Biochemical risk assessment and invasive strategies for acute coronary syndromes without ST-segment elevation

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Chapter 10

The value of coronary CT angiography in the evaluation of non ST-elevation myocardial infarction

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ABSTRACT

Coronary CT angiography (CCTA) is a promising new technique in the immediate assessment of patients presented with a suspected non ST-elevation myocardial infarction (NSTEMI). In addition to its ability to reliably rule out coronary artery disease, lesion characterization can be used to determine the underlying pathophysiology of an acute ischemic event. The following case illustrates the potential ability of CCTA to detect the culprit lesion in a patient with suspected NSTEMI.
A 48-year-old man was presented at the emergency department with a short episode of chest pain. His medical history was unremarkable. Besides smoking there were no other risk factors for coronary artery disease. The ECG and biomarker levels at presentation were normal.

As part of a quick rule out protocol, a CCTA was performed. The scan showed multiple calcifications in the LAD, LCX and included a partially calcified plaque in the proximal LAD. The distal part of this plaque showed a very low attenuation profile with evidence of intraplaque dye penetration. This pattern of a ring-like enhancement is considered to be suggestive of an ulcerated plaque. (Figure 1A) A severe non-calcified plaque was also detected in the LCX. (Figure 1B) The patient was admitted to the hospital and pharmacological treatment for NSTEMI was commenced. This included anticoagulation and dual antiplatelet therapy. Repetitive troponin test results were positive. Coronary angiography was performed as part of an early invasive strategy after 72 hours of pharmacological treatment. Only a slight indentation in the LAD was observed this time. (Figure 2A) The lesion in the LCX was confirmed and treated by PCI. (Figure 2B) The clinical course was furthermore uneventful and the patient was discharged the same day.

Although CCTA is the most accurate non-invasive test in ruling out CAD, its specificity has been questioned because CCTA has the tendency to overestimate the severity of the disease. This case illustrates the potential ability of CCTA to identify the culprit lesion by plaque characterization during the initial presentation of a patient with suspected NSTEMI. Irregular or ulcerated plaques detected by CCTA are more likely to represent ruptured and clinically unstable lesions. In contrast to conventional angiography, CCTA provides the ability to visualize the plaque itself giving new possibilities for plaque characterization. Lesions with low Hounsfield units, positive remodeling and spotty calcifications are thought to be prone to cause unstable ischemic complications. However, it still remains difficult to differentiate between a soft plaque with a high lipid content, a thrombus or an (beam hardening) artifact.
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FIGURE 1
Coronary computed tomography angiography at admittance.

Figure 1A: This figure shows a multiplanar reconstruction of the LAD. A moderate partially calcified stenosis is present in the proximal part of the vessel. The distal part of the lesion has a low attenuation profile and an intra-dye penetration suggesting ulcerated plaque. (white arrow)

Figure 1B: 2D reconstruction. The black arrow shows a severe non calcified lesion in the LCX without any signs of instability.
FIGURE 2
Coronary angiography performed 72 hours after admittance.

Figure 2A: Only a small indentation of the proximal LAD is seen. (white arrow) The lesion in the LCX is severe and was treated by PCI. (black arrow)

Figure 2B: Result of the LCX after PCI
This case demonstrates the complimentary ability of CCTA as compared to conventional angiography in patients with acute chest pain. It was hypothesized that the ulcerated plaque in the LAD would stabilize after several days of pharmacological therapy. Therefore, it was decided to leave the LAD untouched and to perform a PCI in the severe stenotic lesion of the LCX. In conclusion, the early use of CCTA in patients with suspected NSTEMI may give important insight in the pathophysiology of an acute event by using plaque characterization and thereby identifying the culprit lesion. Whether or not the specificity of lesion characterization using CCTA in patients with NSTEMI is high enough to change clinical routines can only be assessed by future research.
REFERENCES