INCIDENTAL CARDIAC FINDINGS ON A NON-GATED COMPUTED TOMOGRAPHY.

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Disclosure

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Computed tomography is commonly done to confirm the clinical suspicion and to narrow the differential in a patient with respiratory or cardiovascular symptoms.

Superior resolution and speed of multidetector CT (MDCT) allows identification of cardiac pathology even on non ECG gated studies.

Wide adoption of MDCT by clinical institutions can have a broad impact on the detection of incidental cardiac findings and has been demonstrated to be useful in detection of significant coronary calcifications.

Incidental cardiac findings can provide important clues to etiology of the patient’s presentation.

- Familiarize with common cardiac findings on chest CT
  - Ischemic heart disease
    - Acute
    - Chronic
  - Coronary arteries and bypass grafts
  - Complications of myocardial infarction
  - Intracardiac thrombi
  - Cardiomyopathy
  - Endocarditis with valvular vegetation
  - Atrial septal defect (ASD)
  - Neoplasms
    - Metastasis
    - Hemangioma
  - Objectives
Diagnosis?

87 year old male who presented with melena stool and low hemoglobin
Acute myocardial ischemia

87 year old male who presented with melena stool and low hemoglobin. CT was ordered to assess for a source of hemorrhage.

Axial chest CT with IV contrast, demonstrates a focal area of septal (arrowhead) and apical hypoperfusion (arrow).

- Imaging findings are in keeping with acute myocardial infarction which was confirmed by elevated cardiac enzymes and septal hypokinesis with decreased cardiac function subsequently demonstrated on an echocardiogram.

- Occlusion of the coronary arteries can sometimes be visualized.
Diagnosis?

CT chest in a 76 yo male
Chronic infarction

CT chest in a 76 yo male

- Long standing ischemia can result in myocardial wall calcification and left atrial enlargement.
- Extensive calcification in the right coronary artery (RCA) (arrowhead).
- Secondary findings include signs of pulmonary venous hypertension.
- Non gated studies can identify aortic aneurysms, dilation of pulmonary arteries and sometimes indirect signs of pulmonary hypertension using Agatson scoring (1).
Diagnosis?

CT pulmonary angiogram, sagital reconstruction in a 88 year old male presenting with pleuritic chest pain and decreased oxygen saturation.
Saphenous vein graft occlusion

CT pulmonary angiogram, sagittal reconstruction in a 88 year old male presenting with pleuritic chest pain and decreased oxygen saturation.

• CT PA demonstrates coronary calcification in the patent native right coronary artery (RCA) (arrows) and non enhancing RCA saphenous vein graft (arrowhead).

• MDCT enables visualization of the coronary arteries and coronary bypass grafts. Visualization on nongated study, while suboptimal, can be diagnostic.

• Important morphologic information, including anatomic variants and postsurgical or post intervention changes can be seen.
Diagnosis?

CT pulmonary angiogram
Cardiac aneurysm

CT pulmonary angiogram

- Apical septal thinning and aneurysmal apical remodelling (arrow) on CTPA

- Cardiac aneurysm or pseudoaneurysm are important complications of myocardial infarction (2).

- Cardiac aneurysm is a dyskinetic segment of scarred, thinned myocardium resulting from prior transmural ischemic infarction. **Common in antero-septal segments** (2).

- Frequently accompanied by LV thrombus.
Diagnosis?

Lung resection follow-up
Cardiac aneurysm

62 year old male, lung resection follow-up

• Apical calcification demonstrated on an unenhanced CT scan.

• Cardiac aneurysm or pseudoaneurysm in the absence of prior cardiac studies can be of great diagnostic importance and will prompt further assessment, including echocardiography and possible surgical intervention.

• Stagnant flow leads to thrombus formation.
• Late findings include myocardial wall or thrombus calcification.
Diagnosis?

Work-up of a right lower lobe mass found on preoperative CXR
Cardiac pseudoaneurysm

Work-up of a right lower lobe mass found on preoperative CXR

• RLL mass and cardiac pseudoaneurysm with mural thrombus (arrowhead). Apical pseudoaneurysm with discontinuous ventricular wall and mural thrombus (arrow).

• Transmural MI complicated by endocardial and myocardial tear, contained by the epicardium.
• Pseudoaneurysms have a small neck diameter with a wide aneurysmal sac and interrupted myocardium (2).
• Typically basal inferior or lateral LV segments
• Pseudoaneurysm has a high rate of rupture at 30-45% and timely detection can be lifesaving.
• Stagnant flow leads to mural thrombus.
• Surgical treatment is indicated with perioperative mortality in the 10 % range (3).
Diagnosis?

58 year old male with retrosternal pain radiating to the back. Computed tomography in arterial dissection protocol was performed.
Intraatrial thrombus

58 year old male with retrosternal pain radiating to the back.

- Filling defect in the left atrial appendage, not visible on transesophageal echocardiogram.
- Bilateral embolic renal infarcts

- Intracardiac thrombus can form in the setting of atrial fibrillation, acute myocardial infarction and its complications, cardiomyopathy, myocarditis, and valvular disease.
- Atrial thrombi are most often found in the left atrium and left atrial appendage in the setting of atrial fibrillation or mitral valve disease.
- Ventricular thrombi generally develop near the left ventricular apex due to decreased contractility secondary to acute myocardial infarction or aneurysm formation.
Diagnosis?

33 yo IVDU in septic shock
Valvular vegetation, septic emboli

33 yo IVDU in septic shock.

- Peripheral reverse halo opacities with a “leading vessel” sign consistent with a pulmonary infarct. Bilateral pleural effusions and consolidation.
- Large filling defect attached to the tricuspid chordal apparatus (arrow)

- Tricuspid endocarditis predominantly affects intravenous drug users, but can occur in patients with pacemakers, central venous lines and hemodialysis catheters (4).
- Most common causative microorganisms include S.aureus (60-90%), P.aeuruginosa, gram negative bacilli and mixed flora (4).
- Embolic phenomena occur in 20-50% of patients with infective endocarditis (4).
Diagnosis?

Incidental finding on a CTPA
Valvular vegetation, septic emboli

Incidental finding on a CTPA

- Inflow of the unenhanced blood from the left atrium across the atrial septal defect (arrows).

- Common congenital defect, making up 30% of adult heart defects (5, 6).
- ASD can range from asymptomatic small volume, low pressure left to right shunts presenting with heart murmur to large defects leading to volume overload with symptoms of congestive heart failure.
- Large shunt can lead to development of Eisenmenger’s physiology presenting with pulmonary hypertension (6).
- ASD can facilitate paradoxical embolization with neurologic sequelae.
Diagnosis?

61 year old patient with esophageal cancer
Pericardial metastasis

61 year old patient with esophageal cancer

• A soft tissue mass extending superolaterally along the posterior pericardial reflection (arrow) to the level of the left atrial appendage and circumferential esophageal thickening with a stent in situ (arrowhead).

• Metastasis are the most common cardiac tumors, with incidence 40-100 fold that of the primary cardiac tumors (5).
• Most common metastases are of breast and colorectal origin.
• Pericardium is most commonly involved manifesting as pericardial effusion. Myocardium invasion is by extension of the pericardial mass.
• Unlike primary tumors, metastasis exhibit intramural growth as opposed to intracavitary (7).
Diagnosis?

62 year old patient with esophageal cancer
Atrial hemangioma

CT for staging of esophageal cancer 62 year old patient with esophageal cancer

Enhancing soft tissue mass with punctate calcification in the right atrial wall.

• Rare benign neoplasm of vascular origin (1-2% of cardiac tumors) (8).
• Often asymptomatic, can present with murmur, dyspnea, atypical chest pain, arrhythmias, including heart block, and cardiac tamponade.
• Valvular or conduction abnormalities.
• Intracavitary growth can lead to congestive symptoms, outflow obstruction and even sudden cardiac death.
• Differential diagnosis: other cardiac tumors including metastases, sarcomas, lipomas, thrombus and myxoma.
Conclusion

- Incidental findings on CT of the thorax can have important diagnostic, treatment and prognostic implications.
- Fast scan times with good temporal resolution available with MDCT technology increase the technical feasibility of identifying and interpreting cardiac findings with greater degree of certainty.
- Awareness of the cardiac pathology that can be visualized on CT can increase the sensitivity of the test and its clinical utility.

References: