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Case Report Open Access

Chronic Total Occlusion of the Left Main Coronary Artery in a 63-Year-Old Woman after Triple Coronary Bypass Surgery

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Abstract

Background: A 63-year-old female with a chronic total occlusion (CTO) of the left main coronary artery (LMCA) after multiple percutaneous coronary interventions (PCI) and triple coronary bypass surgery (CABG).

Investigation: physical examination, EKG, TTE, coronary angiography, appropriate lesion preparation before stenting of the LMCA.

Diagnosis: Multivessel coronary artery disease presenting as CCS third class with ostial LMCA chronic total occlusion and unsuccessful consecutive revascularization.

Management: Recanalization of the LMCA CTO, preparation of the lesion by rotational atherectomy, reverses T-stenting of LMCA.

Keywords: Coronary angioplasty; LMCA chronic total occlusion; Rotational atherectomy; Drug-eluting stent (DES)

Presentation of the Case

A 63-year-old female with high total cardiovascular risk (third degree hypertension according to the ESC, hyperlipidemia, impaired fasting glucose, body mass index of 31 kg/m^2), after endoscopic resection of a bladder tumor in 2000, with a complex history of both surgical and percutaneous revascularization interventions: CABG (coronary artery bypass graft) with left internal mammary artery to the left anterior descending artery (LIMA-LAD) and saphenous vein bypass to the marginal branch (SVG-Mg) in 2000, coronary angioplasty of the LAD because of occlusion of the arterial graft (in 2000 and 2001), angioplasty of the LMCA in 2003 (PCI LMCA/LAD/LCx), saphenous vein bypass to the LAD (reCABG SVG-LAD in 2008) and again vein bypass to the same branch (rereCABG SVG-LAD, short vein insert) in June 2012. On December 13, 2012 the patient was admitted to the Department of Interventional Cardiology of the John Paul II Hospital due to typical symptoms of angina (CCS functional class III), gradually increasing for the last three months. On admission, the patient was stable with no signs of circulatory and respiratory failure. A 12-lead ECG showed normal sinus rhythm at a rate of 70 bpm, intermediate cardiac axis and deep negative T waves in precordial leads V_{1-3}. Echocardiography revealed moderately impaired contractile function with left ventricular ejection fraction about 45%, normal thickness of the LV wall and mild mitral regurgitation. Pharmacotherapy consisted of 75 mg acetylsalicylic acid, nebivolol 5 mg, 10 mg perindopril, eplerenone 25 mg, furosemide 40 mg, rosuvastatin 40 mg. Coronary angiography showed chronic occlusion of the left main coronary artery and outgoing right coronary artery without critical changes (Figures 1 and 2). The saphenous vein graft to the marginal branch was patent, but the vein graft to the left descending artery was critically narrowed in the distal anastomosis (Figure 3).

Based on the local Heart Team decision, the patient was qualified for percutaneous LMCA recanalization. Despite unfavorable angiographic image (ostial occlusion of LMCA, blunt), the only technique available in this case was antegrade recanalization. Reverse artery reentering (retrograde recanalization) was out of the question, since the collateral circulation to LAD was from the last patent (the only remaining) ipsilateral artery (SVG MG). The procedure was performed using a guiding Extra Backup Launcher catheter 4.0/7F (Medtronic, Minneapolis, MN, USA) and coronary guidewires 0.014"

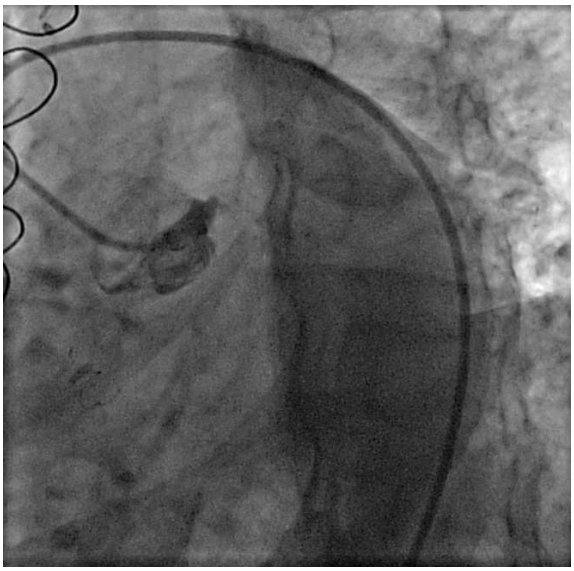

Figure 1: Coronary angiography. Chronic total occlusion of the left main coronary artery.

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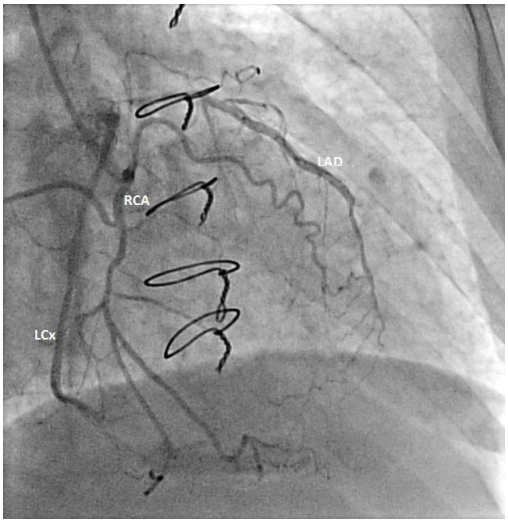

Figure 2: Coronary angiography. The outgoing right coronary artery without critical lesions; perfect retrograde flow to LAD and LCx

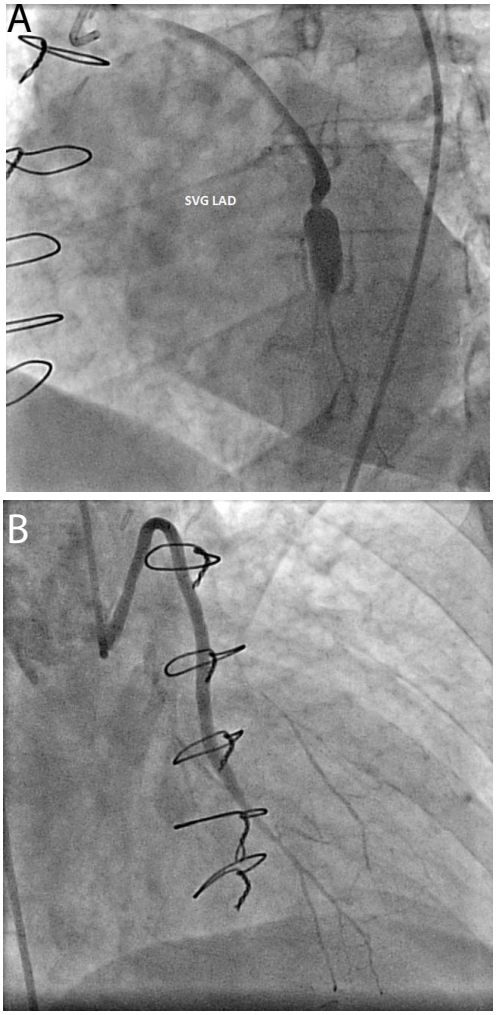

Figure 3: Coronary angiography showed normal venous graft to marginal branch (a) and critically narrowed venous graft to the distally poor left descending artery (b).

CrossIT-200 (Abbott Vascular, Santa Clara, CA USA), Asahi Fielder XT (Asahi Intecc, Nagoya, Aichi, Japan) and Whisper ES (Abbott Vascular, Santa Clara, CA, USA). Primary coronary occlusion was forced by the coronary wires, but despite multiple attempts, they were not placed in true lumen (Figure 4) and the procedure was deferred. Finally, after four weeks, another attempt was made, using a guiding Extra Backup Launcher catheter 3.5/7F. The lesion in LMCA was passed through with an Asahi Fielder XT 0.014“ wire and the transition to the true lumen of LAD was successfully achieved. The CTO dedicated balloon catheters CTO across RX 1.1/6 mm, and then CTO across OPEN 1.1/15 mm (Acrostak, Winterthur, Switzerland) were passed through LMCA and the proximal segment of the LAD with difficulties. Minimal lumen diameter and inflow from the pre-stenotic segment were achieved in the proximal segment. However, the next balloons failed to reach the distal segment of the artery because of the obstruction due to massive calcification. Using the FineCross MG microcatheter (Terumo, Shibuya, Tokyo, Japan), 0.014” the classic wire was switched to 0.009“ Rotawire Extra Support (Boston Scientific, Natick, MA, USA). Then rotational atherectomy with 1.25 mm burr was effectively performed in the main trunk and proximal LAD. The next step was the use of sequential high pressure balloon dilations with noncompliant catheters (NC Quantum Apex™ 2.5/12 mm from Boston Scientific, Natick, MA, USA) in the LAD and then in the proximal part of the LCx (NC Quantum Apex™ 2.5/20 mm from Boston Scientific, Natick, MA, USA) (Figure 5). To cover the ostium of the LM, the everolimus eluting stent Promus Element Long 3.5 mm/38 mm (Boston Scientific, Natick, MA, USA) was implanted in the LAD (Figure 6). Then another everolimus eluting stent Promus Element 3.5 mm/16 mm (Boston Scientific, Natick, MA, USA) was deployed in the ostium of the circumflex branch (reverse T-stenting). The procedure was optimized by noncompliant, high pressure balloon dilatations including a large size balloon catheter (NC Quantum Apex™ 4,0/15 mm (Boston Scientific Natick, MA, USA) in the LMCA and finally „kissing balloons“ inflation. The optimal angiographic result was achieved with proximal stent protrusion to the aorta, without residual stenosis or dissection and good peripheral flow (Figure 7). The method of stent expansion and apposition of both

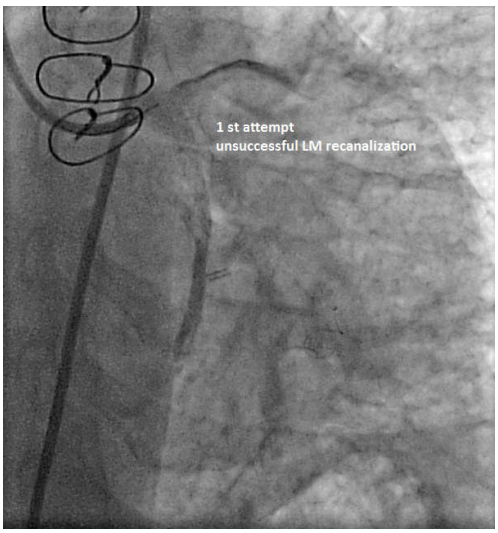

Figure 4: Final result after 1st attempt. Primary coronary occlusion was forced by the coronary wires. The wires are not in the true lumen of artery.

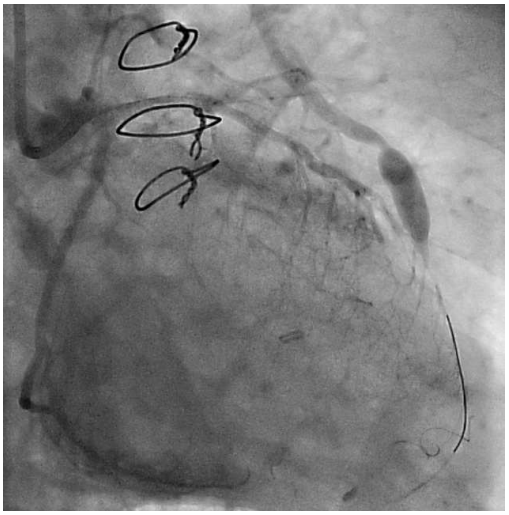

Figure 5: The left coronary artery after CTO recanalization and optimal lesions preparation (rotational atherectomy and sequential high-pressure NC catheters inflation).

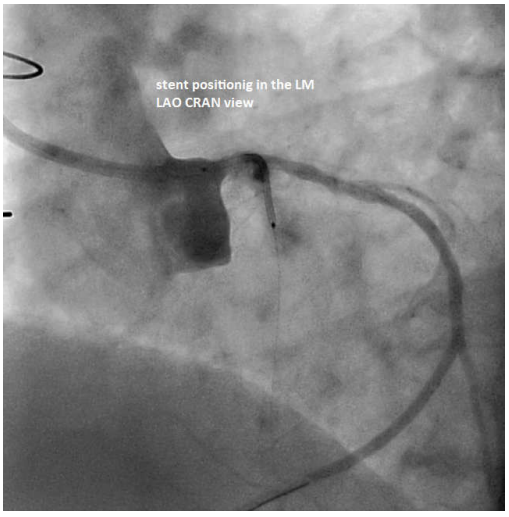

Figure 6: Stent positioning in the left main coronary artery. The optimal view in LAO CRAN.

stents was evaluated further using the option CLEARstent (Siemens Erlangen, Germany). The total procedure duration was 3 h 30 min, the total radiation dose was up to 2 Gy and the amount of contrast acceptable 400 ml (Omnipaque, GE Healthcare, Carrigtohill, Cork, Ireland). We did not observe (within 48 h) any increase in renal parameters. Six months after PCI, the patient did well and did not report any angina symptoms, her exercise tolerance was improved. Repeat coronary angiography (Figures 8 and 9) and intravascular imaging confirmed a good result of percutaneous intervention with an optimal apposition of previously implanted stents. MLA at LM is above 7 mm^2 (10.0 mm^2 in this case), which was an optimistic long-term prognostic factor (Figure 10). Currently (two years after index PCI), the patient has normal exercise tolerance and classic exercise treadmill test with the workload of 9 METS does not show any signs of impaired coronary reserve.

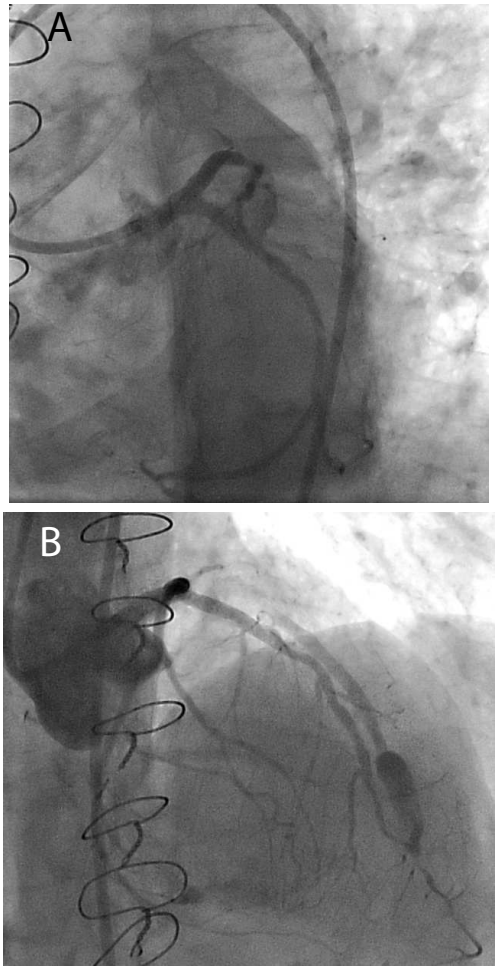

Figure 7: (A) The optimal final result (LAO CAUD) was achieved with proximal stent protrusion to the aorta, without residual stenosis or dissection and good peripheral flow.
(B) The optimal final result (AP CRAN) was achieved with proximal stent protrusion to the aorta, without residual stenosis or dissection and good peripheral flow

Figure 8: Late angiographic result (6 m. FUP, LAO CAUD) after CTO recanalization of the left main coronary artery.

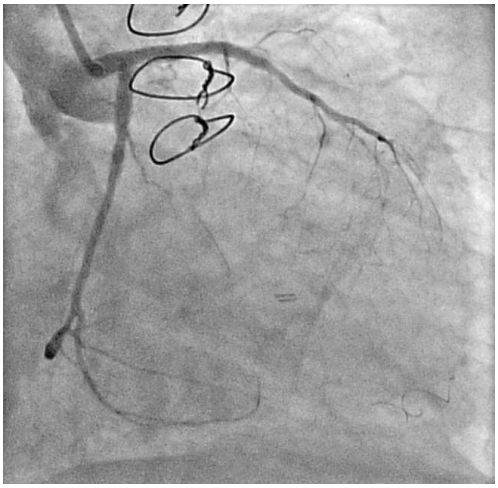

Figure 9: Late angiographic result (6 m. FUP, LAO CAUD) after CTO recanalization of the left main coronary artery.

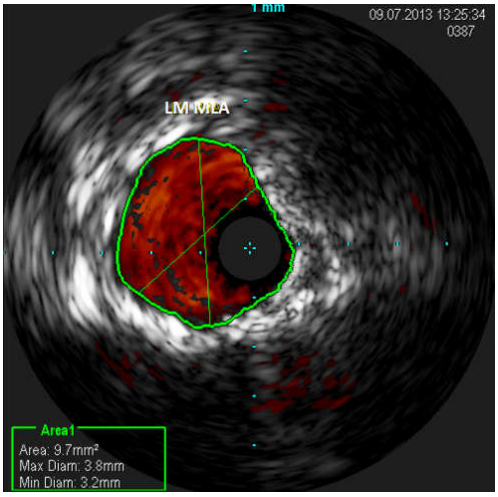

Figure 10: Late ultrasound result (6 m. FUP) after CTO recanalization of the left main coronary artery.

Discussion

According to the current guidelines on myocardial revascularization, qualification for invasive treatment of coronary artery disease should be supported by and documented with the results of patient interview and non-invasive tests to confirm ischemia and/or myocardial viability in the region of the affected coronary artery [1]. The choice of treatment strategy (surgical, percutaneous revascularization or conservative treatment) must be preceded not only by detailed analysis of angiographic anatomy of the coronary arteries, but also by the assessment of comorbidities and patient's preferences. Since the first PCI of the CTO performed in 1982 [2], the number of these technically difficult procedures has increased significantly. In 2005 only 10-15% of patients with CTO qualified for PCI as most CTO patients underwent cardiac surgery or conservative treatment [3]. Due to the development of advanced and dedicated devices as well as new techniques and, in particular, the growing experience of operators, the number of CTO recanalization procedures significantly increased and the effectiveness of PCI CTO reached approximately 80-90% [4-6]. Long-term results of successful recanalization of CTO are contradictory [7-10], but a meta-analysis published in 2012 underlines the improvement at 5 years after effective CTO recanalization by showing a significant reduction of mortality [11]. CABG is still conventionally considered as a treatment of choice and the standard procedure performed in patients with unprotected LMCA stenosis without acute coronary syndrome (ACS) [12]. CABG surgery is associated with better survival rates and significantly reduces the need for repeat cardiac revascularization, although the effects are achieved at an increased risk of cerebrovascular events [13]. Moreover, PCI in unprotected LMCA stenosis should be considered, especially in the presence of favorable anatomical conditions, clearly defined by classification used in the SYNTAX trial [14]. In this case, PCI as an alternative to CABG might be of benefit because reCABG is associated with increased postoperative complication rate and mortality [1]. Additionally, our patient (previous CABG twice) did not have LIMA for optimal LAD grafting. There is a tendency now to use the radial approach in PCI, especially in ACS-patients as it reduces the bleeding complications. However, in a case like ours, with the need to use a large guiding catheter (for larger internal lumen and better system support), the preferred technique is femoral access, which is used in more than 90% of similar interventions in Europe [8]. The technical aspects of percutaneous interventions include a rigorous assessment of the atherosclerotic lesion length, its duration, and the severity of calcifications and the presence of bifurcation. Atherosclerotic lesions in the LMCA are located most often in the ostium or the distal shaft. They are usually calcified and fibrotic with increasing severity in the elderly [15]. Therefore, the classical technique of „antegrade" CTO recanalization can be upgraded with rotational atherectomy [16]. In the context of aging population and higher survival rates in patients with chronic kidney disease, rotablation is becoming more common. In this particular case, the use of rotational atherectomy might be of benefit also because of possible plaque debulking, reduction of vessel stress and lowering the risk of the plaque displacement [17]. This finally may result in the lower restenosis rate [18]. The current clinical guidelines recommend the use of antiproliferative drug eluting stents [19-22].

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