Fainting After Chest Pain

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Variant angina presenting acute chest pain and ST elevation on electrocardiogram accounts for an underdiagnosed scenario in acute coronary syndrome and contributes to syncope as a consequence of ventricular arrhythmia. Here, we report a case of a 48-year-old man with a recent onset of chest pain and palpitations followed by syncope. Holter monitoring documented 2 episodes of evolving ST elevation associated with non-sustained ventricular tachycardia. Emergent cardiac catheterization indicated insignificant coronary narrowing. A non-invasive brachial artery ultrasound, which demonstrated endothelial dysfunction that was salvaged by exogenic nitrate, was used instead of intracoronary provocation. There was no clinical or electrocardiographic recurrence of variant angina after vasodilator treatment. In conclusion, variant angina represents an important but overlooked etiology for syncope. Holter monitoring facilitates the diagnostic and prognostic assessment in patients with syncope precipitated by chest pain.

Key Words: Flow-mediated vasodilation • Holter monitoring • Variant angina • Ventricular arrhythmia

INTRODUCTION

Angina pectoris is characterized by chest pain which is aggravated by physical or emotional stresses and is relieved by rest. The mismatch of myocardial oxygen supply and demand due to increased cardiac workload as the consequence of impaired coronary flow against atherosclerotic plaques is responsible for ischemic symptoms. In most scenarios of acute coronary syndrome (ACS), acute thrombotic occlusion complicated by the rupture of atheroma leads to myocardial necrosis, which presents with prolonged angina in its symptomatology, ST elevation on the electrocardiogram and elevated biomarkers in laboratory results. However, angina at rest accompanying transient ST elevation with rapid resolution that is different from coronary thrombosis is referred to as variant angina (VA) in the nature of coronary vasospasm. We herein report a case which presented to the emergency department (ED) because of recurrent syncope following angina at rest. The clinical consequences and pathophysiology of ventricular arrhythmia after vasospasm were demonstrated by the use of Holter monitoring.

CASE REPORT

A 48-year-old man reported a 3-month history of palpitations and fainting right after chest tightness at rest. Those episodes lasted for several seconds and then subsided immediately as angina dissipated. The patient had stopped smoking more than 2 years earlier. Otherwise, he denied having a history of either hypertension or diabetes. There was no documented sudden cardiac death or ventricular arrhythmia among his family members. His previous blood testing before this event indicated that his low-density lipoprotein cholesterol was 100 mg/dL and high-density lipoprotein cholesterol was 57 mg/dL. He was sent to ED because of the recurrent
syncope. At ED, his physical examination was normal; the electrocardiogram showed sinus rhythm without ischemia. A 24-hour period of Holter monitoring recorded 2 episodes of evolving ST elevation within the duration of 3 minutes at 15:47 and 22:47, respectively. Both recordings corresponded to severe chest pain at rest and the later episode accompanied near-syncope (Figure 1). Cardiac biomarker levels were within normal limits. The emergent angiography showed no significantly obstructive epicardial arteries (Figure 2A and B). Cardiac magnetic resonance imaging indicated no evidence of ventricular dysplasia or infarction (Figure 2C and D). Because of the high probability of inducing fatal arrhythmia, intracoronary provocation was not attempted. Instead, the endothelial function was non-invasively assessed by brachial artery ultrasound. In our study, there was no significant diameter change after 5 minutes of brachial artery occlusion (Figure 2E and F) but an increase of the brachial artery diameter by 26% after sublingual nitroglycerin (Figure 2G and H). The vasospastic pathomechanism as the consequence of endothelial dysfunction resulting in transient ST elevation at rest was suggestive of VA. Thereafter, a combination of calcium blocker and nitrate was prescribed. There was no chest pain clinically and no electrocardiographic ST elevation on the following Holter studies at the first and sixth month after discharge.

Figure 1. Ambulatory electrocardiography marking ST changes during the event. Progressive ST elevation over channel 1 and 3 followed by non-sustained ventricular tachycardia; inverted T wave after normalized ST at channel 3.

Figure 2. Angiography indicated mild stenoses over the left coronary (A) and right coronary artery (B); cardiac magnetic resonance imaging showed no fibrofatty infiltration (C) nor delayed enhancement (D); brachial ultrasound suggested endothelial dysfunction as similar diameter before and after hyperemia (E and F) but preserved endothelium-independent vasodilation as a marked increase in diameter after sublingual nitroglycerin (G and H).
DISCUSSION

VA manifests from angina to ACS but its exact prevalence is unknown. Although ethnic differences have been reported, the diversity in background risk, the use of vasodilators, the utilization of intracoronary provocation tests, and clinical presentations may bias the larger epidemiology results. The reported incidence of VA decreased recently due to the declining number of provocation tests performed. The wide application of calcium blockers for hypertension management and modifications of atherosclerosis are also responsible for this decrease.

Coronary vasospasm is pathologically accountable for VA. The abnormal contraction of major coronary arteries resulting in ischemia at the corresponding myocardium and electrocardiographic ST elevation reflects the pathophysiology other than increased oxygen demand at the presence of the fixed coronary stenosis in effort angina. The mechanisms of pathological vasomotor reactivity have not been fully elucidated. Smooth muscle hyper-reactivity involving intracellular calcium homeostasis, sympathovagal imbalance, increased oxidative stress, chronic inflammation and magnesium deficiency are possible substrates. As nitric oxide, the most potent endogenous vasodilator, is synthesized from L-arginine by endothelial nitric oxide synthase in vascular endothelial cells, endothelial dysfunction plays an important role in the pathogenesis of VA. The reduced bioavailability of nitric oxide in conjunction with hypercontractility of vascular smooth muscle further contributes to VA. In addition, abnormalities of endothelial nitric oxide synthase or gene polymorphisms are also attributed to the pathogenesis of vasospasm.

Traditional cardiovascular risk factors are less associated with VA except smoking. Cigarette and illicit substance use are correlated with higher incidences of vasospasm. Precipitating factors include stressful conditions, hyperventilation, and exposure to cold or sympathomimetic agents.

Vasospastic ischemia is often transient and asymptomatic. The incidence of silent ischemia documented by ambulatory electrocardiograms accounted for two-thirds of all attacks. Symptomatic VA is similar to effort angina in quality. Both symptoms and electrocardiographic abnormalities have circadian variations with the peak frequency from midnight to early morning. Furthermore, such myocardial ischemia sometimes accompanies syncope or sudden cardiac death as the consequence of fatal arrhythmias.

The diagnosis of VA depends on symptoms at rest or at a mild degree of exercising, either transient ST elevation, depression, or the new appearance of negative U waves by electrocardiography while symptoms develop, angiographically normal or insignificant obstructions, and positive results of provocation. The utilization of ambulatory monitoring in subjects with suspected VA falls into a class Ila indication in the practicing guidelines. Both systemic and intracoronary provocation tests are recommended, particularly if there is a high prevalence of pathological responses to provocation tests in unobstructed coronary arteries in the setting of either ACS or stable angina. The Japanese registry indicated the incidence for inducing arrhythmia was at an acceptable level of 6.8% as compared with 7.0% during spontaneous attacks. On the contrary, catheterization and provocation are not necessary for VA diagnosis in certain circumstances. Flow-mediated and nitroglycerin-mediated vasodilation assessed by the brachial artery ultrasound is the validated surrogate of endothelium function. Even though its indication in VA diagnosis falls into class IIb, this non-invasive procedure is generally safe and convenient, particularly when concerns regarding severe coronary stenosis are involved.

The VA attack is usually managed by nitroglycerin; long-acting calcium antagonists and nitrate are routinely the medical treatment of choice for prevention. Since attacks occur more frequently at night or in the early morning, medications should cover the circadian variation. Both calcium blockers and nitrate share a class I indication. The use of nicorandil or beta blockers in subjects with significant coronary lesions has a class Ila indication. Additionally, patient measures to modify endothelial dysfunction are recommended, such as smoking cessation, atherosclerosis risk management, and avoidance of excessive stresses.

Periodic relapses and remits of vasospastic attacks are common. The prognosis is generally favorable. Cardiac mortality was 1.5% among 202 subjects at a median follow-up of 4.5 years. Predictors of unfavorable outcomes include the number of coronary lesions, the involved vessels, and electrocardiographic ST elevation.
CONCLUSIONS

VA is overlooked and underdiagnosed clinically, particularly in the setting of ventricular arrhythmia and syncope. Without invasive provocation, the diagnosis might be made according to clinical presentations and the non-invasive demonstration of endothelium dysfunction. Our findings suggest that Holter monitoring can be applied for both diagnostic and prognostic evaluations in patients with syncope precipitated by chest pain.

CONFLICTS OF INTEREST AND SOURCE OF FUNDING

None.

REFERENCES