Intra-Plaque Hematoma and Minor Intimal Disruption Detected by Optical Frequency Domain Imaging in a Case of Acute Coronary Syndrome

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SUMMARY

A 39-year-old man exhibiting unstable angina was admitted to our hospital, and urgent coronary angiography revealed stenosis of the proximal left anterior descending coronary artery (LAD). A drug eluting stent was implanted at this site, and the patient was discharged uneventfully on the 3rd hospital day. Optical frequency-domain imaging (OFDI) was successful in detecting an intra-plaque hematoma, minor intimal disruption, and thrombus at the culprit lesion in this patient. These observations suggest that this hematoma might be the result of subsequent blood filling into the ruptured plaque through this minor intimal disruption. (Int Heart J 2016; 57: 760-762)

Key words: Percutaneous coronary intervention

Optical coherence tomography (OCT) is considered a safe and feasible imaging strategy that provides a higher resolution compared with intravascular ultrasound (IVUS). OCT images also correlate better with conventional histological analysis than IVUS. OCT can provide a clear and detailed observation of plaque morphologies of the culprit lesion, including the type of plaque, the presence of any disruption, thrombus, and the detection of fibrous cap thickness, in culprit lesions of acute coronary syndrome (ACS). On the other hand, coronary intramural hematomas are known to be rare in the culprit lesions of ACS, and have mainly been reported by IVUS. In this report, we present the case of a 39-year-old male who presented with ACS accompanied by intra-plaque hematoma that was detected by OCT.

CASE REPORT

A 39-year-old man visited his family physician with the complaint of persistent chest pain at rest in the morning. His coronary risk factors were dyslipidemia and current smoking. During exercise testing with a bicycle ergometer in the clinic, he experienced chest pain with transient ST elevation in the precordial leads during electrocardiography. After sublingual administration of nitroglycerin, his symptom was alleviated and he was transferred to our hospital by ambulance. He was diagnosed as having unstable angina (Braunwald Classification III-B) and underwent urgent coronary angiography, which revealed 75% stenosis of the proximal left anterior descending coronary artery (LAD) (Figure 1). Optical frequency-domain imaging (OFDI) (Terumo Intravascular OFDI system, Terumo Corporation, Tokyo) also revealed a typical intra-plaque hematoma with a minor disruption and thrombus (Figure 2). A filter-based embolic protection device (Filtrap, Nipro, Tokyo) was placed at the distal part of the LAD to avoid distal embolization. One everolimus-eluting stent (Promus PREMIER 3.0 × 20 mm) was deployed directly into the proximal LAD. Since filter no-reflow phenomenon occurred after stenting, we quickly removed the filter device and coronary flow was immediately restored. The retrieved filter device contained a small amount of a red thrombus. Final OFDI following post-dilatation using a noncompliant balloon showed that the stent nicely apposed the vessel wall (Figure 3). In a subsequent laboratory assessment, the patient showed no significant increase of creatinine kinase and was discharged uneventfully on the 3rd hospital day.

DISCUSSION

This is the first report to show an image of intra-plaque hematoma and minor intimal disruption that was detected by OFDI in the culprit vessel of ACS. This hematoma was not a consequence of balloon injury because we did not perform predilatation at this site. In consideration of the fact that the size of this intimal disruption was very small compared with those detected in...
Figure 1. Angiography showing the lesion in the proximal left anterior descending coronary artery (white arrow).

Figure 2. Location of intracoronary OFDI imaging at the left anterior descending coronary artery lesion from distal to proximal site (A). These OFDI images show intra-plaque hematoma including the vasa vasorum within the intima and media (1), disruption of intima (2) and thrombus (3).

Figure 3. Final OFDI image showing the well-apposed stent struts.
we speculated that this hematoma might be the result of subsequent blood filling into the ruptured plaque throughout this minor intimal disruption. In general, images of ruptured plaques have shown greater degrees of intimal disruption and cavity formation compared with our case.\textsuperscript{4} Thus, it is possible that this lesion might be a hyper-acute phase of plaque rupture. On the other hand, previous reports showed that the patients with vasospastic angina commonly presented thrombus, and rarely presented fibrous cap disruption at the spasm site in their OCT study.\textsuperscript{5,6} Considering the transient ST elevation of electrocardiography before the coronary angiography in our case, it is possible that intimal disruption and intra-plaque hematoma might be triggered by vasospasm. In general, spontaneous coronary artery dissection (SCAD) is considered to be a cause of ACS accompanied by coronary hematoma and dissection.\textsuperscript{7,8} However, hemorrhage of SCAD occurs within the media and adventitia, which is different from the hematoma within intima and media in our case.

According to previous reports, there has been discussion as to whether intra-plaque hemorrhage, a known trigger of plaque progression and vulnerability,\textsuperscript{9} occurs as a consequence of rupture of vasa vasorum or minor intimal disruption. Although the vasa vasorum was also observed in detailed examination of OFDI images (Figure 2-1), it was likely that minor intimal disruption was the main cause of intra-plaque hemorrhage resulting in ACS presentation in our case. However, the pathophysiology of ACS attributed to intra-plaque hemorrhage remains unclear, and therefore further research is needed.

In our case, we did not perform pathological assessment of the red thrombus within the filter. Thus, it remains unclear whether the filter no-reflow phenomenon was due to the intra-plaque hematoma or thrombus on the surface of plaque. However, we speculated that the filter device was efficient in this case because the filter no-reflow phenomenon occurred just after stenting. Thus, it is possible that precise detection of the intra-plaque hematoma at the culprit lesion of ACS might be helpful for the appropriate selection of a percutaneous coronary intervention strategy.

**Conclusion:** OFDI was helpful in identifying an intra-plaque hematoma in cases of ACS that might be a consequence of plaque rupture with minor intimal disruption.

**Disclosure**

**Conflict of interest:** The authors have no conflicts of interest to declare.

**REFERENCES**