Published in final edited form as:

J Electrocardiol. 2012 May ; 45(3): 285–287. doi:10.1016/j.jelectrocard.2011.11.006.

Acute myocardial infarction with isolated conus branch occlusion

Masanari Umemura, MD, PhD^{a,*}, David Ho, MD^a, Naoki Nozawa, MD^b, Erdene Balginnyam, MD, PhD^a, Kousaku Iwatsubo, MD, PhD^a, Thosihiko Saito, MD, PhD^c, Tsutomu Endo, MD, PhD^c, Yoshihiro Ishikawa, MD, PhD^d, Satoshi Umemura, MD, PhD^e, and Kazuo Kimura, MD, PhD^f

^aCardiovascular Research Institute, Department of Cell Biology and Molecular Medicine, New Jersey Medical School-University of Medicine and Dentistry of New Jersey, Newark, NJ, USA

^bNozwa naika Jyunkankika, Yokohama, Kanagawa, Japan

^cDepartment of Cardiovascular Division, Saiseikai Yokohamasi Nanbu Hospital, Yokohama, Kanagawa, Japan

^dCardiovascular Research Institute Yokohama City University School of Medicine, Graduate School of Medicine, Yokohama, Kanagawa, Japan

^eYokohama City University, Graduate School of Medicine Department of Medical Science and Cardioresenal Medicine, Yokohama, Kanagawa, Japan

^fDivision of Cardiology, Yokohama City University Medical Center, Yokohama, Kanagawa, Japan

Abstract

There are few reports of acute myocardial infarction (AMI) relating to the occlusion of the conus branch, most of which are iatrogenic in nature. So far as we are concerned, this is the first case of spontaneous AMI with isolated conus branch occlusion. Electrocardiogram (ECG) showed mild elevation of ST segment in leads V₁ through V₃. Cardiac markers of myocardial infarction were positive. Right coronary angiography revealed an isolated occlusion of the conus branch. Penetration of the guidewire in the occluded lesion was attempted, and recanalization was successfully achieved. The patient was discharged without any adverse events.

Keywords

Acute myocardial infarction; Conus branch; Occlusion; ST elevation; Spontaneous; Isolated

Introduction

The conus branch of the right coronary artery (RCA) frequently provides blood supply to the outflow tract of right ventricle. Previous papers reported that characteristic electrocardiographic (ECG) changes (elevation of ST segment in the right precordial leads) appeared when the conus branch was occluded or narrowed. All these reported events occurred during coronary angiography/angioplasty or cardiac surgery in the RCA.^{1–5} Here, unlike these iatrogenic occlusions, we show the first case of spontaneous occlusion of the

conus branch. The isolated conus branch occlusion led to acute myocardial infarction (AMI), and we treated the case with successful recanalization using penetration with a guidewire, instead of balloon/stent catheter.

Case report

A 78-year-old Japanese man awoke with retrosternal chest pain. The patient had been on home oxygen therapy for severe pulmonary emphysema and been on maintenance hemodialysis for the past 2 years. He had no history of coronary artery disease, diabetes, thrombosis, or atrial fibrillation and had never received anticoagulation therapy. Other risk factors included a history of tobacco use and smoking 20 cigarettes a day for 60 years. Family history was negative for clotting disorder, stroke, or coronary artery disease.

One hour after the onset of the chest pain, the patient visited an outside clinic. The electrocardiogram showed elevation of ST segment in the precordial leads (V_1 through V_3) (Fig. 1A). Sublingual nitroglycerin was given, and the patient was transferred to the emergency room of our hospital. At presentation, the patient had sustained chest pain that was not reduced by the nitroglycerin given at the outside clinic.

On admission, the blood pressure was 152/66 mm Hg and the heart rate was 82 beats per minute. The result of the physical examination was unremarkable. The electrocardiogram showed mild ST-segment elevation in the leads V_1 through V_3 (Fig. 1B). The maximum elevation of ST segment was 2 mm in the lead V_2 (Fig. 1C) recorded 3 hours after the onset of the chest pain as compared with the ECG 1 month before the admission (Fig. 1A). White blood cell count was 3600 cells/ μ L. C-active protein level was 2.69 mg/dL. Serum creatinine level was 6.48 mg/dL. Cardiac markers were as follows: creatinine kinase level of 138 IU/L, creatinine kinase-MB fraction of 15 IU/L, and troponin T level of 0.37 ng/mL. Echocardiography showed relatively normal segmental wall motions of both right and left ventricles. At that point, acute coronary syndrome was strongly suspected, and coronary angiography was immediately performed. Complete occlusion of the conus branch of the RCA was found (Fig. 2A and B). Because coronary angioplasty was considered to be difficult in this lesion, penetration of guidewire was attempted. The guidewire was easily crossed through the occluded lesion (Fig. 2C), and Thrombolysis in Myocardial Infarction Trial (TIMI) grade III flow was restored as demonstrated in the following coronary angiography (Fig. 2D), suggesting successful recanalization. The resolution of chest pain was immediate. Intravenous infusion of heparin with oral warfarin (3 mg/day) and aspirin (100 mg/day) was initiated. The electrocardiogram taken at 24 hours after recanalization showed the resolution of ST elevations in leads V_1 through V_3 without the development of Q-wave or T-wave inversion (Fig. 1D). Creatinine kinase level peaked at 1066 IU/L with an MB fraction of 137 IU/L 1 day after the recanalization. On day 13, the patient was discharged with aspirin and warfarin. Although CHADS2 score is 1, we added warfarin to the patient because we considered the possibility of his hypercoagulability due to severe emphysema and his maintenance of hemodialysis. It was also likely that thromboembolism caused myocardial infarction, not arteriosclerosis.

The characteristic ECG changes (elevation of ST segment in leads V_1 through V_3) observed in this case are consistent with those in the previous reports of conus branch occlusion.^{3,5} Matthews⁵ reported that conus branch was occluded by injection to RCA during angiography. Eichhofer et al⁴ reported that stent implantation in the right proximal coronary artery resulted in conus branch occlusion. The electrocardiogram showed similar pattern in the precordial leads (V_1 through V_3). These reports did not mention treatments, presumably because it is considered difficult to perform angioplasty or stent implantation for conus branch occlusion due to the small diameter of the artery. Successful balloon angioplasty in

the conus branch was reported in a case of occlusion by suture material after mitral valve reconstruction.² On the contrary, occlusion of the conus branch is known to show similar ECG pattern as those seen with Brugada syndrome, that is, elevations of the ST segment in the right precordial leads (V₁ through V₃). There are 2 reports of Brugada-like ECG changes due to conus branch vasospasms with acetylcholine, which resulted in ventricular fibrillation or ventricular tachycardia.^{3,6} Because Brugada syndrome can lead to ventricular fibrillation, and thus sudden death, treatment of conus branch occlusion is of clinical importance. In our case, penetration of a guidewire was attempted, and blood flow was restored without development of ventricular fibrillation or tachycardia. To our knowledge, this is the first report of successful recanalization with a guidewire in a conus branch occlusion. Because insertion of a guidewire into the conus branch may be easier than that of balloon/stent catheter, guidewire penetration should be considered as the first option for treatment of isolated conus branch occlusion. Furthermore, conus branch occlusion described in the previous reports were unexceptionally iatrogenic in nature; spontaneous occlusion like our case has not been reported. Nonetheless, all cases, including the current case, showed similar ECG changes, that is, ST elevation in the right precordial leads (V₁ through V₃) and moderate elevation in creatinine kinase (300–1000 IU/L). Meanwhile, the conus artery in about 50% of human hearts is not a branch of the RCA but arises from the right sinus ostium of Valsalva directly. Therefore, when ST elevations in the right precordial leads are observed, not only the conus branch of RCA but also the conus artery occlusion should be considered. Nonetheless, when angioplasty is considered to be difficult in either cases, penetration with a guidewire could be an alternative optional for treatment. Because this artery is important in terms of critical ventricular arrhythmia development, such treatment should be performed immediately even though the putative irrigation area may not be very large.

References

1. Celik T, Yuksel US, Kursaklioglu H, et al. Precordial ST-segment elevation in acute occlusion of the proximal right coronary artery. *J Electrocardiol.* 2006; 39:301. [PubMed: 16777516]
2. Hernández FH, Garrido-Lestache EB, Arribas P, et al. Recurrent ventricular fibrillation and ST segment elevation in the right precordial leads due to acute occlusion of the conus branch. *Rev Esp Cardiol.* 2011 [in press].
3. Yamaki M, Sato N, Myojo T, et al. Possible contribution of ischemia of the conus branch to induction or augmentation of Brugada type electrocardiographic changes in patients with coronary artery disease. *Int Heart J.* 2010; 51:68. [PubMed: 20145355]
4. Eichhofer J, Curzen N. Images in cardiovascular medicine. Unexpected profound transient anterior ST elevation after occlusion of the conus branch of the right coronary artery during angioplasty. *Circulation.* 2005; 111:e113. [PubMed: 15753220]
5. Matthews RV, Oesterle SN. Precordial ST elevation with acute conus branch occlusion. *Cathet Cardiovasc Diagn.* 1989; 17:180. [PubMed: 2527606]
6. Ogano M, Iwasaki Y, Morita N, et al. Proarrhythmic ECG deterioration caused by myocardial ischemia of the conus branch artery in patients with a Brugada ECG pattern. *Pacing Clin Electrophysiol.* 2011; 34:e26. [PubMed: 20353416]

Fig. 1.

(A) Electrocardiogram of the conus branch occlusion. (B) Electrocardiogram of the patient showed atrioventricular block 1 month before the onset of AMI. (C) Elevation of ST segment in leads V₁ through V₃ was seen in the outside clinic after sublingual nitroglycerin was given, and (D) resolution of ST-segment elevation after the recanalization using the guidewire.

Fig. 2. Coronary angiograms before and after the penetration of guidewire into the conus branch occlusion. The conus branch of the RCA showed total occlusion (arrows in A and B). The TIMI flow grade was 0 at this point. A guidewire was penetrated into the conus branch lesion (arrowhead in C), and grade III TIMI flow was observed (D). RAO indicates right anterior oblique; LAO, left anterior oblique.