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CLINICAL IMAGE

Computed tomography to detect acute myocardial infarction

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Clinical image

A 48-year-old male with a history of hypertension presented to the emergency room because of sudden-onset dorsal thoracic pain. Computed tomography (CT) revealed a type-A aortic dissection, originating just superior of the aortic valve extending towards the iliac arteries. Subsequently, a replacement of the aortic root and arch was performed without aortic valve replacement. Although the surgical procedure was successful without noteworthy complications, the patient required high vasopressor and positive inotropic agent doses during weaning from cardiopulmonary bypass support. A post-operative transoesophageal echocardiogram revealed a globally impaired left and right ventricular function, without apparent regional wall motion abnormalities. No aortic valve regurgitation was observed. In the ICU, the patient's haemodynamic and respiratory condition progressively deteriorated, accompanied by lactic acidosis. The electrocardiogram displayed a broad complex tachycardia that during carotid sinus massage appeared to be a sinus rhythm with a frequency-dependent complete left bundle-branch block.

To further explore the differential diagnoses of the adverse clinical course (e.g. intestinal ischaemia, thoracic or abdominal bleeding, or pulmonary embolism), a contrast-enhanced CT of the abdomen and thorax was performed. No apparent abnormalities compatible with the potential diagnoses mentioned were identified. There was, however, a remarkable void of contrast agent noted in the interventricular septum and inferior myocardial wall (Figure 1, Post). Interestingly, the pre-operative CT did not display such heterogeneity of myocardial contrast (Figure 1, Pre), indicating post-operative acute myocardial infarction. Unfortunately, before a percutaneous coronary intervention could be employed, the patient died of cardiogenic shock. Post-mortem cardiac examination indeed revealed a ruptured plaque of the right coronary artery, and biochemical staining confirmed the diagnosis of acute myocardial infarction.

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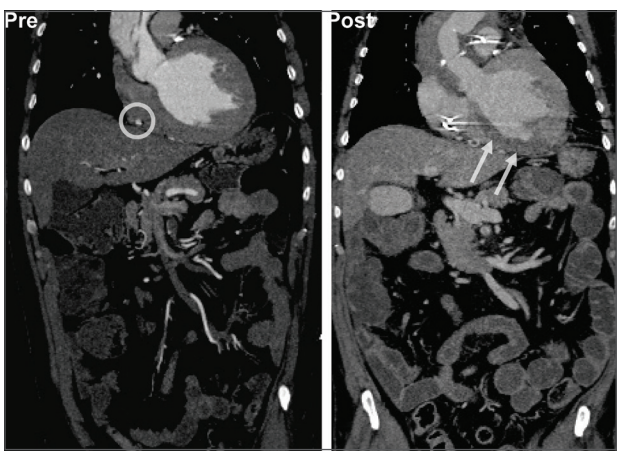
Mortality from acute aortic dissection is primarily caused by massive myocardial infarction due to coronary dissection as well as severe neurologic complications [1]. In clinical cardiology, first-pass imaging of a contrast agent to evaluate myocardial perfusion during rest or during pharmacologically induced stress is commonly used to diagnose coronary artery disease [2]. Although most experience pertaining to this type of imaging has been gained with cardiovascular magnetic resonance imaging using gadolinium enhancement [3], more recently these techniques are increasingly being applied in cardiac CT imaging [4]. With the widespread availability of the 64-slice CT scanner (a 64-slice scanner has a scan time of 12 to 15 seconds compared to 20 seconds with the 16-slice coronary CT angiogram) – and now 256- and 320-slice scanners

Figure 1



Contrast-enhanced CT in a coronal view before (Pre) and after (Post) aortic surgery. Before surgery, the origin of the aortic dissection flap initiates just superior of the aortic valve; please note that the right coronary artery is clearly contrast-enhanced (black circle), suggesting patency. In contrast to the pre-operative CT, there is a lack of contrast in the septum and inferior wall (white arrows) after surgery compatible with a perfusion impairment due to myocardial infarction.

with improved spatial and temporal resolution – coronary CT angiography has an emerging role in the diagnosis of acute chest pain and may serve as first-line imaging of coronary artery disease and aortic dissection [5].

In this particular patient, a non-cardiac and hence non-gated CT revealed acute myocardial infarction by visualizing a perfusion deficit in the vascular territory of the right coronary artery. This unexpected finding probably suggests a new role for CT after cardiothoracic surgery, especially in the ICU, where patients are often sedated and biomarkers and 12-lead electrocardiograms are known for their limited diagnostic sensitivity and specificity [6,7]. Had our patient undergone pre-operative coronary CT angiography, coronary artery disease might have been detected earlier, and this patient would probably have had concurrent coronary artery bypass graft surgery.

Cardiac CT imaging is an interesting new technique, which might have a promising role in detecting coronary artery disease, myocardial infarction, and aortic dissection in the future.

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