CLINICAL VIGNETTE

Coronary Slow Flow Phenomenon as a Cause of Recurrent Chest Pain

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Introduction

Recurrent chest pain spans a wide variety of conditions from the mundane to the lethal. One particularly idiosyncratic variation is coronary slow flow phenomenon (CSFP). It is important to understand this less common cause of recurrent chest pain as such symptoms not only cause extensive frustration to patients and physicians but are also a source of excessive healthcare utilization. Presented here is the case of a 56-year-old man with chronic refractory chest pain ultimately attributed to CSFP.

Case Report

A 56-year-old man with a history of bilateral thoracic outlet syndrome status post right first rib resection and venous angioplasty, GERD status post Nissen fundoplication, and family history of premature coronary artery disease presented to a local emergency room with progressively worsening, non-radiating, non-exertional, "crushing," 8/10 chest pain associated with lightheadedness, and shortness of breath. His symptoms began upon awakening, and he had two similar episodes earlier in the month. In the emergency room, his vitals were normal; nitroglycerin improved but did not resolve his pain, prompting admission. Inpatient workup including labs, serial cardiac enzymes and EKGs, CXR, CT chest, and CT coronary angiography were negative.

Echocardiogram showed a calculated ejection fraction of 52% and mild reduction in right ventricular function but otherwise no other cardiac or valvular abnormalities. He was discharged on a proton pump inhibitor.

After discharge, he continued to have similar debilitating episodes of chest pain despite the PPI, a trial of lorazepam by his primary physician, and a trial of prednisone by a pulmonologist. Gastroenterology workup including endoscopy was unremarkable. Outpatient cardiac monitoring showed no arrhythmias and cardiac MRI for mildly reduced biventricular function showed a small pericardial effusion. However, a trial of NSAIDs and colchicine for possible pericarditis did not improve symptoms. The patient ultimately underwent coronary angiography with acetylcholine challenge, in which his symptoms were recreated with administration of acetylcholine and resolved with verapamil. Slow (TIMI 2) coronary flow was identified after acetylcholine administration with re-establishment of flow with verapamil. This phenomenon was most consistent with coronary slow flow phenomenon (CSFP) due to microvascular disease.

Symptoms initially improved on outpatient Verapamil and Ranolazine, but dose up-titration was limited by constipation. Due to ongoing chest pain, a cardiac PET with CFR analysis was performed, which was unremarkable with a global coronary flow reserve of 3.29 (normal >2.0). He is now seeking a third expert opinion for further management options.

Discussion

Chest pain in the absence of obstructive epicardial coronary artery disease has been attributed to a variety of etiologies, including coronary artery spasm (CAS), microvascular angina, and coronary slow flow phenomenon. The term coronary spasm refers to a sudden vasoconstriction of a coronary artery causing vessel occlusion or near-occlusion.[1] While commonly diagnosed by ST changes during symptomatic periods on ambulatory ECG monitoring, provocative testing such as intracoronary acetylcholine administration is required in about 10% of patients. [2]

What was unusual about our patient's angiographic response was that coronary slow flow was induced with provocative testing rather than typical features of coronary artery spasm. While the mechanisms of coronary spasm, microvascular angina and coronary slow flow are not well understood, their pathogenic substrates include endothelial dysfunction and small vessel disease.[1,3] This suggests that they represent a spectrum of manifestations of a common pathologic process.

CSFP is frequently characterized by remitting, relapsing episodes of angina, which can result in considerable impairment in quality of life to which our patient can certainly attest. Therapeutic strategies which have shown promise include dipyridamole, dihydropyridine calcium channel blockers, statins, and nebivolol.[4-7] Calcium channel blockers and nitrates are the mainstays of treatment for coronary spasm, but statins, antiplatelet agents, non-selective beta-blockers, and renin-angiotensin inhibitors have also been shown to be effective.[8] Ranolazine has been used in patients with refractory angina, but data has been mixed in its use in coronary microvascular

disease. In 58 patients with microvascular angina, after 8 weeks of ranolazine therapy, coronary flow reserve significantly increased in the ranolazine group but not the placebo group.[9] Results of the Angina Myocardial Ischemia (RWISE) trial randomized 128 patients with microvascular disease to ranolazine 500 to 1000 mg BID as tolerated versus placebo for two weeks and evaluated for changes in the Seattle Angina Questionnaire (SAQ), quality of life questionnaire, and cardiac magnetic resonance imaging myocardial perfusion reserve index. None of the primary outcomes improved with ranolazine as compared to placebo.[10]

Conclusion

Pharmaceutical therapy has been able to only partially alleviate our patient's symptoms, reflecting the fact that coronary slow flow phenomenon is not completely understood. Further research is needed in this field in order to help limit the morbidity of this unusual condition.

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