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Distinctive electrocardiographic changes associated with acute aortic regurgitation induced by a guiding catheter

Case report

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ABSTRACT

Effective guiding catheters for back-up support play a crucial role in percutaneous coronary intervention (PCI) of calcified and tortuous coronary lesions. However, these catheters sometimes cause serious complications. We report here a case of acute aortic regurgitation induced by an extra back-up guiding catheter in a patient undergoing PCI of the right coronary artery. The patient suffered hemodynamic collapse accompanied by distinctive electrocardiographic changes including diffuse ST-segment depression with ST-segment elevation in lead aVR.

Keywords: aortic regurgitation; percutaneous coronary intervention; electrocardiogram
INTRODUCTION

Calcified and tortuous coronary lesions remain a technical challenge for interventional cardiologists, and usually involve the use of guiding catheters with good support that might lead to well recognized complications such as acute aortic regurgitation [1,2]. However, there are no reports on the associated electrocardiographic (ECG) presentation of the latter complication. We here describe a case of acute aortic regurgitation induced during PCI by an extra back-up (EBU) guiding catheter that manifested as hemodynamic collapse with distinctive ECG changes including diffuse ST-segment depression with ST-segment elevation in lead aVR.

CASE PRESENTATION

A 76-year-old woman with a history of hypertension and type 2 diabetes mellitus suffered from chest pain on exertion for 1 month. Echocardiography revealed no signs of valvular disease. Coronary angiography revealed that the right coronary artery (RCA) was calcified and tortuous with severe diffuse stenosis in the middle portion (Fig. 1). Calcification was also noted in the proximal left anterior descending artery and left circumflex artery. There was approximately 50% stenosis in the middle portion of the left anterior descending artery. Severe diffuse stenosis was present in the middle and distal portions of the left circumflex artery. PCI of the RCA was determined to be the most appropriate therapeutic strategy. Arterial access was obtained from the right radial artery. Because of the complex RCA disease, a 6-Fr EBU guiding catheter (Medtronic, Santa Rosa, CA) was used to engage the RCA for good back-up support. A 0.014-in BMW guidewire (Abbott) was advanced into the distal RCA, followed by balloon predilatation, and implantation of a 2.5×33-mm Firebird stent (Microport, China), a 2.5×18-mm Cypher stent (Cordis), and a 2.75×33-mm...
Cypher stent (Cordis) positioned from distal to proximal along the RCA lesion. A 2.5- × 15-mm noncompliant Quantum Maverick balloon (Boston Scientific) was then advanced to the Firebird stent in the distal part of the RCA lesion for postdilatation. However, this procedure required pushing the EBU guiding catheter with great force and difficulty.

**Figure 2.** Electrocardiogram of the patient. A: Electrocardiogram before percutaneous coronary intervention. B: ST-segment depression in leads I, II, aVL, aVF, and V2–V6, with ST-segment elevation in lead aVR during aortic regurgitation.

At this point, the patient’s blood pressure dropped from 124/72 to 82/36 mmHg, with a sudden increase in heart rate from 88 to 97 beats/min. ST-segment depression was apparent on the ECG monitor. A full ECG was immediately performed and showed ST-segment depression in leads I, II, aVL, aVF, and V2–V6, with ST-segment elevation in lead aVR, which usually indicate acute left main coronary artery occlusion (Fig. 2). With the guiding catheter still in place, an injection of contrast material revealed that the stents were in their proper positions with no evidence of perforation, thrombus, dissection, or abrupt closure. The contrast agent was noted to leak from the aortic root into the left ventricle, indicating severe aortic regurgitation (Fig. 3). The patient’s vital signs and ECG rapidly regained normality upon withdrawal of the EBU guiding catheter. Cautious maneuvering allowed successful PCI completion. At follow-up, the patient’s symptoms improved significantly.
Figure 3. Contrast agent was noted to leak from the aortic root into the left ventricle, implying severe aortic regurgitation (left anterior oblique projection).

DISCUSSION

A sudden drop in blood pressure accompanied by ST-segment changes on ECG during a PCI procedure, first calls attention to coronary perforation, thrombus, dissection, or abrupt closure. We here report a case of acute aortic regurgitation induced by an EBU guiding catheter that caused hemodynamic collapse and extensive ST-segment depression and ST-segment elevation in lead aVR, mimicking acute left main coronary artery occlusion. Cases of Amplatz left guide catheter-induced acute aortic insufficiency with hemodynamic collapse during percutaneous transluminal coronary angioplasty have been previously reported [1,2], but the distinctive changes in ECG have not been published.

Hoffman et al. [3] suggested that increased left ventricular diastolic pressure would result in underperfusion of the inner layer of the myocardium. Ino-Oka et al. [4] reported that coronary flow reduction with a higher left ventricular end-diastolic pressure (LVEDP) induced subendocardial ischemia, whereas flow reduction of the same degree with a normal LVEDP induced transmural ischemia. In this case, the rapidly increased preload induced by acute aortic regurgitation boosted the left ventricular diastolic pressure and suddenly enlarged the left ventricle, which might result in diffuse ischemia of the subendocardium. We previously reported similar ECG changes in three patients with acute dysfunction of aortic valve prostheses [5]. The present case confirms that acute and severe aortic regurgitation results in the distinctive ECG presentation.

CONCLUSION

We herein described the distinctive changes in ECG in a patient with hemodynamic collapse due to acute aortic regurgitation...
induced by a guiding catheter. Coronary interventional cardiologists should be aware of the ECG signs associated with this complication.

REFERENCES


