IMAGES IN CARDIOLOGY

Successful Percutaneous Coronary Intervention in Tandem Coronary Lesions with Subtotal and Chronic Total Occlusion

Antonis S. Manolis, MD, Evangelia Bei, MD, Petros Z. Stavrou, MD

First and Third Departments of Cardiology, Athens University School of Medicine, Athens, Greece
E-mail: asm@otenet.gr

Abstract

Percutaneous coronary intervention and stenting of tandem lesions of the left anterior descending coronary artery, one of which was a chronic total occlusion, was successfully performed in a symptomatic patient with extensive ischemia on myocardial scintigraphy with use of a standard antegrade approach and routine tools without the need to resort to elaborate techniques and sophisticated tools. ***Rhythmos 2018;14(1):10-12***.

Key Words: coronary artery disease; angina; myocardial ischemia; tandem coronary lesions; chronic total occlusion; revascularization; percutaneous coronary intervention; drug-eluting stents

Abbreviations: CTO = chronic total occlusion; DES = drug-eluting stent(s); LAD = left anterior descending (coronary artery); LV = left ventricular; PCI = percutaneous coronary intervention

An 80-year-old gentleman with history of hypertension and hypercholesterolemia who had been submitted to chest irradiation for lung cancer 20 years earlier, presented with symptoms suggestive of crescendo angina over the preceding several months which prompted his referral for a myocardial perfusion imaging test. The test was performed with use of 99m technetium (^{99m}Tc) sestamibi administered during pharmacologic stress and at rest. It was positive for extensive reversible perfusion defects predominantly in the territory of the left anterior descending (LAD) coronary artery involving the anterior, septal, apical, inferoapical and mid-inferior walls of the left ventricle (Fig. 1; 3 sets of images are displayed, during stress, both in supine and prone positions, and at rest in

ventricular (LV) ejection fraction (~60%) with no segmental wall motion abnormalities and aortic valve calcification with mild aortic stenosis. The 12-lead electrocardiogram (ECG) showed first degree atrioventricular block with repolarization abnormalities (biphasic/negative T waves in the anterolateral leads V4-6).

Subsequently, the patient was submitted to coronary angiography which revealed two tandem lesions of the LAD, a subtotal occlusion in the mid segment as seen in Figure 2, indicated by the thin arrows in panels A (left anterior oblique-LAO view with cranial angulation) and B (right anterior oblique view with cranial angulation) and a chronic total occlusion (CTO) in the early distal segment of the LAD, indicated by the thick arrows in the same views. The apical segment of the LAD was visualized via collaterals provided by the right coronary artery (Fig. 1, elbow arrow, panel C).

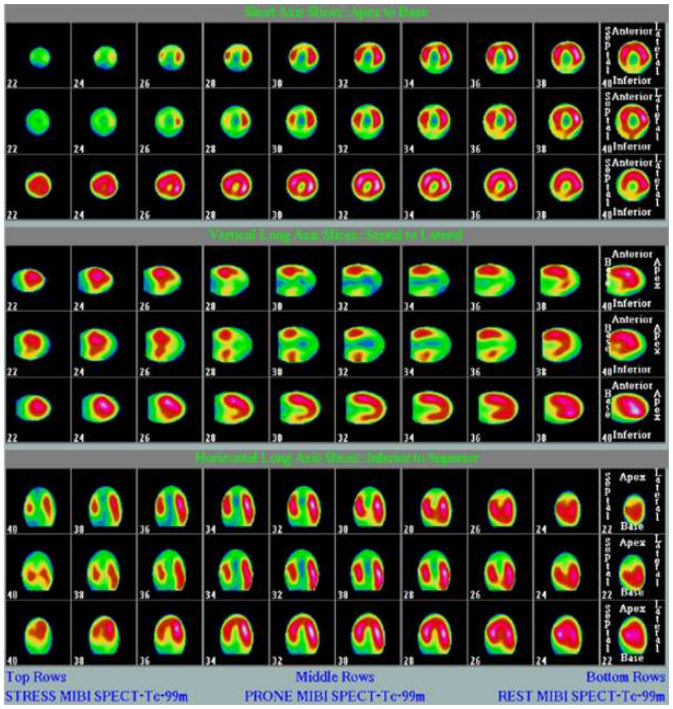

Figure 1

Upon completion of coronary angiography, ad-hoc percutaneous coronary intervention (PCI) of the LAD lesions was performed. A 6F extra back-up 3.5 guiding catheter was used to engage the left coronary ostium. The first lesion was easily wired with a 0.014″ floppy wire and pre-dilated with use of a 2/15 mm compliant balloon, while [illegible] during wiring the CTO at [illegible]pport of the balloon, the floppy wire finally crossed the CTO which was also pre-dilated using the same balloon. Subsequently, both lesions were stented with use of drug-eluting stents (DES) employing a technique of stent oversizing and high-pressure deployment;[1, 2] a 2.5/24 mm DES was placed in the CTO lesion and a 3/24 mm DES was implanted in the mid lesion (Fig. 2, panels D, E, F); a more proximal moderate lesion that was visualized after placement of the

stent in the mid-LAD (Fig. 2, asterisk, panel E) was dilated with use of direct stenting (Fig. 2, panel F). No complications occurred and the post-procedural course of the patient was uneventful; the patient was discharged home the next day on dual antiplatelet therapy. He has remained free of symptoms over the subsequent 2.5-month short-term follow-up.

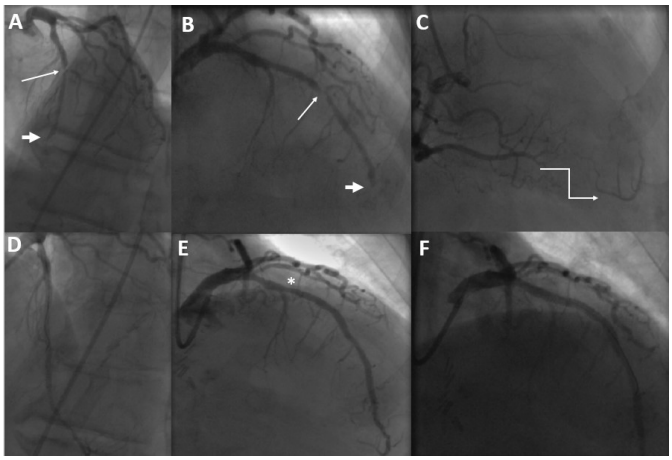

Figure 2

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Tandem-lesion PCI of the LAD has been reported to have a high success rate, however, no CTO has been present in these tandem lesions.[3] Total vessel occlusion as one of the tandem lesions has only been studied in the PERFECT-AMI study, wherein the total occlusion was acute and the totally occluded vessel was the infarct-related artery.[4] That study included acute ST-elevation myocardial infarction (STEMI) patients with tandem lesions in the culprit vessel, where a strategy of partial stent implantation for only the occluded segment during primary PCI improved post-procedural myocardial perfusion and LV function at the 6-month clinical follow-up. Interestingly, patients with partial coverage with a stent versus those with complete coverage of tandem lesions fared relatively well with similar rates of major adverse cardiac events. However, in our case, failure to recanalize the distally located lesion of total occlusion would have led to a futile angiographic result, as stenting of the proximal subtotal occlusion, with certainty would have led to proximal stent thrombosis due to lack of distal flow. Furthermore, the option of resorting to surgical revascularization in our patient was ruled out due to lack of a distal target.

Exercise-induced vasoconstriction has been shown in tandem lesions that may enhance effort symptoms, however, vasomotion of the proximal lesion is dependent on the severity of the second one; the more severe the distal stenosis, the less exercise-induced stenosis narrowing of the proximal lesion is observed.[5] Hence, one may assume that this mechanism could not have been responsible for our patient's symptoms, as the distal lesion was a CTO. Rather, the inadequacy of collateral supply to the distal LAD during exertion was most likely the mechanism of exercise-induced ischemia in our patient.

In symptomatic patients, a CTO, even with excellent collateral development, produces a persistently ischemic zone in its territory, which can be normalized by PCI.[6] This was fully confirmed in our case, wherein an extensive ischemic zone was demonstrated by myocardial scintigraphy (Fig. 1), despite functioning collaterals demonstrated during coronary angiography (Fig. 2, panel C). Furthermore, following successful PCI, our patient has been free of anginal symptoms over the short-term follow-up.

Although convincing evidence of survival benefit of CTO PCI remains elusive, recanalization has been shown to relieve symptoms, reduce ischemia, and improve left ventricular function.[7] Current guidelines recommend that PCI of CTO should be considered in patients with angina resistant to medical therapy or with a large area of documented ischemia in the territory of CTO (class IIa/level of evidence B).[8] However, again there are no available data regarding tandem lesions, when one of them is a CTO. There is one study of 173 CTO PCIs indicating that the presence of tandem occlusions, among other factors, was an independent predictor of procedural failure, however, the study has not provided any angiographic details.[9] Nevertheless, PCI of both tandem lesions was successful in our patient despite the presence of a CTO, which on its own presents a major challenge, and this was accomplished via the antegrade approach with use of routine PCI tools without the need to resort to elaborate techniques and sophisticated tools.[10]

In conclusion, a challenging PCI of tandem lesions of the LAD that included a CTO was successfully performed in a symptomatic patient with extensive ischemia on myocardial scintigraphy with use of an antegrade approach and routine PCI tools, providing relief of angina over the ensuing short-term follow-up.

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