

## Spontaneous Coronary Artery Dissection A Rare Defect in Young Adult Male Managed Surgically : A Case Report

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### Abstract

Spontaneous Coronary Artery Dissection (SCAD) is a rare defect in the coronary artery wall due to tear in the coronary arterial wall, which may lead to heart muscle ischemia and important cause of acute myocardial infarction and sudden cardiac death. It mostly common in young female but also occurs in male. The exact aetiology of Spontaneous Coronary Artery Dissection (SCAD) is unknown but associated with some risk factors. Prompt diagnosis and management is necessary to prevent sudden death. Invasive coronary angiography is the main diagnostic modality and treatment options ranges from conservative to percutaneous intervention or a surgical procedure.

**Key words:** Acute myocardial infraction; Bypass Surgery; Coronary artery; Coronary angiography; Spontaneous Coronary Artery Dissection (SCAD).

### Introduction

Spontaneous Coronary Artery Dissection (SCAD) is defined as an epicardial coronary artery dissection that is not associated with atherosclerosis or trauma and not iatrogenic. A coronary artery obstruction brought on by an Intramural Hematoma (IMH) or intimal disruption that compromises the actual lumen at the site of dissection is the main mechanism of myocardial damage.<sup>1</sup> SCAD most commonly affects women in their 40s and 50s, though it can occur at any age

and can occur in men. The exact aetiology of Spontaneous Coronary Artery Dissection (SCAD) is unknown but multiple factors may cause SCAD, such as female sex, child birth, pregnancy, fibromuscular dysplasia, hormone therapy, connective tissue disorder like Marfan's Syndrome, Ehlers-Danlos syndrome, inflammation of blood vessel like polyarteritis nodosa, severe high blood pressure, intensive exercise, atherosclerosis, history of physical and emotional stressors, Oral contraceptives, cocaine abuse.<sup>2,3</sup>

Spontaneous coronary artery dissection was first described by Pretty in 1931 in the autopsy of a 42 years old woman.<sup>4</sup> According to angiographic studies, the total incidence of SCAD ranges from 0.28 to 1.1%. Due to asymptomatic or sudden cardiac mortality prior to diagnosis, the true incidence of Spontaneous Coronary Artery Dissection (SCAD) is hence likely underestimated.<sup>5,6</sup>

The Clinical presentation ranges from asymptomatic to acute coronary syndrome. Patients may also present with ventricular arrhythmia and sudden cardiac death.<sup>7,8</sup> Coronary angiography is the first-line diagnostic tool for patients presenting with acute coronary syndrome due to suspected Spontaneous Coronary Artery Dissection (SCAD) and should be performed as early as possible. When coronary angiography is ambiguous, intracoronary imaging techniques like Optical Coherence Tomography (OCT) or intravascular ultrasonography can be a valuable tool for improving the diagnostic yield, particularly in cases when there is an intramural hematoma without an intimal tear. Additionally, Multidetector Computed Tomography (MDCT) non-invasive coronary angiography has been used for long-term monitoring of individuals with SCAD.

When SCAD is present, intramural hematoma can form in one of two forms. First, there is the initial rupture, which results in blood flow into the

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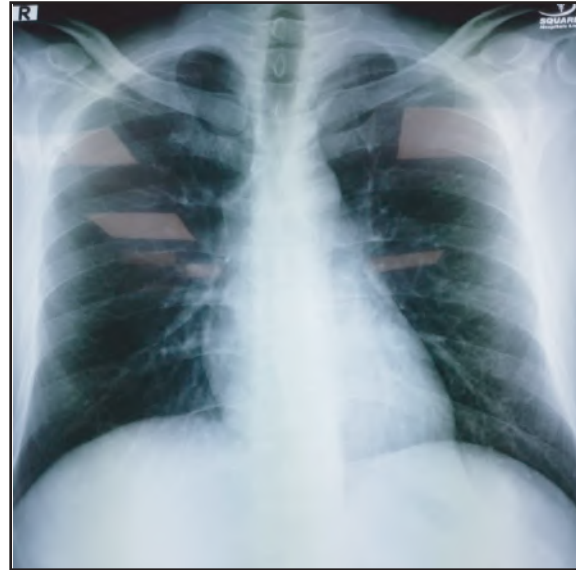
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luminal space and creates a false lumen inside the artery; second, there is the vasa vasorum breach.<sup>9</sup> Management of Spontaneous Coronary Artery Dissection (SCAD) have many options like conservative medical treatment, percutaneous coronary intervention and surgical procedure and are applied based on the severity and site of the lesion, hemodynamic status and other causes of ACS.<sup>10</sup> Here, we present a case of spontaneous coronary artery dissection -a rare defect in young adult male managed surgically.

### Case Report

A 40 years old normotensive, non-diabetic gentleman got admitted on 20th March 2019 in Cardiac Surgery Unit through our Out-Patient Department of Square Hospitals Ltd's with complaints of tightness of the chest with shortness of breath on exertion and retrosternal chest pain. He had complaints of sudden severe chest pain radiating to left arm with shortness of breath and palpitation about 15 days back prior to admission. Then he was taken to a medical college hospital and transferred to coronary care unit to treat that problem. In coronary care unit, initial ECG showed minimal ST segment elevation with elevated troponin level to 0.54 ng/ml. Patient was diagnosed as acute MI and was treated by medical management with low molecular heparin, aspirin, clopidogrel, beta-blocker, nitrates and atorvastatin followed by coronary angiogram revealed spontaneous dissection of the Left Anterior Descending artery (LAD) extending from proximal to mid segment. As the patient's condition was improved patient was discharged from hospital on the next day with aspirin, clopidogrel, beta-blocker, nitrates and atorvastatin and referred to Cardiac center for further management. Three days later after discharged from the hospital, he was admitted to our Cardiac center with complained of occasional retrosternal chest pain with shortness of breath and planned for surgery. For roughly the past 22 years, the patient has smoked, averaging three to four cigarettes per week. He had no family history of coronary artery disease, spontaneous coronary artery dissection, dyslipidaemia, atherosclerotic disease, hormonal therapy, connective tissue disorder and no history of drug abuse. He had also no history of CKD, COPD, TIA, Bronchial asthma or any major surgery. Physical examination on admission revealed:

Average body build, Blood pressure-100/80mmHg, Pulse-76/ min, no added sound on auscultation of heart and lung bases. Initial electrocardiogram (Before CAG) revealed ST segment elevation in lead V2, V3. Chest radiograph showed normal findings. All biochemical investigations were within normal limit except LDL and Triglyceride levels were raised.

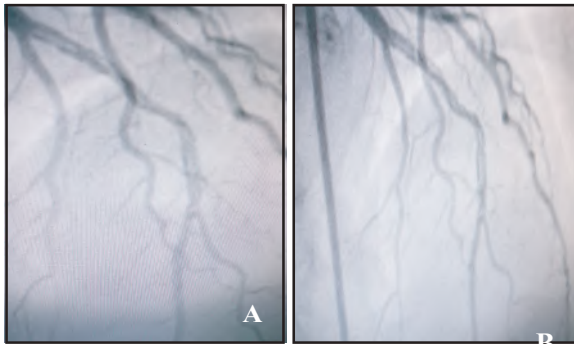


**Figure 1** X-ray chest P/A view showed normal findings



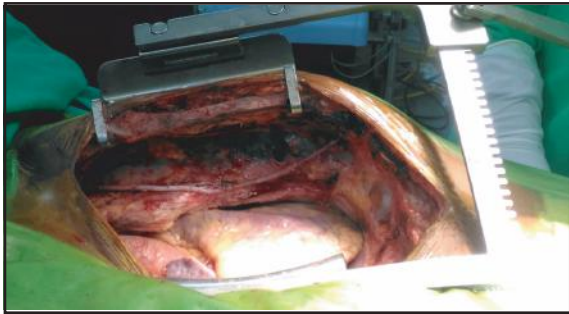
**Figure 2** Initial ECG (Before CAG) showed ST segment elevation in lead V2, V3

Echocardiographic findings showed severely hypokinetic to akinetic entire anterior, antero-inferoseptum. Moderate LV systolic dysfunction (EF-40%), PASP: 30-35mmHg, no pericardial effusion/ intracardiac thrombus seen. Coronary angiography revealed spontaneous dissection of the Left Anterior Descending artery (LAD), extending from proximal to mid segment and no involvement of other coronary arteries.



**Figure 3** (A, B) CAG showing long spontaneous dissection of LAD

As the patient chest pain persists, so planned for surgery. The patient was sent to the operating room for coronary artery bypass surgery. Surgery was performed with endotracheal intubation under G/A and with median sternotomy. After median sternotomy, pericardiotomy was done. Aorta showed healthy, PA (Pulmonary Artery) showed mildly tense, LV-Normal. Left internal mammary artery was harvested. After giving heparin, on beating heart single bypass graft was performed by left internal mammary artery to the distal left anterior descending artery. Noted that- Intraoperatively dissection was found extending from proximal to mid segment of left anterior descending artery. Heparin was reversed with protamine sulphate.



**Figure 4** Skeletonized LIMA harvesting



**Figure 5** LIMA to Distal LAD grafting

After maintaining proper haemostasis wounds was closed in layers after keeping mediastinal and one left pleural chest drain tube in situ. Patient was shifted to ICU with stable hemodynamic. He was extubated on 1<sup>st</sup> post-operative day and subsequent post-operative period was uneventful. Patient was discharged from hospital on the 10<sup>th</sup> day after surgery with good condition.

At the 2-year follow-up, the patient was doing well and the echocardiography revealed 50% LVEF.

### Discussion

Spontaneous Coronary Artery Dissection (SCAD) is an unusual cause of acute myocardial infarction or sudden cardiac death.<sup>11,12</sup> Young women account for approximately 70% of the patients (Female to male ratio: 2:1) and 30% of such cases are associated with the peripartum period.<sup>13,14</sup> Although it has been recognized as a unique clinical entity, the frequency is not known with certainty. The incidence in patients with ACS was 2/1000 as reported by the Denmark Heart Registry.<sup>15</sup>

The most common site of dissection is the Left Anterior Descending artery (LAD) about 80% of coronary dissection due to myocardial bridging mostly in the bridging part or distal part of the artery followed by the left circumflex coronary artery. The second most common site is the right coronary artery followed by the left main artery.<sup>16</sup> In men, right coronary artery and in women, left coronary artery are mainly affected.

Tajrishi et al hypothesized mechanisms by which myocardial bridging can predispose to Spontaneous Coronary Artery Dissection (SCAD) which includes vasospasm of the artery in the area of myocardial bridging, decreased response to vasoactive agents and increased pressure in the bridging artery leading to disturbances in the flow.<sup>17</sup> In our case report, patient was male and the dissection was in the LAD- a rare case report.

Pathophysiology of SCAD is dissection of tunica intima from media. Two hypotheses are proposed: “outside-in”, which is development of intramural hematoma within the vessel wall by rupture of vasa vasorum before its propagation and connection to true lumen, is considered most common, while the “inside-out” suggests that a tear happens first and then creates a false lumen between tunica intima and media.

In spontaneous coronary artery dissection, the mean age of presentation for male is 46 years and for female is 38 years.<sup>18</sup>

Based on the coronary angiogram, four types of SCADs are classified: Type 1 is defined as the presence of connection between true and false lumen. Type 2: the dissection is greater than 20mm in length with no connection between true and false lumen-this is most common SCAD. Type 3 has a dissection of less than 20 mm and no connection between true and false lumen. Type 4 has a dissection and obstruction to flow at the end of the coronary arteries which mimics an embolus.<sup>19</sup>

Another classification of SCAD, based on coronary angiogram: Type 1- The classic description is of a longitudinal filling defect, representing the radiolucent intimal flap. There is often contrast staining of the arterial wall with appearance of a double lumen, Type 2- Diffuse long smooth tubular lesions (Due to intramural hematoma) with no visible dissection plane that can result in complete vessel occlusion. Lesions are typically 30mm in length with an abrupt change in vessel diameter between normal and diseased segments, Type 3- Multiple focal tubular lesions due to intraluminal hematoma that mimic atherosclerosis.<sup>20</sup> Our patient had type -1 angiographic findings of Spontaneous Coronary Artery Dissection (SCAD).

In Type 2 SCAD, the lumen is compressed by an intramural hematoma without an intimal flap (67% of cases), while Type 1 SCAD has a classic dissection flap (29% of cases), and Type 3 SCAD is relatively rare (4% of cases).<sup>21</sup> There are four categories for patients with spontaneous coronary artery dissection - i) Patient with atherosclerotic coronary artery disease, especially men at an average age of 55 years ii) Patients with hereditary connective tissue disorders associated with a defective arterial wall (Marfan and Ehlers-Danlos syndrome) iii) Women in the peripartum period-increased blood flow, shear stress and fluctuation in oestrogen and relaxin blood level are responsible for this event iv) Patients with idiopathic SCAD, comprises heterogenous group of populations with some associated predisposing factors, eg, oral contraceptives, hormone therapy, menstruation, cocaine, cyclosporine, 5-fluorouracil, fenfluramine, systemic lupus erythematosus,

polyarteritis nodosa, fibromuscular dysplasia, polycystic kidney disease, heavy exercise, smoking, dyslipidaemia, hypertension.<sup>22-24</sup> Other risk factors like mechanical stressors including strenuous exercise is responsible for SCAD in males whereas emotional stressors are associated with SCAD in females.<sup>25</sup> Coronary artery tortuosity on angiography is more common in patients with SCAD. Patients with Spontaneous coronary artery dissection are thought to have more fragile coronary artery walls. To prevent catheter-induced dissection, careful consideration to angiographic technique is necessary. There are numerous clinical signs of Spontaneous Coronary Artery Dissection (SCAD) ranging from minor symptoms and stable angina to myocardial infarction and even cardiogenic shock and arrhythmias.

Coronary angiography is the main diagnostic tool for patients presenting with acute coronary syndrome due to suspected spontaneous coronary artery dissection. Other imaging modalities like Optical Coherence Tomography (OCT) Intravascular Ultrasound (IVUS) Cardiac Computed Tomography Angiography (CCTA) can be used for diagnosis of SCAD. The intraluminal thrombi, intimal tears, false lumen, and intramural hematoma are all detected by OCT. IVUS is more effective at determining the full length of the intramural hematoma and deeper vessels.<sup>20</sup> Magnetic resonance coronary angiography can also help in diagnosis of SCAD in selected inconclusive cases to improve early diagnosis and outcomes.<sup>26</sup> Due to the patient's excellent diagnostic accuracy as determined by an angiographic assessment, we did not use OCT or IVUS on this patient. It has been unclear how best to treat individuals with spontaneous coronary artery dissection. Patients with Spontaneous Coronary Artery Dissection (SCAD) managed by medical treatment, percutaneous coronary intervention and surgery. Medical treatment of spontaneous coronary artery dissection is highly individualized. It has weak scientific evidence base due to the lack of randomized controlled trials. Patients who are clinically and hemodynamically stable with no high-risk anatomy can be treated conservatively with beta-blockers, aspirin and statins to preserve patency of the true lumen and prevent thrombotic occlusion.

A consensus has been developed on using dual antiplatelet therapy for a limited duration. Beta-blockers are used as a mainstay of treatment for significant role in the prevention of recurrent SCAD.<sup>27</sup> Nitrates and calcium channel blockers are sometimes used for management of SCAD. Patients with extensive dissections resulting in persistent ischemia are usually treated with surgery or Percutaneous Coronary Intervention (PCI). Percutaneous Coronary Intervention (PCI) is associated with significant challenges. Technical difficulties include negotiating the guidewire into the true lumen, dissection or hematoma extension and side branch occlusion. Stent placement can result in haematoma propagation and loss of vessel flow. Coronary Artery Bypass Surgery (CABG) is indicated when patient is hemodynamically unstable with active ischemia despite optimal medical management, when PCI has been unsuccessful or is not technically feasible, patient with left main stem dissection or severe proximal two vessel dissection, triple vessel diseases, ostial LAD arteries, large lesions. Our patient was treated with Coronary Artery Bypass Surgery (CABG) because of continuing active ischemia and hemodynamically unstable and angiographically a large portion of Left Anterior Descending artery (LAD) was involved. However, in SCAD patients having CABG, there is a chance of connecting false lumen. To correctly identify the lesion, additional care must be taken.

#### Limitation

Single center study with absence of long term followup due to financial burden.

#### Conclusion

Spontaneous Coronary Artery Dissection (SCAD) is an uncommon disease that commonly affects young females but also affects adult males. Most of the patients present with clinical features of acute coronary syndrome.

#### Recommendation

Physicians' awareness is important for early recognition and diagnosis of this condition. Coronary angiogram is the gold standard for diagnosis of SCAD. For hemodynamically stable Spontaneous Coronary Artery Dissection (SCAD) patients' conservative management may be considered

the mainstay of treatment but in patients with ongoing ischemia, hemodynamically unstable or involvement of critical anatomy (eg, Left main) treated with CABG or PCI.

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#### Contribution of authors

MSSP-Conception, drafting & final approval.  
SDG-Citing reference, drafting & final approval.  
MRM-Design, drafting & final approval.  
MAI- Design, drafting & final approval.  
MAH-Citing reference, drafting & final approval.  
JU-Design, critical revision & final approval.

#### Disclosure

All the authors declared no competing interests.

#### References

1. K. E. S. J. a. Hayes SN, Spontaneous Coronary Artery Dissection: Current State of the Science: A Scientific Statement From the American Heart Association. *Circulation*. 2018;137:e523-e557.
2. P. C. R. W. T. L. G. H. P. E. B. Auer J, Spontaneous coronary artery dissection involving the left main stem: assesment by intravascular ultrasound. *Heart*. 2004;90:e39.
3. P. C. H. C. S. H. H. D. Hering D, Prospective study of the incidence, pathogenesis and therapy of spontaneous, by coronary angiography diagnosed coronary artery dissection. *Z Kardiol*. 1998; 87:961-970.
4. S. P. K. J. P. A. P. R. d. M. F. Tanis W, Spontaneous coronary artery dissection: current insights and therapy. *Neth Heart J*. 2008;16:344-349.
5. C. L. A. T. e. a. Shahzad K, postpartum spontaneous dissection of the first obtuse marginal branch of the left circumflex coronary artery causing acute coronary syndrome: A case report and literature review. *J Med Case Rep*. 2013;7:82.
6. B. G. K. M. Pfeiffer M, Spontaneous coronary artery dissection: a case series highlighting diagnostic challenges and the potential for underestimating the incidence of this presumed rare disorder. *J Invasive Cardiol*. 2013;25:E159-162.
7. B.-C. E. B.-R. G. C. O. B. H. ., H. R. e. a. Vanzetto G, Prevalence, therapeutic management and medium-term prognosis of spontaneous coronary artery dissection: results from a database of 11,605 patients. *Eur J Cardiothorac-Surg*. 2009;35:250-254.
8. S. A. A. J. Kamineni R, Spontaneous coronary artery dissection: Report of two cases and a 50 -year review of the literature. *Cardiol Rev*. 2002;10:279-284.

9. S. J. Yip A, Spontaneous coronary artery dissection : A review. *Cardiovasc Diagn Ther.* 2015; 5(1):37-48.
10. A. J. Schmid J, Spontaneous coronary artery dissection in a young man-case report, *J CardiothoracSurg.* 2011;6:22.
11. A. G. P. D. M. J. Silvia MO, Spontaneous coronary artery dissection: a diagnosis to consider in acute coronary syndromes. *Rev Port Cardiol.* 2009;28(6):707-713.
12. M. G. T. G. Basso C, spontaneous coronary artery dissection: a neglected cause of acute myocardial ischaemia and sudden death. *Heart.* 1996;75:451-454.
13. A. J. Schmid J, spontaneous coronary artery dissection in a young man-case report. *J CardiothoracSurg.* 2011;6.
14. S. R. B. G. C. J. Schroder C, Postpartum multivessel spontaneous coronary artery dissection confirmed by coronary CT angiography. *Proc (BaylUniv Med Cent).* 2006; 19:338-341.
15. T. L. K. I. C. E. Mortensen KH, Spontaneous coronary artery dissection: a Western Denmark Heart Registry study. *Catheter Cardiovasc Interv.* 2009;74;710-717.
16. A. S. R. L. R. M. C. C. Z. G. F. R. a. Zampieri P, Follow up after spontaneous coronary artery dissection : A report of five cases. *Heart.* 1996;75(2):206-209.
17. A. A. J. A. e. a. Tajrishi FZ, Spontaneous coronary artery dissection and associated myocardial bridging: Current evidence from cohort study and case reports. *Med Hypotheses.* 2019;128:50-53.
18. A. G. P. D. M. J. Silvia MO, Spontaneous coronary artery dissection: A diagnosis to consider in acute coronary syndromes. *Rev Port Cardiol.* 2009;28(6):707-713.
19. K. ESH., Spontaneous coronary artery dissection. *N Engl J Med.* 2020;10:2358-2370.
20. S. J, Coronary angiogram classification of spontaneous coronary artery dissection. *Catheter Cardiovasc Interv.* 2014;84(7):1115-1122.
21. E. M. B. P. L. R. L. A. R. C. H. D. H. S. G. R. Tweet M.S, Spontaneous coronary artery dissection: Revascularization versus conservative therapy. *Circ Cardiovasc Interv.* 2014;7(6):777-786.
22. S. P. K. J. P. A. P. R. d. M. F. Tanis W, Spontaneous coronary artery dissection: Current insights and therapy. *Neth Heart J.* 2008;16:344-349.
23. W. M. D. G. , A. B. N. A. G. S. J. R. P. O. J. Butler R, Spontaneous dissection of native coronary arteries. *Heart.* 2005;91:223-224.
24. S. N. S. R. R. D. A. L. R. J. e. a. Marysia ST, Clinical features, management and prognosis of spontaneous coronary artery dissection. *Circulation.* 2012;126:579-588.
25. R. S. R. S. H. B. J. C. Ravipati H, The young heart tears easily apart: a case report of spontaneous coronary artery dissection. *Cureus.* 2021;13(6):13(6): e15590.
26. S. J., Coronary angiogram classification of spontaneous coronary artery dissection. *Catheter Cardiovasc Interv.* 2014;84(7):1115-1122.
27. B. R. Lebrun S, Spontaneous coronary artery dissection(SCAD):The underdiagnosed cardiac condition that plagues women. *Trends Cardiovasc Med.* 2018;28:340-345.
28. H. K. A. E. T. P. R. S. A. M. G. Saw J, Spontaneous coronary artery dissection: clinical outcomes and risk of recurrence. *J Am Coll Cardiol.* 2017;70(9):1148-1158.