A Case of Left Main Coronary Stenting for Acute Myocardial Infarction Complicated by Ascending Aortic Dissection

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ABSTRACT
We report here on a case of ascending aortic dissection combined with anterior myocardial infarction that was caused by a retrograde dissection into the left main coronary trunk and proximal left anterior descending artery. We successfully treated this with stenting of the left main coronary artery and proximal left anterior descending artery, and this allowed for the definitive surgical correction. Stenting a collapsed left main coronary artery can be lifesaving procedure and serve as a bridge to surgery. (Korean Circulation J 2004;34(12):1210-1215)

KEY WORDS: Aortic disease; Dissection; Myocardial infarction; Coronary disease.

Introduction

Aortic dissection is caused by a circumferential tear or less frequently, it is caused by a transverse tear of the intima. It often occurs along the right lateral wall of the ascending aorta where the hydraulic shear stress is high. Acute aortic dissection presents with the sudden onset of pain, which is often described as being very severe with a tearing sensation, and diaphoresis associated with this condition. Aortic regurgitation, bowel ischemia, hematuria, myocardial ischemia, and various neurologic findings due to carotid artery obstruction (hemiplegia and hemianesthesia) or spinal cord ischemia (paraplegia) have all been observed as complications resulting from the dissection occluding the major arteries.1)

Of these maladies, acute myocardial infarction by coronary artery dissection is a rare, but fatal complication of aortic dissection because this usually involves the left main coronary artery and the proximal right coronary artery.2,3) In such a case, the only modality of treatment was operative correction of aortic dissection and coronary artery bypass graft surgery. However, great progress for the interventional skill of doctors has recently been displayed, and there has been the development of new stenting procedures and intravascular ultrasonography (IVUS). Accordingly, attempts are being made to treat left main coronary artery dissection by stent insertion and there are several reports showing successful results.4-7)

Yet, there has not been such report in Korea. We report here a successfully treated case of left main coronary artery dissection that was complicated by ascending aortic dissection.

Case

A 41-year-old male visited the emergency room of a local hospital with a two-hour long chest pain. The pain felt like an excruciating ripping sensation through the
Figure 1. The initial ECG showing the tall T wave on the precordial leads (A). The follow up ECG showing the improved tall T wave on the precordial leads (B). The follow up ECG showing the ST segment elevation on the I, aVL and precordial leads (C). ECG: electrocardiogram.

Figure 2. At the initial phase of contrast injection, the left anterior oblique caudal view (A) and anteroposterior caudal view (B) showed the heterogenous filling defect in the proximal left anterior descending artery. Later, however, the left anterior oblique caudal view (C) and anteroposterior caudal view (D) showed no filling defect in the proximal left anterior descending artery.
anterior chest radiating toward the back, and this was accompanied by cold sweating, nausea and vomiting. The blood pressure dropped to 90/60 mmHg with the patient displaying an altered mentality and shallow respiration. After endotracheal intubation, he was transferred to our hospital.

He was a 20-pack-year smoker without any specific comorbidity. His elder brother died suddenly at the age of 37. There were no specific findings on the physical examination. The results of laboratory tests, including cardiac enzyme testing, were within the normal range except for a mild leukocytosis. The initial electrocardiogram (ECG) showed a tall T wave at the V2-6 precordial lead. There was no elevated ST segment (Figure 1A). Antiplatelet agent and heparin were administered under the impression of acute myocardial infarction. After an hour, follow-up

![Figure 3](image)

**Figure 3.** After stenting the proximal left anterior descending artery, IVUS showed malposition of the stent (A). The large false lumen compromising the true lumen and dissection flap (arrow) in the left main coronary artery (B). After left main coronary artery stenting, IVUS showed a residual false lumen (arrow) at the left main coronary artery (C). IVUS showed the membranous structure (arrow) in the ascending aorta near to the left main coronary artery (D). IVUS: intravascular ultrasonography.

![Figure 4](image)

**Figure 4.** After stenting the proximal left anterior descending artery, the coronary angiogram shows the compromised left main and left circumflex artery flows (arrow) (A). After left main coronary artery stenting, the coronary angiogram shows the recovered blood flow (B).
ECG showed a resolution of the tall T wave (Figure 1B), but the chest pain persisted. To differentiate acute myocardial infarction from other possible causes such as aortic dissection, echocardiography and computed tomography (CT) were planned. At that time, he again complained severe chest pain and the follow-up ECG showed ST segment elevation at the I, aVL and precordial leads (Figure 1C). The echocardiography showed hypokinesis of the interventricular and the anterior wall of the left ventricle. On the follow up laboratory study, the level of the cardiac enzymes was elevated (CKMB: 224 ng/mL). So we diagnosed the patient as having ST-elevation myocardial infarction because of the typical changes on the ECG and echocardiography. CT was skipped and the patient was moved to the cardiac catheterization room for primary coronary intervention.

Right coronary angiography (CAG) showed no abnormality except for a mild luminal narrowing at the ostium of the right coronary artery. Left CAG showed an inhomogenous filling defect, which was probably due to external compression (Figure 2A, B). The arterial lumen appeared to be expanded slightly during contrast injection (Figure 2C, D). During CAG, the coronary artery lumen was compromised again and ventricular fibrillations requiring DC cardioversion occurred several times.

Balloon angioplasty (Scimed, 3.5 × 20 mm) was done at 6 atmospheres for 30 seconds on the proximal left anterior descending artery. After this, a stent was inserted (3.5 × 9 mm, 10 atmospheres for 20 seconds). Following this, IVUS was performed to find out the exact pathophysiology. Apposition of stent was poor in the proximal left anterior descending artery (Figure 3A). A large false lumen and dissection flap compressing the true lumen were noted in the left main coronary artery (Figure 3B). With retraction of the guiding catheter to the aorta, we found that the left main coronary artery was compressed. The blood flow was impaired not only in the left anterior descending artery, but also in the left circumflex artery (Figure 4A). The blood flow was restored by an immediate stenting in the left main coronary artery (4.0 × 13 mm, 12 atmospheres for 20 seconds, Figure 4B). On the followup IVUS, the true lumen was patent, but the false lumen still remained (Figure 3C). Membranous structure that seemed to be a dissection flap was seen at the ascending aorta just outside the left main coronary artery (Figure 3D). This lesion extended to the left main coronary artery (Figure 5). The computed tomography imaging showing dissection of the ascending aorta and descending aorta. The left main and proximal left anterior descending artery show good patency after stenting.

Figure 5. The computed tomography imaging showing dissection of the ascending aorta and descending aorta. The left main and proximal left anterior descending artery show good patency after stenting.

Figure 6. Follow up coronary angiogram shows no significant stenosis in the left anterior oblique caudal view (A) and anteroposterior caudal view (B). Follow up IVUS shows the intact stent and the residual false lumen (arrow) (C). IVUS: intravascular ultrasonography.
Coronary artery and the proximal left anterior descending artery. Emergency chest CT showed the ascending aortic dissection (Figure 5). Upon operating, a large hematoma in the false lumen was found to be compressing the ascending aorta and coronary artery. Glue aortoplasty and aortic valve resuspension were then performed in a timely fashion. Five days after the operation, the patient was weaned from the mechanical ventilator and he was discharged without any specific complication. Restenosis was not present in the inserted stent on the follow-up CAG performed at the 19th month after the operation (Figure 6A, B). No intimal proliferation was noted in the IVUS, but the false lumen in the left main coronary artery and left anterior descending artery persistently remained (Figure 6C). The echocardiography showed marked improvement for the left ventricular wall motion and systolic function.

**Discussion**

Acute myocardial infarction occurs in 1−2% of patients with dissection of the ascending aorta, and this happens because of compression of the coronary ostia by hematoma or occlusion by an intimal flap. The dissection more often affects the right coronary artery than the left, and this explains why these myocardial infarctions tend to be inferior in location. In case of patients presenting with acute chest pain and showing ST segment elevation on the electrocardiogram, treatment is often done by primary coronary intervention or thrombolytic therapy due to the clinical impression that the patient is only suffering from acute myocardial infarction. In case of aortic dissection, however, thrombolytic therapy is contraindicated. Our patient was a case of myocardial infarction resulting from external compression caused by an intimal hematoma stemming from aortic dissection. In addition, Ikari et al., Ohara et al., and Cardozo et al. have also reported on treating cases of acute myocardial infarction associated with aortic dissection by stenting the left main coronary artery and/or the other coronary arteries as well.

In this case, too, by promptly maintaining adequate myocardial blood flow, extensive myocardial damage was avoided. Accordingly, this treatment was believed to have reduced the pre- and post operative complications. Additionally, early stenting was considered to improve the patient’s critical state and to have played a role as a bridge to definitive surgical management. This stenting procedure was also believed to have contributed to reducing the patient’s risk of mortality.

In summary, left main coronary artery dissection combined with aortic dissection is a rare but fatal complication of aortic dissection; this condition has a high mortality rate and it usually requires emergency surgical manage-
ment. We report here on a case of a left main coronary artery dissection complicated by ascending aortic dissection that was treated successfully with left main coronary artery stenting.

REFERENCES