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Case Reports

Acute thrombosis during left main stenting using tap technique in a patient presenting with non-ST-segment elevation acute coronary syndrome ☆

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ABSTRACT

This case reports the sudden development of large burden of thrombi in the left anterior descending coronary artery immediately following distal left main stenting using TAP technique in a middle aged man who presented with non ST-segment elevation acute coronary syndrome despite having been administered 7,500 units of unfractionated heparin and being given 325 mg of aspirin and 60 mg of prasugrel prior to the procedure. The thrombi were managed effectively by giving an intra-coronary high bolus dose of tirofiban (25 mcg/kg) without the need for catheter thrombus extraction. Tirofiban intra-venous infusion was maintained for 18 hours, and the patient was discharged in stable condition on the third day. Importantly there is no controlled study on upstream administration of glycoprotein IIb/IIIa inhibitors in addition to the newer more potent anti-platelet agents in patients with unprotected distal left main disease presenting with non ST-segment elevation acute coronary syndrome, nor is there any data on safety and efficacy of mandatory usage of injectable anti-platelet agents at the start of a procedure in a catheterization laboratory in such a setting.

1. Introduction

Coronary artery bypass graft surgery continues to hold its preeminent position as treatment of choice for significant unprotected left main stem (UPLMS) artery disease. Recent randomized trials have however suggested that PCI may be considered reasonable alternative to CABG if the anatomy of LM disease is suitable and in acute coronary syndrome settings [1–6]. The SYNTAX trial randomly assigned 705 patients with distal LM disease to CABG or PCI, and at 5 years follow up rates of death (CABG = 14.6% vs. PCI = 12.8%; P = 0.53) and myocardial infarction (CABG = 4.8% vs. PCI = 8.2% P = 0.10) were not significantly different. There were more strokes with CABG than PCI (15% vs. 4.3%; P = 0.03), but repeat revascularization were lesser in the surgery patients (15.5% vs. 26.7%; P < 0.001) and no significant difference in overall major cardiovascular and cerebral events (MACCE). Importantly MACCE rates were comparable in the lower (0–22) and intermediate (22–32) SYNTAX score tertiles.

There is paucity of data on PCI intervention in acute coronary syndrome (ACS) settings when surgery may be contraindicated [7–9]. This case report describes the treatment of large thrombi suddenly appearing in the LAD artery soon after distal left main stenting using the T and protrusion (TAP) stenting technique in a patient who presented with an impending myocardial infarction.

2. Case presentation

A 55 year old hypertensive man who had been smoking for the last 4 decades was admitted in the ER with severe retrosternal chest pain, radiating to both arms, for the previous 2 hours. His pain was not relieved with sublingual nitroglycerin. On examination his heart rate was 78/minute, respiration 22/minute, O2 saturation at room air was 92%, there were minimal basal crackles in both lungs, and a loud fourth heart sound. His 12 lead ECG showed sinus rhythm, ST segment coving in leads L1, AVL, V4-V6 accompanied with T wave inversion in these leads (Fig. 1). Troponin T was positive, CK was 1,700 units and CK-MB 215 units. The 2D colour Doppler echocardiogram revealed global hypokinesia of the left ventricle, left ventricle ejection fraction of 40%, with mild mitral regurgitation.

The patient was wheeled into the cath lab after pre-loading with 60 mg prasugrel and 300 mg of aspirin. He received 7,500 units of unfractionated heparin and underwent coronary angiography from the right femoral route, which revealed 70% distal left main (LM) stenosis, and 70–80% ostial blocks of the left anterior descending (LAD) and left circumflex (LCX) arteries (Figs. 2–3), (video 1).The right coronary artery had a 50% stenosis at mid level (Fig. 4). The patient was continuing to have chest pain despite prior administration of intra-venous morphine in the ER. He however was in a position to give informed consent for primary percutaneous intervention (PCI) subsequent to explaining that PCI would be a viable alternative keeping in view the urgency of intervention in his condition.

A 7 Fr EBU guiding catheter was employed to engage the LM artery and two BMW 0.014" wires were placed in the distal LAD and LCX arteries. The LM-LAD lesion was pre-dilated with a 2.5 × 15 mm balloon, and

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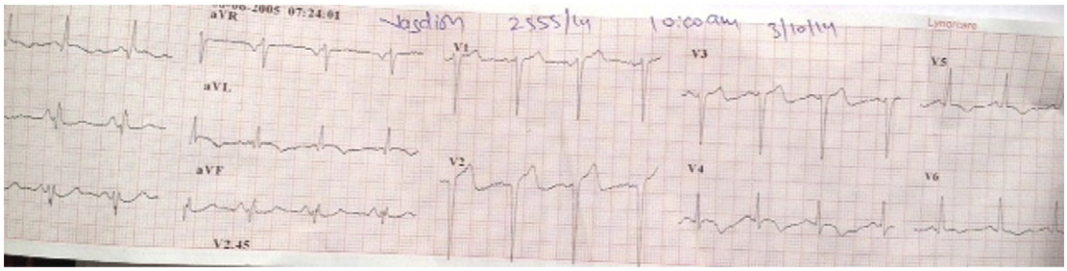

Fig. 1. 12 lead electrocardiogram demonstrating ST segment coving and T wave inversion in L1, AVL, V4-V6.

a 3 × 18 mm zotarolimus eluting stent (ZES) was deployed covering the LM and LAD stenosis (Fig. 5). Proximal optimization was done by placing a 3.5 × 9 mm non-compliant (NC) balloon at the bifurcation of the LM artery and inflating it to 10 atm(Fig. 6). One more BMW wire was negotiated through the distal struts of the LM-LAD stent into the LCX artery (Fig. 7), and the jailed wire was withdrawn. The struts at the LCX artery ostium were opened by a 2 × 12 mm balloon; a 3 × 15 non-compliant balloon was parked in the LM-LAD stent across the LCX ostium, and then a 2.75 × 22 mm ZES was positioned such that its proximal marker was at the lower shoulder of the carina and in between the 2 markers of the balloon parked within the LM-LAS stent (Fig. 8), (video 2). The LCX stent was deployed at 14 atm, the balloon was withdrawn into the LM-LAD stent, and kissing done with the parked LM-LAD balloon at 10 atm (Fig. 9).

A check shot done at this stage of the procedure demonstrated fully expanded LM-LAD and LCX stents with brisk TIMI 3 flow into both arteries, but large fragments of thrombi appeared in the LAD artery (Fig. 10), (video 3). The patient complained of chest discomfort, and this was accompanied with slight lowering of heart rate and drop in blood pressure. An intra-coronary (IC) bolus injection of tirofiban (25 mcg/kg) was immediately administered, and this rapidly completely lysed the thrombi in the LAD artery (Figs. 11–12), (video 4).

The patient was shifted to the CCU on intra-venous tirofiban infusion for the next 18 hours. His further stay in hospital was unremarkable, and he was discharged on the third day in stable condition on aspirin, prasugrel, atorvastatin, ramipril and metoprolol.

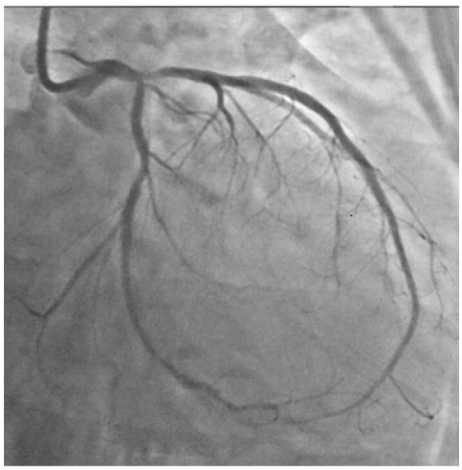

Fig. 2. Right anterior oblique caudal view coronary angiogram showing significant distal left main disease involving ostia of left anterior descending and left circumflex arteries.

3. Discussion

The Premier of Randomized Comparison of Bypass Surgery vs. Angioplasty Using Sirolimus-Eluting Stent in Patients with Left Main Coronary Artery Disease (PRECOMBAT) trial randomized 600 patients with LM disease to PCI or coronary surgery. The one year composite rate of death, myocardial infarction or stroke was similar for both groups (3.3% for PCI and 4% for CABG; P = 0.66). Similar clinical outcomes were maintained at 2 years (mortality of 2.4% with PCI vs. 3.4% with CABG; P = 45) [10]. This case, however, reports T (and protrusion) stenting in a patient presenting with impending anterior ST-elevation with distal LM stenosis involving ostia of the LAD and LCX. A recent British registry has reported mortality as high as 28.3% at 30 days. Risk of

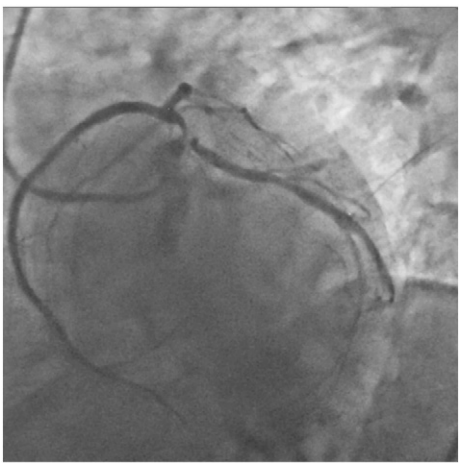

Fig. 3. Left anterior oblique caudal view coronary angiogram showing severe stenoses of distal left main coronary artery, ostial left anterior descending and ostial left circumflex arteries.

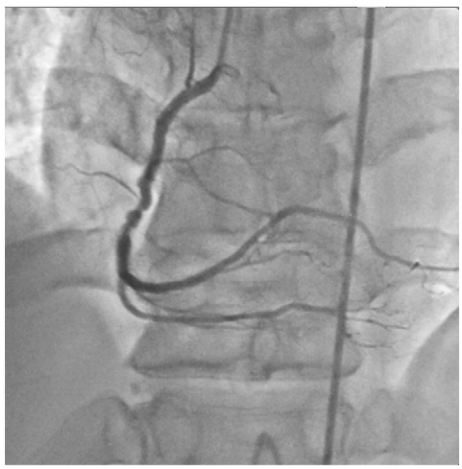

Fig. 4. Right coronary artery with a non critical block in mid-segment.

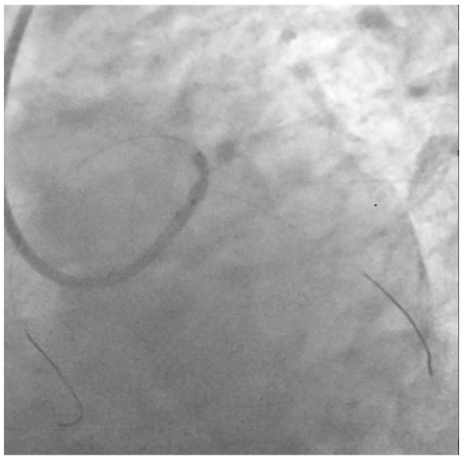

Fig. 5. A 3 × 18 mm zotarolimus eluting stent being deployed from left main to left anterior descending artery; 2 0.014" BMW wires are placed in distal left anterior descending and left circumflex arteries.

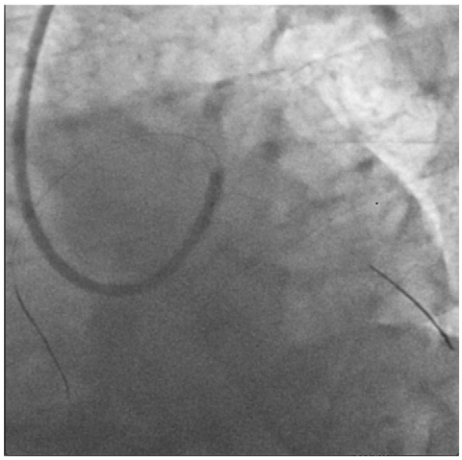

Fig. 6. Proximal optimization of left main-left anterior descending stent being done with a NC 3 × 9 mm balloon at 10 atm; this opens the struts of the stent into ostia of left circumflex artery and prevents a guide wire from going in between the stent and left main artery.

30-day mortality was significantly greater in patients with ST-elevation myocardial infarction and non-ST elevation acute coronary syndrome (NSTEACS) than in patients with chronic stable angina. Patients with

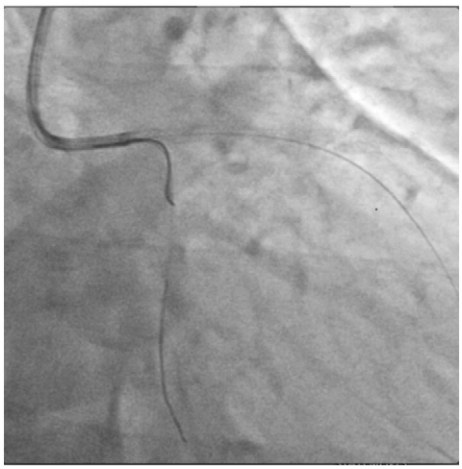

Fig. 7. Another 0.014" BMW wire is easily negotiated through distal struts of left main-left anterior descending stent into left circumflex artery.

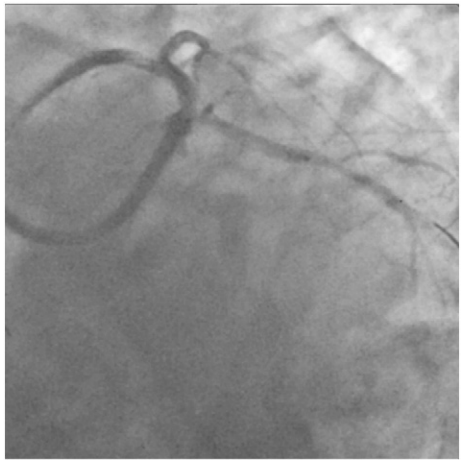

Fig. 8. A 2.75 × 22 mm zotarolimus eluting stent is positioned such that the proximal marker is at the lower shoulder of the carina, and in between the markers of a 3 × 15 NC balloon parked in the left main-left anterior descending stent, so as to fully cover the ostium of the left circumflex artery.

STEMI presenting with shock (more than 40%) had greater mortality at 30-days than patients without shock (52.0% vs. 11.7%). Patients with UPLMS presenting with STEMI or NSTEACS are at greater risk of death than stable angina elective cases [11].

The British registry reports that femoral access was used in two-thirds of patients, bare metal stents were used in 36% of STEMI and in 25% of NSTEACS patients, and intra-vascular ultrasound (IVUS) was used more frequently in elective cases (CSA:36%, STEMI:14.6% and NSTEACS: 30%). An intra-aortic balloon pump was inserted in 39% of STEMI and in 17% of NSTEACS patients. Glycoprotein IIb/IIIa inhibitor abciximab was used in 60% STEMI, 29% NSTEACS and in 24% CSA patients. A meta-analysis of 24 studies (including 14,203 patients) looked at clinical outcomes when PCI with drug eluting stents was compared with CABG in unprotected left main disease and concluded that PCI with DES was a safe and durable alternative to CABG for unprotected LM disease at 1 year [12]. The current American College of Cardiology/American Heart Association guidelines have upgraded PCI of unprotected LM disease from Class III indication in 2006 to a Class IIb indication in 2009, and to class IIa indication in 2011, when surgical risk is high and anatomy is favorable [6].

Facilitated PCI for STEMI or the administration of pharmacological substances before primary PCI, have been found not to offer clinical benefits over primary PCI, and in fact resulted in increased bleeding

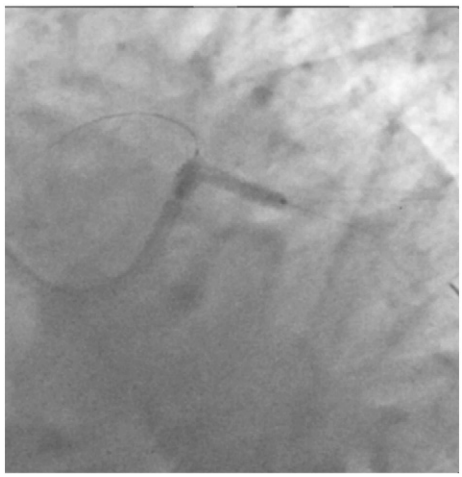

Fig. 9. Kissing balloon being done subsequent to deployment of the left circumflex artery stent at 14 atm with the NC balloon that was parked in the left main-left anterior descending stent.

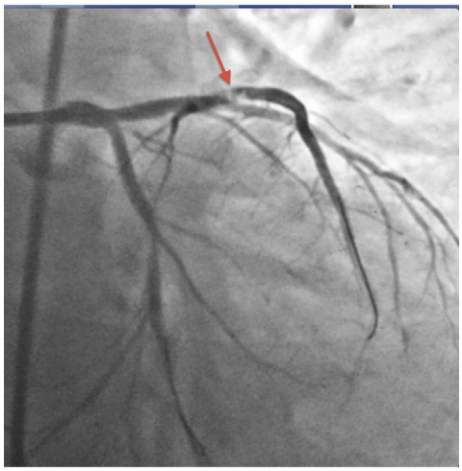

Fig. 10. Sudden appearance of large thrombus burden in mid left anterior descending coronary artery almost immediately after deployment of left main-left anterior descending and left circumflex artery stents.

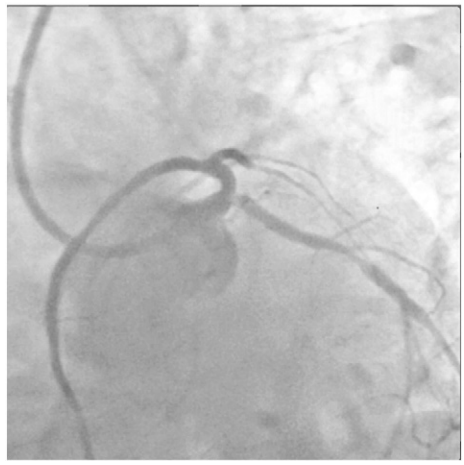

Fig. 12. Check shot in left anterior oblique caudal view demonstrating fully expanded stents in left main-left anterior descending and left circumflex arteries with no residual stenosis and brisk TIMI 3 ante-grade flow.

complications [13,14]. More than 2,400 patients with STEMI were randomized to 3 groups; early treatment with abciximab plus half dose reteplase (combination facilitated PCI, abciximab alone) (abciximab-facilitated PCI, and abciximab administered immediately before the procedure (primary PCI)), by the FINESSE investigators. There was no improvement in clinical outcomes either with combination facilitated PCI or abciximab facilitated PCI compared to primary PCI [15]. A couple of years later a randomized study using high bolus dose (HBD) of tirofiban used early in the ambulance concluded that clinical outcomes were improved with HBD tirofiban in STEMI patients with a trend toward reduced mortality [16].

The introduction of new anti-platelet agents such as prasugrel and ticagrelor having quicker onset and more powerful anti-platelet effects than clopidogrel may challenge the use of GPI's in STEMI. Both new agents have shown lower clinical events including stent thrombosis than clopidogrel. In the TRITON-TIMI 38 (Trial to Assess Improvement in Therapeutic Outcomes by Optimising Platelet Inhibition with Prasugrel–Thrombolysis in Myocardial Infarction 38) operators used GPI's in 60% of patients, while in the PLATO trial with ticagrelor 40% of patients were administered a GPI. There was however little clinical improvement with the addition of a GPI to prasugrel in the TRITON study, nor was there excess bleeding [17–19].

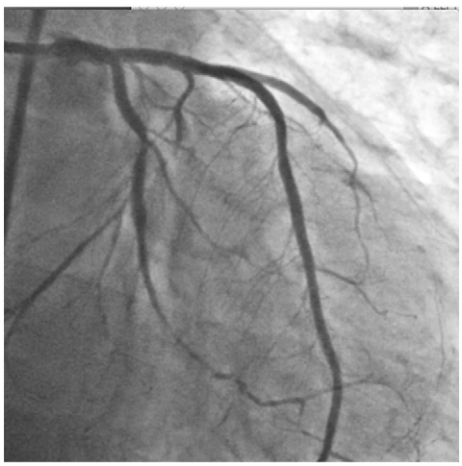

Fig. 11. Right anterior oblique caudal view soon after high bolus dose of intra-coronary tirofiban into the left anterior descending artery showing fully expanded stents; TIMI 3 flow; and no coronary dissection.

There is however little or no randomized data on safety and efficacy of GP IIb/IIIa inhibitors (GPI) in patients with LM disease in the setting of acute coronary syndrome, particularly patients presenting with NSTEACS. The patient presented in this case report presented with ongoing severe chest but without classic ST-segment elevation in his ECG. His cardiac enzymes were substantially raised and should ideally be placed somewhere in between STEMI and NSTEACS. Multiple thrombi developed in his LAD artery soon after TAP of distal LM stenosis involving Ostia of LAD and LCX arteries, despite prior administration of 7,500 units of unfractionated heparin, oral intake of 325 mg aspirin and 60 mg prasugrel. This was successfully managed with intracoronary high bolus injection of tirofiban, without in this case the need for catheter thrombus extraction. There is need for randomized trials to assess the timing, safety and efficacy of GPIs in patients with LM disease presenting with acute coronary syndrome, who have received the prasugrel or ticagrelor. This case report suggests added value in the catheterisation laboratory of GP IIb/IIIa inhibitors in patients who have been administered the newer more potent rapid onset anti -platelet agents, albeit the European guidelines emphasise that there is overall no evidence of benefit in upstream administration of GPIs [5].

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