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IMAGES IN MEDICINE

Inordinately Sluggish Coronary Artery Flow in an Angiographically Normal Coronary Artery

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A 53-year-old male smoker, without any significant medical history was admitted via the emergency room to the cardiac care unit due to a single episode of unstable angina lasting for approximately 10 minutes. Over the last one year he admits to symptoms indicative of effort angina of class II according to the Canadian Cardiovascular Society (CCS) classification. He had been submitted to an exercise stress test a year earlier which was characterized as positive based on clinical criteria only. On admission no ischemic ECG changes were noted; chest pain had subsided upon arrival to the emergency room, thus an ECG recording during the episode of chest pain was lacking. Cardiac enzymes were normal. However, due to the typical clinical presentation, prior history of effort angina and report of a positive exercise test in the past, a decision was made to proceed with cardiac catheterization, which was performed the following day.

Coronary angiography revealed no significant atherosclerotic lesions, however an impressively *sluggish flow* was observed in the left anterior descending (LAD) coronary artery (Figure 1). During injection of contrast material into the left coronary artery, the left circumflex (LCx) coronary artery (panel A, left side) fills up quickly, while there is an inordinate delay of flow in the LAD which has only filled half-way (panel A, right side). Only several frames later when the circumflex has started to empty (panel B, left side), has the LAD filled up with the contrast material (panel B, right

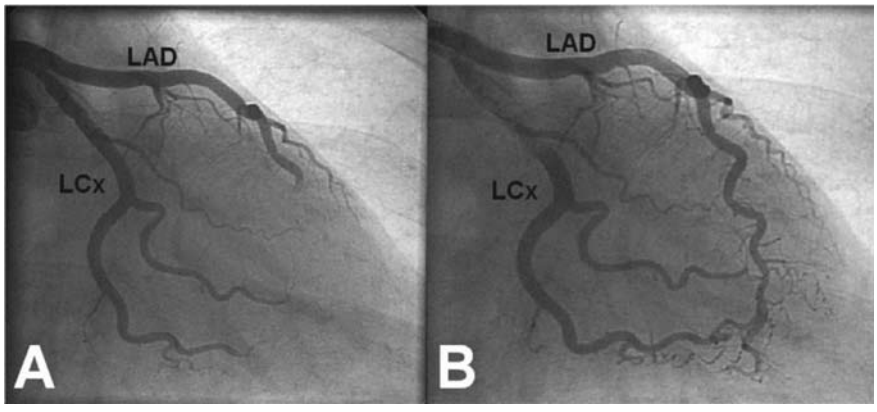

Figure 1.

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side). During each dye injection into the left coronary artery, the patient complained of chest pain similar to his regular symptoms. There were no findings of coronary stenosis, ectasia or spasm. There were only mild irregularities noted in the proximal segment of the circumflex but not in the LAD. The patient was discharged home the following day on full antianginal regimen, including aspirin, clopidogrel, nitrates, β-blocker and statin. At three months later the patient has remained free of symptoms.

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Sluggish or slow flow has been reported in coronary arteries during reperfusion via percutaneous coronary interventions in the setting of acute myocardial infarction, in ectatic coronary arteries, during spasm or with spontaneous or iatrogenic coronary dissections. On the other hand, the no-reflow phenomenon relates to complete stasis of contrast dye in the coronary artery which has just been mechanically reperfused in the setting of acute myocardial infarction and total coronary artery occlusion. However, in some patients spontaneously tardy coronary flow may be observed during coronary angiographies with an estimated incidence of 1%,[1-5] but usually not to the extent noted in the present case and usually the patient is asymptomatic or has rest pain, and not typical effort angina. There seems to be a predilection for sluggish flow in heavy smokers,[1] as was the case in our patient, but not usually leading to such a prolonged and predicted symptomatology as in the present case, having symptoms of effort angina for over one year. For the follow-up 3-month period after initiating full antianginal therapy, the patient remained asymptomatic.

Mechanisms involving increased viscosity due to increased fibrinogen and/or platelet dysfunction known to occur in smokers, or endothelial dysfunction and microvascular disease or microvascular spasm[3] could be some plausible explanations for this phenomenon, which formed the base upon which the antianginal regimen was prescribed for this patient, which appeared to be effective at least for the short-term. The features of the patient's clinical picture also differ from the typical presentation of microvascular angina or syndrome X, which typically occurs in post-menopausal women and is usually associated with ischemic ECG changes in the presence of normal coronary angiograms but commonly in the absence of slow flow. Contrariwise, the slow flow phenomenon, proposed by some to be called *syndrome Y*,[4] occurs in young male smokers and usually presents with rest pain commonly in the absence of ischemic ECG changes and its prognosis is not as benign as that classically reported for coronary syndrome X.[5]

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