



## An Unusual Case of Spontaneous Left Main Coronary Dissection in A Young Pregnant Woman Treated with Percutaneous Intervention

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### ABSTRACT

Spontaneous coronary artery dissection (SCAD) is the spontaneous separation of the coronary artery wall, not iatrogenic or related to trauma. SCAD is an uncommon disease in which the left main coronary involvement is rare. SCAD is commonly non-atherosclerotic, according to predisposing factors (fibromuscular dysplasia, female gender, pregnancy, ecc) and precipitating factors (intense exercise/emotional stress, vigorous Valsalva type activities, abuse of recreational drugs, ecc). Diagnosis of SCAD is first based on clinical grounds and then confirmed with imaging. Access to different imaging techniques, in particular coronary angiography (CA) and intravascular ultrasound (IVUS), is crucial to recognize and manage SCAD in acute care settings.

We report an unusual case of high risk acute coronary syndrome due to the left main coronary dissection in a 33 year-old pregnant woman at 19th week of gestation. According to coronary angiography and clinical unstable conditions, LM was successfully treated with a provisional stenting technique. Intra-procedural IVUS was helpful to obtain good stent apposition and confirm the underlying intramural hematoma. Before invasive strategy, the cooperation of the heart team was crucial because we not only considered some protocols to reduce radiation and contrast agent exposure, but also planned a follow up in order to organize the delivery and minimize potential stress conditions and bleeding risk to the fetus.

SCAD should not be underestimated when associated to ACS and pregnancy: urgent coronary angiography and bail-out adjunctive imaging are crucial. Improvements in materials and techniques together with a protocol for radiation/contrast media exposure and for antithrombotics drugs administration could make percutaneous interventions feasible and safe in these scenarios.

### 1. Introduction

Spontaneous coronary artery dissection (SCAD) is defined as the spontaneous separation of the coronary artery wall, not iatrogenic or related to trauma. SCAD is an uncommon disease, presenting frequently among women as an acute coronary syndrome (ACS) or sudden cardiac death (1). The prevalence of SCAD remains uncertain, reported from 0.07 to 1.1%. SCAD involves different coronary vessels: the left anterior descending (LAD) in 70 - 75% of cases, right coronary artery (RCA) in 20% of cases, circumflex (CX) in 5%, and left main (LM) in

less than 4% of cases, respectively. SCAD is commonly non-atherosclerotic, classified according to predisposing factors such as fibromuscular dysplasia, female gender, pregnancy related conditions, recurrent pregnancy, systemic inflammatory diseases, hormone therapy and precipitating factors. The latter include intense exercise/emotional stress, vigorous Valsalva type activities, conditions leading to huge catecholamine surge, and abuse of recreational drugs (2, 3). Therefore, diagnosis of SCAD is based on clinical suspicion first and then confirmed at invasive/non invasive imaging. Availability of different invasive imaging techniques, in particular coronary angiography and intravascular ultrasound (IVUS), is crucial to promptly recognize and manage SCAD in the acute care setting. We report an unusual case of left main dissection in a 33

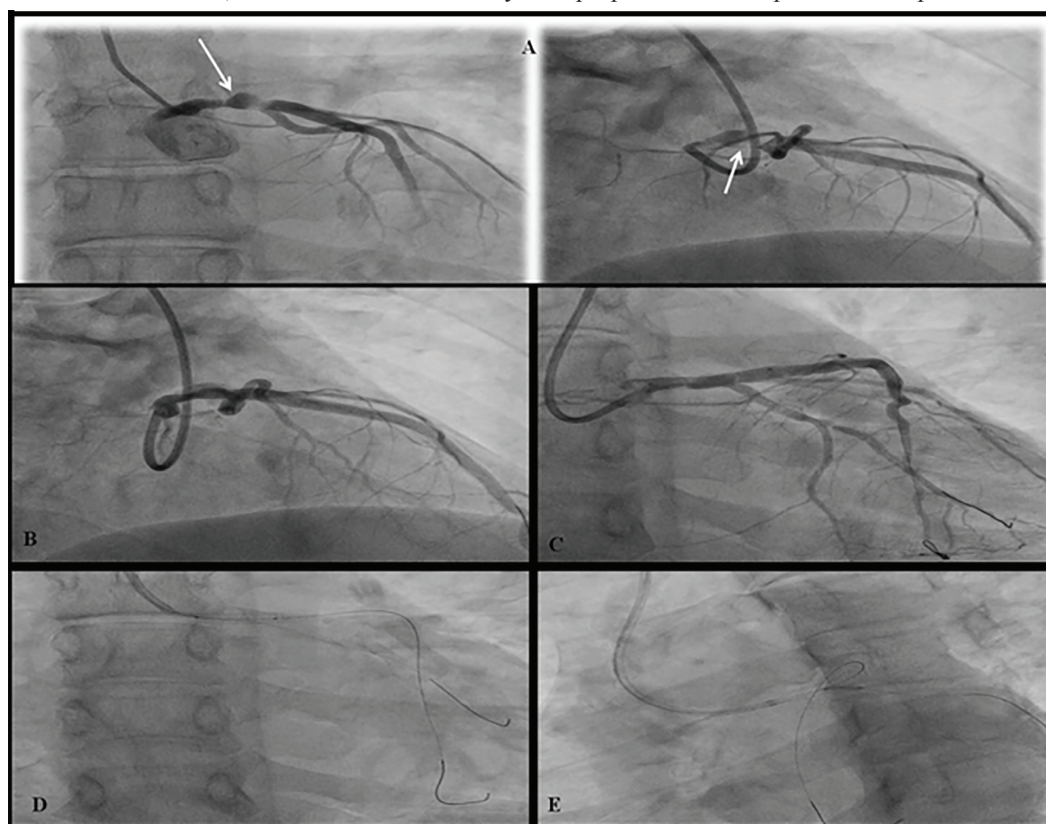
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year-old pregnant woman at the 19th week of gestation, successfully treated with PCI.

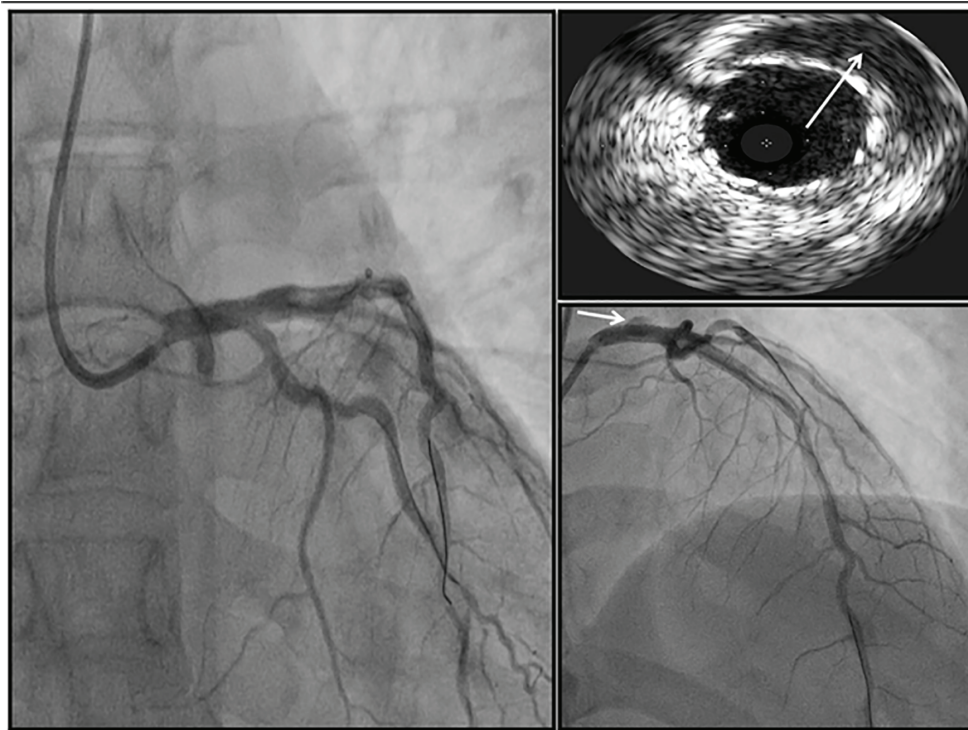
## 2. Case Presentation

On June 2016, a 33 year old first time pregnant woman at 19th week of gestation and without cardiovascular risk factors was admitted for acute coronary syndrome with transient chest pain concomitant with diffuse anterolateral ST depression and a typical rising curve of cardiac biomarkers (peak troponin I = 80 nanograms/mL). After consultation with an obstetrician, she was initially managed conservatively with aspirin (100 milligrams daily) and low molecular weight heparin (Enoxaparin 4000 Units twice daily). After one week of hospital stay, being completely asymptomatic and on optimal medical therapy, the patient suffered acute chest pain with persistent electrocardiographic changes and anteroseptal wall motion hypokinesia (ejection fraction 50%). After a rapid heart team discussion (cardiologist, interventionalist, obstetrician, and cardiac surgeon), a coronary angiography was urgently planned. The patient and her relatives were well informed regarding the potential adverse effect of media contrast and X-ray exposure, especially to the fetus. A shielder protection with an X-ray dosimeter was also applied to the mother's pelvis and the access route was the radial artery. Coronary angiography showed a sub-occlusive LM and proximal LAD artery dissection complicated by intramural hematoma (Figure 1: A). According to coronary anatomy and clinical unstable conditions, we decided to immediately

treat the LM dissected bifurcation with a provisional stenting technique. The intervention was performed using a 6 French guiding catheter (EBU 3.5 Medtronic). The procedure consisted of double wiring into LAD/CX passing through the dissection. A right cranial projection was very helpful to enter the true lumen. Then, we performed direct stenting with everolimus eluting stent 4x23mm into the LM-LAD system; finally, it was rewired into CX and stent post-expansion with non-compliant balloon 4,5x15mm and lateral kissing with semi-compliant balloon 2x10mm (Figure 1: B-E). The final angiograms showed good flow restoration and intra-procedural IVUS (Volcano Corporation) before and after high pressure non-compliant balloon confirmed persistence of mild IMH (Figure 2). Intra-procedural unfractionated Heparin (5000 UI) and a loading dose of Prasugrel (60 milligrams) were administrated. The invasive procedure ended with a total amount of Iodixanol media contrast (GE Healthcare Visipaque 320) < 150 milliliter and a insignificant fetal X ray exposure was measured (0,02 mSievert). The patient was discharged completely asymptomatic on Prasugrel 10 milligrams and Aspirin 100 milligrams once daily; the good fetal status was confirmed clinically and by a postprocedural echography. A regular post-hospitalization follow up was planned; the obstetrician decided to organize a delivery via Caesarean section in order to minimize stress conditions. On 12<sup>th</sup> of October, the surgical procedure was performed previous suspension of Prasugrel 7 days before and administration of prophylactic Enoxaparin: no complications were recorded



**Figure 1 (A-E).** Basal CA and Step by Step Procedure: (A) LM Dissected and Suboccluded Due to Compression of IMH with a Residual True Lumen Involving Ostium of LAD (White Arrows); (B) Double Wiring into LAD/CX (0.014 Balance Middle Weight); (C) Direct Stenting with Everolimus Eluting Stent (Xience Pro 4x23mm) into LM-LAD System; (D) Rewiring with Pilot 50 into CX, Postexpansion with Non-Compliant Balloon (Accuforce Terumo) 4,5x15mm; (E) Lateral Dilatation with Semi-Compliant Balloon (Euphora Medtronic) 2x10mm.



**Figure 2.** Final CA and IVUS Assessment: Optimal Flow Restoration, Good Stent Struts Apposition, No Residual Dissection and Persistence of Mild IMH after High Pressure Non-Compliant Balloon Post-Expansion (White Arrow)

and resumption of Prasugrel was made 2 days later with a loading dose of 60 milligrams.

### 3. Discussion

Coronary angiography represents the gold standard imaging for ACS patient. However, in SCAD patients presenting with ACS, coronary angiography could be sometimes challenging because of intrinsic limitation of the technique, a two-dimensional luminogram that does not image the arterial wall. Therefore, when multiple views at angiograms remain still doubtful, IVUS utilization is strongly suggested not only to guide PCI, but also to confirm and display the extension of the dissection process. The optimal treatment of SCAD remains unclear and no guidelines have been established, given the small number of cases reported; an evidence-based approach consists of pointing out the role of medical therapy alone (anti-thrombotics, anti-hypertensive drugs) or revascularization strategies (PCI,CABG) or both (4). Although medical therapy is usually preferred, in our clinical case, despite the first conservative approach, we finally addressed our patient to urgent revascularization due to ongoing/recurrent ischemia and proximal dissection with reduced flow on LAD at invasive imaging, according to the acute management algorithm proposed by Tweet et al. (5). PCI was preferred over CABG considering the patients will, in favor of a suitable bifurcation anatomy without a diseased side branch and in order to minimize the risk of fetal damage/complications deriving from CABG surgery. Regarding the kind of stent implanted, there is growing evidence supported also by our Centre favoring treatment of SCAD with bioresorbable vascular scaffold (BVS) instead of drug eluting stents (DES). Advantages of BVS include early restoration of the biomechanical characteristics of

the vessel and good radial strength without the need of permanent prosthesis implantation (6). In this scenario, we preferred not to implant BVS due to 1) discrepancy between the sizing of the vessel (4 - 4,5mm) and sizing available of the scaffold; 2) presence of intramural hematoma (IMH) and connected risk of temporal resorption with potential consequences in the residual late malapposition; and 3) lack of randomized trial exploring treatment of LM with BVS.

Enoxaparin was the anticoagulant of choice settled until coronary angiography and then used peri-procedurally during hospitalization for childbirth. We preferred Enoxaparin over Fondaparinux, another frequently used synthetic inhibitor of activated Factor X in ACS, due to a stronger indication during pregnancy supported by Food and Drug Administration (FDA, category B). Dual antiplatelet therapy was decided after coronary anatomy visualization; we did not find any evidence promoting or discouraging administration of Clopidogrel, Ticagrelor or Prasugrel in ACS patients during pregnancy, so we followed European Society of Cardiology guidelines recommendation. We also preferred a new antiplatelets drug over Clopidogrel due to the high ischemic risk and a low bleeding risk (Crusade score = 28), in the acute phase, the type of lesion, the mild and residual IMH (7). A point of debate was about dual antiplatelet therapy and its management just before delivery; approximately, 3 months after the stent implantation and an intermediate bleeding risk of the Caesarean section, we decided to avoid bridging with Tirofiban and not to proceed with DAPT; as a consequence, we transiently stopped Prasugrel (8).

Heart Team negotiations was helpful not only for planning invasive and medical treatment but also for reducing the peri-procedural application of radiation and administration of contrast agent. Indeed, the major deleterious effects of

inappropriate radiation exposure include teratogenicity, mental retardation, intrauterine growth retardation, and induction of cancers such as leukemia that may appear later in childhood. For the same reason, we preferred radial approach over femoral. We applied a dosimeter and a shielder also to the maternal pelvis; then, we injected the lower possible dose of Iodixanol contrast media agent (9). The total amount of radiation obtained, in particular regarding the fetal exposure, was not linked with an increasing risk of adverse events. (10).

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#### Authors' Contribution

All authors have participated in the work and have reviewed and agree with the content of the article.

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