Myocardial bridge: Is the risk of perforation increased?

Weimin Li MD, Yue Li MD, Li Sheng MB, Yongtai Gong MD

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It has been demonstrated that stent implantation in a myocardial bridge is associated with a high restenosis rate; however, coronary perforation caused by stent implantation has been reported. The present report describes two myocardial bridge cases with severe coronary rupture soon after stent implantation. Previous studies have reported that the diameter of the bridge vessels was less than that of the proximal and distal vessels; thus, coronary perforation may be due to stent oversizing. To determine the risks and benefits associated with this therapeutic option, interventional therapy should be critically evaluated, and careful selection of balloon and drug-eluting stent size using intravascular ultrasound is recommended.

Key Words: Coronary perforation; Myocardial bridge; Stent implantation

Although percutaneous coronary intervention has been advocated for the successful treatment of myocardial bridge (MB), cases of patients with coronary artery rupture are occasionally reported. In the present report, two cases of stent implantation for the treatment of an MB followed by coronary perforation are described. The appropriate measures necessary to address this problem are also discussed.

CASE PRESENTATIONS

Case 1

A 44-year-old man with a 25-year history of hypertension and a 30-year history of smoking was admitted because of intermittent chest pain that had persisted for six months. Both the patient's general physical examination (blood pressure, 110/70 mmHg; pulse rate, 66 beats/min) and routine laboratory examination were normal. The electrocardiogram showed pronounced ST segment depression and inverted T waves in the anterior leads. The subsequent coronary angiography showed the typical 'milking effect' of an MB in the left anterior descending coronary artery (LAD). The degree of systolic narrowing was greater than 90% (Figure 1A), while the degree of end-diastolic compression was approximately 40% (Figure 1B). The other two coronary arteries were normal. Thrombolysis In Myocardial Infarction (TIMI) grade 3 blood flow was found. A 3.0 mm × 28 mm Cypher Select stent (Cordis Corporation, USA) was directly implanted and deployed at 12 atm. Following treatment, a perforation at the site of the MB was immediately found in the middle of the LAD (Figure 1C). A stent balloon was promptly dilated using low pressure at the site of the perforation. After 10 min, no contrast medium effusion was observed at the perforation site. During the one-month follow-up period, there were no complaints of discomfort and the second coronary angiography was normal.

Case 2

A 54-year-old woman with a five-year history of hypertension had suffered chest pain for one year. One month before presentation to the

Le pont myocardique : Le risque de perforation est-il plus élevé?

Il est démontré que l'implantation d'une endoprothèse dans un pont myocardique s'associe à un fort taux de nouvelle sténose, mais on l'a également associée à des cas de perforation coronaire. Le présent rapport décrit deux cas de pont myocardique où une grave rupture coronaire a suivi l'implantation de l'endoprothèse. Des études antérieures ont révélé que le diamètre des vaisseaux du pont était inférieur à celui des vaisseaux proximal et distal. Ainsi, la perforation serait peut-être causée par un surdimensionnement de l'endoprothèse. Pour déterminer les risques et les avantages de cette possibilité thérapeutique, il est recommandé d'évaluer attentivement la thérapie interventionnelle et de choisir soigneusement la dimension du ballonnet et de l'endoprothèse à élution de médicament par échographie intravasculaire.

hospital, the pain became severe. There were no abnormal findings after a physical examination and her laboratory test results were also normal. The electrocardiogram showed inverted T waves in leads V1 to V4. Coronary angiography revealed that the LAD had a striking muscle bridging of approximately 20 mm in length in its middle one-third, with near luminal obliteration during systole and 50% stenosis in end-diastole (Figures 2A and 2B). TIMI grade 3 blood flow was found in all three coronary arteries. Initially, a 2.5 mm × 20 mm Medtronic Sprinter balloon (Medtronic Inc, USA) was predilated at the site of the MB (12 atm) and then a single 3.0 mm × 23 mm Cypher Select stent was implanted at 14 atm dilation. A coronary rupture was immediately found at the site of the MB (Figure 2C). Meanwhile, a cardiac shock occurred with a progressive fall in systolic blood pressure from 130 mmHg to 50 mmHg. The stent balloon was deployed with low inflation pressure to seal the perforation and pericardiocentesis was performed immediately; however, the syndrome did not improve. Emergency coronary artery bypass graft surgery was performed, resulting in the patient being successfully rescued. There were no major adverse cardiac events during the following six months of investigation.

DISCUSSION

MB, a congenital anomaly of the coronary arteries, is defined as a segment of a major epicardial coronary artery (the 'tunnelled artery') that runs intramurally through the myocardium beneath the muscle bridge. MB is generally confined to the LAD and its main characteristic is systolic compression of the involved epicardial coronary artery. Prendergast et al (1) reported that the prevalence of MB at autopsy varies from 15% to 85% and from 0.5% to 2.5% on angiography. MB is usually considered to be a benign and asymptomatic condition in a majority of patients, but has been implicated in causing myocardial ischemia, myocardial infarction and some other complications. Quantitative angiographic and intravascular ultrasound (IVUS) studies in patients with MB have demonstrated that the vessel compression is not limited to systole, causing the angiographic 'milking effect',

Cardiovascular Department, First Clinical Hospital, Harbin Medical University, Harbin, Heilongjiang, China

Correspondence: Dr Yue Li, Cardiovascular Department, First Clinical Hospital, Harbin Medical University, 23 Youzheng Street, Harbin 150001,

Heilongjiang, China. Telephone 86-451-86836633, fax 86-451-53675733, e-mail ly99ly@vip.163.com

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Figure 1 Coronary angiography showing the typical 'milking effect' of a myocardial bridge in the left anterior descending coronary artery. The degree of systolic narrowing was greater than 90% (A), while the degree of end-diastolic compression was approximately 40% (B). Soon after stent implantation myocardial bridge treatment, a perforation at the site of the myocardial bridge was found in the middle of the left anterior descending coronary artery (C)

Figure 2 Coronary angiography revealing that the left anterior descending coronary artery had a striking muscle bridging of approximately 20 mm in length in its middle one-third, with near luminal obliteration during systole and 50% stenosis in end-diastole (A,B). Soon after stent implantation for myocardial bridge treatment, a coronary rupture was found at the site of the myocardial bridge (C)

but also persists into diastole, thereby affecting the predominant phase of coronary perfusion (2), leading to a reduced coronary flow reserve, and possibly accounting for the ischemic syndrome (3).

In symptomatic patients, three types of therapy have been explored. The first type, medical therapy, includes an optimal dose of negative inotropic and/or negative chronotropic agents (ie, beta-blockers and calcium channel antagonists). The objective of this approach is to relieve symptoms and/or protect against the risk of future coronary events. The second type, percutaneous coronary interventional therapy, includes coronary stenting in MB. The third type, surgical operation, includes myotomy and coronary artery bypass graft surgery. Medical treatment is recommended as the first-line strategy. For patients who are refractory to the medication, both surgical myotomy and stenting are considered. Although there have been reports of risks associated with this approach, including coronary injury, mural aneurysm and scar formation, surgery is regarded as the most suitable treatment for all patients, particularly for patients with an MB length of less than 2.5 cm and an MB width of less than 0.5 cm, and where systolic compression has been completely released during diastole.

It has been demonstrated that stent implantation in an MB is associated with a high restenosis rate; however, there have been a few reports of coronary perforation caused by stent implantation. The two patients described in the present report were observed to have severe coronary rupture soon after stent implantation for the treatment of MB.

Mohlenkamp et al (4) demonstrated that when using IVUS, the diameter of the bridge vessels was less than that of the proximal and distal vessels; thus, coronary perforation occurred due to stent oversizing. In addition, the coronary perforation may be related to a narrowing of the coronary artery induced by long-term compression of the MB.

To determine the risks and benefits associated with this therapeutic option, interventional therapy should be critically evaluated, and careful selection of balloon and drug-eluting stent size using IVUS is recommended.

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