Internal Medicine
The Japanese Society of Internal Medicine
doi: 10.2169/internalmedicine.9652-22
Intern Med 61: 3687-3691, 2022
http://internmed.jp

【 CASE REPORT 】

Native Aortic Valve Thrombus Complicating Intermittent Occlusion of a Left Main Coronary Artery

Hangyul Kim, Hye-Ree Kim, Min Gyu Kang, Kyehwan Kim, Jin-Sin Koh, Jeong-Rang Park, Seok-Jae Hwang and Jin-Yong Hwang

Abstract:
Intermittent left main coronary artery ostium obstruction (LMOO) caused by native aortic valve thrombus (NAVT) is an extremely rare condition. It may therefore be challenging to identify the cause using only coronary angiography, even though the clinical presentation and electrocardiography (ECG) strongly suggest myocardial infarction. We herein report a 53-year-old man with NAVT complicating intermittent occlusion of left main disease in preexisting coronary artery stenosis.

Key words: native aortic valve thrombus, non-ST-elevation myocardial infarction

(Intern Med 61: 3687-3691, 2022)
(DOI: 10.2169/internalmedicine.9652-22)

Introduction

Native aortic valve thrombosis (NAVT) is an extremely rare condition, and as of 2021, only 74 cases have been reported according to a wide literature-based systemic review, 36% of whom presented with acute myocardial infarction (1).

We herein report a 53-year-old man with aortic valve thrombi complicating intermittent left main coronary artery ostium occlusion (LMOO) whose culprit lesion was not detected at initial coronary angiography.

Case Report

A 53-year-old man with a 30-pack-year smoking history and hypertension suddenly felt severe chest pain accompanied by cold sweating while walking 3 h earlier. One hour after the onset of pain, he was transported to a local medical center, where his chest pain was markedly relieved. He was transferred to our hospital emergency room where he was prescribed dual antiplatelet medication and continuous infusion of intravenous heparin.

A serum laboratory examination showed hemoglobin 15.3 g/dL, white blood cell (WBC) 20,020/mm^3, platelet 336,000/mm^3, blood glucose 173 mg/dL, blood urea nitrogen 24.3 mg/dL, creatinine 1.64 mg/dL, aspartate aminotransferase (AST) 22 u/L, alanine aminotransferase (ALT) 26 u/L, lactic acid 3.4 mmol/L, troponin T 24 ng/L (1,628 ng/L after 6 hours), NT-pro brain natriuretic peptide (BNP) 45.6 pg/mL and low-density lipoprotein (LDL)-cholesterol 119 mg/dL.

Before coronary angiography, he complained of severe chest pain again. Electrocardiography showed a left main coronary obstructive disease pattern, including ST-segment elevation in aVR and diffuse ST-segment depression in all leads except V1 (Fig. 1A). His symptoms immediately disappeared after a catheter was placed into the left coronary artery. Coronary angiography and intravascular ultrasound sonography (IVUS, not shown) showed significant stenosis at the mid-left anterior descending artery without plaque rupture or thrombi (Fig. 2A, B). Simultaneously, spontaneous disappearance of ST-segment changes was noted on subsequent electrocardiography (ECG) (Fig. 1B). At that time, we postulated that his symptoms might be related to coronary spasm in the lesion, irrespective of the discordance between the lesion located on coronary angiography and the ECG localization of ischemic myocardial territory. We placed one stent in the mid left anterior descending (LAD) lesion (Fig. 2C).

The next day, unexpectedly, routine transthoracic echocar-

Division of Cardiology, Department of Internal Medicine, Gyeongsang National University School of Medicine and Gyeongsang National University Hospital, Republic of Korea
Received: February 28, 2022; Accepted: April 3, 2022; Advance Publication by J-STAGE: May 14, 2022
Correspondence to Dr. Jin-Yong Hwang, jyhwang@gnu.ac.kr

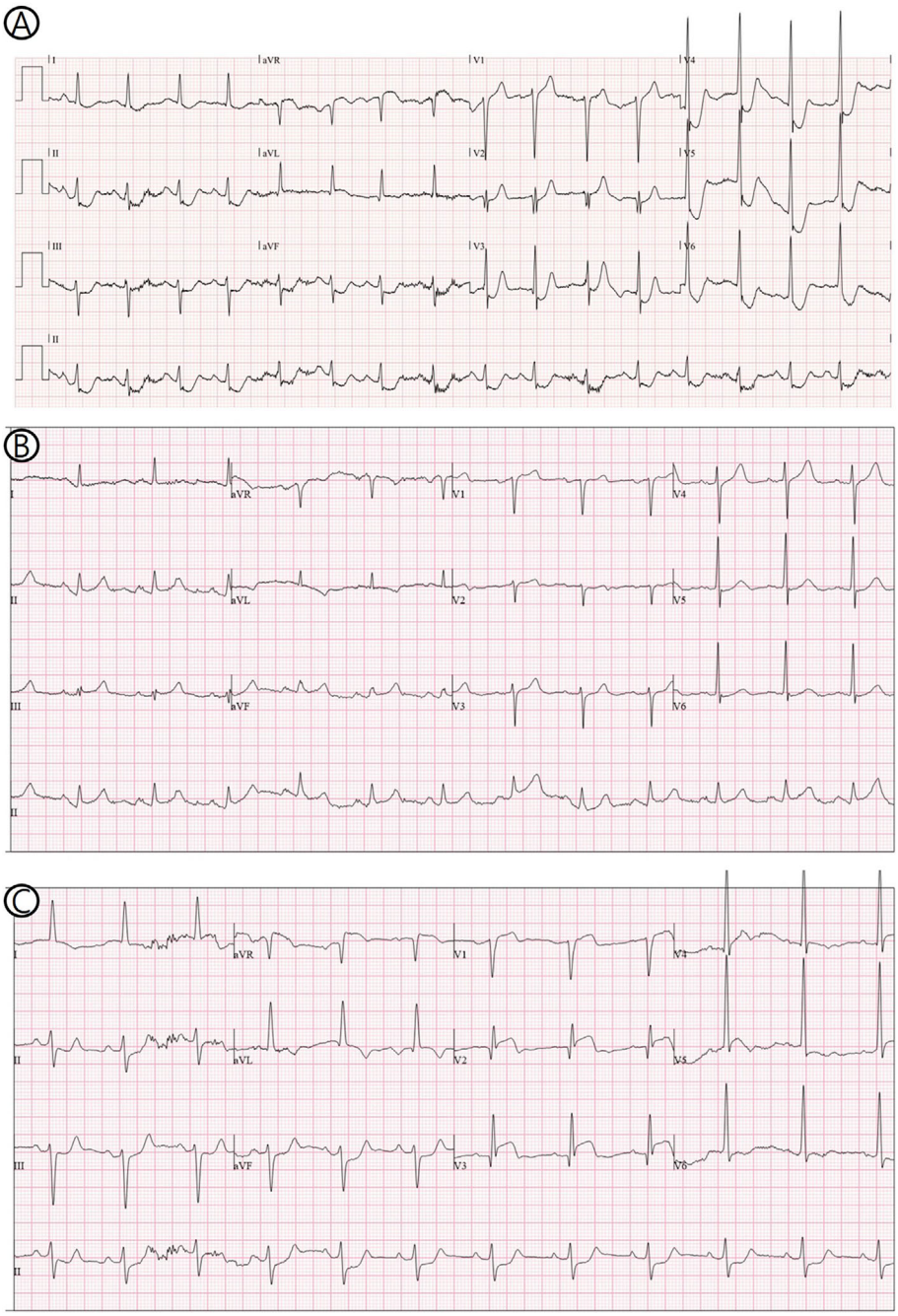

Figure 1. **(A) The electrocardiogram (ECG) at admission. ST-elevation at aVR and ST depression in at least six leads suggested occlusion of the left main coronary artery. (B) The ECG normalized after primary angioplasty. (C) The ECG showed ST elevation in all precordial leads and ST depression in inferior leads concomitant with severe chest pain.**

diography (TTE) revealed a 31×15 mm mobile thrombus on the left coronary cusp of the aortic valve (Fig. 3A-C). We immediately prepared emergency open-heart surgery to remove the suspected aortic valve thrombus.

Unfortunately, soon after, the patient complained of excruciating chest pain again, and his ECG showed ST-segment elevation in all precordial leads and ST-segment depression in the inferior leads (Fig. 1C). We confirmed the occlusion of the left main opening, but the coronary blood flow was acceptable on second coronary angiography, and his chest pain was relieved (Fig. 4A). Unfortunately, the thrombus migrated into the left main coronary artery and totally occluded the blood flow (Fig. 4B). Extracorporeal membrane oxygenation (ECMO) was immediately applied, and aspiration thrombectomy was performed to reopen the occluded lesion. However, the thrombus drifted more distally and completely blocked the LAD/diagonal bifurcation lesion (Fig. 4C). Despite several attempts of aspiration thrombectomy, blood flow was only partially restored to a thrombolysis in myocardial infarction (TIMI) grade 2 flow.

He underwent emergency open-heart surgery to remove the remnant aortic valve and coronary thrombus, but the

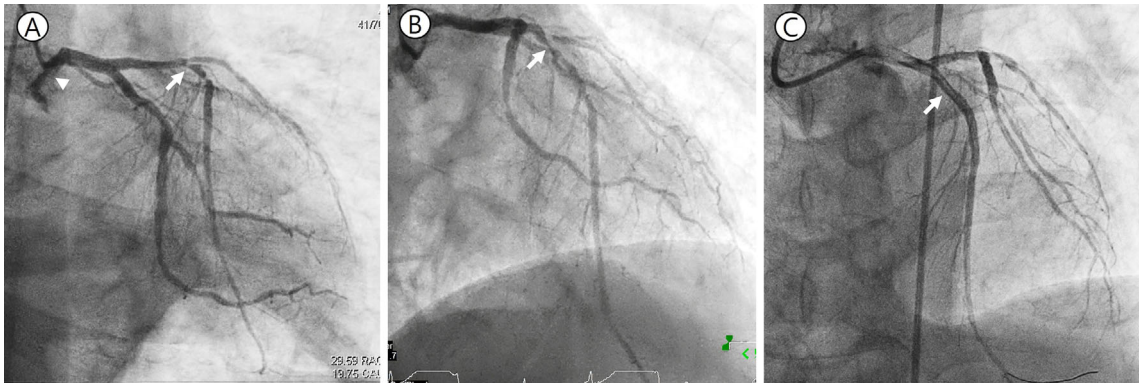

Figure 2. **(A, B) Significantly stenotic lesion at the mid-left anterior coronary artery (LAD) (white arrow) with no visible thrombus at the left main coronary artery (arrowhead). (C) Thrombolysis in myocardial infarction (TIMI) flow 3 at mid LAD (white arrows) after primary angioplasty.**

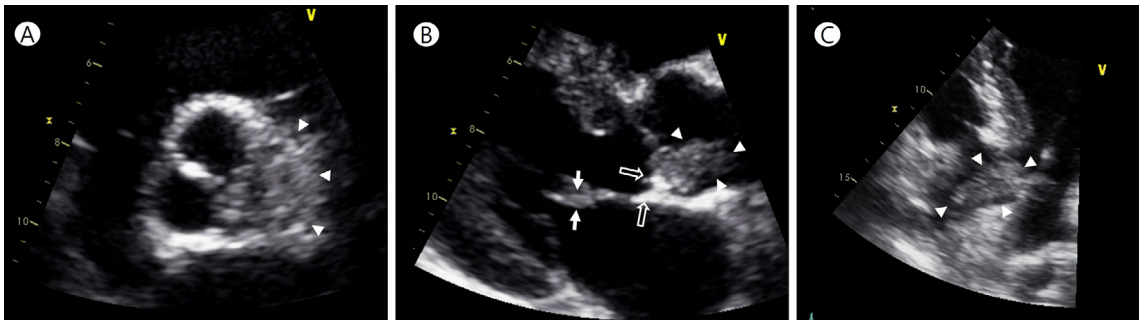

Figure 3. **(A-C) An echogenic mobile mass (31×15 mm) (arrowheads) at the left coronary cusp of the aortic valve was detected on the parasternal short-axis view (A) and parasternal long-axis view (B) as well as the five-chamber view (C). (B) Proximal nodular calcification at non-coronary cusp of aortic valve (3 mm) (white border arrows) and mitral valve leaflets were thickened (white arrows) and calcified (blank arrow).**

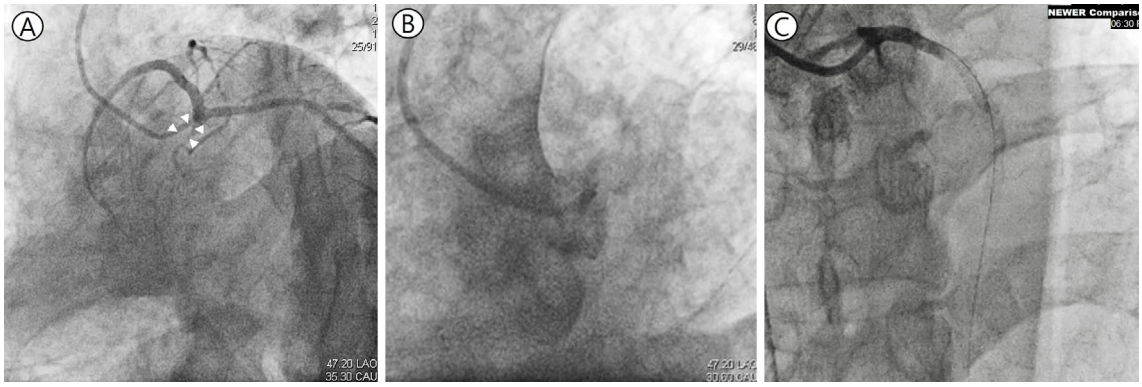

Figure 4. **(A) Follow-up coronary angiography showed that the aortic valve thrombus was blocking the left main ostium along the diagnostic catheter. There was no contrast dye reflux (arrowheads) in the left anterior oblique (LAO) caudal view. (B) The thrombus migrated into the left main coronary artery and totally occluded the blood flow. There was no left coronary artery flow in the same LAO caudal view. (C) Repeated attempts at aspiration thrombectomy were performed, but the thrombus drifted more distally and completely blocked the left anterior descending artery and diagonal bifurcation lesion. After several attempts at aspiration thrombectomy and stent deployment, partial blood flow was restored.**

thrombus was not visible in the surgical field. Despite ECMO support, the patient expired within the next 24 h. The titer of lupus anticoagulant was 1.99 (reference 0.8-1.19), and anti-cardiolipin IgM was 10.8 immunoglobulin M phospholipid unit (MPL)-U/mL (reference <10.0) in the initial blood sample. A pathologic examination of the aspi-

rated mass revealed it to be a thrombus.

Discussion

NAVT complicating LMOO is a life-threatening condition, and prompt recognition and management is critical before the clinical deterioration takes place (1). However, it is challenging to detect NAVT without high suspicion because NAVT is a rare pathologic condition in patients without aortic valve or aortic root abnormalities and is invisible on routine coronary angiography if there is no embolism in coronary arteries.

In routine practice, the determination of the culprit lesion in coronary angiography among non-ST-elevation (NSTE)-acute coronary syndrome patients with multi-vessel disease was also impossible in 14% of patients, and an ECG analysis also showed a low sensitivity (28-36%) and high specificity (90-96%) (1). Because the patient had significant preexisting stenosis in the mid-left anterior descending artery, it was very difficult to identify the actual culprit lesion, leading to inappropriate management. In contrast to this case, another two cases of LMOO NAVT showed normal coronary angiography findings with high suspicion of LMOO, which was first discovered by aortography (2, 3).

However, retrospectively considering this case might give several clues supporting a proper diagnosis. For example, his symptoms and ischemic changes on an ECG showed abrupt worsening and improving patterns without triggering and relieving factors, such as nitroglycerin infusion. We postulated at that time that it was related to the spasm of a stenotic lesion in the mid-LAD lesion. However, the initial ECG was not correlated with mid-LAD lesion ischemia but rather with left main lesion ischemia, featuring aVR ST-segment elevation and diffuse ST-segment depression in more than six contiguous leads. This ECG feature has 81% sensitivity, 80% specificity, and 81% accuracy for diagnosing left main artery obstruction (4). Because routine coronary angiography is not enough when evaluating the culprit lesion in situations suggestive of LMOO, clinicians should consider other modalities such as TTE, transesophageal echocardiography (TEE), aortography, computer tomography (CT), and magnetic resonance imaging (MRI). Indeed, the sensitivity for the detection of NAVT was 100% for TEE and aortography individually, whereas TTE and coronary angiography along showed sensitivities of 59% and 29%, respectively (5). Imaging studies should be performed in patients as soon as possible after percutaneous coronary intervention, especially when patients are suspected of having left main disease based on an ECG but, no lesions on angiography.

NAVT is usually associated with hypercoagulable diseases, excluding aortic root and valve abnormalities, left ventricular assistant devices, hypoplastic left heart syndrome, aortic valve injury, cocaine, and amphetamine use (5). The most common hypercoagulable diseases associated with NAVT include antiphospholipid syndrome (APS), polycythemia, and protein C and S deficiency (5). Although the pathogenesis of NAVT in the present case remains elusive because of his early death, it may be due in part to the presence of APS, one of the most common hypercoagulable diseases associated with NAVT, given the high titer of lupus anticoagulant and weak positivity for anti-cardiolipin IgM antibody. Furthermore, valvular involvement is the earliest and most common finding of APS, including typically localized valvular thickening (>3 mm), valve vegetation, fibrosis, and calcification in the middle and proximal portions of the leaflets (6). Proximal nodular calcification at the non-coronary cusp of the aortic valve and thick calcified mitral valve leaflet were prominent on echocardiography in this patient. However, the antiphospholipid antibody titer may be transiently elevated as an epiphenomenon, and to meet the diagnostic criteria for APS, the titer must be consistently positive at evaluations 12 months apart (7). Other causes of NAVT, such as protein C or S deficiency (5), undetected cancer (8, 9), the calcific valve itself, and other autoimmune disease, such as systemic lupus erythematosus (SLE) (6), could not be excluded because these tests were not able to be performed in this case.

Open thrombectomy for NAVT complicating LMOO is an appropriate treatment of choice before clinical deterioration begins in the hospital, as the mortality risk is 45 times higher once clinical deterioration occurs compared with stable patients (5). In addition, percutaneous intervention was not effective, and although the intervention has been successful in some cases, surgical treatment is appropriate.

In conclusion, we encountered a rare case of NAVT complicating intermittent LMOO in a patient with preexisting significant coronary stenosis, focusing on the importance of the determination of culprit lesions.

The authors state that they have no Conflict of Interest (COI).

References

1. Balbi MM, Scarparo P, Tovar MN, et al. Culprit lesion detection in patients presenting with non-ST elevation acute coronary syndrome and multivessel disease. Cardiovasc Revasc Med **35**: 110-118, 2022.
2. Jobic Y, Provost K, Larlet J-M, et al. Intermittent left coronary occlusion caused by native aortic valve thrombosis in a patient with protein S deficiency. J Am Soc Echocardiogr **12**: 1114-1116, 1999.
3. Nagata Y, Miyamoto T, Komura M, et al. Giant organized thrombus in the left sinus of valsalva causing intermittent left coronary obstruction - an unusual case of acute myocardial infarction - : an unusual case of acute myocardial infarction. Circ J **68**: 795-798, 2004.
4. Yamaji H, Iwasaki K, Kusachi S, Murakami T, Hirami R, Hamamoto H, et al. Prediction of acute left main coronary artery obstruction by 12-lead electrocardiography: ST segment elevation in lead aVR with less ST segment elevation in lead V_1. J Am Coll Cardiol **38**: 1348-1354, 2001.
5. Alajaji W, Hornick JM, Malek E, Klein AL. The characteristics and outcomes of native aortic valve thrombosis. J Am Coll Cardiol **78**: 811-824, 2021.

6. Kolitz T, Shiber S, Sharabi I, Winder A, Zandman-Goddard G. Cardiac manifestations of antiphospholipid syndrome with focus on its primary form. Front Immunol **10**: 941, 2019.
7. Miyakis S, Lockshin MD, Atsumi T, et al. International consensus statement on an update of the classification criteria for definite antiphospholipid syndrome (APS). J Thromb Haemost **4**: 295-306, 2006.
8. Edoute Y, Haim N, Rinkevich D, Brenner B, Reisner SA. Cardiac valvular vegetations in cancer patients: a prospective echocardiographic study of 200 patients. Am J Med **102**: 252-258, 1997.
9. Takeuchi N, Takada M, Fujita K, Nishibori Y, Maruyama T, Naba K. Aortic valve papillary fibroelastoma associated with acute cerebral infarction: a case report. Case Rep Cardiol **2013**: 485029, 2013.