Delayed post-dilated stenting to treat an embolic myocardial infarction

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Thromboembolism infrequently occurs in coronary arteries. In contrast to an in situ thrombosis, a thrombus is not fresh and floating. There has been no recommended treatment strategy for this rare condition, especially for large thrombi in main arteries. Here, we report a modified stenting strategy to treat thromboembolism in the left main coronary artery.

An 82-year-old male with ongoing chest pain and dyspnea for two hours was transferred to our emergency department. He had a history of moderate hypertension, an irregular pulse of 88 beats/min and a blood pressure of 96/54 mmHg; bibasilar crackles were noted during the first medical contact. The electrocardiogram revealed atrial flutter and ST-segment elevation in leads I, aVL and V1-V6. Coronary angiography (CAG) was proposed for his probable diagnosis of ST-segment elevation myocardial infarction (STEMI).

A radial CAG was performed immediately after loading dual antiplatelet therapy (DAPT). The left anterior descending (LAD) and left circumflex (LCX) coronary arteries were cut off in their proximal segments with thrombolysis in myocardial infarction (TIMI) grade 0 flow (Figure 1A). A 6F aspiration catheter (Zeon Medical Inc., Tokyo, Japan) was employed for thrombectomy. When pieces of dark red thrombi were extracted from the LAD, the occluded portion appeared, and the flow was restored to TIMI 3. However, 80% stenosis was revealed in the mid LAD, and the distal D1 (first diagonal branch) was occluded (Figure 1B). In consideration of a residual embolus located in the mid-LAD, a 3.5 mm × 36 mm Firebird stent (Microport Co., China) was deployed at 6 atmospheres (nominal 9 atmospheres) to confine the thrombus to prevent floating. After deflation, a long arc of residual stenosis was distributed through the former site of narrowing, and the blood flow was TIMI 3 (Figure 1C). The distal D1 was recanalized by a guide wire. Aspiration from the LCX resulted in a favorable outcome (Figure 1D). There was no residual stenosis or dissection in the proximal LCX, and TIMI 3 flow was noted in the distal segment.

The patient’s troponin I was 25.91 ng/mL (normal < 0.05 ng/mL), and his 24-h ECG demonstrated permanent atrial flutter. DAPT and warfarin overlapped with enoxaparin were given. A 1.5 cm × 1.5 cm clot adhering to the left atrial appendage (LAA) was detected using enhanced CT scan (Figure 2A), and diffuse ventricular hypokinesis, moderate mitral regurgitation and reduced ejection were revealed using echocardiography. After ten days of medication, the patient was discharged with cardiac function improvement to NYHA II (New York Heart Association classification II).

After three months of anticoagulation treatment (without chest pain occurrence), a significant gap was noted between arterial wall and the stent, and a slight atherosclerotic plaque was revealed using intravascular ultrasound (IVUS) (Figure 2B). Post-dilatation (12 atmospheres) was performed to achieve improved stent apposition.

Coronary thromboembolism is a rare cause of acute myocardial infarction (AMI). Embolization of the two main branches of the left coronary artery was not documented. There was no consensus on therapeutic strategy for AMI caused by thromboembolism. Percutaneous interventions including catheter-guided embolus aspiration, percutaneous transluminal coronary angioplasty (PTCA) with or without stenting and the medical approach with thrombolytic agents are currently available modalities in this situation. Intra-coronary thrombolytic therapy yielded a favorable result in cases of incomplete occlusion.[1,2] In our case, the prompt restoration of LAD blood was the top priority. Accordingly, fibrinolysis was not considered as a potential treatment. Balloon inflation could crush the thrombus and result in distal embolization.[1] Aspiration was an effective treatment
Figure 1. The angiographic procedure of thrombectomy and stenting. (A): Proximal segments of the LAD and LCX were totally occluded (arrows); (B): 80% stenosis (arrows) was shown in the mid-LAD, and the distal D1 was occluded after cycles of aspiration; (C): a long arc of residual stenosis (arrows) was distributed in the mid-LAD after low-pressure inflated stent implantation. The distal D1 was re-canalized by a guidewire. (D): The LCX was patent after aspiration (black arrow). D1: first diagonal branch; LAD: left anterior descending; LCX: left circumflex.

Figure 2. Mural thrombus in CT and gap in IVUS. (A): A 1.5 cm × 1.5 cm clot (white arrow) adhered to the LAA wall in enhanced CT scan; and (B): a significant gap between the lumen wall and stents. A small atherosclerotic plaque (white arrow) was also displayed in the lumen wall. IVUS: intravascular ultrasound; LAA: left atrial appendage.
to restore blood flow immediately and reduce the clot burden. Additional procedures prevented the rest of the thrombus from migrating. IVUS was not employed. The determination of whether the stenosis was an in situ atherosclerotic plaque or a residual thrombus was difficult without IVUS. Multiple coronary embolizations and the appearance of the removed thrombus implied that the remaining stenosis in the mid-LAD was probably a thrombus. The residual thrombus could migrate or leak as micro-emboli from the cells of the fully expanded stent upon balloon deflation. A secondary embolism downstream could result in a fatal infarction. Therefore, we deployed a single stent under low pressure to confine the thrombus. After undergoing three months of anticoagulation, the gap in the IVUS may have resulted from the resolution of the confined thrombus. Delayed post-dilatation was performed to achieve improved stent apposition.

Residual thrombus after catheter aspiration in a proximal coronary artery is a risk factor for secondary embolism. A stent inflated to below nominal pressure confined the thrombus and avoided crushing it into pieces. Delayed post-dilatation was then performed after months of anticoagulation. Two-step stent implantation may be a suitable strategy to manage massive clot-burdened embolization to avoid secondary occlusion.

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