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LETTER TO THE EDITOR

Myocardial Viability by Dual-Energy Delayed Enhancement Computed Tomography

A 77-year-old male presented with an inferior ST-segment elevation myocardial infarction. Coronary angiography revealed thrombotic occlusion of the right coronary artery (Fig. 1). Percutaneous intervention was unsuccessful, and imaging was requested to determine suitability for surgical revascularization.

Computed cardiac tomography (CT) was performed on day 4 post-infarction using a dual-source 128-slice CT scanner (Somatom Definition FLASH, Siemens Healthcare, Forchheim, Germany). Coronary imaging was performed with prospective electrocardiogram (ECG) gating, 100 kV, 0.28-s rotation time, pitch 0.9, 64-mm × 0.6-mm slice acquisition, B26f soft kernel reconstruction (Figs. 2A and 2B). A total of

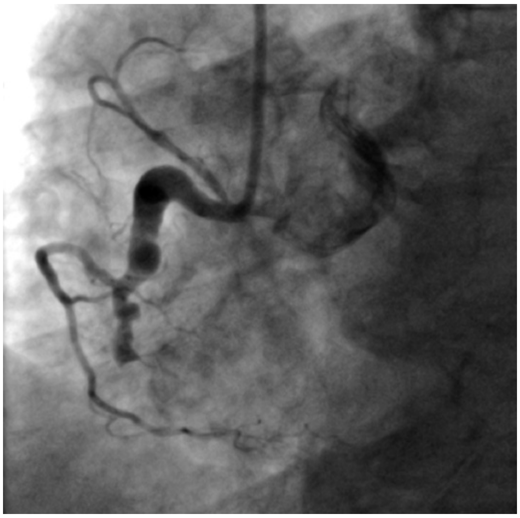

Figure 1. Invasive Coronary Angiography Demonstrating Acute Thrombotic Occlusion of the Right Coronary Artery

Percutaneous intervention was unsuccessful, and viability imaging was requested in order to assess suitability for surgical bypass grafting.

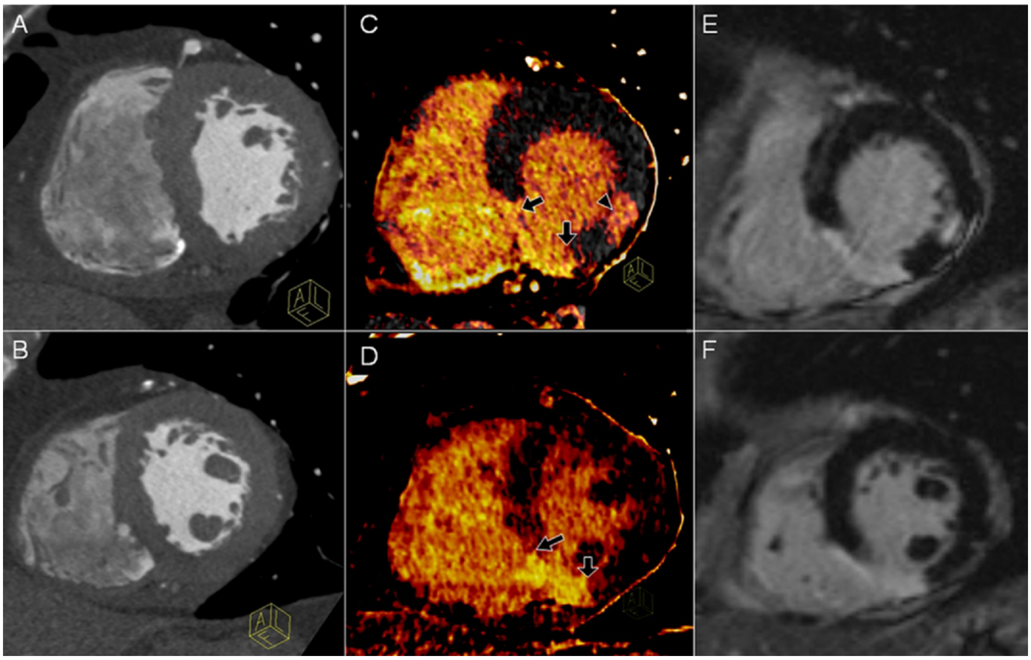

Figure 2. Myocardial Viability by Dual-Energy Computed Tomography and Comparison With CMR

(A and B) Dual-source cardiac computed tomography with multiplanar reformat into short-axis slices at the basal and mid-ventricular levels. **(C and D)** Dual-energy delayed acquisition images with merged iodine map and morphological delayed enhancement maximum-intensity projection 8-mm slice; a full-thickness inferior wall infarction is present **(arrows)**, with a smaller subendocardial infarction in the basal lateral wall **(arrowhead)**. **(E and F)** Cardiac magnetic resonance (CMR) with late gadolinium enhancement demonstrates identical infarct distribution and extent to that detected by dual-energy computed tomography.

100 ml of iodine contrast material (Ultravist 370, Bayer-Schering HealthCare, Berlin, Germany) was injected at a flow rate of 6 ml/s, followed by a 50-ml saline bolus. Delayed reimaging was performed at 12 min after the contrast bolus using a dual-energy CT protocol; retrospective ECG gating, pulse width 60% to 80%, tube A 100 kV at 165 mA, tube B 140 kV at 140 mA. Total radiation dose for both acquisitions was 4.8 mSv.

Images were reconstructed with a slice thickness of 0.75 mm each 0.5 mm, with a 512^2 matrix and individually adapted field-of-view (FOV = 130 to 150 mm), using a dual-energy soft-tissue kernel (D30f), and displayed to assess the myocardium in short-axis views (Figs. 2A and 2B). Dual-energy iodine map and morphological delayed enhancement CT images were merged (Syngo Dual-Energy, Siemens) to clearly demonstrate transmural inferior wall infarction with a high signal differential from infarcted to normal myocardium (Figs. 2C and 2D). A separate subendocardial infarct is also detected in the basal-lateral wall (Fig. 2C, arrowhead). The distribution and extent of infarction show striking similarity to the cardiac magnetic resonance images acquired 1 day later (Figs. 2E and 2F).

These images document the first use, to our knowledge, of dual-energy CT delayed enhancement myocardial viability imaging. Dual-energy CT harnesses the intrinsic variations in attenuation when iodine is exposed to beams of differing kV, made possible in this case by using dual-source technology (1). Delayed enhancement imaging exploits the similar myocardial washout kinetics of iodine to gadolinium, allowing imaging of infarcted myocardium in a similar manner to CMR (2).

Myocardial delayed enhancement imaging using dual-energy CT acquisition may provide a feasible alternative for myocardial viability assessment in patients with contraindications to magnetic resonance. Further research will define the accuracy and reproducibility of this technique.

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