Multivessel coronary artery disease: atheroma progression and dynamic component

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ABSTRACT

Multivessel or multisegment spasm in patients with known widespread coronary atherosclerotic disease is an infrequent occurrence.

We describe a prolonged spasm of both the left main and the left anterior descending artery in a patient with chronic effort angina and multivessel coronary artery disease, who previously underwent percutaneous coronary intervention and drug eluting stents implantation. The patient complained of episodes of angina and palpitations, mainly at rest. Exercise stress test resulted positive in therapeutic wash-out. Coronary angiography was performed which showed: 80 % stenosis in the proximal segment of the Left Main (LM) and the mid Left Anterior Descending artery (LAD), 90 % stenosis of the Posterior Descending Artery (PDA); there was no angiographic evidence of instent restenosis in the previously stented segments. Coronary Artery By-pass Graft (CABG) was proposed, but the patient refused surgery. Reperfusion strategy included coronary angioplasty of the LM and the LAD. Before the procedure, in the presence of ischemic EKG changes, nitrates were infused in the left coronary artery with resolution of both the LM and LAD stenoses. However, intracoronary nitrates in the right coronary artery did not resolve the PDA stenosis. The patient underwent angioplasty and stenting of the PDA alone.

Selective spasm involving two anatomically different segments is rare. The left main location is critical since it can lead to unnecessary coronary artery by-pass. Intracoronary nitrates should be administered before invasive strategies are advised.

Keywords: *coronary artery disease, coronary spasm; intracoronary nitrates; PCI, CABG.*

INTRODUCTION

Coronary spasm represents one of the pathophysiological mechanisms of myocardial ischemia, not only in variant angina, but also in ischemic heart disease in general, including stable angina, unstable angina, acute myocardial infarction and sudden death (1-3), and in patients with no obstructive coronary artery disease at all (4-5). The site of vasospasm leading to angina may not only be in a fixed location within a coronary artery but may also shift involving different segments of the same coronary artery or more than one vessel in the same patient (6).

Even if rare, fluctuating vasospasm in multiple segments of the coronary vessels may be the basis for recurrent and persistent angina.

Nevertheless, spontaneous multivessel or multisegment spasm, mimicking a severe obstructive coronary artery disease, has been infrequently described (7). This clinical situation may represent a therapeutic dilemma, mainly when coronary artery by-pass grafting is advised.

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This report raises the question of whether the routine use of intracoronary nitrates should be revaluated before invasive strategies are performed, even in patients with a history of chronic atherosclerotic coronary disease and an apparently straightforward indication for by-pass grafting.

CASE REPORT

We present the case of a simultaneous prolonged spasm of the left main (LM) and the left anterior descending artery (LAD) in a 59 year old man, who is a heavy smoker, with a history of hypercholesterolemia, chronic effort angina, and multivessel coronary artery disease. He previously underwent percutaneous coronary intervention (PCI) with paclitaxel-eluting stents implantation on the proximal LAD, obtuse marginal, and mid segment of the right coronary artery.
Two years after this procedure he returned to hospital with recurrent angina, responsive to sub-lingual nitrates (CCS II), and palpitations, even though on maximal beta-blocker therapy and anti-plated therapy. Coronary angiography was performed as exercise stress test resulted positive with symptomatic ST segment depression in leads V2-V6, associated with ventricular couplets. Right femoral approach with 5 French catheters was used. The coronary study showed: 80 % stenosis in the proximal segment of LM and in the mid of LAD (*Figure 1*), and 90 % stenosis of the posterior descending artery (PDA). There was no angiographic evidence of instent restenosis in the previously stented segments.
In front of an apparently clear progression of chronic multivessel disease, coronary artery by-pass graft was proposed, that the patient decisively refused. Therefore PCI of LM and LAD was decided. Before the procedure, because of the presence of ischemic EKG changes with symptomatic ST segment depression in leads V2-V6, nitrates were selectively infused in the left coronary artery. The angiographic control showed complete resolution of the critical stenoses of both LM and LAD (*Figure*

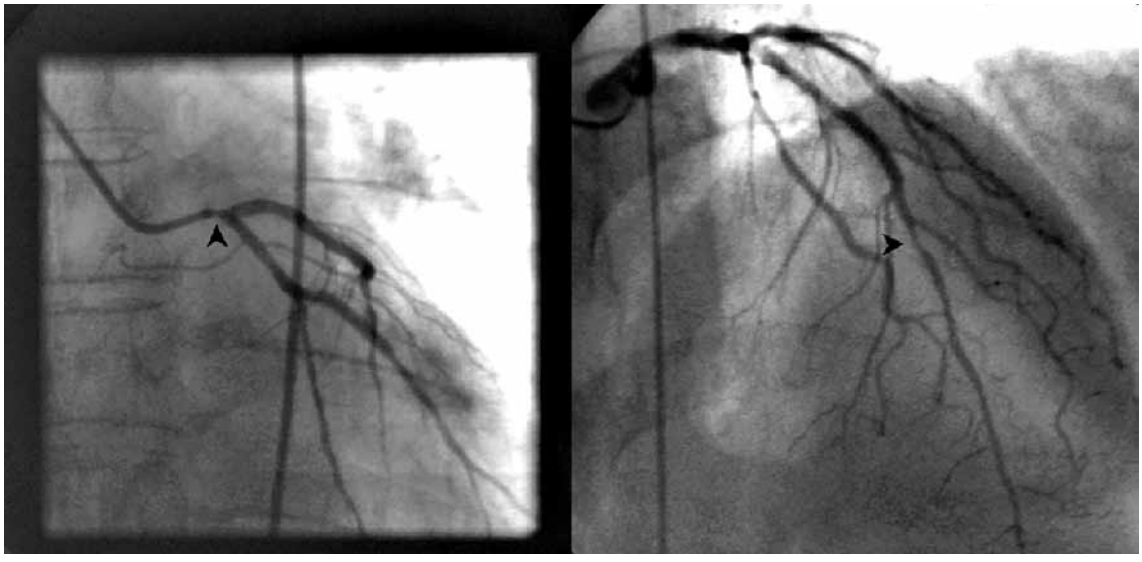

Figure 1
LM and LAD, 40° cranial / 5° RAO view. Femoral approach 5 French catheter.

2) with resolution of symptoms and EKG alterations. On the contrary, intracoronary nitrates in the right coronary artery did not resolve the PDA stenosis, that persisted unmodified (*Figure 3*). Therefore, patient was treated by PCI and a drug eluting stent was implanted on the PDA alone (*Figure 4*).
The patient was discharged with dual antiplated therapy, ACE-inhibitor, statin and long acting calcium channel blockers. Six

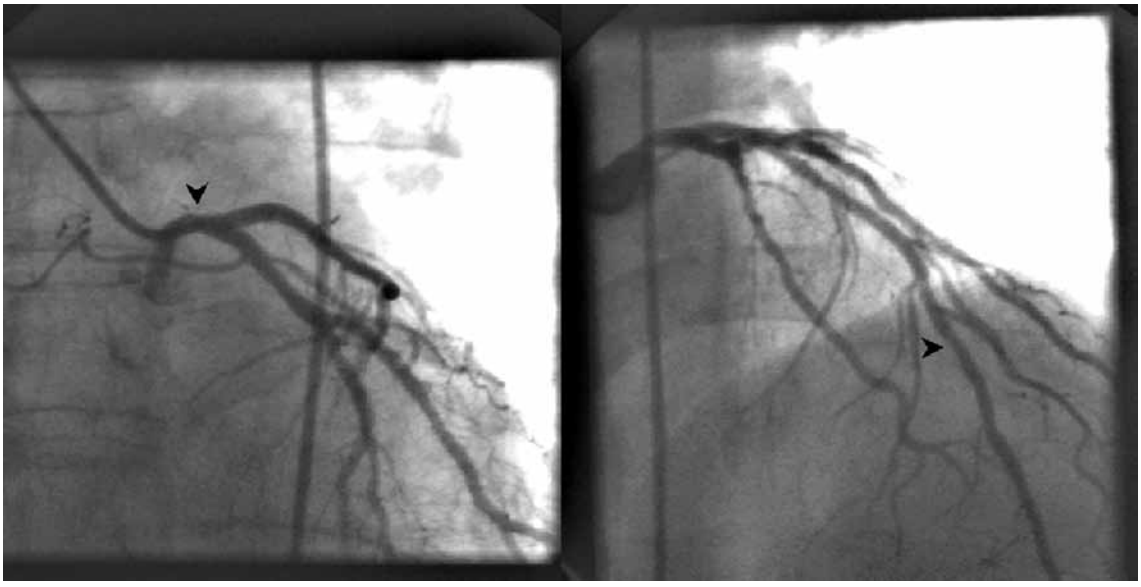

Figure 2
LM and LAD after intracoronary nitrates, 40° cranial / 5° RAO view. Femoral approach 5 French catheter.

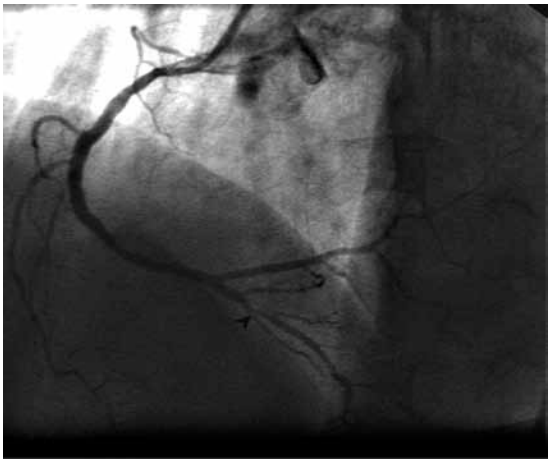

Figure 3
PDA of the right coronary artery after intracoronary nitrates, 25° cranial / 35° LAO view. Femoral approach 5 French catheter. The stenosis is unmodified.

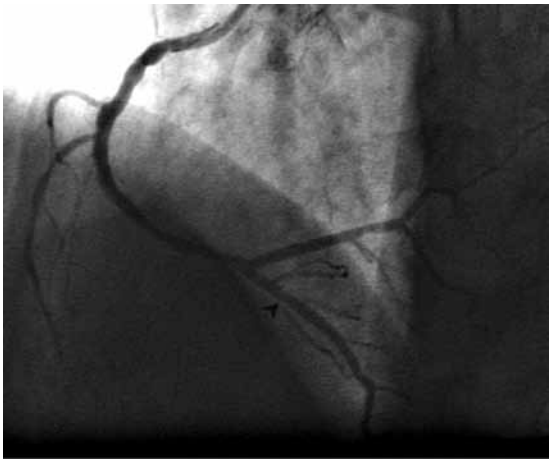

Figure 4
PDA of the right coronary artery after stenting, 25° cranial / 35° LAO view. Femoral approach 6 French guider catheter.

months later he was completely asymptomatic; a stress test was performed which resulted negative for myocardial ischemia.

DISCUSSION

The mechanism of coronary artery vasospasm is poorly understood. The focus of spasm is thought to be more common adjacent to atherosclerotic plaques and tends to occur in the proximal third of the coronary arteries corresponding to the historical high-risk zones for acute coronary occlusion. In addition, coagulability factors, endothelial vasoconstrictor factors, such as leukotrienes, serotonin and histamine, and the influence of autonomic nervous system are thought to cause contraction of the vascular medial smooth muscle (8).

The incidence of cigarette smoking is higher among patients with coronary spastic angina than among those with stable effort angina, in which diabetes mellitus and hypercholesterolemia are the most important risk factors.

Cigarette smoke, infact, markedly suppresses endothelium vasodilatatory factors and is associated with chronic low-grade inflammation (9).

Our report is interesting as it proves that even in patients with chronic coronary atherosclerosis with multivessel coronary artery disease, previously treated by PCI, recurrent episodes of angina, apparently suggesting coronary disease progression, can on the contrary be caused by multifocal spasm, mimicking a severe atherosclerotic pattern. Today, cardiologists resource to percutaneous coronary intervention more and more, therefore coronary spasm is often disregarded. Routine use of intracoronary nitrogliceryn may be considered time-consuming for a busy invasive-interventional lab. It should be kept in mind that the appearance of coronary vasospasm can mimick a stenosis suitable for stenting but is invariably reversed by intracoronary nitrates or verapamil (10).

It is well known that coronary artery vasospasm can be catheter induced (11-13), but we think this is unlikely in our case, because angiography was performed using a 5 French catheter. Moreover, the ST segment depression pattern induced during the exercise stress test was reproduced in an identical way.

Finally, catheter-induced spasm is generally limited to the proximal segments of the vessel and relieved only after the withdrawal of the catheter.

In conclusion, this case report shows that the presence of multivessel coronary artery disease, previously treated by PCI, may not exclude a superimposed dynamic component as a cause of coronary stenosis, in addition to atheroma progression. Vasospasm involving two anatomically different segments such as the LM and LAD may exist even if rare.

Thus, to rule out the presence of a superimposed dynamic component, intracoronary nitrates administration is always advisable, even in patients with multivessel disease and an apparently straightforward indication to coronary artery by-pass grafting, to avoid unnecessary coronary revascularization. In every cath-lab it is relatively frequent to perform coronary angiography in patients treated with CABG and to find functional graft occlusion because of the absence of critical stenosis in the native coronary vessels.

The latter is another good reason to stress the necessity to always administer intracoronary nitroglycerin before any interventional decision is made.

Acknowledgements
We are indebted to Nicole Cristell for excellent assistance in revising the English style.

No conflict of interest is acknowledged by the authors.

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