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Iatrogenic Dissection of Left Main-Stem during Primary PCI for Inferior STEMI: A Catastrophic Complication

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ABSTRACT:

Coronary artery dissection is a rare but well-recognized complication of coronary angiography with high morbidity and mortality rate. We present the case of a 54-year-old male who experienced iatrogenic left main-stem (LMS) dissection during transradial coronary angiography for inferior STEMI. The patient was successfully treated by prompt bail-out stenting. Intracoronary stenting is of value in stabilising the patients before emergency bypass surgery and can save lives in LMS complications.

Key words: left-main stem dissection, coronary angiography

INTRODUCTION

Coronary artery dissection may occur during diagnostic coronary angiography but most often during therapeutic coronary interventions. It is defined as the separation of the media by hemorrhage with or without an associated intimal tear. Clinically significant dissection is reported only 0.1%.[1] Dissection may be extensive and may lead to vessel closure or perforation. The causes of dissection include guiding catheter, guide-wire, over-inflation of balloon and stent.[2,3] We present a case of iatrogenic Left Main Stem (LMS) dissection during a diagnostic transradial coronary angiography in a patient with inferior STEMI.

CASE REPORT

A 54 year old nondiabetic, normotensive, dyslipidemic gentleman with positive family history for IHD presented to Emergency department of Ibrahim Cardiac Hospital & Research Institute with the complaints of severe central chest pain for last 6 hours. His ECG showed acute STEMI inferior with RV infarction. Loading dose of Dual Antiplatelet Therapy (DAPT) was given. The patient was sented to the cath lab for primary percutaneous coronary intervention (pPCI) within 40 minutes of presentation. Bed side echo revealed Left Ventricular Ejection Fraction (LVEF) of 50% with inferior wall hypokinesia. Biochemical parameters were within normal range. Cardiac biomarkers were raised. Coronary Angiogram (CAG) done through transradial approach showed 90% stenosis in RCA with plaque burden in its mid part (Fig 1). Left sided engagement was impossible by conventional 5 Fr TIG diagnostic catheter. So, a 5 Fr XB 3.5 guiding catheter was taken to engage left system which is a regular and effective practice in our cath lab. The catastrophe happened there. Left main-stem showed catheter induced dissection (Fig 2). Left anterior descending (LAD) and left circumflex (LCx) were otherwise disease free.

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The patient had severe chest pain. But still the hemodynamics was not compromised. The case was discussed in an emergency consultation between the interventional cardiologists and the cardiac surgeons. Leaving pPCI to RCA, we had to jump for fixing the dissection of LMS. The strategy was to wire both the LAD and the LCx, followed by intravascular ultrasound (IVUS) imaging of the LAD in order to confirm the correct position of the wire in the true lumen and to seal the dissection by bailout stenting. Insertion of an intra-aortic balloon pump was considered as a supportive option, but finally not needed. A 6 Fr JL 4.0 guiding catheter was used to promptly engage the ostium of the LM, and two Sion Blue guide wires were advanced through the LCx and LAD.

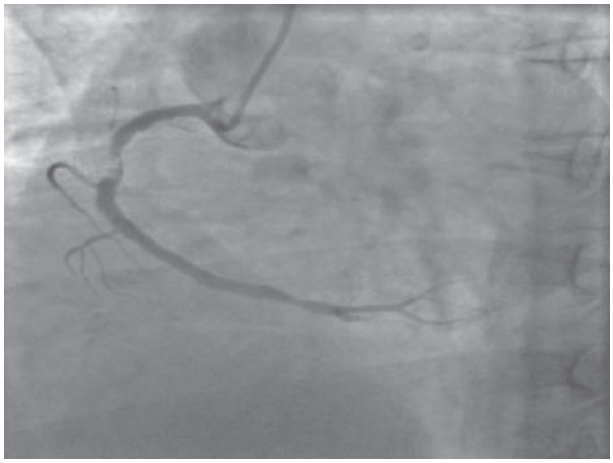

Fig 1 : 90% stenosis in mid RCA.

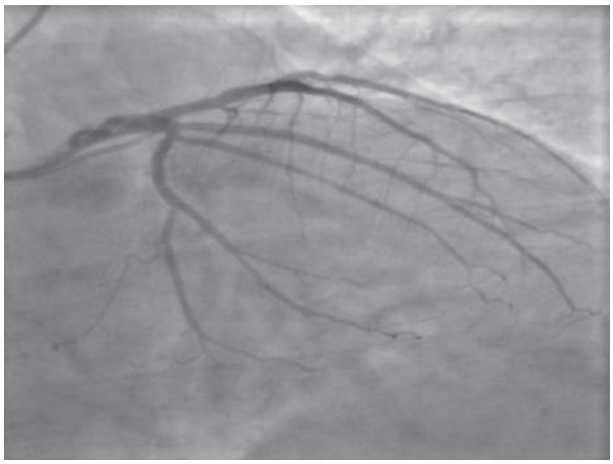

Fig 2 : Catheter induced LMS dissection

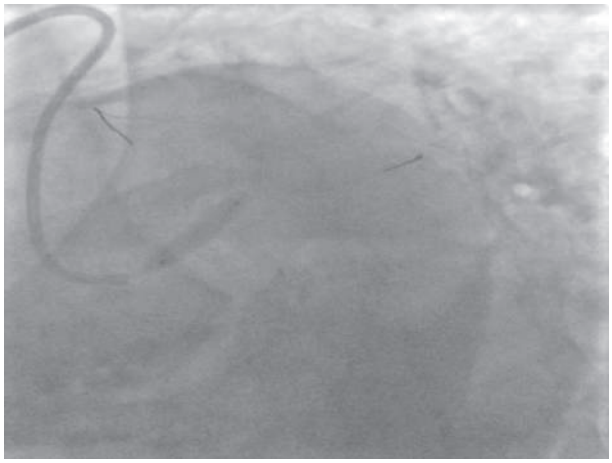

Fig 3 : Bail-out stenting of LMCA

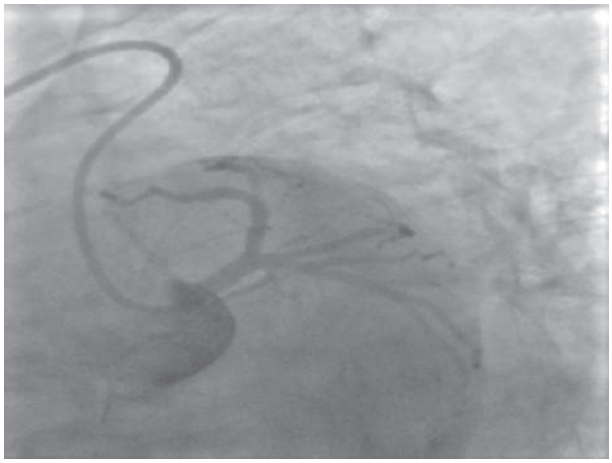

Fig 4 : Successful revascularization of LMS.

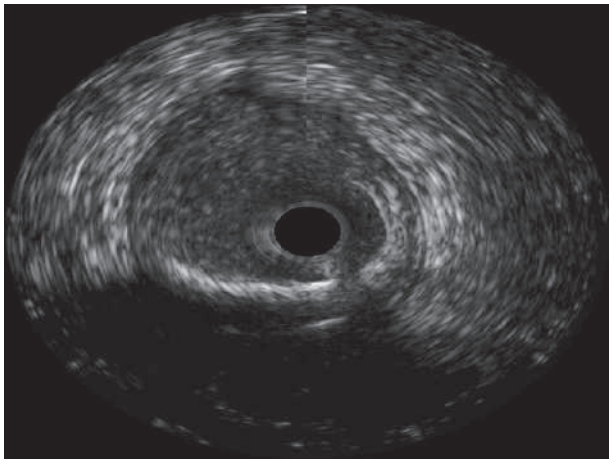

Fig 5 : IVUS confirmed complete sealing of dissection in LMS.

The LAD wire was advanced to the distal vessel without any significant resistance. Intravascular Ultrasound imaging was performed. Then shaft and distal LMS was stented directly by a 4.0x15 mm Drug Eluting Stent (DES) (COMBO) at 16 ATM for 20 sec (Fig 3). Postdilatation was performed by a 4.5x10 mm NC balloon at 20 ATM for 20 sec. Final angiography showed successful revascularization of LMS with TIMI 3 flow (Fig 4). IVUS confirmed complete sealing of the dissection, with full stent apposition (Fig 5). Then using a 6 Fr JR 3.5 guiding catheter, the target lesion in RCA was wired by a Sion Blue guide wire and directly stented by another 3.5x23 mm DES (COMBO) at 18 ATM for 20 sec (Fig 6). Distal TIMI 3 flow was achieved (Fig 7).

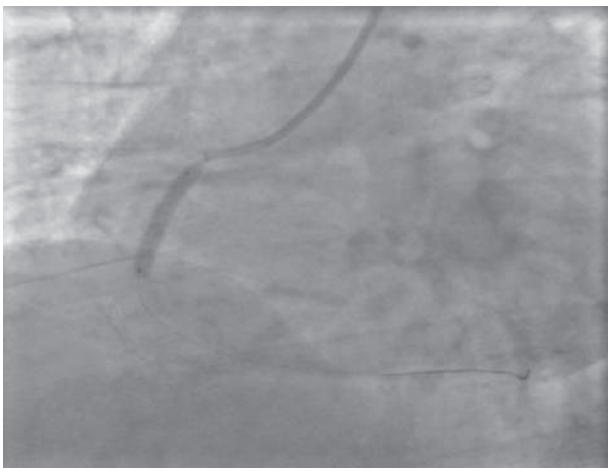

Fig 6 : Stenting of RCA (IRA) with DES.

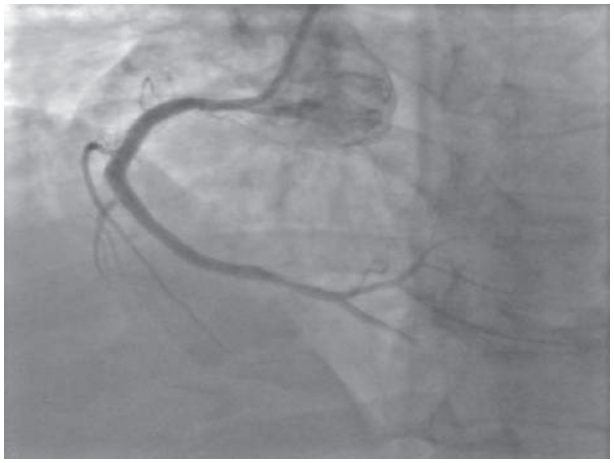

Fig 7 : Distal TIMI 3 flow across the RCA after stenting

DISCUSSION

Coronary artery dissection represents a unique complication of percutaneous coronary intervention and to small extent diagnostic coronary angiography and, if untreated, can lead to serious sequelae including abrupt vessel closure, periprocedural myocardial infarction, closure of major side branches, vessel perforation, tamponade and death.[4,5]

Arterial injury and dissection results from mechanical injury to the arterial wall during catheter or wire manipulation, passage or deployment of an interventional device, forceful injection of contrast medium, or balloon dilatation or stenting.[6] Catheter related dissection are often related to the use of large bore (i.e. 7 Fr) or aggressive catheter (such as an Amplatz curve) in order to get engagement, deep engagement of catheter especially when the catheter is not coaxial to the vessel, and when the vessel is abnormal. In our case, the slightly aberrant position of the diagnostic catheter, with its tip into the roof of the LMCA has caused the dissection. In a large study of 38 patients with iatrogenic LM dissection, an inappropriate position of the diagnostic catheter was responsible for 58% of the cases.[1]

Depending on the extent of the dissection flap and the resulting luminal obstruction, the clinical manifestation varies from an asymptomatic angiographic findings to a complete haemodynamic collapse due to the abrupt closure of the LM. The original National Heart, Lung and Blood Institute classification system for intimal tears is based upon their angiographic appearances and is graded from type A to F.[7] In a simplified and more practical classification (based on the extension of the dissection flap), the intimal tears are graded as type I (a localized dissection without extension into the LAD or LCx), type II (extension of the dissection from the LM into the LAD or LCx) and type III (extension of the dissection flap into the aortic root). While type I dissections were associated with excellent outcomes (no hemodynamic instability nor in-hospital death), type III dissections had 100% in-hospital mortality.[1]

Prompt bailout stent implantation, urgent CABG, or conservative therapy, are the alternative strategies for the treatment of an iatrogenic LM dissection. Conservative therapy is considered in a minority of the cases, and only in selected stable patients with localized dissections and TIMI 3 flow. LM stenting with a drug-eluting stent and CABG have shown favorable long-term results for stable coronary artery disease, with similar rates of death and major adverse cardiovascular events during long-term follow up.[8,9] Both treatment options are valid in the case of an acute LM dissection and should be weighed against each other in terms of the extension of the dissection, the patient's hemodynamic status, technical feasibility, prompt treatment availability, and the operator's experience. If PCI is chosen, wiring the true lumen of the dissection is of paramount, importance because inadvertent stenting of the false lumen will completely occlude the coronary artery, with dramatic hemodynamic consequences ultimately resulting in the patient's death.[10] If doubt exists as to whether the true lumen is wired or not, IVUS may be the best imaging tool. In our case, IVUS imaging confirmed the correct position of the wire in the true lumen. In addition, it helped to detect the media dissection, and the existence and extent of the intramural hematoma, and also allowed adequate vessel sizing and proper stent selection.[11]

In a large observational study of 38 patients with iatrogenic LM dissection, 17 patients were treated by CABG and 14 patients were treated by bailout stenting. Patients were more likely to undergo CABG if they were stable and had multivessel disease. Unstable patients were more likely to undergo PCI. There was no in-hospital mortality. Major adverse cardiac events (including cardiac death, myocardial infarction, and target vessel revascularization) at 5 years, independent of the initial revascularization strategy, were 41% and 36% for CABG and PCI, respectively ($p = 0.8$).[1] In a review of the literature, with a total of 54 patients, the vast majority (50 patients) were treated by PCI and only 4 were treated by CABG. Among the 54 patients there was only 1 cardiac death.[12] Thus, the findings of the present study and those of other investigators presented so far suggest that, although LM dissection is a rare complication, outcomes are favorable when it is recognized promptly and managed properly.

Several lessons can be learned from this case study. First, it obliges us to remember that coronary angiography remains an invasive investigation with rare but life-threatening complications. Second, all catheters must be manipulated cautiously, especially when engaging the LM. Injections should only be made when catheters are properly placed and when normal pressures have been identified. Third, in the unlucky situation of an iatrogenic LM dissection, prompt diagnosis and therapy must be initiated. Fourth, if available and if tolerated by the patient, IVUS can help confirm the correct position of the wire in the true lumen, determine the extension of the dissection, and guide stent sizing.

CONCLUSION

In conclusion iatrogenic LMS dissection while performing diagnostic angiography is not a common phenomenon. Especially at the setting of STEMI, non-culprit vessel dissection during angiography is a monstrous complication. Meticulous screening is necessary to find out the dissection. XB 3.5 5Fr guiding catheter is a pretty useful tool for abnormally originated left system to be engaged according to our experience as our center is a high volume centre with 99.5% of the procedures are done by transradial approach. While confronting this sort of grave situation, there is no need to switch of vascular access. The interventional cardiologist should not hesitate to deploy a stent in the LMCA.

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