Findings on the Chest

- Cardiac
- Pericardial
- Vascular
- Mediastinal
- Lung
- Musculoskeletal
- Soft tissues



## **Non-cardiac findings on coronary electron beam computed tomography scanning.**

**Schragin JG, Weissfeld JL, Edmundowicz D, Strollo DC, Fuhrman CR.**

Department of Epidemiology, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. [schraginjg@msx.upmc.edu](mailto:schraginjg@msx.upmc.edu)

The objective of this study was to estimate the prevalence and significance of non-cardiac findings on Electron Beam Computed Tomography (EBT) scanning when used in population screening for the quantitative measurement of coronary artery calcium and estimate of coronary risk. Clinic files of 1366 subjects who underwent EBT scanning between September 1996 and December 1998 at the University of Pittsburgh affiliated Comprehensive Heart Care Center were abstracted. The files of 1356 subjects contained the calcium score and non-cardiac findings as reported by board-certified radiologists, who interpreted the scans during the period 1996-1998. A National Death Index (NDI) Plus match was performed to ascertain cause of death. Two hundred seventy-eight of 1356 (20.5%) subjects had 1 or more non-cardiac findings on EBT scanning. Fifty-seven of 1356 (4.2%) received a recommendation for diagnostic CT follow-up. Forty-six of the 57 recommendations were for pulmonary nodules and 11 were for non-nodule, non-cardiac findings. Seven members of the cohort died during a short follow-up period. In 1 case, the non-cardiac finding was the cause of death. Non-cardiac findings in a healthy cohort referred for EBT coronary screening are relatively common. Findings range from clinically insignificant to the cause of death during a short follow-up period. EBT scanning is a frequently used coronary screening procedure. With the relatively high detection of significant, non-cardiac pathology in this increasingly common screening procedure, consideration should be given for radiologists to interpret the scans.

- 1366 patients, >2years period, including death f/u
- 21% non-cardiac findings
- 4% recommendation for CT (81% for nodules)
- 0.5% died, 1 (of 1366) from non-cardiac cause

Comment in:

- [Eur Heart J. 2001 Sep;22\(18\):1639-41.](#)

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## **Prevalence and clinical significance of accidental findings in electron-beam tomographic scans for coronary artery calcification.**

**Hunold P, Schmermund A, Seibel RM, Gronemeyer DH, Erbel R.**

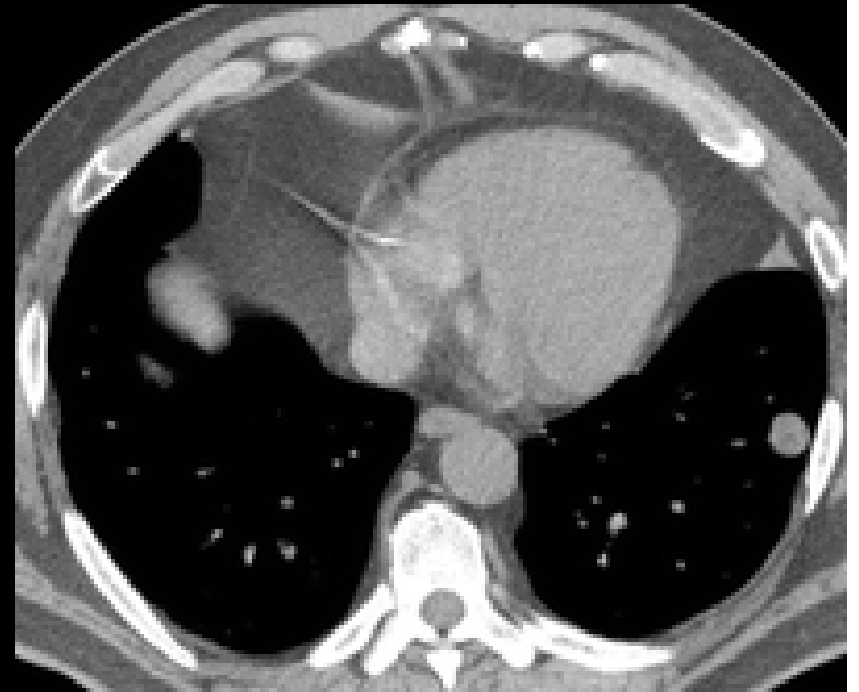
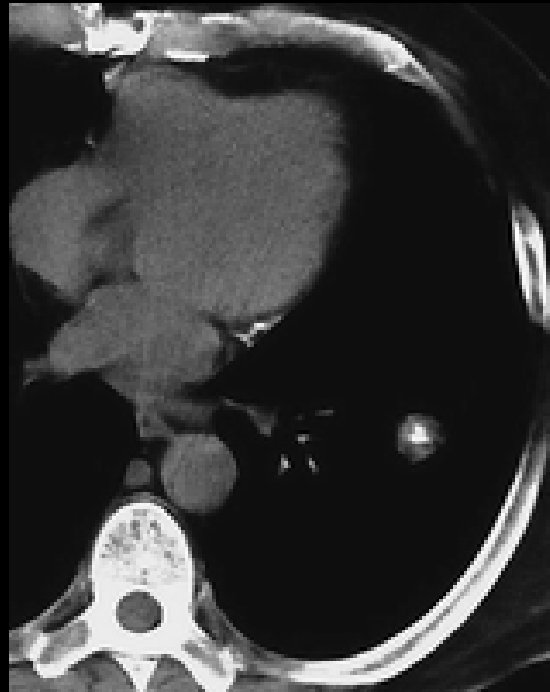
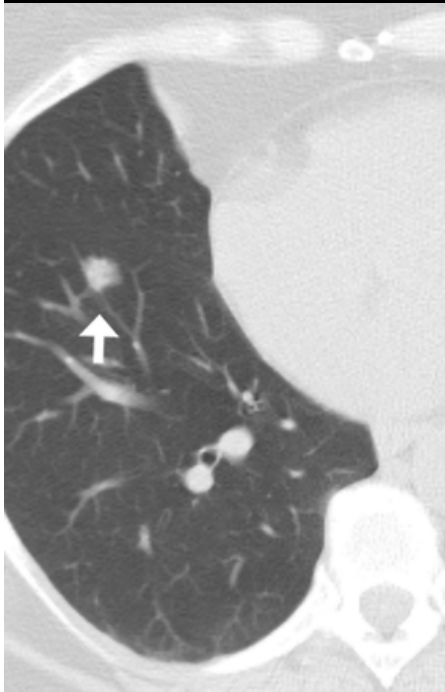
Department of Cardiology, University of Essen, Germany.

**AIMS:** To analyse the prevalence, and diagnostic and therapeutic consequences, of accidental findings in electron-beam tomographic scans performed for evaluation of coronary artery calcification. **METHODS AND RESULTS:** A total of 1812 consecutive patients with known or suspected coronary artery disease underwent electron-beam tomography. In 583 (32%) of the patients, i.v. contrast was also administered for non-invasive coronary angiography. A total of 2055 non-coronary pathological findings were observed in 953 (53%) of the patients. The prevalence of extra-cardiac disease, as shown in native scans and contrast studies, was assessed separately. In 583 (32%) patients, cardiac structures or the pericardium were affected, in 423 (23%) aortic disease was found. Lung disease was found in 357 (20%), and pathology of other organs in 273 patients (15%). The most frequent findings were aortic calcium in 423 (23%) patients and heart valve calcification in 317 patients (17%). Malignant disease could be detected in three patients. Further diagnostic investigations were done in 191 (11%) patients, 141 (74%) of which concerned the heart. In 22 (1.2%) patients, specific therapy was initiated following electron-beam tomographic findings. **CONCLUSION:** Accidental non-coronary pathology is a frequent finding in electron-beam tomographic calcium scanning, and often requires diagnostic or therapeutic action. Profound knowledge of the radiological differential diagnosis of the thoracic organs is necessary for reporting electron-beam tomographic scans, in order to avoid misdiagnosis and to receive a high quality interpretation. Copyright 2001 The European Society of Cardiology.

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Hunold P, Schmermund A, Seibel RM, Gronemeyer DH, Erbel R.  
Eur Heart J. 2001 Sep;22(18):1748-58.

The Solitary Pulmonary Nodule. Winer-Muram, HT.  
Radiology 2006;239:34-49.



# Gross Estimates for Nodules

- CT in 4%

  - @ \$250 = \$ 10

  - @ 6, 12, 24 months = \$ 30

- PET in 2%

  - @ \$1250 = \$100

- Bx in 1%

  - @ \$2500 = \$200

- 0.5% death (preventable)

  - \$340/0.005 = \$74,000 per life

# Benefit of Identifying Pulmonary Nodules

- **ELCAP and f/u IELCAP**

- For baseline and f/u of patients

- 31,567 patients and 27,456 f/u

- Patient population variable, no control group

- **Lung cancer**

- Identified in 484 (1.53%)

- Of these, 412 (85%) at stage I

- Estimated 10 year survival = 88%

- Observed survival with early surgery (302) = 92%

- Observed survival without surgery (8) = 0%

# Benefit of Identifying Pulmonary Nodules

- **CT Screening and Lung Cancer outcomes**
  - 3264 patients at 2 centers, asymptomatic current and former smokers
  - Initial and annual followup
- **Lung cancer**
  - Identified in 144 (4.4%)
    - 44 expected, RR = 3.2
  - Lung resection in 109 (76% of above)
    - 11 expected, RR = 10.0
  - No decline in number of advanced cancers diagnosed
    - 42 observed, 33 expected
  - No decline in number of deaths
    - 38 observed, 39 expected

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# Benefit of Identifying Pulmonary Nodules

- **Conclusions:**

- Screening may increase the rate of lung cancer detection but may not decrease the risk of advanced lung cancer presentation.

## Incidental findings with cardiac CT evaluation: Should we read beyond the heart?

“The weight of evidence suggests that it is most prudent to not specifically reconstruct and reread CTA scans for lung nodules.”

## Concepts on Incidental Findings

- Asymptomatic (healthy) patients undergoing coronary artery calcium assessment is not a predictor of significant findings in patients with CP syndromes.
- Whether suspected or not, within imaging, medico-legal history (and certainly medical interest) is that identification of all important findings is expected and desired.

# Non-Cardiac Findings

- Frequency of identifying non-cardiac findings related to pretest risk of comorbidity
  - Some related to CAD risk factors(eg aortic aneurysm)
  - Some unrelated to CAD but increased in certain clinical presentations
- Where are the findings?

# Differential Diagnosis: Chest Pain Presentation

Number and Frequency in 204 non-acute MI Patients

