

Case Report

Optical coherence tomography reveals a non-spasm pseudo-coronary artery stenosis: a case report and review of literature

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Abstract: We described a case of angiographic stenosis that was highly suitable for stenting and it remained even after repeated intracoronary administration of nitroglycerin. However, optical coherence tomography showed the stenosis disappeared and the artery wall was smooth. It was therefore speculated that this was a just non-spasm pseudo-coronary artery stenosis. We hope that sharing this experience can aid cardiologists to avoid unnecessary implantation of stents.

Keywords: Optical coherence tomography, coronary spasm, coronary angiography, laminar flow

Introduce

Coronary spasm is defined as an abnormal contraction of an epicardial coronary artery resulting in myocardial ischemia [1, 2]. Several factors may precipitate coronary spasm, including physiological factors and pharmacological agents. Coronary spasm often occurs at rest, particularly from midnight to early morning. However, in the early morning, even mild exertion may induce coronary spasm [2]. Physical and/or mental stress, particularly the latter, for several weeks or months may induce coronary spasm, particularly at rest [3]. Exposure to cold, Valsalva maneuver and hyperventilation may also induce coronary spasm. Some research showed magnesium deficiency was associated with coronary spasm. Coronary spasm itself often induces coronary spasm, causing a vicious circle. Pharmacological agents include catecholamines, parasympathomimetic agents, anticholinesterase agents, ergonovine, serotonin, histamine, beta-adrenergic blocking agents, etc [4-6]. Furthermore, coronary spasm is often reported to occur in percutaneous coronary interventions and can be induced even solely by guide wire insertion. Cardiogenic shock caused by severe coronary spasm imme-

diately after stenting is frequently but not always resolved by local injection of nitroglycerin. Coronary spasm can lead to arrhythmia or even sudden death. Coronary spasm is estimated to involve 3%-4% of patients undergoing diagnostic coronary angiography for chest pain syndromes [7], and to complicate 1%-5% of balloon angioplasty procedures [8]. However, non-spasm pseudo-coronary artery stenosis can also be present. We described a case of angiographic stenosis that were highly suitable for stenting even after intracoronary administration of nitroglycerin, but the stenosis disappeared upon imaging by optical coherence tomography (OCT).

Case report

A 67-year-old female was admitted to the Department of Cardiology of Tongji Hospital (Tongji University, Shanghai, China) due to a feeling of tightness in the chest, palpitations and dyspnea for 1 month. She had a history of hypertension for 6 months but no diabetes mellitus. She told us that her highest blood pressure (BP) was 160/90 mmHg.

Upon physical examination on admission, the BP was 160/100 mmHg. Our initial diagnosis

A non-spasm pseudo-coronary artery stenosis

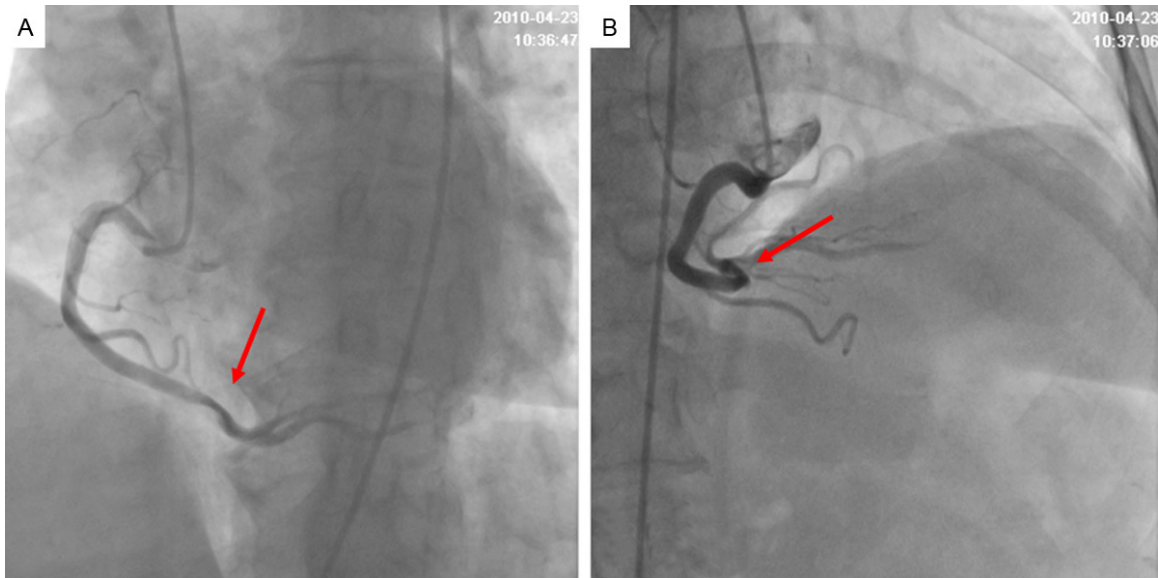


Figure 1. RCA angiography at different angles before intracoronary injection of nitroglycerin, A and B (arrow: filling defect).

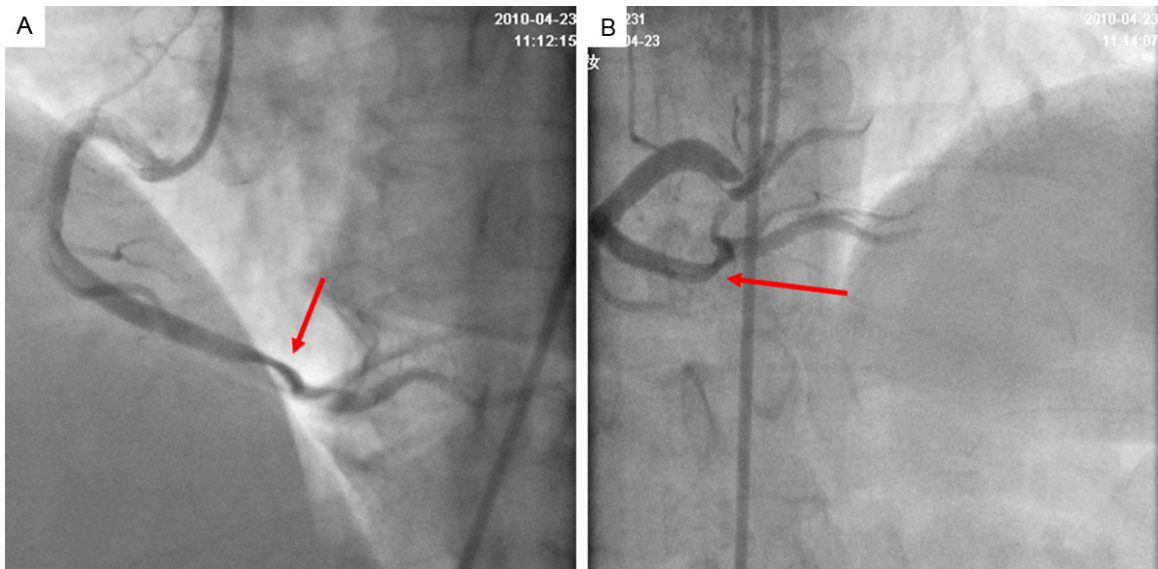


Figure 2. RCA angiography at different angles after intracoronary injection of nitroglycerin, A and B (arrow: filling defect).

was grade-2 hypertension (a very high risk group), but the diagnosis of coronary artery disease (CAD) could not be excluded. Then, coronary angiography was performed.

A limited filling defect of ~75% was found in the distal right coronary artery (**Figure 1**), and thus the spasm of this vessel was proposed. Immediately, an intracoronary injection of 400 µg of nitroglycerin was done. However, the filling

defect remained (**Figure 2**). Therefore, we speculated that the filling defect was ~75% stenosis. After obtaining consent from the patient and her family, the target artery was evaluated by using OCT as previously described [9, 10]. However, the stenosis in the coronary angiography was not observed during OCT. The intima of target artery was smooth and integrated, with no intima thickening. Plaques and/or thromboses were not found (**Figure 3**).

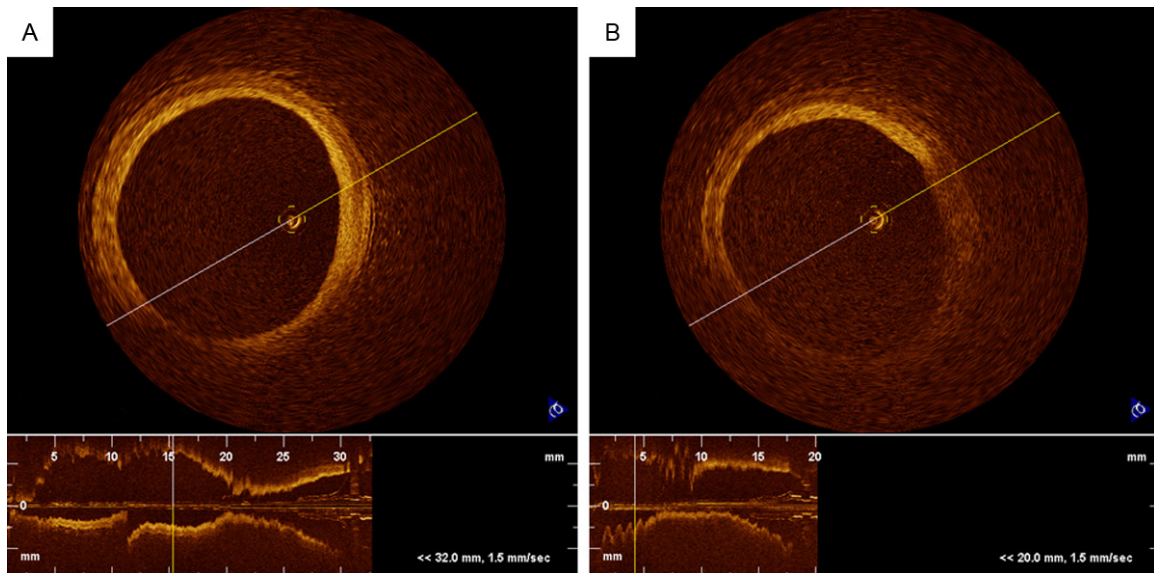


Figure 3. OCT image of the filling defect of the RCA. A and B are OCT images of different parts of the filling defect.

With respect to routine treatments, BP was strictly controlled. Aspirin was used for anti-platelet therapy. The patient felt well during the 3-month follow-up period.

Discussion

In this patient, one filling defect was found in the distal right coronary artery during the coronary angiography. This filling defect sustained after intracoronary administration of nitroglycerin. However, we did not immediately implant a stent in the distal right coronary artery (RCA), but the filling defect was assessed by OCT.

The finding was unexpected: the stenosis in the RCA, and even the intimal hyperplasia, was not observed in OCT. We proposed three reasons: (i) coronary spasm; (ii) blood laminar flow causing the filling of the local contrast agent was incomplete in the coronary angiography; (iii) regional blood flow was slow, and thus the contrast agent was not clearly seen.

Coronary angiography is a “gold standard” for the diagnosis of coronary heart disease, and is used to guide stent implantation [11]. Although we administered nitroglycerin and imaged the response, the stenosis remained. According to findings in coronary angiography and OCT, the patient did not meet the diagnostic criteria for coronary artery disease. She did not need sec-

ondary or tertiary prevention against coronary artery disease. Medical cost would be reduced greatly.

Coronary spasm can lead to arrhythmia and even sudden death [12]. During coronary angiography, the prevalence of coronary artery spasm is not low, particularly in the RCA [13]. Under most instances, such spasm is due to stimulation caused by the catheter; in general, the proximal blood vessels begin to spasm, and may extend [14]. Normal coronary spasm can be relieved after intracoronary administration of nitroglycerin [15]. In this case, nitroglycerin was given twice, but imaging showed the localized stenosis sustained. In general, the whole coronary artery become smaller at the spasm site [16]. In this case, the diameter of RCA was not significantly reduced. Hence, we thought spasm could not completely explain the stenosis.

There is no standard method for the coronary angiography. For instance, the injection rate, dose and pressure of the contrast agent are adjusted for individual patient. Most operators adjust these parameters based on their experience due to no unified criterion. With respect to this case, the laminar flow of the contrast agent may also be considered [17, 18]. This phenomenon occurs more often in an artery with large lumen and at a lower dose of contrast agent. In this case, if a larger catheter was used during coronary angiography, and/or the injection rate

of the contrast agent increased appropriately, this phenomenon would have been avoided, resulting in better clearer images.

Conclusion

We hypothesize that the filling defect in our case of non-spasm pseudo-coronary artery stenosis is closely related to the laminar flow of the contrast agent. We are not the first researchers to encounter this phenomenon in coronary artery angiography [19], but perhaps are the first to confirm pseudo-coronary artery stenosis using OCT. On the basis of our experience, a larger catheter used for coronary angiography, and/or appropriate increase in the injection rate of the contrast agent have the chance to avoid this phenomenon. We hope that sharing this experience can aid cardiologists to avoid unnecessary implantation of stents.

Disclosure of conflict of interest

None.

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