

Optical coherence tomography guided successful treatment without stent implantation in a patient with non-ST-segment elevation myocardial infarction caused by plaque rupture

A case report

Fei-Fei Zhang, PhD, Yi Dang, PhD*, Qing-Qing Hao, MD, Yue-Tao Xie, MD, Shu-Ren Li, PhD, Xiao-Yong Qi, PhD

Abstract

Rationale: Primary percutaneous coronary intervention (PPCI) with immediate stenting provides effective revascularization. While the risks of no-reflow, stent thrombosis, stent undersizing, and malapposition reduced the benefits in patients with high burden thrombosis. Intravascular imaging, especially optical coherence tomography (OCT), offers potential in optimization of percutaneous coronary intervention.

Patient concerns: A 51-year-old male underwent coronary angiography (CAG) due to chest pain with minimal ST-segment depression of the electrocardiogram.

Diagnoses: Urgent CAG revealed burden thrombus in the mid left anterior descending coronary artery (LAD) with TIMI grade I distal flow.

Interventions: After aspiration thrombectomy, OCT was used to evaluate the target lesion of non-ST-segment elevation myocardial infarction (NSTEMI) and conservative treatment without stent implantation was selected.

Outcomes: CAG repeated 1 month after PPCI revealed TIMI grade III blood flow in LAD and only minimal stenosis in the target lesion. OCT showed a cavity formation due to plaque rupture and MLA increased after thrombus dissolution. Follow-up was uneventful at 6 months.

Lessons: OCT may be useful imaging modality to identify the characteristic of culprit lesion of acute myocardial infarction and subsequently guide individual treatment.

Abbreviations: ACS = acute coronary syndrome, CAG = coronary artery angiography, LAD = left anterior descending coronary artery, NSTEMI = non-ST-segment elevation myocardial infarction, OCT = optical coherence tomography, PPCI = primary percutaneous coronary intervention.

Keywords: non-ST-segment elevation myocardial infarction, optical coherence tomography, plaque rupture

1. Introduction

Timely reperfusion with stent implantation in target lesion is the standard treatment for primary percutaneous coronary interven-

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This study was approved by the Ethics Committee of Hebei General Hospital.

Informed consent was obtained from the patient included in the article.

The authors report no conflicts of interest.

Department of Cardiology Center, Hebei General Hospital, Shijiazhuang, Hebei Province, China.

* Correspondence: Yi Dang, Department of Cardiology Center, Hebei General Hospital, Shijiazhuang, 050051, Hebei Province, China (e-mail: dangyiemail@126.com).

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tion (PPCI). However, the risks of no-reflow, stent thrombosis, stent undersizing, and malapposition, among other complications in PPCI, might impair patients' prognosis.^[1] Although aspiration thrombectomy was recommended as class III in the latest ESC guideline, select patients with very high thrombus burden may still derive clinical benefit from it. Moreover, intravascular imaging, especially optical coherence tomography (OCT), could make us understand the pathogenesis and offer potential in the planning and optimization of percutaneous coronary intervention.^[2,3] Here we report a case of successful treatment without stent implantation in a patient with non-ST-segment elevation myocardial infarction (NSTEMI) caused by plaque rupture.

2. Case report

A 51-year-old male was admitted to the emergency room with 3 h of severe, pressure-like, substernal chest pain, diaphoresis, and dyspnea. He was diagnosed without hypertension or hyperlipemia but was addicted to smoke. The patient's electrocardiogram registered normal sinus rhythm with ST-segment depress in II, III, aVF, V4-V6 leads and elevation in aVR, V1 leads (Fig. 1 A). His

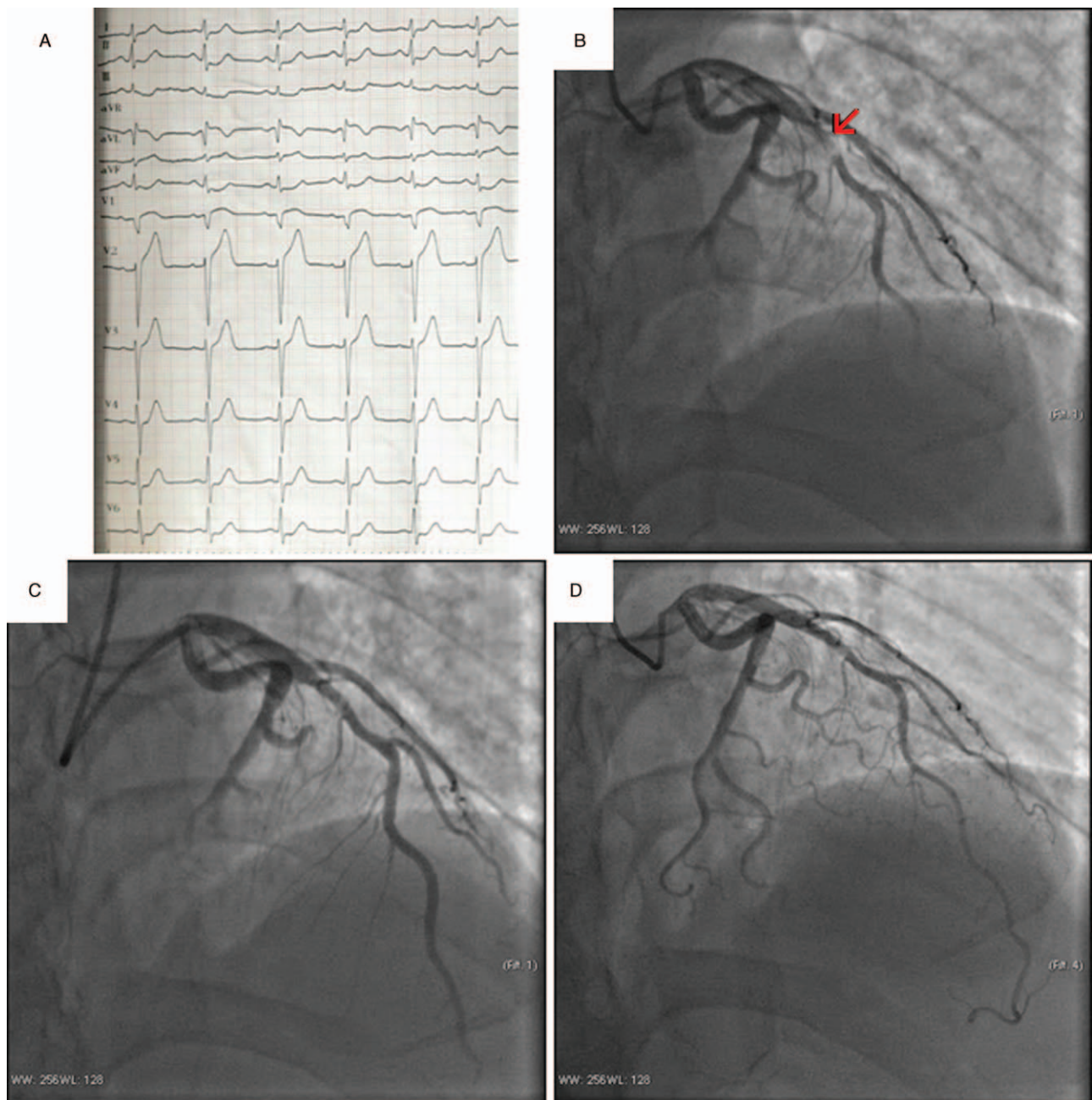


Figure 1. (A) Electrocardiogram before PPCI. (B) Initial angiography revealed a large thrombus in the mid LAD with TIMI grade I distal flow. (C) After thrombus aspiration no remaining significant obstructive lesions in LAD and improvement of TIMI flow. (D) CAG revealed no obstructive lesions in LAD with 1 month follow-up. CAG = coronary artery angiography, LAD = left anterior descending coronary artery, PPCI = primary percutaneous coronary intervention.

vital signs on presentation were a pulse of 71 beats per minute, blood pressure 103/54 mmHg, respiratory rate 18, SpO₂ 99% on room air, and temperature 35.5°C. Physical inspection is normal. Echocardiography showed the reduction movement from the anterior wall to the apex, a left ventricular ejection fraction of 69%, without valve abnormalities. Cardiac troponin was elevated [0.21 ng/L (upper limit of normal: 0.1 ng/L)]. During recurrent chest pain refractory to medical treatment, an immediate invasive strategy was recommended. He received aspirin 300 mg, ticagrelor 180 mg, and a bolus of 3000 units intravenous heparin and taken to the catheterization laboratory. Coronary angiography (CAG) revealed that there was a large filling defect in the mid left anterior descending coronary artery

(LAD) consistent with thrombus with TIMI grade I distal flow (Fig. 1 B). A bolus of unfractionated heparin (5000 IU) and glycoprotein IIb/IIIa antagonist (tirofiban) was administered and manual aspiration thrombectomy was performed using a ZEEK aspiration catheter (Zeon Medical Inc., Tokyo, Japan). Chest pain relieve and ST-segment resolution occurred after aspiration thrombectomy and CAG demonstrated no remaining significant obstructive lesions in the LAD and TIMI grade III flow was established (Fig. 1 C). OCT depicted discontinuity of intima, thin fibrous cap lipid-rich plaque and a small white thrombus attached to the arterial wall (Fig. 1 D). Which is the first time in the literature, we did not deploy a stent with NSTEMI caused by plaque rupture. OCT showed that the MLA was 4.24 mm² in the

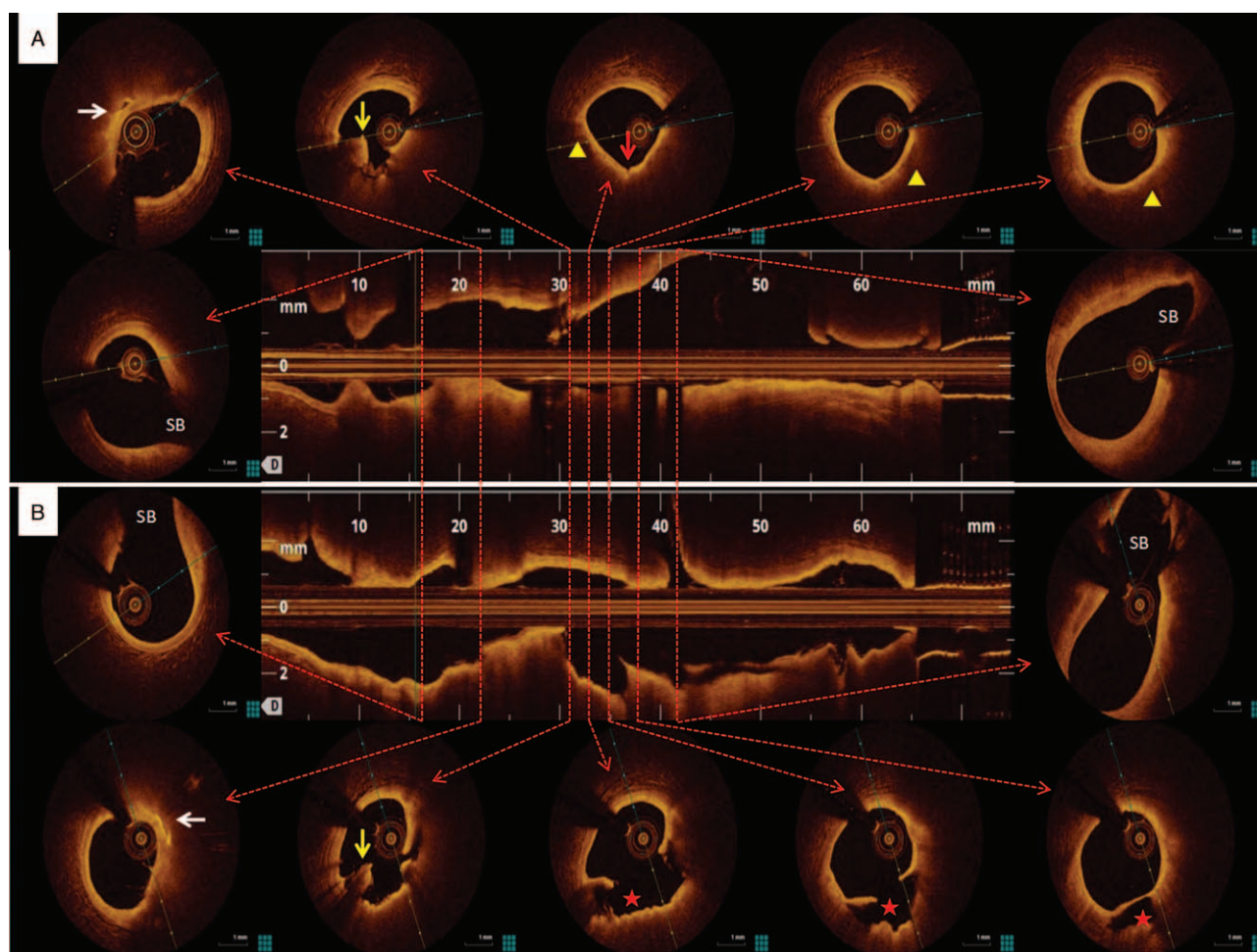


Figure 2. (A) OCT longitudinal view together with cross-sectional views of post procedure. (B) OCT longitudinal view and cross-sectional views with 1 month follow-up. SB: Side branch, white arrow: cholesterol crystal, yellow arrow: plaque rupture with mural thrombus, red arrow: discontinuity of intima, yellow triangle: large lipid burden with more than 180° arc, red star: a cavity formation inside the plaque. OCT = optical coherence tomography.

lesion. The patient was discharged with optimal medical therapy including aspirin, ticagrelor, metoprolol, and statin. CAG repeated 1 month after primary PCI revealed TIMI grade III blood flow in LAD and only minimal stenosis in the lesion (Fig. 2 A). OCT showed a cavity formation due to plaque rupture and MLA increase to 6.19 mm² after thrombus dissolution (Fig. 2 B). Follow-up was uneventful at 6 months.

3. Discussion

Primary angioplasty with immediate stenting is recommended in primary PCI,^[4] while in a thrombus-laden coronary lesion can lead to complications, such as distal embolization, no-reflow and acute stent thrombosis, stent undersizing, and malapposition. Limited research revealed that ST-segment elevation myocardial infarction patients caused by single vessel disease and intermediate stenosis treated without stent implantation have similar cardiac death rate, repeat revascularization rates, ischemia driven-readmission, and bleeding with stent implantation.^[5] Intravascular imaging makes us better understand the mechanism of acute coronary syndrome (ACS), thus enables us to rethink current treatment strategies in ACS.^[2] Plaque rupture, plaque erosion, and calcified nodule are the most frequently identified causal mechanisms in ACS. The EROSION trial preliminary

showed that conservative treatment with antithrombotic therapy in ACS patients caused by plaque erosion and without severe stenosis was feasible and safe.^[6] Moreover, Souteyrand et al^[7] reported that effective antithrombotic therapy without stenting in case of absence of vulnerable plaque rupture and <70% stenosis was reliable. Three criteria required to define vulnerable plaque rupture, appearance of a mobile plaque in continuity with the coronary wall; plaque prolapse into the lumen; maximal plaque length exceeding one-third of the arterial diameter. In our patient, OCT confirms plaque rupture with minor thrombus after aspiration thrombectomy. Morphological characteristic of the plaque rupture was beyond the criteria of vulnerable plaque rupture mentioned above. Thus more researches needed to identify in ACS patients caused by plaque rupture has characteristics of what could avoid stent implantation. After all, effective antithrombotic therapy, by promoting thrombus resolution and preventing further thrombus formation, will allow for healing of the ruptured plaque and abrogating the need for stenting in a selected population.

Author contributions

Data curation: Qing-Qing Hao.

Investigation: Feifei Zhang, Yi Dang, Qing-Qing Hao, Yue-Tao Xie, Shu-Ren Li, and Xiao-Yong Qi.

Methodology: Feifei Zhang, Yi Dang, and Xiao-Yong Qi.

Writing – original draft: Feifei Zhang.

Writing – review & editing: Xiao-Yong Qi.

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