



Bicoastal Spontaneous Coronary Artery Dissection: A Therapeutic Dilemma

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Abstract

Due to the potential for severe maternal morbidity and even mortality, pregnancy-associated spontaneous coronary artery dissection (P-SCAD) often presents as a clinical conundrum. While current recommendations encourage coronary interventions when medically indicated even during pregnancy, the hesitation still understandably exists. Meanwhile, given the rarity of the condition, the guidelines for management are still based on expert consensus.

We present a case of P-SCAD in a 38-year-old woman with initial presentation at 28 weeks' gestation and recurrence at 9 days postpartum. A unique complication of this case is its transcontinental nature: the initial event occurred while the patient was on vacation across the country from her home. Questions arose not only with regard to her immediate management and care but also when she would be able to travel and how her complex care would be continued cross-country.

This case raised important questions regarding the antepartum management of acute coronary syndrome (ACS). It also highlights the importance of multidisciplinary care, especially with a cardio-obstetrics team, in the management of P-SCAD and emphasizes the role for universal screening for cardiac diseases in pregnancy.

Keywords

- pregnancy
- spontaneous coronary artery dissection
- pregnancy-associated SCAD

Spontaneous coronary artery dissection (SCAD) is defined as a separation of the layers of the epicardial coronary artery by intramural hemorrhage, with or without an intimal tear, not related to atherosclerosis, trauma, or iatrogenic injury.¹ Unlike atherosclerotic ACS, SCAD is not associated with known cardiovascular risk factors, such as hyperlipidemia or diabetes.² SCAD disproportionately affects females of reproductive age^{1,3} and is the most common mechanism of myocardial infarction (MI) in pregnancy.^{4,5} Maternal complications have been reported in about 25% of patients

and may lead to severe morbidity and even mortality.² Despite increased awareness of SCAD, guidelines to inform management are predominantly based on expert consensus.

Traditionally, when SCAD is suspected, early coronary angiography is encouraged for diagnostic confirmation,³ and intervention when appropriate. Medical management is however preferred in the setting of hemodynamic stability as intervention may propagate the dissection. Moreover, the natural history is vessel wall healing within several weeks postevent.³

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We present a case of SCAD diagnosed at 28 weeks' gestation with recurrence in the postpartum period—both managed conservatively, with heart rate (HR) control as the primary treatment target due to overall normal blood pressures. Coronary angiography was initially deferred and only employed to consider management changes. Aside from navigating the challenges of antepartum SCAD diagnosis and management, this case was uniquely complicated by a transcontinental nature: the patient's first episode occurred after the patient had traveled across the country from her home. Therefore, concerns also arose regarding travel home and coordination of multidisciplinary care elsewhere.

Case Presentation

A 38-year-old primigravida woman at 28 weeks' gestation presented to the emergency room in Orange, CA, after a 20-minute episode of acute-onset mid-sternal crushing chest pain. She had just traveled by plane from Massachusetts.

The patient had no pertinent personal or family history of cardiovascular disease (CVD). She was on prenatal vitamins and had no history of drug use. She was afebrile with a blood pressure of 130/90 mm Hg and HR of 120 beats per minute (bpm). Her cardiovascular examination was unremarkable with normal jugular venous pressure and no peripheral edema.

Initial electrocardiogram (EKG) noted sinus tachycardia (►Fig. 1A). Serial troponin I measurements demonstrated progressive rise, peaking at 13,500 ng/L (reference range 0–15 ng/L). A computed tomography (CT) angiogram of the chest revealed normal aorta and pulmonary arteries. An echocardiogram demonstrated a low normal left ventricular ejection fraction of 53% with no valvular abnormalities and no reported left ventricular wall motion abnormalities. A combination of chest pain with elevated troponins in a healthy individual of reproductive age with no known cardiovascular risk factors led to the diagnosis of ACS likely due to SCAD. She was started on aspirin 81 mg and metoprolol with goal HR of less than 100 bpm. Continuous fetal monitoring remained reassuring without signs of fetal compromise. She remained on telemetry without further incident and was discharged home on hospital day 6 on acetylsalicylic acid (ASA) and metoprolol tartrate 25 mg twice daily.

Two days after discharge, the patient returned after experiencing 40 minutes of crushing substernal pain. Her blood pressure was noted to be 140/90 mm Hg and her HR was 125 bpm. EKG was unchanged and the serial troponin revealed continued normalization, suggesting this was not secondary to extension of her dissection flap. Symptoms gradually subsided without intervention. On hospital day 2, she experienced a third episode of chest pain that persisted for 40 minutes. Troponin was down-trending and sublingual nitroglycerin did not relieve her symptoms. Repeat EKG demonstrated new ST elevations in the precordial leads V1 and V2 (►Fig. 1B). Due to recurrence of chest pain with new ST-segment elevation, coronary angiography was performed, demonstrating type II SCAD with 90% occlusion of the mid to distal left anterior descending artery (►Fig. 2) with TIMI 3

flow, other vessels were angiographically normal. As the patient was hemodynamically stable with single vessel disease, catheter-based intervention was deferred in favor of continued conservative management. Metoprolol was increased to maintain HR less than 100 bpm.

After 5 days of monitoring without recurrent chest pain and stable hemodynamics, the patient was discharged on ASA and metoprolol tartrate 100 mg twice daily. She was advised for close follow-up with a cardio-obstetrician within 3 days after discharge and was permitted to fly home to Massachusetts after 1 week without symptoms. In the interim, a multidisciplinary cardio-obstetrics team was identified near to the patient's home, and information regarding the patient's history, workup, diagnosis, and plan was relayed to facilitate a smooth transition of care.

For the remainder of her pregnancy, she was managed by the multidisciplinary cardio-obstetrics team near her home without incident. She had an uncomplicated cesarean delivery at term for obstetric indications. On postpartum day 9, she again experienced chest pain and was found to have elevation of TIMI to 1,005 ng/L (normal range 0–9 pg/L). Due to hemodynamic stability and known mechanism of prior ACS, coronary angiography was deferred in lieu of coronary CT angiography, which demonstrated newly identified obstructive flaps in the left circumflex artery and a similar known nonobstructive dissection flap in the left anterior descending artery, but no evidence of intramural hematoma or obstruction (►Fig. 3). She was managed conservatively with aspirin and metoprolol and discharged home several days later. She did not plan on breastfeeding.

Discussion

Pregnancy-associated SCAD (P-SCAD) is associated with greater hemodynamic instability and more multivessel involvement compared to when it occurs in the general population,⁷ thus risk for severe maternal morbidity and even mortality can approach 25%. When it occurs, P-SCAD is most likely to present in the first week postpartum, subsequently the first month postpartum.^{3,6} However, as women of reproductive age are at risk for this particular coronary event, suspicion for the condition should remain high when assessing chest pain even during pregnancy.

Antepartum Diagnosis

The current recommendation when SCAD is suspected is to perform urgent coronary angiography to confirm the diagnosis.³ However, this carries inherent risk for dissection propagation.⁶ In the case presented, the patient had a classic presentation of SCAD: typical chest pain in a reproductive-aged woman without cardiovascular risk factors. As she was hemodynamically stable, diagnostic angiography and cardiac interventions were initially deferred in pursuit of conservative management. Ultimately in her course, coronary angiography was utilized to confirm diagnosis in the setting of persistent chest pain and ST segment elevation. However, this brings into question whether diagnostic coronary angiography is necessary for all potential SCAD patients, or whether it is reasonable

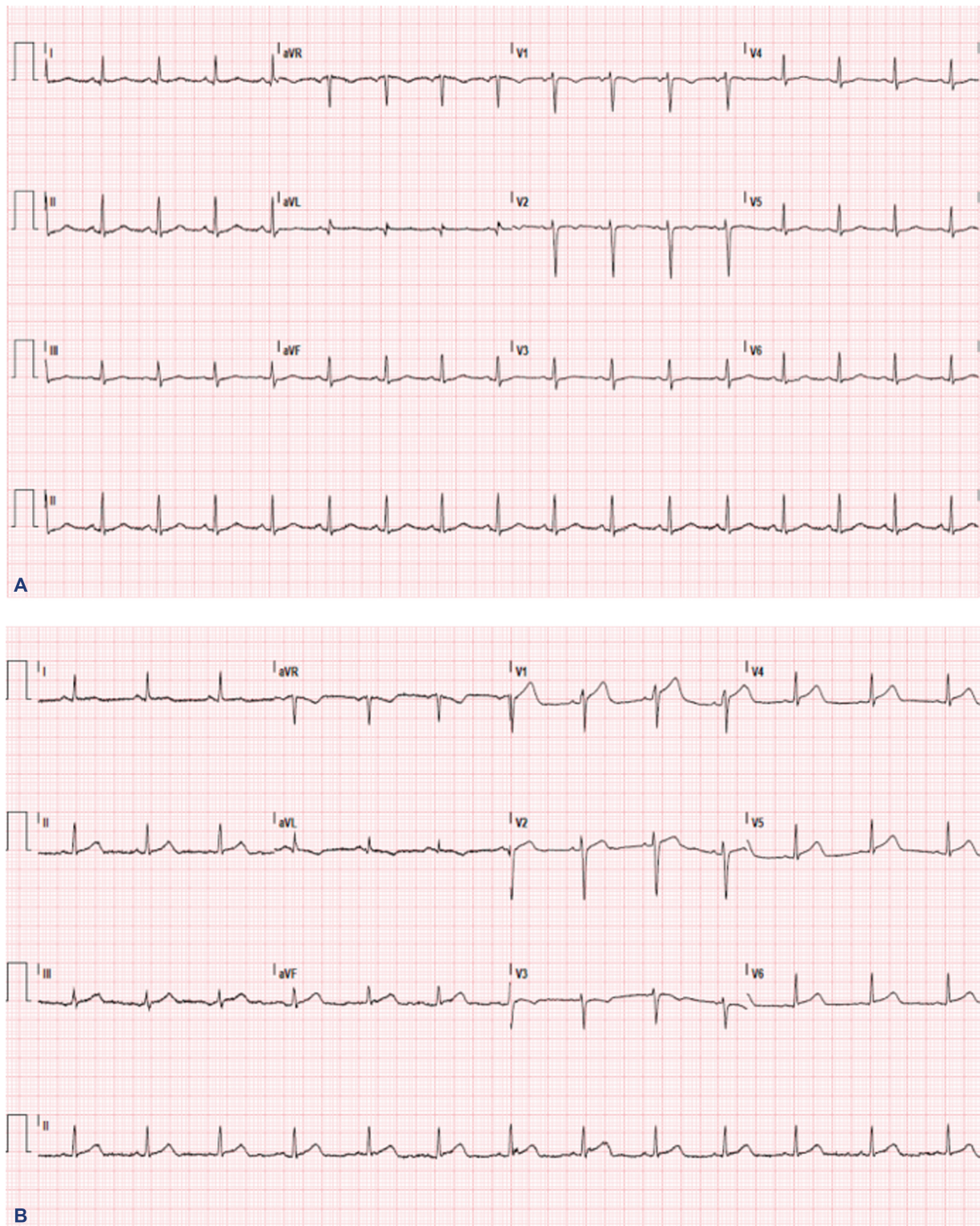


Fig. 1 (A) EKG on presentation with sinus tachycardia with short P-R interval. (B) EKG during third episode of chest pain, demonstrating subtle new ST-segment elevations in the precordial leads. EKG, electrocardiogram.

to defer this unless the diagnosis is questionable or changes to management are needed.

Antepartum Management

When it occurs in the antepartum period, the decision to intervene in SCAD is complex and includes consideration for

the extent of myocardium at risk as well as the patient's hemodynamic stability. Conservative management is generally pursued as angiographic vessel healing occurs in the majority of patients.³ In the general population, coronary intervention is considered in patients who are hemodynamically unstable, have SCAD of the left main coronary artery, or

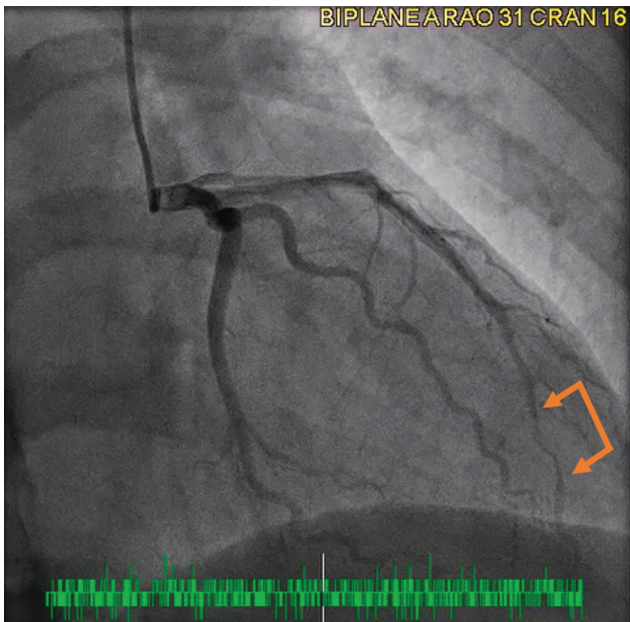


Fig. 2 Coronary angiography: demonstrating diffuse narrowing of the mid-distal LAD with 90% stenosis, consistent with type II SCAD with TIMI 3 flow. LAD, left anterior descending artery; SCAD, spontaneous coronary artery dissection; TIMI, thrombolysis in myocardial infarction.

multiple vessel disease.^{1–3,6,8} The decision to intervene in pregnancy should follow these same principles. Concern for fetal radiation exposure from coronary angiography should not prevent intervention as the total exposure is low and

preservation of maternal health is crucial. A distinction from the nonpregnant population would be deciding on the use of stents and type, with consideration for the duration of dual antiplatelet therapy in anticipation of neuraxial anesthesia for delivery.

On the other hand, while conservative management does not treat SCAD, the goal is to prevent immediate complications and recurrence.^{6,8} Although components of the conservative approach may vary across institutions, blood pressure control has universally been the primary target in patients with SCAD. However, in the case presented, the patient was generally normotensive while being persistently tachycardic. Our primary target was therefore HR control. We employed single antiplatelet therapy and beta blockade with metoprolol to curtail progression and propagation of the dissection, and improve symptoms related to demand ischemia. At high dose of beta blockade, the HR remained within normal ranges with no further symptoms until the postpartum period. The recurrence at that time was also managed successfully in a conservative manner. Therefore, in normotensive patients with SCAD, we recommend that a lower HR should be regarded as an additional treatment target in management. There is no data to inform what the actual heart rate goal should be.

Delivery Considerations

While there are no data to guide the decision for vaginal or cesarean delivery in SCAD, in general for antepartum ACS, vaginal delivery is not contraindicated if pursued more than

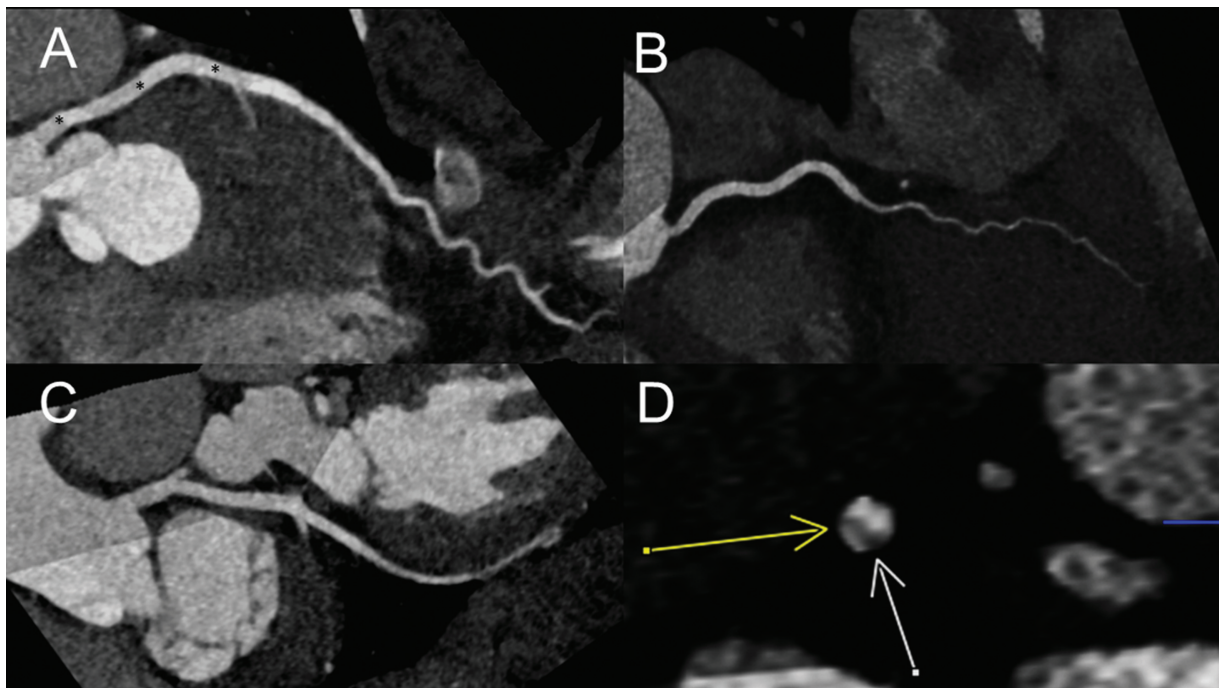


Fig. 3 Coronary CTA: Multiplanar reformatted images of the LAD (A), LCx (B), and RCA (C) demonstrate absence of atherosclerotic plaque and obstruction. A subtle nonobstructive flap was evident in the left proximal to mid-LAD (asterisks in A). The intimal flap is confirmed to be nonobstructive in a double-oblique short axis reformat (arrows, D) of the LAD, with contrast opacifying both the true and false lumens albeit at different intensities. No intramural hematoma was identified throughout the visualized course of the coronary arteries. The distal LAD and LCx are notably somewhat tortuous. CTA, computed tomography angiography; LAD, left anterior descending artery; LCx, left circumflex artery; RCA, right coronary artery.

2 weeks from the cardiac event.⁹ Vaginal delivery is generally preferred in individuals with structural heart disease due to more gradual hemodynamic shifts, lower risk for infection, and thrombosis. The decision to perform a cesarean delivery for cardiac indications should be individualized for each patient and consider timing of infarction with respect to gestational age, the extent of infarction, and the presence of congestive heart failure or instability.

Breastfeeding Considerations

The potential role for breastfeeding as contributing to risk has been raised as animal models of Marfan's syndrome support greater risk for dissection in breastfeeding mice. However, there are no data in the SCAD population.¹⁰ Due to the beneficial impact to the mother and infant pair, breastfeeding is still encouraged.

Considerations for Future Pregnancies

Patients are counseled to avoid pregnancy after SCAD. Based on the limited data available, pregnancy does not appear to increase risk for recurrence, though further data are needed.^{3,5,8} If a patient desires another pregnancy, she should be counseled extensively preconception regarding potential risks and be managed by a multidisciplinary team, with continuation of aspirin and beta blockers throughout pregnancy. It is important to realize that the highest risk for SCAD is postpartum. In those who do not desire another pregnancy, it is critical to discuss and provide effective birth control. This is especially true in abortion-restricted states, where the option for termination may not exist. SCAD occurs most often in women and is the most common mechanism of pregnancy-associated MI,⁷ thus felt to have a hormonal-based mechanism. As such, hormonal-based contraception is generally avoided, except for hormonal-based intrauterine devices due to its limited systemic absorption.

Prevention

While prevention for SCAD remains unknown, screening for cardiac diseases in pregnancy may facilitate earlier investigation and detection in patients who are at higher risk for SCAD. Pregnancy is a physiologic cardiovascular stressor that can unmask preexisting structural heart disease, but many individuals develop de novo disease. Moreover, there is overlap between the signs and symptoms of pregnancy and CVD. Most patients are initially cared for by noncardiologists and many individuals live in maternal health care deserts. Therefore, a tool to identify these at-risk individuals is critical. A CVD screening algorithm for pregnant patients put forth by the California Maternal Quality Care Collaborative has been screening pregnant and postpartum individuals at each clinical encounter to encourage early evaluation and intervention.⁴ This screen includes: tachycardia greater than 110 bpm, systolic BP less than 140 mm Hg, palpitations, dyspnea, orthopnea, persistent asthma, chest pain, wheezing, or crackles on examination. This patient's clinical status on presentation would have elicited a positive screen, prompting further investigation, preventing a missed cardiovascular event.

Traveling Considerations

Finally, this case is unique not only due to recurrence of SCAD within the same pregnancy but also due to the transcontinental nature of her care. Initially, the question arose as to when the patient might be able to fly home to Massachusetts from California, where the initial event occurred. Previous literature with ACS patients has demonstrated that patients with MI can generally travel 2 to 3 weeks after the event¹¹; therefore, a similar approach was utilized here. As the second hospitalization was due to symptomatic angina and not proliferating/recurrent SCAD, the patient was permitted to fly home 2 to 3 weeks after the initial event pending stability. Another important component of her care was the transcontinental coordination of care. Due to her need for a multidisciplinary cardio-obstetrics team, prior to her travel home, the California and Massachusetts care teams jointly discussed her case to ensure a smooth transition of care. This further ensured that no unnecessary workup would be undertaken and no information was missed in between transition.

Conclusion

SCAD is the most common mechanism of MI in pregnancy and often presents with greater hemodynamically instability and multivessel involvement compared with nonpregnant individuals.⁵ Antepartum SCAD poses unique challenges including diagnosis, use of coronary interventions, treatment targets, medications for management, and mode/timing of delivery. Management recommendations are currently based on expert consensus but focus on preservation of maternal health, and thus, multidisciplinary team involvement is critical to consider all aspects of care. If clinically indicated, coronary angiography and intervention should not be withheld in pregnant patients, although this case questions whether it is necessary to perform in all suspected cases. Finally, this case highlights the importance of recognizing individuals at risk for cardiovascular decompensation and the benefits of a screening algorithm to detect and intervene early.

Disclosures

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Conflict of Interest

None declared.

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