INFECTIVE ENDOCARDITIS CAUSING ACUTE MYOCARDIAL INFARCTION BY COMPRESSION OF THE PROXIMAL LEFT CORONARY ARTERY DUE TO A MYCOTIC ANEURYSM OF THE SINUS OF VALSALVA

SEIICHI KOIKE, M.D., SHIN TAKAYAMA, M.D., AKIKO FURIHATA, M.D.
YASUTAKA FURIHATA, M.D., YASUYUKI SASAKI, M.D., SEIICHI FURUTA, M.D.
AND MASAMI MORIMOTO, M.D.*

An extremely unusual case of myocardial infarction associated with infective endocarditis (IE) is described. A 38-year old male with a high fever was transferred to our hospital for further treatment of IE. Two-dimensional echocardiogram showed a large mycotic aneurysm of the sinus of Valsalva in contact with neighbouring structures. The patient had a rapid recovery within several days after administration of antibiotic agents. However, he then developed abrupt onset of severe precordial pain. From the echocardiogram images and biochemical evaluation he was diagnosed as having an acute subendocardial infarction. Serial echocardiograms revealed expansion of the aneurysm, extending from the myocardium of the anterolateral free wall to the lower margin of the proximal left coronary artery. The cause of acute myocardial infarction was thought to be incomplete occlusion of the coronary artery through compression by the enlarging mycotic aneurysm of the sinus of Valsalva. Urgent surgery confirmed compression of the left coronary artery by the large mycotic aneurysm as the cause of acute myocardial infarction.

Acute myocardial infarction is a comparatively rare complication of infective endocarditis (IE). Embolization of vegetations to the coronary arteries is thought to be a common cause of myocardial infarction. This article describes a unique case of acute myocardial infarction associated with IE, in which a large mycotic aneurysm of the sinus of Valsalva constricted a proximal segment of the left coronary artery. To our knowledge a case of mechanical coronary compression by an aneurysm of the sinus of Valsalva causing an acute myocardial infarction

has not been previously reported in Japan.

CASE REPORT

A 38-year old man was admitted to a local hospital with persistent fever of up to 39 °C for one week. The patient was diagnosed with IE after observing two-dimensional echocardiogram images of vegetations on the aortic valve. He was then transferred to our institute in December, 1988. Heart murmurs of both aortic stenosis and regurgitation had been first noted at 15 years of age. At the age of 25 he had a subtotal gastrectomy for gastric ulcer. On admission to our unit his

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The Second Department of Internal Medicine, The Second Department of Surgery,* Shinshu University School of Medicine, Matsumoto, Japan.

Mailing address: Seiichi Koike, M.D., Department of Internal Medicine, Suzaka Prefecture Hospital, 1332, Suzaka, Suzaka city, Nagano Pref., Japan

Fig. 1a. Short axis view of the aortic valve.
Abbreviation: AV: aortic valve. AO: aneurysm of sinus of Valsalva. LA: left atrium.

Fig. 1b. Short axis view of the mitral valve.
Abbreviation: AN: aneurysm of sinus of Valsalva.

general condition had improved slightly due to antibiotic treatment for several days in the previous hospital. Physical examination revealed a temperature of 37.5 °C, pulse rate of 92/min and blood pressure of 90/70 mmHg. The skin was pale without petechiae or Osler's nodes. He was not anemic and had no conjunctival icterus. His oral cavity revealed many untreated dental caries. A grade 4/6 harsh systolic ejection murmur and a grade 2/6 diastolic decrescendo murmur were noted in the aortic area. The lungs were clear. Hepatosplenomegaly could not be detected. There was no pretibial edema. The hemoglobin level was 11.2 g/dl, red blood cell count was $380 \times 10^4/\text{mm}^3$ and white blood cell count was $11,800/\text{mm}^3$, with a left shift. The C-reactive protein was level 10.5 mg/dl and the erythrocyte sedimentation rate was 63 mm/h. Urinalysis was negative for blood cells. Arterial blood culture yielded *Streptococcus viridans* on admission. The chest X-ray revealed mild cardiomegaly with normal pulmonary vascular markings. The electrocardiogram showed left ventricular hypertrophy and mild depression of the ST segment in leads V₅, V₆. Two-dimensional echocardiography showed a calcified aortic valve and a vegetation adherent to the right coronary cusp of the aortic valve. Between the region of the right and left sinus of Valsalva a round echofree space, suggestive of a mycotic aneurysm, whose maximal diameter was 3.0 cm, could be observed (Fig. 1a). Its cranial portion was located adjacent to the main pulmonary artery and the caudal

portion protruded into the myocardium of the anterolateral free wall (Fig. 1b). Two-dimensional doppler echocardiography revealed grade 3/4 aortic regurgitation.

Clinical course

The patient was diagnosed with IE of the aortic valve, complicated by a mycotic aneurysm of the sinus of Valsalva. Elective surgery was planned when the IE had resolved following medical treatment. Immediately after admission, intravenous injection of 10^7 units of penicillin-G combined with intramuscular injection of 1 g streptomycin was started. A few days after admission, following medical treatment, he was afebrile and asymptomatic. On the 5th hospital day laboratory data including the white blood cell count, erythrocyte sedimentation rate, and C-reactive protein gradually improved. Two-dimensional echocardiography showed that the vegetation appeared to reduce in size visually. On the 7th hospital day the patient suffered a sudden onset of severe anterior chest pain accompanied by diaphoresis and dyspnea, which gradually increased in intensity. The electrocardiogram showed significant ST segment depression in leads II, III, aVf and V₄, V₅, V₆ (Fig. 2). The chest X-ray disclosed marked pulmonary edema. He was followed closely with serial echocardiograms. The mycotic aneurysm of the sinus of Valsalva was enlarging, the maximum diameter was found to be about 4 cm, causing gradual compression of the neighbouring structures,

Fig.2. Electrocardiogram at the onset of severe chest pain

especially the proximal portion of the left coronary artery (Fig. 3). Left ventricular wall motion was significantly reduced in the anteroseptal wall. Blood biochemical studies disclosed creatine phosphokinase of 1156 mIU and glutamic oxaloacetic transaminase of 206 KU. We postulated that compression of the left anterior descending artery by the mycotic aneurysm had caused the acute subendocardial infarction. As the pulmonary edema progressively worsened despite high doses of catecholamines, urgent surgical intervention took place on the 8th hospital day. Cardiac catheterization and angiography were considered to be an additional risk and were not deemed necessary because the echocardiographic images were clearly obtained.

Fig.3. Short axis view of the aorta.
Abbreviation: AN: aneurysm of sinus of Valsava. LCA: Left coronary artery AO: aorta. LA: left atrium.

Fig.4. Illustration of the finding of the operation
Abbreviation: An: aneurysm. LCA: left coronary artery. RCA: right coronary artery. LCC: left coronary cusp. RCC: right coronary cusp. NCC: non-coronary cusp. L-R com.: commissure of the left and right coronary cusps. R-N com.: commissure of the right and non-coronary cusps. L-N com.: commissure of the left and non-coronary cusps.

Operative findings and procedure

The aortic valve was thickened and heavily calcified with vegetations, which were probably in healed phase. A large mycotic aneurysm of the right and left sinus of Valsava was found extending from posterior to left side of the main pulmonary artery. The diameter of the orifice of the aneurysm was about 4 cm. A white structure representing proximal left coronary artery was observed in close contact with cranial portion of the

aneurysm (Fig. 4). The infected aortic valve was excised. Along the portion of the annulus in the area of the aneurysm, the sutures used for valve insertion were placed through a horse-pericardium patch tailored to obliterate the orifice of the aneurysm. A No. 23 St. Jude Medical aortic prosthesis was inserted into the annulus. The postoperative course was complicated by left heart failure. An intraaortic balloon pump and high dose dopamine provided gradual recovery without relapse of infection. Cardiac catheterization and angiography were performed just before discharge. Both left and right coronary arteries showed no organic lesions. Left ventriculography, which was performed by pulmonary arteriography, revealed moderately diminished wall motion over anterolateral and inferior free walls. Aortography showed no evidence of prosthetic valve leakage. He was discharged on the 58th hospital day with uneventful course.

DISCUSSION

A mycotic aneurysm of the sinus of Valsalva is a relatively rare complication of IE. In 1980, 13 cases of mycotic aneurysm of the aorta were reviewed by Castaneda-Zuniga.¹ Burger et al reported 32 cases of mycotic aneurysm of sinus of Valsalva from the literature in 1984.² Feigl et al discussed 20 autopsied cases of mycotic aneurysm of the aortic root in 1986.³ From a review of 63 cases in the literature, the most frequent and devastating complication is rupture of the aneurysm into adjacent organs. For instance, in 32 of 65 cases (the total number of perforated sites were 33) the aneurysm perforated into the right ventricle (13 cases), right atrium (11 cases), pericardial space (4 cases), mediastinum (2 cases), interventricular septum (2 cases) and left atrium (1 case). Another complication is mechanical compression of neighbouring structures. Encroachment on the region of the atrioventricular node by mycotic aneurysm caused atrioventricular conduction disturbance in six cases. In two autopsied cases, compression of the right or left coronary artery by a large aneurysm was thought to be the probable cause of myocardial infarction. The present case is considered to be similar to those two cases. Although the detailed coronary ana-

tomy was not clearly determined by coronary arteriography while the myocardial infarction was developing, the cause of the myocardial infarction was strongly suspected after examination of the echocardiogram and was documented by the operation.

Two similar cases presenting as angina pectoris are described in the literature. The etiology of the aneurysm was infective endocarditis in one case⁴ and probably congenital aneurysm of the sinus of Valsalva in the other.⁵ The authors asserted that a large aneurysm of the sinus of Valsalva in proximity to the coronary artery may stenose or occlude the coronary artery and causes an ischemic heart attack. In the present case, extensive non-transmural myocardial infarction occurred without ST segment elevation on electrocardiogram. The large aneurysm may not have totally occluded the proximal left coronary artery, including the left main trunk. Mechanical compression of the coronary artery could have reduced coronary flow significantly, enough to cause a subendocardial infarction. Acute myocardial infarction associated with IE is commonly due to embolization of a vegetation to the coronary artery⁶⁻⁸ or less commonly, due to propagation of an aortic vegetation over the coronary orifice with development of ST segment elevation on electrocardiogram.^{9,10} If a mycotic aneurysm of the sinus of Valsalva adjacent to the coronary artery is detected on echocardiogram, the aneurysm should be observed closely, even though an acute coronary event is an infrequent complication. Furthermore, echocardiography was helpful in diagnosing the cause of the myocardial infarction and determining the operative procedure without angiography.

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