

Prevalence of incidental noncardiac findings diagnosed by computer tomography in 875 consecutive patients in an academic outpatient cardiac computer tomography facility

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Abstract

Introduction: To determine the prevalence of clinically significant noncardiac findings in patients undergoing computer tomography in an outpatient cardiac computer tomography facility.

Material and methods: Eight hundred and ninety-four procedures were performed in 875 consecutive patients referred for computer tomography procedures in an academic outpatient cardiac computer tomography facility. The patients included 518 men and 357 women, mean age 64±12 years. Cardiac and coronary artery calcium studies were interpreted by 1 of 2 board certified cardiologists experienced in cardiac computer tomography. All noncardiac studies as well as all segments of the chest imaged during cardiac and coronary artery calcium studies were interpreted by 1 of 3 experienced board certified radiologists.

Results: Radiologically significant clinically significant noncardiac findings were found in 163 of 875 patients (19%). Clinically significant incidental pulmonary findings were found in 133 of 875 patients (15%) and clinically significant noncardiac nonpulmonary findings in 44 of 875 patients (5%).

Conclusions: A significant number of radiologically significant clinically significant noncardiac findings requiring follow-up can be identified by cardiac computer tomography.

Key words: computer tomography, computer tomography coronary angiography, computer tomography of chest.

Introduction

Computed tomography (CT) identified clinically significant noncardiac findings requiring follow-up in 8% of 1,326 patients [1], in 4% of 1,356 patients [2], in 23% of 503 patients [3], and in 24% of 617 patients undergoing coronary artery calcium (CAC) scoring or cardiac CT [4]. We are reporting the prevalence of incidental noncardiac findings in 875 consecutive patients who underwent CT studies at our academic outpatient cardiac CT facility. This study is important because it shows how often patients referred for cardiac CT for diagnosis of cardiovascular disease can

Table I. Baseline characteristics of 163 patients with incidental noncardiac findings and of 711 patients without incidental noncardiac findings

Variable	Incidental noncardiac findings	
	Yes (n=163)	No (n=712)
Men	88 (54%)	430 (60%)
Women	76 (46%)	281 (40%)
Age [years]	65±12	63±12
Current smoking	17 (10%)	54 (8%)
Ex-smoking	55 (34%)	210 (30%)
Family history of lung cancer	18 (11%)	67 (9%)

No significant differences were found between the two groups

Table II. Prevalence of pulmonary findings by computer tomography in 875 patients

Variable	Pulmonary findings
Lesions suspicious of malignancy	7 (1%)
Pulmonary masses	2 (<1%)
Pulmonary densities	11 (1%)
Pulmonary opacities	7 (1%)
Pulmonary nodules >6 mm	18 (2%)
Pulmonary nodules 3-6 mm	49 (6%)
Pulmonary lymph nodes 1.6-3.0 cm	16 (2%)
Pulmonary lymph nodes 1.0-1.5 cm	16 (2%)
Miscellaneous	7 (1%)
All pulmonary findings	133 (15%)

be diagnosed with radiologically significant clinically significant noncardiac findings requiring diagnostic follow-up and therapy if indicated.

Material and methods

Between January 17, 2006 and February 28, 2007, 894 procedures were performed in 875 consecutive patients were referred for CT studies at our outpatient academic cardiac CT facility. The 894 procedures included 64-slice CT coronary angiography in 731 patients, CT angiography of the chest in 114 patients, and CT CAC scoring alone in 49 patients. Indications for the procedures were chest pain in 361 patients, an abnormal stress test in 188 patients, evaluation of coronary artery disease in 238 patients, evaluation of the aorta in 73 patients, and miscellaneous indications in 15 patients. The patients included 518 men and 357 women, mean age 64±12 years.

Computed tomography studies were performed using a 64-slice Siemens Somatom Sensation Cardiac scanner (Siemens Medical Solutions, Forheim, Germany). Cardiac CT and CAC studies were performed as previously described [5, 6]. Cardiac and CAC studies were interpreted by 1 of 2 board certified cardiologists experienced in cardiac CT. All noncardiac studies as well as all segments of the chest imaged during cardiac and CAC studies were interpreted by 1 of 3 experienced board certified radiologists. All studies were evaluated for noncardiovascular findings by review of axial images using mediastinal, lung, and bone windows at a slice thickness of 3 to 5 mm.

Recommendations regarding follow up of non-cardiovascular findings were based on consensus opinion of reporting radiologists and recently reported guidelines [7]. No follow-up was recommended for pulmonary nodules that were 1 to 2.9 mm in size. For nodules that were 3 mm or greater, 6 month follow-up with noncontrast CT was recommended. Specific recommendations for nodules that were 8 mm or greater or of suspicious morphology were made on a case by case basis. Follow-up was recommended for mediastinal lymph nodes greater than or equal to 1 cm in axial view or 1.3 cm in long axis views. Recommendations for incidental nonpulmonary findings were made on a case by case basis by the interpreting radiologist.

Results

Radiologically significant incidental noncardiac findings were found in 163 of 875 patients (19%). Table I shows the baseline characteristics of the 163 patients with incidental noncardiac findings which were clinically significant and of the 712 patients without incidental noncardiac findings. No significant differences were found between the 2 groups.

Table II shows the prevalence of incidental pulmonary findings in the 875 patients. Table III shows the prevalence of the incidental noncardiac nonpulmonary findings in the 875 patients. Follow-up was recommended in the 163 of 875 patients (19%) who had clinically significant noncardiac findings. None of these 163 patients had previously known disease which could result in these incidental findings.

Discussion

Horton et al. [1] found that 103 of 1,326 patients (8%) who had CT for CAC scoring had clinically significant noncardiac findings requiring follow-up. Of these 103 patients, 53 had noncalcified lung nodules <1 cm, 12 patients had lung nodules ≥1 cm, 24 patients had pulmonary infiltrates, 7 patients had indeterminate liver lesions, 2 patients

had sclerotic bone lesions, 2 patients had breast abnormalities, 1 patient had polycystic liver disease, 1 patient had suspicious esophageal thickening, and 1 patient had ascites.

Schragin et al. [2] showed that 57 of 1,356 patients (4%) who had CT for CAC scoring had a recommendation for diagnostic CT follow-up. Of these 57 patients, 46 had pulmonary nodules, 3 had pulmonary consolidation and infiltrates, 3 had pulmonary fibrosis and interstitial disease, 2 had hilar adenopathy, 1 had a large pulmonary mass, 1 had a thoracic aneurysm, and 1 had a liver mass.

Onuma et al. [3] demonstrated that 114 of 503 patients (23%) who had CT cardiac scans had clinically significant noncardiac findings. Of these 114 patients, 49 had noncalcified pulmonary nodules <1 cm, 12 had pulmonary nodules >1 cm, 16 had pulmonary infiltrates, 17 had pleural effusion, 1 had an extrapleural mass, 3 had breast abnormalities, 3 had lymph node swelling, 1 had a dissecting aorta, 7 had an aortic aneurysm, 2 had mediastinitis, and 3 had a thyroid nodule.

Kawano et al. [4] reported that 149 of 617 patients (24%) who had CT coronary angiography had clinically significant noncardiac findings. Of these 149 patients, 4 had lung cancer, 2 had thyroid cancer, 1 had hepatic cancer, 58 had post-inflammatory lung nodules, 49 had hepatic cysts/hemangiomas, 18 had benign thyroid tumors, 12 had mediastinal lymphadenopathy, 4 had benign mammary gland tumors, and 1 had an esophageal submucosal tumor.

The present study showed in 875 patients who had CT studies at our academic outpatient cardiac CT facility that 163 (19%) had clinically significant noncardiac findings. There was no significant differences in age, gender, current smoking, history of smoking, and family history of lung cancer in patients with and without clinically significant noncardiac findings.

Radiologically significant clinically significant noncardiac findings requiring diagnostic follow-up and therapy if indicated were found in 8 [1], 4 [2], 23 [3], 24 [4], and in 19% of patients in the present study. Radiologically significant clinically significant pulmonary findings requiring diagnostic follow-up and therapy if indicated were found in 7 [1], 4 [2], 19 [3], 12 [4], and in 15% of patients in the present study. Radiologically significant clinically significant noncardiac nonpulmonary findings requiring diagnostic follow-up and therapy if indicated were found in 1 [1], <1 [2], 4 [3], 12 [4], and in 5% of patients in the present study. The reasons for the differences in the different studies are unknown.

The major contribution of the present study is the reinforcement that radiologically significant clinically significant noncardiac findings requiring diagnostic follow-up and treatment if indicated may

Table III. Prevalence of noncardiac nonpulmonary findings by computer tomography in 875 patients

Variable	Noncardiac nonpulmonary findings
Hepatic	15 (2%)
Renals	3 (<1%)
Adrenal	4 (<1%)
Thyroid	1 (<1%)
Breast	2 (<1%)
Vascular	7 (1%)
Skeletal	4 (<1%)
Miscellaneous	8 (1%)
All nonpulmonary findings	44 (5%)

be detected by cardiac CT in in patients referred for diagnosis of cardiovascular disease. The additional diagnostic procedures will determine the clinical relevance of these findings.

In conclusion, of the 163 patients with radiologically significant clinically significant noncardiac findings, 133 had pulmonary findings (Table II), and 44 had nonpulmonary findings (Table III). Follow-up was recommended for all 163 patients.

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