

## Case Report

# Main stem erosion as cause of acute coronary syndrome-short-term optical coherence tomography therapy control

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**Abstract:** In the Western countries morbidity caused by coronary heart disease is still accelerating and plenty of patients suffer from acute coronary syndrome (ACS). Plaque rupture (PR) and plaque erosion (PE) are important underlying substrates leading to ACS. To differentiate between these underlying substrates optical coherence tomography (OCT) is a suitable imaging modality, which is generally not performed in clinical routine so far. Therefore, coronary stents are placed in most lesions in ACS. We present a case of an ACS patient with PE diagnosed and followed up with OCT, treated without coronary stents but dual platelet therapy (DAPT) alone. In the early OCT therapy control we could demonstrate, that the PE was still detectable, but the thrombus mass was already reduced substantially. Discriminating between PR and PE as the major mechanisms of ACS might well be important for the choice of therapy in the future.

**Keywords:** Acute coronary syndrome, optical coherence tomography, plaque erosion

## Introduction

Urgent coronary angiography with percutaneous coronary intervention (PCI) improves outcome in patients presenting with acute coronary syndrome (ACS) and coronary artery disease with flow limiting stenosis. Limited coronary flow in ACS is most often attributed to plaque rupture (PR) with subsequent thrombus formation in “culprit” lesions. Generally, these lesions are treated with coronary stents. Nevertheless, other causes for ACS such as plaque erosion (PE) exist. Unfortunately, angiography alone does not provide sufficient visualization of coronary vessel wall to differentiate between PR and other possible causes for ACS. Intravascular ultrasound (IVUS) or optical coherence tomography (OCT) for precise coronary imaging are generally not performed in clinical routine so far. Therefore, coronary stents are placed in most lesions in ACS.

## Case report

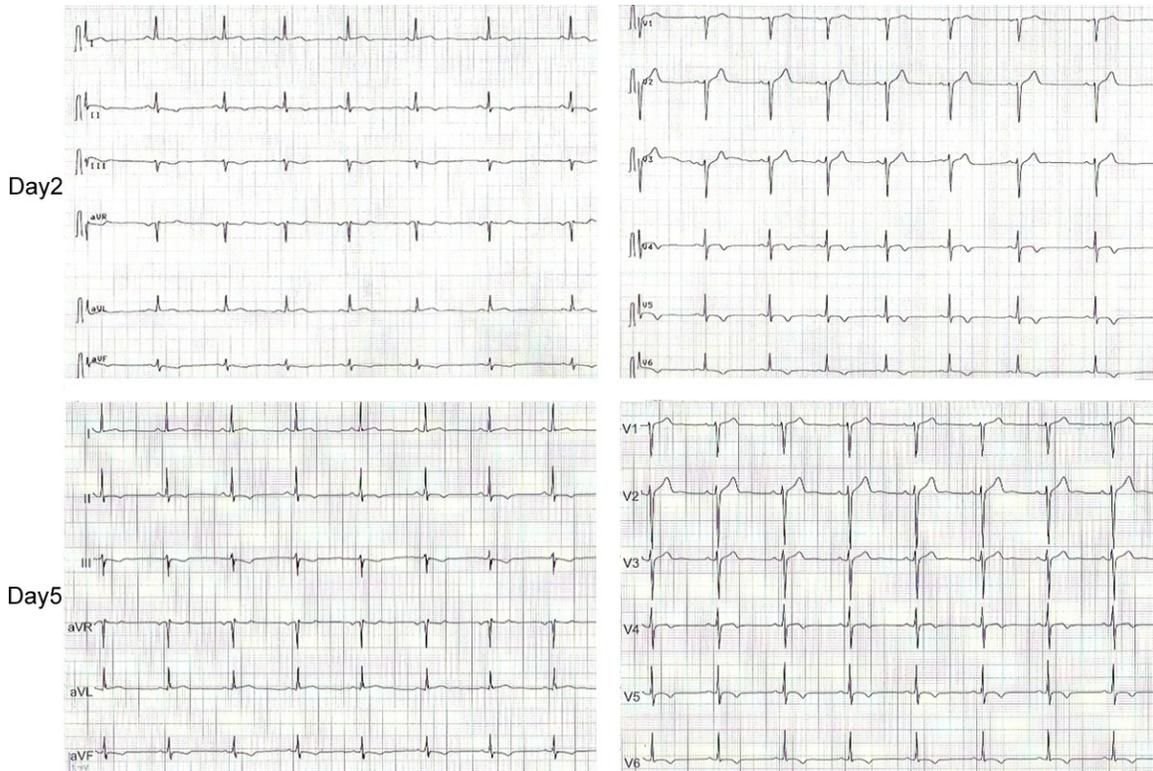
A 44-year-old male presented with severe chest pain radiating to the left arm to a tertiary hospi-

tal. With increased high sensitive Troponin T the diagnosis of non-ST-elevation myocardial infarction (NSTEMI) was made and the patient was referred to coronary angiography. A thrombus protruding from the left main stem into the left anterior descending artery (LAD) was suspected and the patient was transferred to our hospital for further diagnosis and treatment.

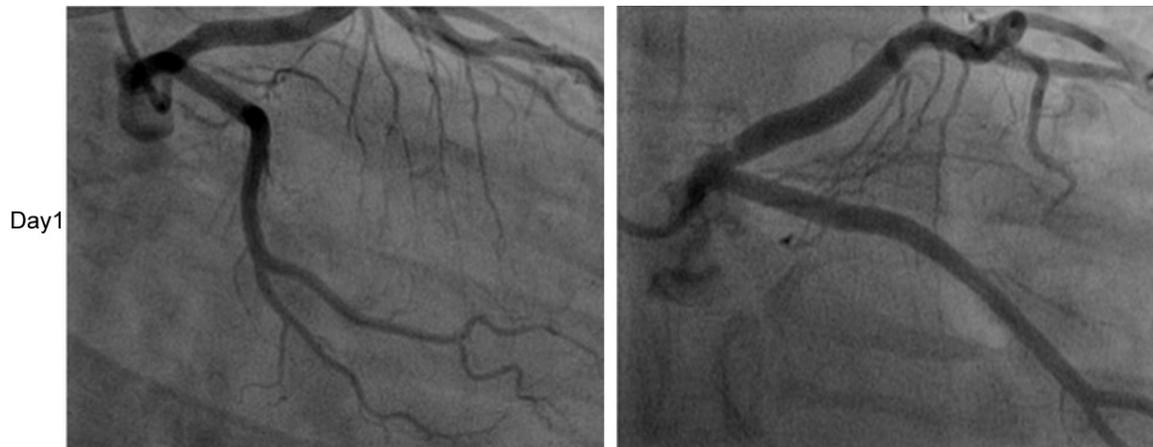
Medical history revealed no prior chest pain episodes and the patient was not affected by prior heart diseases. The patient was a smoker with 10 pack years and had a history of hypertension, which was medially controlled. Left ventricular function was normal without regional wall motion abnormalities. Electrocardiography showed changes in terms of T-wave negativity in inferior (II, III, aVF) and lateral leads (V4-V6) (**Figure 1**).

We performed an additional coronary angiography and found a discreet brightening in the left main stem and the proximal LAD (**Figure 2**). Intravascular imaging by OCT revealed PE with overlaying thrombus as the underlying mechanism (**Figure 3A-D**). We decided to defer stent

## ACS-short-term OCT therapy control



**Figure 1.** Electrocardiogram (ECG). ECG shows constantly present ischemic changes in terms of T-wave negativity in inferior (II, III, aVF) and lateral leads (V4-V6) mainly explainable as a result of left ventricular hypertrophy.



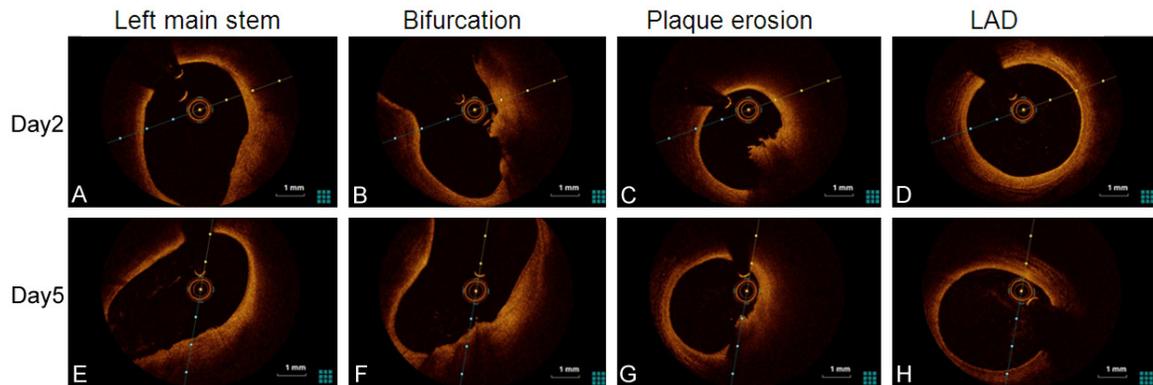
**Figure 2.** Coronary angiogram. Coronary angiogram shows a discrete brightening in the left main stem and the proximal LAD.

implantation because the arterial intima layer was not ruptured and other parts of the vessel did not show any atherosclerosis including the left main stem and the proximal LAD.

Our medical treatment included Bisoprolol, Ramipril, Atorvastatin as well as dual platelet

inhibition with acetylsalicylic acid and Ticagrelor. Furthermore, we started a continuous anticoagulation treatment with unfractionated heparin over three days.

We performed a second look coronary angiography including OCT 3 days later (**Figure 3E-H**).



**Figure 3.** Optical coherence tomography (OCT). OCT cross-sectional images from proximal to distal (A-D) of the culprit lesion indicate plaque erosion with red thrombus. After five days of treatment OCT images (E-H) show a substantially reduce of thrombotic material.

Therein, the PE was still detectable, but thrombus mass reduced substantially. Thereby our conservative treatment approach was successful. As followed up by telephone interview six month after treatment, the patient remained asymptomatic. In accordance with guideline recommended therapy we recommended to continue dual platelet inhibition therapy (DAPT) over a total of one year.

### Discussion

PR and PE are important underlying substrates leading to coronary thrombosis and ACS [1]. Jia et al. [2] showed that PE is widespread in patients with NSTEMI in a population similar to our patient. OCT is an excellent imaging modality to verify the underlying mechanism [2, 3]. Nevertheless, OCT is not used in daily clinical care of ACS patients, which may result in missing PE. These missed cases will be interpreted as PR and predominantly be treated with coronary stents. In published literature, there is one similar case report presenting treatment of a patient suffering from ACS without coronary stenting and assessment of the therapeutic effect by OCT [4]. ACS in this case was caused by a thrombotic sub-occlusion without any underlying organic lesion and treated by manual thrombectomy. This concept was recently substantiated by bigger studies presenting ACS patients with mostly thrombotic culprit lesions diagnosed by OCT and successfully treated by thrombus aspiration and medical therapy [5, 6]. Interestingly, Niccoli et al. [7] evaluated the prognostic value of PR compared with intact fibrous cap (IFC  $\approx$  PE) in 139 patients

with ACS. Results showed that major cardiac events occurred more frequently in patients with PR when compared with those having IFC. Similar findings were shown in the study of Yonetsu et al. [8]. Adverse cardiac events were significantly less in the group of patients with IFC as culprit lesions, which was hence associated with better long-term prognosis. Beyond that, Prati et al. [9] examined the underlying mechanism of NSTEMI by OCT and treated 40% of patients with subcritical occlusive plaque with DAPT only. Most importantly, the recently presented EROSION study by Jia et al. [10] is of particular interest. In this study, patients with ACS caused by PE were treated with DAPT only. OCT was the method of choice to evaluate the underlying mechanism of ACS and was repeated one month after the event. In 47 of 60 patients the thrombus volume was reduced by more than half and 22 patients had no visible thrombus. The vast majority of patients remained symptom free.

In the future, discriminating between PR and PE as the major mechanisms of ACS might well be important for the choice of strategy and OCT seems to be the optimal method to classify the underlying mechanism. Further prospective studies on the potential of OCT in this context are desirable.

### Disclosure of conflict of interest

None.

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