

## Right Ventricular Myocardial Infarction due to Right Coronary Artery Total Occlusion Originating From the Distal Left Circumflex Artery

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An isolated single coronary artery is rare but often associated with other congenital cardiac malformations and myocardial ischemia. We report a rare case of right ventricular myocardial infarction due to total occlusion of the right coronary artery originating from the distal left circumflex artery. (**Korean Circ J 2012;42:565-567**)

**KEY WORDS:** Myocardial infarction; Coronary vessel anomalies.

### Introduction

Congenital coronary artery anomalies are usually detected as incidental findings during conventional coronary angiography (CAG). These anomalies are found in 0.6-1.3% of the population who undergo CAG.<sup>1)</sup> An isolated single coronary artery (SCA) with the right coronary artery (RCA) originating from the left circumflex coronary artery (LCX) is a rare variant among coronary artery anomalies.<sup>2)</sup> Also, it is extremely rare that this anomaly is associated with right ventricular myocardial infarction.

### Case

A 39-year-old male smoker with hyperlipidemia suffered from sudden chest pain and dyspnea -1 hour earlier. He had no specific medical or family history of coronary artery disease. On physical examination, the blood pressure was 85/60 mm Hg, and his pulse rate

was 46/min with Kussmaul's sign. An initial electrocardiogram showed definite ST-segment elevation in the inferior leads (II, III, aVF) with reciprocal changes (Fig. 1A), as well as ST-segment elevation in the reverse precordial leads (V3R, V4R, V5R, V6R) (Fig. 1B). Transthoracic echocardiography demonstrated akinesia of the right ventricular free wall, inferior wall, and posterior-lateral wall from the left ventricle base to the apex. Also, echocardiography showed 43.6% of the left ventricular ejection fraction. The initial cardiac enzyme test was elevated (creatinine kinase-MB 6.7 ng/mL). Emergency CAG was performed with the assumption of right ventricular myocardial infarction related to the proximal RCA. The CAG showed total occlusion of the distal LCX (Fig. 2) and absence of the RCA ostium, despite repeated attempts at RCA catheterization and ascending aortography. Therefore, we concluded that the coronary artery related with the right ventricular infarction was the RCA originating from the distal LCX. Immediately after thrombus aspiration with a thrombus aspiration catheter (Thrombuster II®, Kaneka, Osaka, Japan) at the distal LCX, percutaneous coronary intervention (PCI) was followed by balloon angioplasty (Ikazuchi® 3.0×15 mm, Kaneka, Osaka, Japan) and stent insertion (Biomatrix® 4.0×18 mm, Biosensors, Morges, Switzerland) at the distal LCX. After stent insertion, CAG showed no residual stenosis and good distal flow at the distal LCX. Also, CAG showed that the distal LCX extended to the course of the RCA (Fig. 3). Before discharge, contrast enhanced 320-slice multi-detector cardiac computed tomography showed that the RCA ostium was absent (Fig. 4A), and the distal LCX was extended to the RCA territory while supplying the right ventricle and patent distal LCX stent (Fig. 4B). After PCI, the patient had no chest pain and was discharged without any significant complications.

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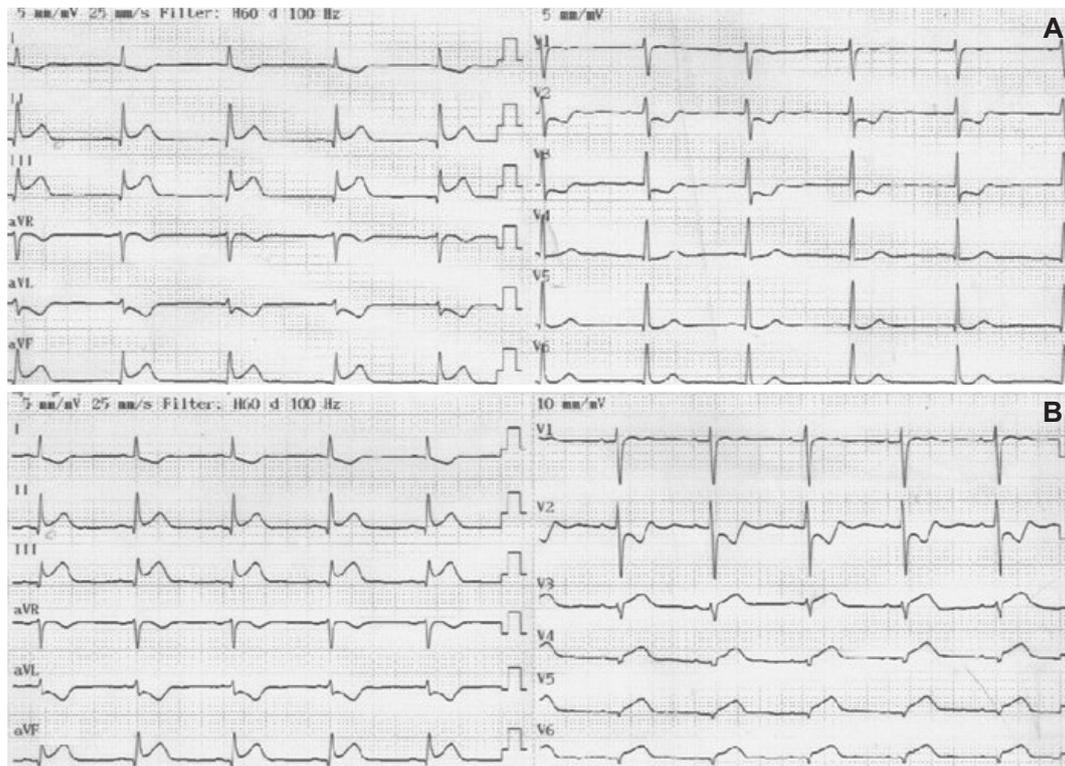
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## Discussion

The definition of SCA is that the blood flow of all coronary arteries

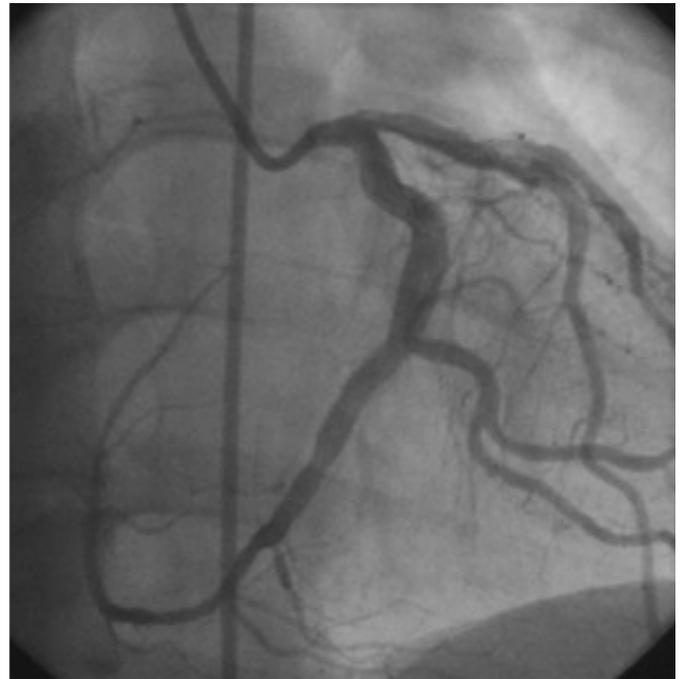
is provided by a single aortic ostium.<sup>3)</sup> Coronary artery anomalies are rare and SCA is present in 0.04–0.4% of the population who undergo CAG.<sup>4)</sup> This anomaly can be associated with a congenital



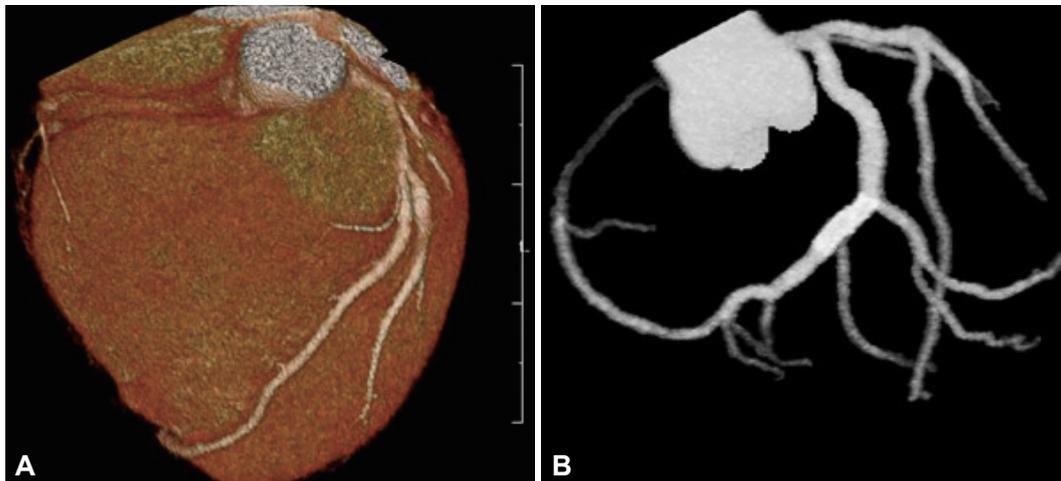
**Fig. 1.** Electrocardiography showing ST-segment elevation in the inferior leads (II, III, aVF) (A), and ST-segment elevation in the reverse precordial leads (V3R, V4R, V5R, V6R) (B).



**Fig. 2.** Coronary angiography showing total occlusion at the distal left circumflex artery.



**Fig. 3.** Coronary angiography after stent insertion showed no residual stenosis with good distal flow and extended the distal left circumflex artery belong to course of the right coronary artery.



**Fig. 4.** Contrast enhanced 320-slice multi-detector cardiac computed tomography. Note the absence of the right coronary artery ostium at right coronary cusp (A) and the extended distal portion of the left circumflex artery with patent stent (B).

heart anomaly such as Tetralogy of Fallot, coronary arterio-venous fistula, or a bicuspid aortic valve.<sup>2)</sup>

If this anomaly is not accompanied by atherosclerosis or aortic stenosis, the prognosis of SCA is relatively good. However, the more distal the SCA, the higher the blood flow resistance. This may cause a myocardial ischemia of the distal portion of the coronary artery.<sup>4)</sup> Sudden death of exercising men with this anomaly has often been reported and the cause is known to be insufficient collateral blood supply compared to that of a normal coronary artery. However, the clinical course can deteriorate as a myocardial infarction in the SCA.<sup>5)</sup>

In this case, the RCA originated from the distal LCX and this anomaly was classified as type L-1 according to the Lipton classification.<sup>4)</sup> Total occlusion of the RCA originating from the distal LCX caused right ventricular myocardial infarction with inferior myocardial infarction. Thus, we made a successful PCI and the patient's condition improved.

Through a literature review, we searched for other types of RCA abnormalities originating from the left coronary sinus. There were 3 cases of the RCA arising from the LAD.<sup>6-8)</sup> These cases were associated with myocardial infarction and PCI was conducted. However, these cases were not associated with right ventricular myocardial infarction. In another case with right ventricular myocardial infarction, the RCA arising from the aorta passed between the ascending aorta and the pulmonary outflow tract, and the occlusion of the proximal RCA caused right ventricular myocardial infarction.<sup>9)</sup> Also, there was a similar case of the RCA arising from the LCX. This case was associated with right ventricular infarction and the initial CAG showed severe stenosis in the proximal LCX and a visible RCA arising from the distal LCX.<sup>10)</sup> However, our case involved a total occlusion of the RCA and the initial CAG showed no visible RCA. After PCI, we could observe the RCA originating from the distal LCX. Thus, our case is the first report of right ventricular infarction due to total oc-

clusion of an RCA originating from the distal LCX, followed by a successful PCI in Korea. We also report here a review of literature relevant to this case.

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