Left Main Coronary Artery Spasm: A Rare Entity as a Cause of Myocardial Infarction in a Patient

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Abstract: Coronary artery disease (CAD) remains the major cause of mortality and morbidity in the United States despite significant advances for the prevention and treatment of CAD. Coronary artery spasm causing demand-supply mismatch with coronary ischemia can mimic CAD, resulting in unnecessary interventions. Left main coronary artery spasm, in particular, is a rare entity with only a few cases described in the literature. **Case presentation.** A 49-year-old African-American female was evaluated at outpatient clinics for ongoing episodes of substernal chest pain which were then classified as atypical. Adenosine myocardial perfusion imaging study showed a small-size, mild-intensity, reversible ischemia in the anterior wall attributed to breast attenuation artifact. Medical management failed to relieve her chest pain and she was eventually referred for left heart catheterization. Angiography raised the suspicion of vasospasm and intra-coronary nitroglycerin was injected, with resolution of the stenosis. **Conclusion.** There are multiple risk factors associated with coronary spasm. Although medical management, ie, vasodilators are the treatment of choice, cases refractory to medical therapy have been treated with coronary stenting and even coronary artery bypass graft surgery with acceptable outcomes.

J INVASIVE CARDIOL 2013;25(2):E36-E38

Key words: left main, coronary artery spasm

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Coronary artery disease (CAD) remains the major cause of mortality and morbidity in the United States despite significant advances for the prevention and treatment of CAD. The battle against atherosclerosis and its consequential involvement of the endothelium and vascular tree continue to evolve with HMG-CoA reductase inhibitors, newer and better antiplatelet agents, ie, prasugrel and ticagrelor, and glycoprotein IIb/IIIa inhibitors. The pathophysiological role of atherosclerosis and its involvement in the vascular tree has been proven and validated with a deep understanding at the molecular level. The effect of atherosclerosis on the vasomotor activity has also been elucidated, with impairment of endothelial function associated with advanced atherosclerosis. Prinzmetal and colleagues described an entity of coronary artery spasm with no underlying atherosclerosis as being responsible for coronary ischemia.[1] Coronary artery spasm causing demand-supply mismatch with coronary ischemia can mimic CAD, resulting in unnecessary interventions. Spasm of coronary arteries has an incidence from 0.3%-2.9%.[2] Left main coronary artery spasm, in particular, is a rare entity with only a few cases described in the literature.[3] We describe a case of left main coronary artery spasm.

Case report

A 49-year-old African-American female with history of hypertension, hyperlipidemia, and chronic smoking had been evaluated in outpatient clinics for ongoing episodes of substernal chest discomfort. Based on her history and symptoms, the chest pain was classified as atypical.

The patient described her pain as sharp, shooting, left-sided, and substernal, at times related to activity not relieved with rest. For the above complaints, she underwent a regadenosine myocardial perfusion imaging study that showed a small-size, mild-intensity, reversible ischemia in the anterior wall attributed to breast attenuation artifact. She was then treated conservatively with medical management based on American College of Cardiology/American Heart

Association guidelines, which placed her at lower risk for underlying coronary artery disease. Following the stress test, she continued to have recurrent episodes of chest pain and was re-evaluated in our clinic 3 months later. Based on the patient s comorbidities, her calculated 10-year global cardiovascular risk based on Framingham risk score was 18.5%. This placed her in the moderate-risk category, with her vascular age estimated as >80 years. She therefore was referred for a left heart catheterization to evaluate underlying coronary artery disease.

On engagement of the left main coronary ostium, we noted dampening of pressure, raising the suspicion of ostial left main disease. Very careful slow injection of intravenous contrast in two orthogonal planes showed evidence of 70% stenosis of the left main coronary, after which the catheter was disengaged. At that time, a consult for cardiothoracic surgery was placed for evaluation for bypass surgery. On evaluating the right coronary arterial system with a Judkins right 4.0 catheter, arterial dampening in pressure wave form was again noted. A very careful 2 cc injection revealed proximal 90% stenosis of the right coronary artery. Considering that the rest of the coronary system was smooth, suspicion for vasospasm was raised and intracoronary nitroglycerin was injected. A repeat right coronary angiogram following injection of intracoronary nitroglycerin showed resolution of the 90% stenosis. Subsequently, the left coronary system was re-evaluated with JL 4.0 catheter after injecting intracoronary nitroglycerin into the left main artery; repeat angiogram showed resolution of 70% left main stenosis. The cardiothoracic surgeon had arrived at the end of the case to go over the cineangiographic films.

The patient was discharged home on calcium-channel blockers, statins, and long-acting nitrates.

Discussion

Most cases of coronary artery spasm are associated with underlying coronary artery disease, but about 10%-20% of cases have normal coronaries on angiography.[3] There are multiple factors that are now known to have causal relationship with coronary spasm. Decreased nitric oxide synthase activity and vascular smooth muscle hypercontractility, personality traits (type A personality), imbalance between the vagosympathetic control, circadian rhythm (most of the events occur in early morning time), chronic low-grade inflammation (raised c-reactive protein), enhanced phospholipase-C activity, alcohol, smoking, hyperlipidemia, illicit drugs, and inappropriate choice of catheters or excessive manipulation during the interventional procedures have been described in the literature as etiologies of coronary spasm by many workers.[4-9] Additional factors implicated in vasospasm include hypocalcemia, sotalol, pseudoephedrine, hyperventilation, ephedrine administration during spinal anesthesia, and cocaine use.[10] Vasodilators like calcium-channel blockers and/or nitric oxide are widely used for treatment and are the current agents of choice. Beta-blockers are usually considered detrimental when used alone, because beta-blockade may result in unopposed alpha-adrenergic stimulation and an increase in coronary vascular tone.[11] Some workers have also advocated the use of statins based on the nitric oxide pathway. For cases refractory to medical therapy, coronary stenting or even coronary artery bypass graft surgery have also been documented in the literature with acceptable outcomes. Some recommend surgical therapy only after treating the patient with medical therapy for at least 8 weeks.[3,10] Some workers have also documented the denervation plexectomy.[12] Although spasm secondary to catheterization is a rare event in the case of LMCA as compare to RCA, careful angiography should be performed after intracoronary nitroglycerin injections and LMCA spasm should be considered in the diagnosis of LMCA disease particularly when there is isolated LMCA disease.[13,14]

Acknowledgment. The authors wish to thank Dr Theodore Schreiber for his valuable contribution to this case report.

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Disclosure: The authors have completed and returned the ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors report no conflicts of interest regarding the content herein.

Manuscript submitted August 2, 2012 and accepted September 24, 2012.

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