

[ CASE REPORT ]

## Exercise-induced Atrioventricular Block with Coronary Artery Stenosis that Appeared Five Years after Bypass Surgery

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### Abstract:

A 68-year-old man with a history of coronary artery bypass surgery was referred to our hospital because of pre-syncope on effort. During a treadmill exercise electrocardiogram test, the patient developed advanced atrioventricular block associated with dizziness. Coronary angiography revealed significant stenosis of the right coronary artery, which had not existed at the time of the bypass surgery. We implanted drug-eluting stents in the stenotic lesion, and an exercise test showed resolution of the atrioventricular block. Exercise-induced atrioventricular block is rare, and it is necessary to distinguish it from ischemic heart disease, especially in patients with a history of coronary artery disease.

**Key words:** exercise-induced atrioventricular block, coronary artery bypass surgery, percutaneous coronary intervention

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### Introduction

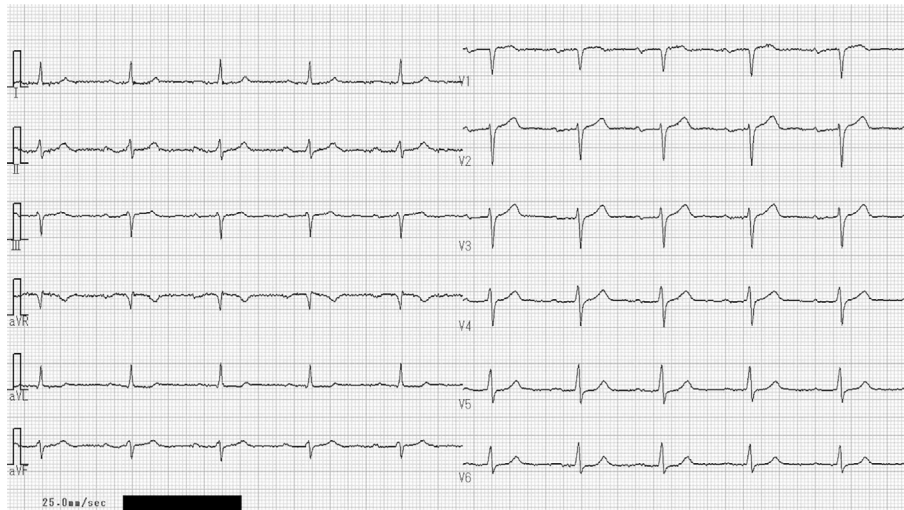
Exercise-induced atrioventricular block (EIAVB) associated with ischemic heart disease is an uncommon arrhythmia. This case report describes the resolution of EIAVB following percutaneous coronary intervention in a patient after coronary artery bypass surgery (CABG).

### Case Report

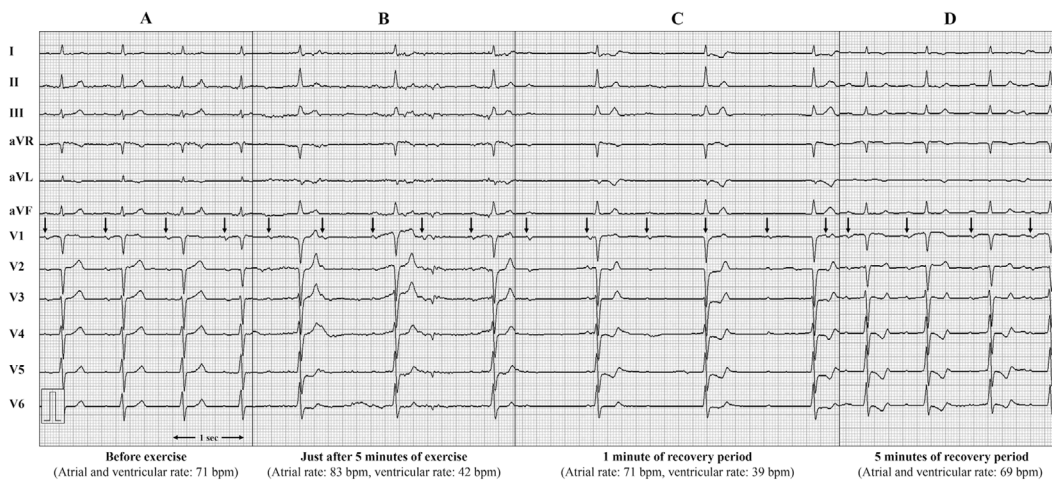
A 68-year-old man with comorbidities of hypertension and hyperlipidemia was referred to our hospital because of pre-syncope attack on effort. The patient had undergone CABG five years earlier. Coronary angiography before CABG showed total occlusion of the left anterior descending artery and significant stenosis of the left circumflex artery, and there were no significant lesions in the right coronary artery (RCA). Therefore, the bilateral internal thoracic artery was bypassed to the left coronary arteries. The patient had been given 5 mg of carvedilol, 10 mg of imidapril, and 100 mg of aspirin after CABG.

Electrocardiography at rest revealed first-degree atrioventricular (AV) block without significant ST-T change (Fig. 1). A treadmill exercise electrocardiogram test was performed. After five minutes of exercise, second-degree AV block appeared and progressed to complete AV block with ST depression in leads V3-6 (Fig. 2). He complained of his usual episodes of dizziness and pre-syncope. AV conduction returned to 1:1 after 2 minutes. We suspected a new stenotic lesion in the native coronary arteries or bypass graft failure and performed angiography. Although bilateral internal thoracic artery grafts to the left coronary arteries were patent, coronary angiography showed a severe stenotic lesion in the mid RCA (Fig. 3A) that had not existed five years earlier (Fig. 3B), and there were no collateral vessels. Drug-eluting stents were implanted in the RCA, and final angiography showed a favorable flow (Fig. 3C). A second treadmill exercise test, performed the day after coronary revascularization, revealed resolution of the EIAVB and ST depression (Fig. 4), and the patient's symptoms disappeared.

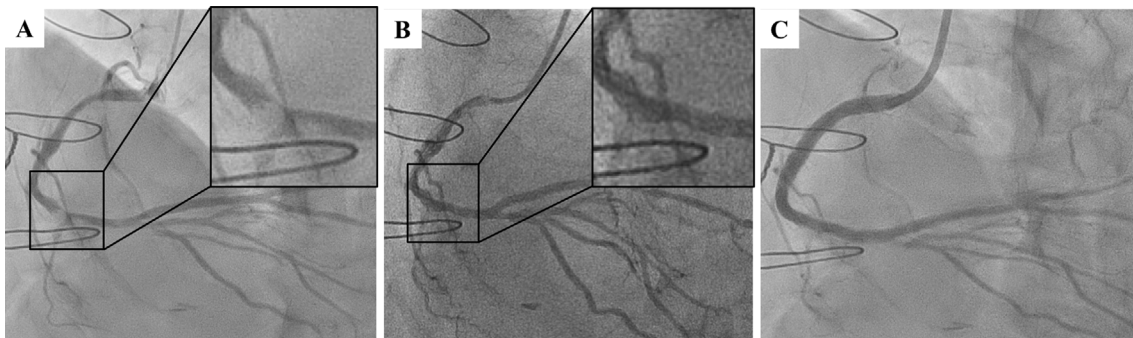
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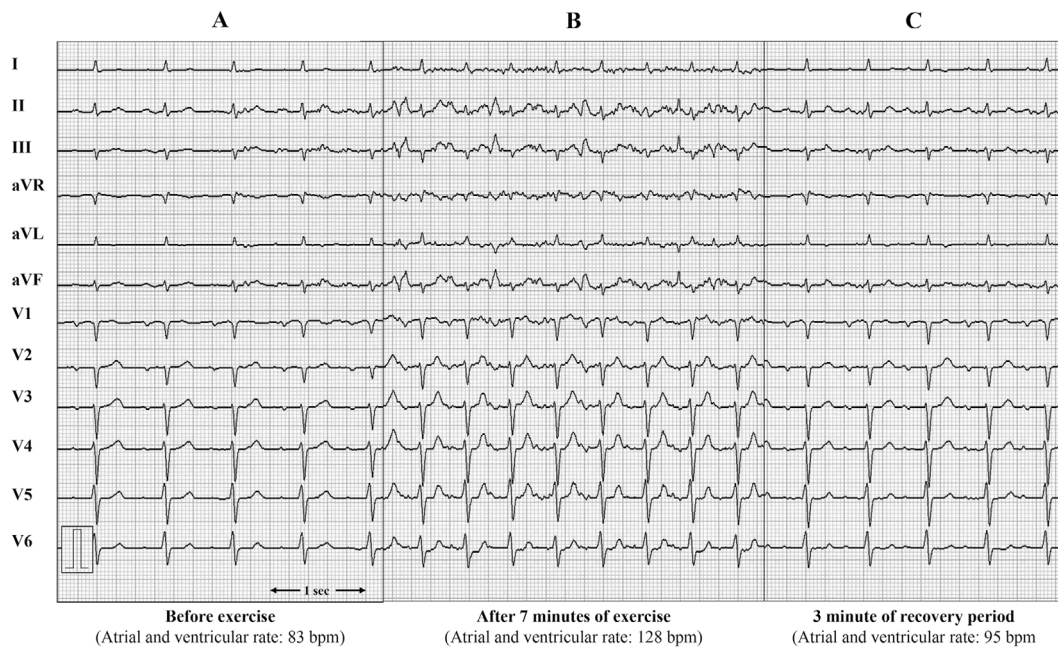
**Figure 1.** Electrocardiography at rest showed first-degree AV block without significant ST-T changes.



**Figure 2.** Treadmill exercise stress test. A: Electrocardiography before exercise showed no ST-T changes with 1: 1 AV conduction. B: Second-degree AV block appeared after around 5 minutes of exercise, and the patient could not continue the exercise (maximum P wave rate: 92/min). C: The block progressed to complete AV block with ST depression in leads V3 to V6. D: AV conduction returned to 1: 1 after 5 minutes of recovery. The arrows indicate the P waves in lead V1.



**Figure 3.** Coronary angiography showed a severe stenotic lesion in the mid RCA (A) that had not existed 5 years earlier (B). Drug-eluting stents were implanted in the RCA, and final angiography showed a favorable flow (C).



**Figure 4.** Treadmill exercise electrocardiogram test after coronary stenting. The patient was able to achieve the target heart rate of 128 bpm while maintaining 1: 1 AV conduction, and no symptoms appeared.

## Discussion

EIAVB is not common. AV nodal conduction has generally been shown to improve during exercise, as AV nodal conduction is influenced by the autonomic nervous system. Therefore, in most cases of EIAVB, the sites of the blockage are distal to the AV node, in the His-Purkinje system (1-3). Myocardial ischemia during exercise is considered a cause of EIAVB. However, EIAVB without myocardial ischemia (1), as well as following cardiac surgery (2), has also been reported.

Only two reports have been published on the resolution of EIAVB after coronary revascularization (4, 5). Both reported cases showed single-vessel disease of the right coronary artery, as in the present case. Enhanced vagal modulation caused by inferoposterior myocardial ischemia may be involved in the appearance of AV block (6).

In the present case, the new stenotic lesion appeared five years after CABG, although the patient had no chest symptoms, unlike before CABG. Kimura et al. (7) reported that the incidences of myocardial infarction and revascularization within 4 years after CABG were 3.2% and 11.3%, respectively. Park et al. (8) reported that 2.3% of patients underwent revascularization for new lesions within two years after CABG. Although CABG is an established treatment for ischemic heart disease with satisfactory mid- to long-term outcomes (7, 8), it is necessary to conduct careful long-term follow-up after surgery. The incidence of myocardial ischemia should be taken into consideration with the appearance of not only angina symptoms but also AV block, especially in patients with a history of coronary artery disease.

## Conclusion

We reported a case in which EIAVB developed after CABG due to a new coronary artery lesion and was improved by percutaneous coronary intervention. Careful follow-up is necessary for patients with a history of treatment for ischemic heart disease. The further assessment of myocardial ischemia is necessary when AV block occurs.

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

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