Global ST-Segment Elevation Associated With Impending Cardiac Rupture During Diagnostic Cardiac Catheterization

Tadayuki Kadohira,1 MD, Yoshio Kobayashi,1 MD, Yuriko Niitsuma,2 MD, Mizuho Imamaki,2 MD, and Issei Komuro,1 MD

SUMMARY

Cardiac rupture is a life-threatening complication during diagnostic cardiac catheterization, however, it rarely occurs nowadays. The present case report describes cardiac rupture during diagnostic cardiac catheterization using a 4F pigtail catheter and a 0.035” flexible guidewire, and global ST-segment elevation associated with impending cardiac rupture. (Int Heart J 2009; 50: 539-542)

Key words: Rupture, Catheterization, Complication

Diagnostic cardiac catheterization is performed routinely to diagnose and assess cardiovascular diseases. Improvement in contrast and catheter technologies has made major complications infrequent1-7. Cardiac rupture is one of the major complications of diagnostic cardiac catheterization, although it rarely occurs nowadays.1-3 However, it is a life-threatening event when it happens. Thus it would be very useful to identify a sign of impending cardiac rupture. The present case report describes cardiac rupture during diagnostic cardiac catheterization and global ST-segment elevation associated with impending cardiac rupture.

CASE REPORT

An 80-year-old man with previous stent placement in the mid-left anterior descending coronary artery due to non-Q-wave myocardial infarction (peak creatine kinase 544 IU/L) was admitted for follow-up coronary angiography, which did not demonstrate in-stent restenosis. A 0.035” J-type Radifocus guidewire (Terumo, Tokyo) and a 4F pigtail catheter (TORAY, Tokyo) were advanced in
the ascending aorta to perform left ventriculography. The guidewire incidentally crossed the aortic valve. The operator introduced the pigtail catheter over the guidewire without any difficulty. However, immediately after the pigtail catheter entered the left ventricle, the patient complained of chest pain and an electrocardiogram (ECG) showed global ST-segment elevation (Figure 1). Nitroglycerin was administered sublingually but the ST-segment elevation did not return to the baseline. The guidewire and pigtail catheter were withdrawn. Coronary angiography was then performed and showed no significant stenosis. Transthoracic echocardiography was performed and demonstrated no pericardial effusion. The chest pain gradually subsided and the ST-segment elevation diminished slightly.

Figure 1. Global ST-segment elevation associated with impending cardiac rupture.

Figure 2. Left ventriculography at end-diastole (A) and end-systole (B). Note there was no pericardial staining.
The guidewire and pigtail catheter were introduced into the left ventricle. There were no additional symptoms or ECG changes. Left ventriculography was performed and demonstrated no pericardial staining (Figure 2). He was then transferred to a room in the Cardiovascular Unit. Ten minutes later (about one hour after the event) he experienced diaphoresis and his blood pressure measured 70 mm Hg. Transthoracic echocardiography was performed and demonstrated pericardial effusion. Pericardiocentesis was performed. A total of 200 mL of blood was withdrawn. Blood pressure increased. However, it went down several minutes later. He was transferred to an operating room and surgical correction of the rupture was performed. There was a tear at the anterolateral wall of the left ventricle that was the infarct zone of a previous non-Q-wave myocardial infarction. It was sutured directly. The patient recovered without any cardiac sequelae, although he had acute cholecystitis during hospitalization.

**Discussion**

Extensive analyses of complications of diagnostic cardiac catheterization were performed in the 1980s and early 1990s, showing a relatively stable mortality rate between 0.1% and 0.2% and an overall complication rate between 0.8% and 1.8%. Improvement in catheter technologies has made major complications infrequent. Cardiac rupture is one of the major complications of cardiac catheterization. Nowadays, because flexible guidewires and soft, thin guiding catheters are used, cardiac rupture during diagnostic cardiac catheterization rarely occurs, although it may be observed during cardiac interventions, electrophysiologic study, and myocardial biopsy. Tsang, et al reported 4 cardiac ruptures (0.006%) in 63,128 patients undergoing diagnostic cardiac catheterization between 1979 and 1997. Other studies showed an incidence of cardiac rupture during diagnostic cardiac catheterization between 0% and 0.013%. Until then, in our hospital, there has been no case complicated by cardiac rupture during diagnostic cardiac catheterization, since we started using 4F guiding catheters in 1998.

Cardiac rupture is a life-threatening complication. Thus, it is important to notice a sign of impending cardiac rupture. In the present case, global ST-segment elevation seemed to be a sign of impending cardiac rupture. New ST-segment elevation is one of the ECG changes to suspect cardiac rupture complicating acute myocardial infarction. Cardiologists must be aware that global ST-segment elevation during cardiac catheterization is a sign of impending cardiac rupture even in a patient without acute myocardial infarction. In the present case, transthoracic echocardiography immediately after the development of ST-segment elevation showed no pericardial effusion. One possible explanation
may be subepicardial hematoma, which is known as a cause of ST-segment elevation. However, no subepicardial hematoma was observed when surgical correction was performed. In the present case, it might be possible that a 0.035” flexible guidewire created a tiny cardiac rupture, which was sealed temporarily with cardiac muscle. However, a small amount of bleeding into pericardial space that could not be detected with transthoracic echocardiography might occur and cause global ST-segment elevation. The tear was located at the anterolateral wall of the left ventricle that was the infarct zone of a non-Q-wave myocardial infarction 7 months previously. The surgeon felt weakness of cardiac muscle when sutures were placed. It is conceivable that the non-Q-wave myocardial infarction made the infarct zone vulnerable, and this was involved in the cardiac rupture.

Even using a 4F pigtail catheter and a 0.035” flexible guidewire, there is a risk of cardiac rupture during diagnostic cardiac catheterization. Operators must know that global ST-segment elevation during cardiac catheterization is a sign of impending cardiac rupture, even in a patient without acute myocardial infarction, and follow the patient carefully.

References

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