

ORIGINAL ARTICLE

When your tools turn against you; a nightmare for Interventional Cardiologist

Bilal Ahmed^{ID}, **Furqan Yaqub Pannu**^{ID} & **Bilal S. Mohyidin**^{ID}
Mayo Hospital, Lahore-Pakistan.

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Corresponding Author Email:
bilalmohyidin@gmail.com

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Abstract

Background: One of the rarest but potentially life-threatening complications of coronary angiography and angioplasty is an iatrogenic dissection of the left main coronary artery (LMCA). Risk factors for left main dissection included coronary artery anomalies, atherosclerotic changes-left main stenosis, aortic root calcification, Marfan syndrome, arterial hypertension, older age, and bicuspid aortic valve⁴. Iatrogenic left or separate origin LAD/ LCX dissections result from catheter manipulation, forceful injection of contrast medium, balloon dilatation, and stenting.

Case Presentation: 54 year old hypertensive woman with family history of ischemic heart disease presented with unstable angina, who underwent iatrogenic dissection of anomalous origin of ostio-proximal left anterior descending artery.

Management: Patient received bail out percutaneous coronary intervention with drug-eluting stent (DES) 2.75 x 28 mm but there was distal shifting during deployment which resulted in placement of another DES 3.0 x 12 mm to cover the ostium.

Conclusion: A diagnostic catheter-induced proximal LAD dissection during a diagnostic coronary angiogram and bailout stenting of an anomalous left system course with an absent left main stem and separate origins of LAD and LCX was performed.

Keywords

Left main coronary artery, Iatrogenic dissection, Anomalous origin, Bail out PCI, Type of dissection.

Introduction

One of the rare complications of coronary angiography and angioplasty is an iatrogenic dissection of the left main coronary artery (LMCA). The incidence of LMCA dissection is 0.07%, as mentioned in literature¹. Absent left main with separate Ostia of left circumflex and left anterior descending artery constitutes about 0.41% of LMCA anomaly cases. Urgent intervention is required to prevent the acute closure of vessels that can lead to STEMI, resulting in acute heart failure and hemodynamic collapse, increasing the chances of fatal outcomes². Percutaneous coronary intervention (PCI) is considered the best therapeutic option depending on the type of dissection³. We here report a case of a 54 years old woman with iatrogenic anomalous left anterior descending artery (LAD) dissection treated by the percutaneous coronary intervention (PCI).

Case Report

A 54-year-old woman was presented with palpitations and retro-sternal chest pain for forty minutes that resolved on the administration of oral dual anti-platelets and nitrates sub-lingually in ER. She had a risk profile positive for hypertension with good compliance and control and a family history of ischemic heart disease. There is no history of

diabetes mellitus and hyperlipidemia. She had a BMI of 27, while another physical examination was unremarkable. Laboratory data showed a rising titer of troponins levels but remained below cut-off values. On electrocardiography (ECG), there was an ST depression of 2mm in V1-V4 on electrocardiography (ECG). Transthoracic echocardiography showed preserved left ventricular function without significant wall motion abnormalities, and no valvular lesions were identified. The right femoral approach was used to perform a coronary angiogram. A diagnostic 6 Fr left Judkins 4.0 catheter (Medtronic, Inc.) was used during angiography for left coronary system engagement. The left coronary artery appeared normal in the first (RAO caudal view) (Figure 1A), but the deep selective engagement of LAD can be seen due to anomalous origin (Figure 1B). On disengaging LAO view with caudal projection, it was evident that there was a dissection in the ostio-proximal part of LAD, and the presence of underlying atherosclerotic disease could not be ruled out. There was suspicion of retrograde extension into ascending aorta. (Figure 2). The patient immediately complained of severe chest pain, accompanied by an elevation of the ST segment in precordial leads on the cardiac monitor and a deterioration in hemodynamic condition.

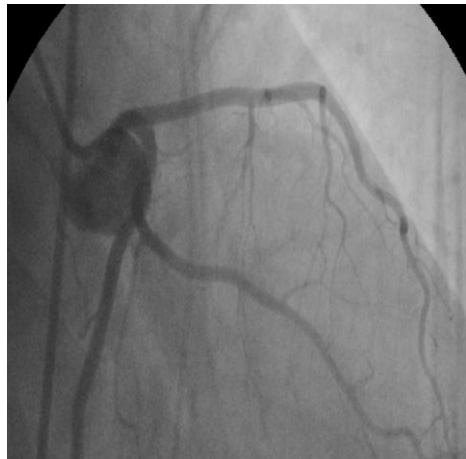


Figure 1 A

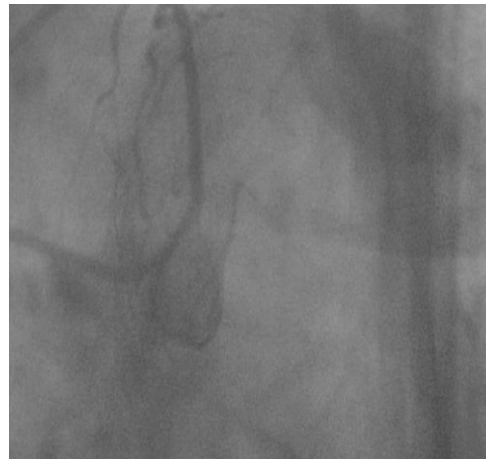


Figure 1 B

A) Normal left the coronary system in the RAO, caudal projection; B) Deep selective engagement of left anterior descending artery due to anomalous origin LAO, caudal projection



Figure 2 : Ostio-proximal part of LAD shows dissection of Type E on disengagement in caudal projection with LAO view.

Management and Treatment

The dreadful complication was recognized immediately and without wasting any further time. A. Asahi Rinato 0.014" guidewire was advanced into the true lumen of LAD using the same 6F JL 4.0 diagnostic catheter.

Due to separate origin and ostio-proximal involvement of LAD, it was possible to lose the engagement, and complete occlusion of the vessel was expected, which resulted in immediate improvement in the patient's hemodynamics. A

drug-eluting stent (DES) 2.75 x 28 mm (Promus Element Plus) was placed in the proximal segment covering the ostium of the left anterior descending artery (LAD).

However, there was the distal shifting of the stent during deployment, as noted on check injection. Hence ostial part was not covered (Figure 3). Another DES 3.0 x 12 mm (Promus Element Plus) covered the ostial part by overlapping with a previously placed stent proximal to mid LAD (Figure 4A).



Figure 3: Stent deployed in LAD, but ostial part of the vessel is not covered.

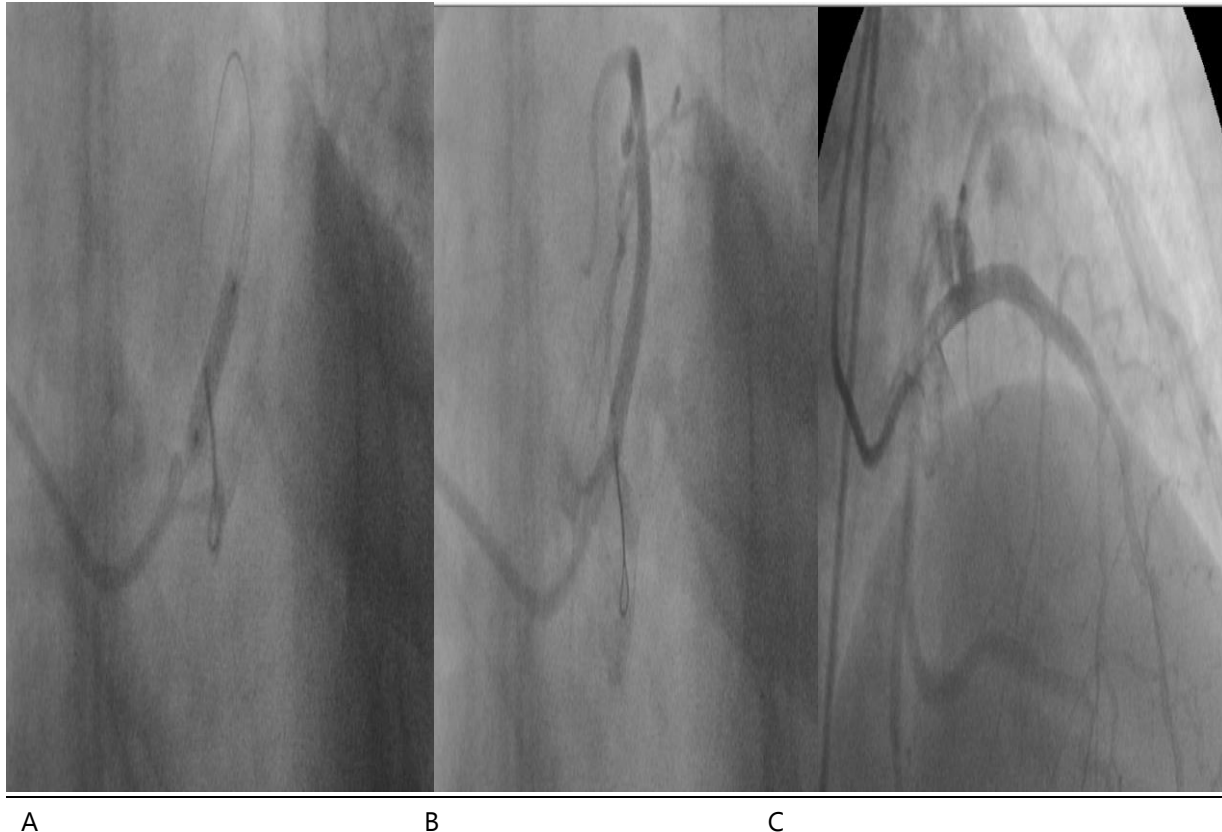


Figure 4: A) Ostium of LAD covered with a second DES by overlapping previously placed stent in proximal to mid LAD; B) Ostium well covered with second DES, Angiography results in caudal view; C) Angiography results in RAO cranial view

Results

Final angiography showed good results with TIMI 3 flow across the left coronary artery (Figure 4C caudal view). In the end diagnostic, 6 Fr right Judkins 4.0 catheter (Medtronic, Inc.) for engaging right coronary artery was used and showed non-dominant normal right coronary artery. The patient remained stable after the procedure without any significant symptoms, and she was discharged home on optimal medical therapy after two days. The patient remained in regular follow-up at 1, 3, 6, and 12 months intervals. At 18 months, the patient is symptoms-free with good functional capacity.

Discussion

Left main iatrogenic dissection is relatively rare but a life-threatening complication encountered during invasive procedures in the catheterization lab. Risk factors for left main dissection included

coronary artery anomalies, atherosclerotic changes-left main stenosis, aortic root calcification, Marfan syndrome, arterial hypertension, older age, and bicuspid aortic valve⁴. Iatrogenic left or separate origin LAD/ LCX dissections result from catheter manipulation, forceful injection of contrast medium, balloon dilatation, and stenting^{5,6}.

In our case, deep intubation, the inappropriate catheter position, and robust hand injection of contrast led to increased wall stress resulting in the dissection of the ostium of anomalous origin of the left anterior descending artery. This catastrophic complication can be avoided by co-axial alignment of the catheter within the artery before any robust injection of contrast medium^{2,7}. Coronary artery dissection has been classified into six types, i.e., A-F, according to the National Heart, Lung and Blood Institute classification (NHLBI) as per their appearance on coronary angiogram⁸.

Table. 1: Type of Dissection (NHLBI Classification)

Type A	The minor radiolucent area within the coronary lumen
Type B	Linear dissection/ Double Lumen
Type C	The extraluminal cap of contrast
Type D	Spiral dissection
Type E	Persistent filling defect in coronary lumen
Type F	Total Occlusion

Types A and B are classified as benign ones, but types C to F have significant mortality if they are left untreated⁹. According to Dunning classification, coronary artery dissection is also classified on its basis of retrograde extension into the aortic root. Restriction to the coronary cusp is the type I, involvement of cusp along with ascending aorta up to 40 mm is type II, whereas type III includes cusp and ascending aorta more than 40 mm¹⁰. Eshtehardi classified iatrogenic aortocoronary dissection into three types; type I involves the localized dissection of the ostium of left main if dissection extends into left circumflex or left anterior descending artery is classified as type II. Extension into the aorta is classified as type III¹.

Dissection of the left main coronary artery (LMCA) can be followed by varying degrees of thrombolysis in myocardial infarction (TIMI) flow which determines hemodynamic stability and clinical status. The alternative strategies for the treatment of iatrogenic LMCA dissection are percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), and conservative therapy. Percutaneous coronary intervention (PCI) is preferred in patients hemodynamically unstable in terms of time and technique^{11,12,13}. The foremost is the successful wiring of the true lumen of the LMCA and its branches, considering that the false lumen is usually larger and inadvertent stenting of the false lumen will completely occlude the coronary artery¹⁴. In another study comprising of 38 patients with left main iatrogenic dissection, 17 (45%) patients were treated by coronary artery bypass grafting (CABG), 14 (37%) patients were treated by bailout stenting, 6 (16%) patients were treated conservatively, and 1 (3%) patient died before any therapeutic attempt was performed.

On follow-up of five years, there was no significant difference observed between CABG and bailout stenting¹. Another literature review showed that among 54 patients, four patients underwent CABG, and the bailout stenting treated the remaining 50 patients, and there was only one cardiac death². For favorable outcomes in hemodynamically unstable patients due to iatrogenic left main coronary artery dissection, bailout stenting is a crucial determinant. There is some data on the management of dissection of left main, but there is almost nonexistence of data on anomalous origin (absent LMS and separate Ostia of LAD and LCX), which makes this case superlative. In conclusion, the anomalous left main coronary artery which underwent iatrogenic dissection, the best strategy is to prompt recognition of this complication and management according to the operative skills, facilities available at the center, and the patient's hemodynamics. Bail-out stenting as a therapeutic strategy should be performed as early as possible in hemodynamically unstable patients

Conclusion

Catheter induced coronary artery dissection is a well-known but life threatening complication. Key to success is to recognize the complication early followed by intervention. If patient is hemodynamically deteriorating, there is fear of loss of lumen and complex PCI like bifurcation is not expected than PCI with diagnostic catheter can be attempted like in this case.

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