



Appearance of Acute and Chronic Coronary Occlusions in Contrast-Enhanced Cardiac Computed Tomography

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CONTRAST-ENHANCED CARDIAC COMPUTED TOMOGRAPHY (CT) is being increasingly used for the investigation of patients with suspected coronary artery disease. Recent technological developments have allowed the reliable diagnosis of both coronary stenosis and occlusion with this modality. In addition to the identification of luminal stenosis, CT has the potential to visualize coronary plaque, collateral circulation, myocardium, and left ventricular function. Although the typical CT appearance of chronic coronary occlusion (extensive calcification and negative remodeling within the artery, potential presence of collateral coronary circulation and, in most cases, impaired left ventricular function associated with thinned myocardium) is well known, characteristics of acute occlusion have not been well described. The distinction between acute and chronic coronary occlusion has particular importance for the management of patients presenting with acute chest pain. In this series of cases, we highlight some characteristic features of acute and chronic coronary occlusions as demonstrated by contrast enhanced cardiac CT (Figs. 1 to 5).

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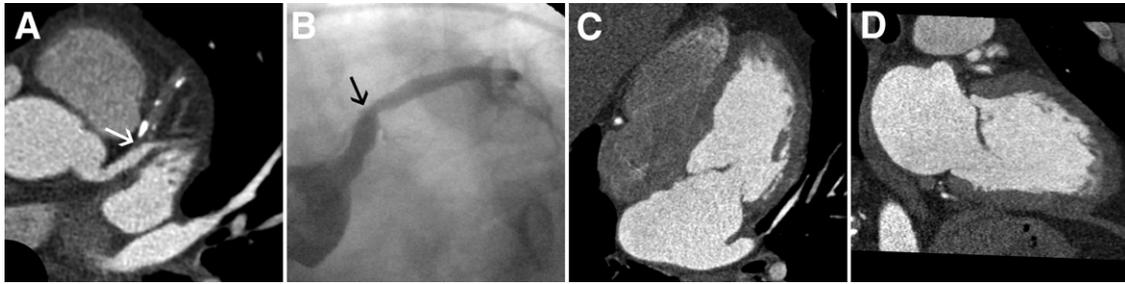


Figure 1. Acute Occlusion of the Mid Left Anterior Descending Coronary Artery

Acute occlusion of the left anterior descending (LAD) coronary artery in a patient with chest pain is shown. The multiplanar reformatted computed tomography image in (A) demonstrates total occlusion of the LAD at the site of the first diagonal branch (arrow), confirmed by invasive coronary angiography (B, arrow). In this case the anomalous left circumflex artery arising from the right coronary artery is not visualized. In addition to absence of contrast within the coronary lumen, calcified plaque can be seen in the occluded segment. Left ventricular wall thickness may provide evidence of the chronicity of coronary occlusion. In this case, the combination of akinesis of the anterior and septal segments (Online Videos 1 and 2 and accompanying legends) but preserved wall thickness (C and D), is consistent with acute occlusion.

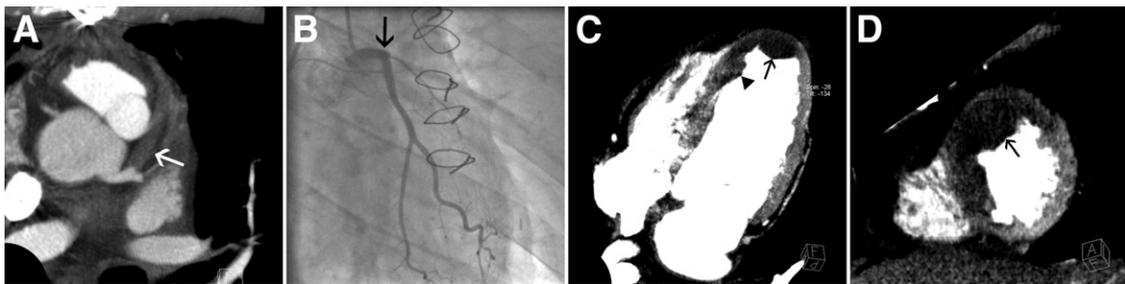


Figure 2. Acute Occlusion of the Proximal LAD Coronary Artery

The contrast-enhanced computed tomography image (A, arrow) demonstrates acute occlusion at the ostium of the LAD, confirmed by invasive coronary angiography (B, arrow) in a patient with previous surgery for thoracic lymphoma. This case displays an absence of extensive calcification and pronounced positive remodeling within the occluded segment, 2 features of acute occlusion. In addition, this case also demonstrates a contrast perfusion defect in the corresponding myocardial territory (C, arrowhead) and the formation of left ventricular thrombus (C and D, arrows). Abbreviations as in Figure 1.

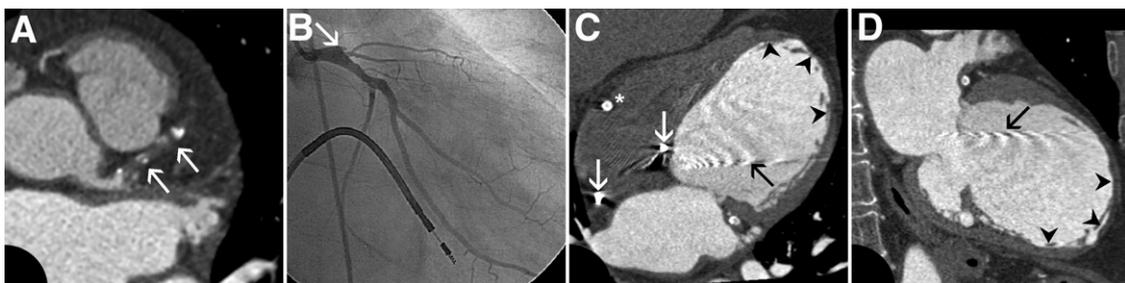


Figure 3. Chronic Occlusion of the Proximal LAD Coronary Artery

The axial computed tomography image in (A) demonstrates a known chronic total occlusion of the proximal LAD (arrows), confirmed by invasive coronary angiography (B, arrow). The vessel lumen in the occluded segment displays a slightly lesser degree of positive remodeling, but otherwise it appears similar to the acute occlusion in Figure 1. However, the left ventricle shows wall thinning and the formation of a left ventricular aneurysm (C and D, arrowheads). An artifact (black arrow) is seen from the pacemaker leads in the right atrium and ventricle (white arrows). A coronary stent (*) is visualized within the RCA. Online Videos 3 and 4 (and accompanying legends) confirm akinesis in the anterior and septal segments with myocardial thinning, which indicates chronic occlusion and scar formation. Abbreviations as in Figure 1.

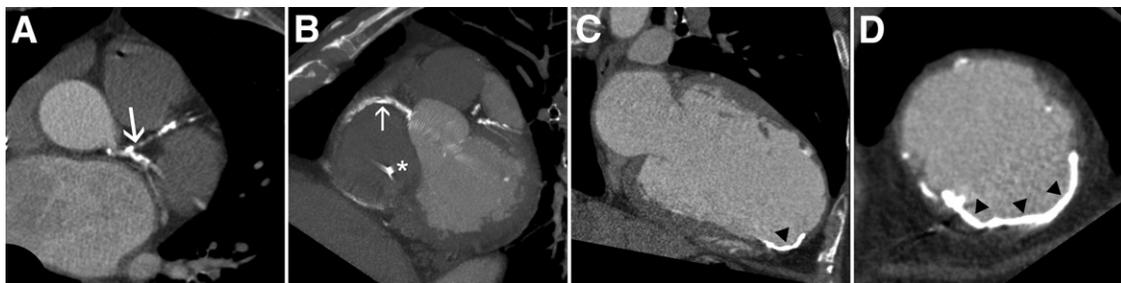


Figure 4. Chronic Occlusion of the LAD and RCA

This patient has known chronic total occlusion of the LAD and RCA. In contrast-enhanced CT (A and B, respectively), both arteries reveal pronounced calcifications and negative remodeling (arrows). Consistent with previous myocardial infarction, a calcified aneurysm of the apical and inferior segment (C and D, arrowheads) is well demonstrated by computed tomography. A pacing lead is visualized within the right heart (B, *). RCA = right coronary artery; other abbreviations as in Figure 1.

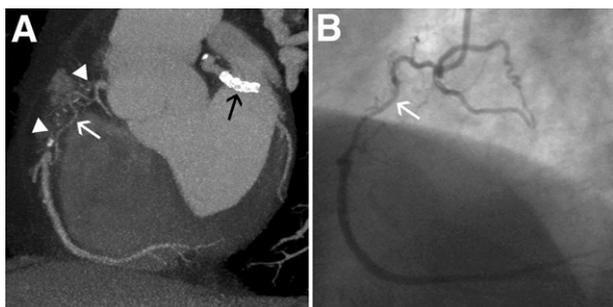


Figure 5. Collateral Coronary Circulation in Chronic Occlusion

In response to chronic ischemia, a collateral coronary circulation may develop. Large collaterals can occasionally be visualized by CT and provide supporting evidence of the chronic nature of the occlusion. A known chronic total occlusion of the proximal RCA is demonstrated in (A, arrowheads). In addition, there is a large right-to-right collateral vessel seen on both the contrast-enhanced CT (A, white arrow) and the invasive coronary angiogram (B, arrow), with contrast enhancement of the distal vessel in both studies. A stent is also seen within the left circumflex coronary artery on the CT image (A, black arrow). CT = computed tomography.