Stent Graft Used to Rescue Coronary Rupture during Percutaneous Coronary Intervention for Myocardial Bridge

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Abstract

Myocardial bridge (MB) is a congenital variation of the coronary arteries and the segment of the coronary artery through myocardium is compressed during systole. Although it is relatively asymptomatic, percutaneous coronary intervention (PCI) may be necessary to relieve symptoms. Perforation or frank rupture of coronary arteries occurs rarely in patients undergoing percutaneous coronary intervention. We report the coronary rupture in a case with myocardial bridge which occurred during percutaneous coronary intervention. We deployed a stent graft to successfully rescue the rupture of the distal segment of left anterior descending coronary artery (LAD-D) with myocardial bridge (MB).

Key words: coronary rupture, myocardial bridge, percutaneous coronary intervention, stent graft

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Introduction

Myocardial bridge (MB) is an abnormality of the coronary arteries which follow a focal or segmental intramyocardial course. This phenomenon was characterized by the decrease in the coronary blood flow during systole due to the compression of the epicardial coronary artery by the surrounding myocardial fibrils (1, 2). Although usually asymptomatic, medical therapy, percutaneous coronary intervention (PCI), and rarely surgery may be necessary to relieve symptoms (5, 6). Perforation or frank rupture of coronary arteries occurs rarely (0.2 to 0.6%) in patients undergoing percutaneous coronary intervention (PCI), and rarely surgery may be necessary to relieve symptoms (5, 6). Perforation or frank rupture of coronary arteries occurs rarely (0.2 to 0.6%) in patients undergoing percutaneous coronary intervention (7-10), including cases with MB (12). We demonstrate that rupture of LAD can occur during PCI in a patient with MB. We deployed a stent graft to rescue it successfully.

Case Report

A 75-year-old woman patient, non-smoker, non-diabetes had typical chest pain and received beta-blockers and calcium-channel antagonists to relieve angina. Her blood pressure was 130/80 mmHg, Pulse rate 65/min. Previous resting ECG was within normal limits (Fig. 1A), the treadmill exercise test (exercise time was 6 min 35 sec, peak blood pressure 150/90 mmHg, and maximum pulse rate 137) showed positive findings for ischemia with ST-segment horizontal depression in precordial leads V4, V5 and V6 (Fig. 1B). The coronary angiography revealed MB causing 70% stenosis in the distal segment of the left anterior descending coronary artery (LAD) (Figs. 2A, 2B). We performed PCI with direct stent (3.0/20 mm), inflation time 15 sec, maximum 12 bar. Unfortunately, coronary angiography showed Class III-perforation with contrast streaming or cavity spilling as evidence of rupture of the LAD (Fig. 3A). Due to ongoing chest pain and ST elevation in EKG monitor, we performed PCI with PTFE-covered stent graft to rescue the rupture of the LAD-D with MB (Fig. 3A). Following the rescue with stent graft her chest pain subsided and ST elevation reversed on EKG. Her admission course was smooth. She had no cardiac events and her treadmill exercise test was negative during 6 months of out-patient follow-up.

Discussion

In anatomical studies, the prevalence of myocardial bridge is reported to vary between 5.4% and 85.7%, but in angiographic studies, the prevalence is 0.5% to 4.5% (1, 2). The
condition is generally found at the middle and distal LAD (1, 2). Myocardial bridging is usually asymptomatic, but it has been linked in rare cases to more severe complications including acute myocardial infarction, life-threatening arrhythmias, and sudden death (3, 4). In the patients with symptomatic myocardial bridge who have evidence of ischemia on stress tests and are resistant to medical therapy, PCI or surgical treatment should be performed (5, 6). It is not determined whether PCI or surgical treatment should be performed. PCI or surgical treatment may be reliable therapeutic options. Stenting with a IVUS guide is an alternative mode of therapy in some cases. Some studies have reported concentric intimal thickening underneath the bridges, and increased atherosclerotic plaques proximal to the bridging with the use of IVUS (11). In some studies, MB patients can be treated by PCI and the safer approach is direct stenting without balloon predilatation. The risks of coronary dissection and rupture are higher during balloon dilatation in patients who have atherosclerotic plaques together with a myocardial bridge. Dynamic compression of the artery and the stretching effect at the border of the bridge may lead to coronary dissection and rupture (1% (12, 13). In the present case, the rupture occurred at the middle portion of MB, not at the border of MB during direct stenting. The mechanism of the rupture, not dissection, may be due to dynamic compression and stretching effect at weak point of the artery during direct stenting. The PCI with polytetrafluoroethylene-covered (PTFE-covered ) stent graft is the most effective approach to urgent management of coronary perforation (14).

Figure 1. Treadmill exercise test. A: Rest electrocardiography (ECG). B: Terminal exercise ECG Leads V4, V5, V6 ST segment depression.
Figure 2. Coronary angiography showed the myocardial bridge in the distal-LAD. A: Systolic compression of the epicardial artery. B: Normalization during diastole. LAD: left anterior descending artery

Figure 3. A: Coronary angiography showing Class III- perforation, (perforation ≥1 mm in diameter with contrast streaming or cavity spilling) after direct stenting. B: The rupture of the LAD disappears after deploying a PTFE-covered stent graft.

Conclusion

If angina pectoris persists in patients with myocardial bridge despite medical treatment, and the stress tests prove myocardial ischemia, intervention should be performed. Despite reports of successful PCI in the treatment of MB, complications like perforation have been reported. The emergency PTFE-covered stent graft implantation may be the most effective means to rescue coronary perforation or rupture, though sometimes an emergency operation is necessary.

References
