

Spontaneous Coronary Artery Dissection and Diagnosis by Computed Tomography Angiography: a Case Report

Dissecção Espontânea de Artéria Coronária e Diagnóstico por Angiotomografia: um Relato de Caso

Mathias Silvestre de Brida¹, Georgia Pergher Postingher¹, Fábio Vieira Caovilla¹, Juarez Neuhaus Barbisan¹

¹Institute of Cardiology - University Foundation of Cardiology, Porto Alegre, RS, Brazil.

Introduction

Spontaneous coronary artery dissection (SCAD), defined as separation of the layers of the coronary wall unrelated to trauma, iatrogenesis, or atherosclerosis, often occurs in young women without cardiovascular risk factors.¹ First described almost a century ago, it was poorly understood for some time, known only to be associated with the peripartum and pregnancy periods.² SCAD is a rare cause of acute coronary syndrome (ACS), and despite technological advances in invasive or non-invasive imaging tests increasing our understanding of its pathophysiology and treatment, it remains underdiagnosed.^{1,3} This report describes the case of an ACS patient without obstructive lesions on coronary angiography in which coronary computed tomography angiography (CCTA) was an indispensable tool in the diagnosis of SCAD with an unusual location, highlighting its growing importance based on the current scientific literature.

Case report

A white 55-year-old postmenopausal and hypertensive woman who regularly used hydrochlorothiazide and enalapril went to the emergency room with typical chest pain after emotional stress. A physical examination revealed no significant findings, including asymmetric peripheral pulses, blood pressure levels, or dermatological lesions. Electrocardiography (ECG) showed extensive anterior wall ST-segment elevations (Figure 1). The patient was clinically treated for ACS and referred to a reference hospital for primary angioplasty.

On admission, she presented complete improvement in symptoms and resolution of ST-segment elevation on ECG but new anterior wall T-wave inversion suggestive of ischemia in this territory. Myocardial necrosis markers were elevated, with the ultrasensitive troponin T level increasing from 17.00 to 68.00 pg/mL (reference range, <14.00 pg/mL). Early (24-hour) coronary angiography revealed no significant obstructive

lesions in the coronary arteries, with normal ventriculography and preserved systolic function (Figure 2). By pragmatic definition, the patient was diagnosed with myocardial infarction and nonobstructive coronary arteries (MINOCA).

During the etiological investigation, computed tomography angiography of the thoracic aorta and coronary arteries showed parietal thickening involving the segments proximal and in the middle of the anterior descending artery (ADA) (Figure 3), suggesting an intramural hematoma resulting from a coronary artery dissection.

The patient remained stable during hospitalization, with favorable progression under conservative treatment. She was discharged from the hospital after five days with dual antiplatelet and beta-blocker therapy in addition to the antihypertensive drugs previously used.

Discussion

SCAD is an important cause of acute myocardial infarction in women with few cardiovascular risk factors and should be considered in cases in which MINOCA is the initial diagnosis.⁴ The prevalence of SCAD remains unknown due to its underdiagnosis, but recent studies reported SCAD in 1–4% of coronary angiographies performed for acute chest pain.⁵ Approximately 90% of cases occur in women, in whom SCAD accounts for more than one third of ACS cases in patients under the age of 50 years or associated with pregnancy.¹

One of the most accepted theories in etiopathogenesis is the weakening of the coronary artery wall layers, with vasa vasorum rupture, bleeding into the false lumen, and consequent formation of intramural hematoma between the intima, media, or adventitia, obstructing blood flow and causing myocardial injury.^{1,3}

The most frequently related condition is fibromuscular dysplasia, with a prevalence of approximately 80% in recent studies.⁶ This condition predominates in women in the gestational period or who are using contraceptive or fertility drugs, suggesting hormonal influence on vascular connective tissue and the consequent fragility of the middle arterial layer.² Emotional disorders such as depression, anxiety, and migraine are associated with this higher prevalence.⁷

Since it typically presents as chest pain, diagnosing SCAD is challenging. Like other ACS etiologies, it also causes biomarker and electrocardiographic changes, including ST-segment elevation and ventricular arrhythmias, making it difficult to clinically differentiate it from an atherothrombotic event.⁸

Thus, the use of coronary angiography is essential to its classification as described by Saw into type 1 (contrast visualization on the arterial wall), type 2 (smooth and diffuse

Keywords

Acute coronary syndrome; Chest pain; Computed tomography angiography; Dissection.

Mailing Address: Mathias Silvestre de Brida •

Av. Princesa Isabel, 395. CEP: 90040-371, Santana, Porto Alegre, RS - Brazil.

E-mail: mathias-sb@hotmail.com

Manuscript received 13/2/2021; revised 4/10/2021; accepted 7/6/2021

DOI: 10.47593/2675-312X/20213403eabc191



Case Report

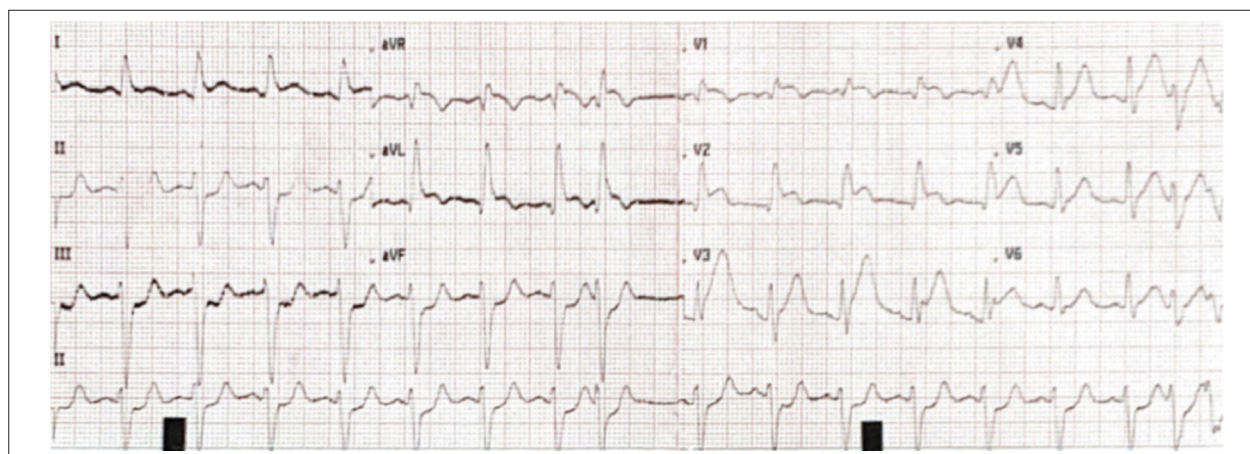
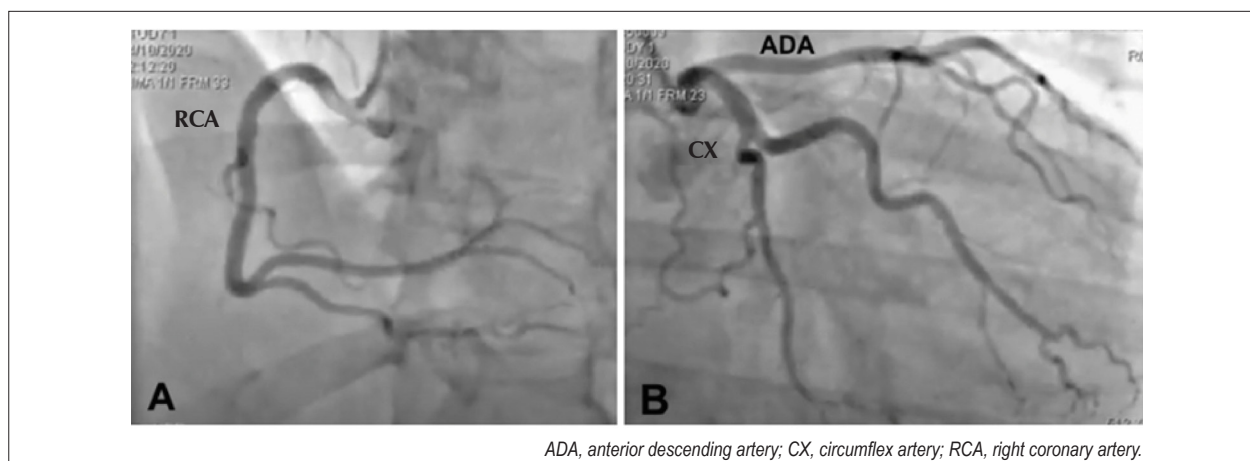


Figure 1 – 12-lead electrocardiogram showing ST-segment elevation in the extensive anterior wall.



ADA, anterior descending artery; CX, circumflex artery; RCA, right coronary artery.

Figure 2 – Coronary angiography demonstrating the absence of obstructive lesions. Observe the right coronary system in left anterior oblique projection (A) and the left coronary system in right anterior oblique caudal projection (B).

stenosis with a medial-distal predominance in the vessel), and type 3 (focal stenosis similar to atherosclerosis differentiated by intracoronary imaging).⁹ Type 2 is the most common, being found in approximately two-thirds of cases, predominantly in the medial-distal segment of the ADA. This report describes the involvement of the proximal segment, which occurs in less than 10% of cases.¹

Intravascular coronary imaging, such as optical coherence tomography and intravascular ultrasound, are used in cases of diagnostic uncertainty or as guides for invasive targeted treatments.¹⁰ However, its use is limited by its high cost and limited availability.

Technological advances in non-invasive imaging tests have consolidated this modality in the etiological investigation of ACS. Current literature reviews have highlighted the role of CCTA in SCAD, stressing the fundamental importance in parietal and extra-coronary evaluations and its essential nature for diagnosis in some cases.¹¹ Recent retrospective studies demonstrated that the most common findings were abrupt

or conical luminal stenosis and intramural hematoma, but others findings such as dissection flap, total lumen occlusion, bridging, and tortuous coronary have also been described.^{12,13} One of the most relevant advantages is to minimize the risk of iatrogenesis as in invasive angiography.²

However, a normal CCTA does not exclude the diagnosis of SCAD, as distal segments smaller than 1.5 mm in diameter may be beyond the method's resolution.¹¹

Therapeutic management is mostly conservative and supportive since more than 70% of cases progress with regression of angiographically visible lesions.⁵ In the long term, beta-blockers play a role in reducing recurrence, and dual antiplatelet therapy consisting of aspirin and clopidogrel for up to one year is recommended by specialists.⁶ Renin angiotensin system antagonists are indicated in cases of systolic dysfunction or hypertension, while statins are used for preexisting dyslipidemia or concomitant atherosclerotic disease.¹

Although the survival rate is close to 100%, half of patients experience an important correlation with a major cardiovascular

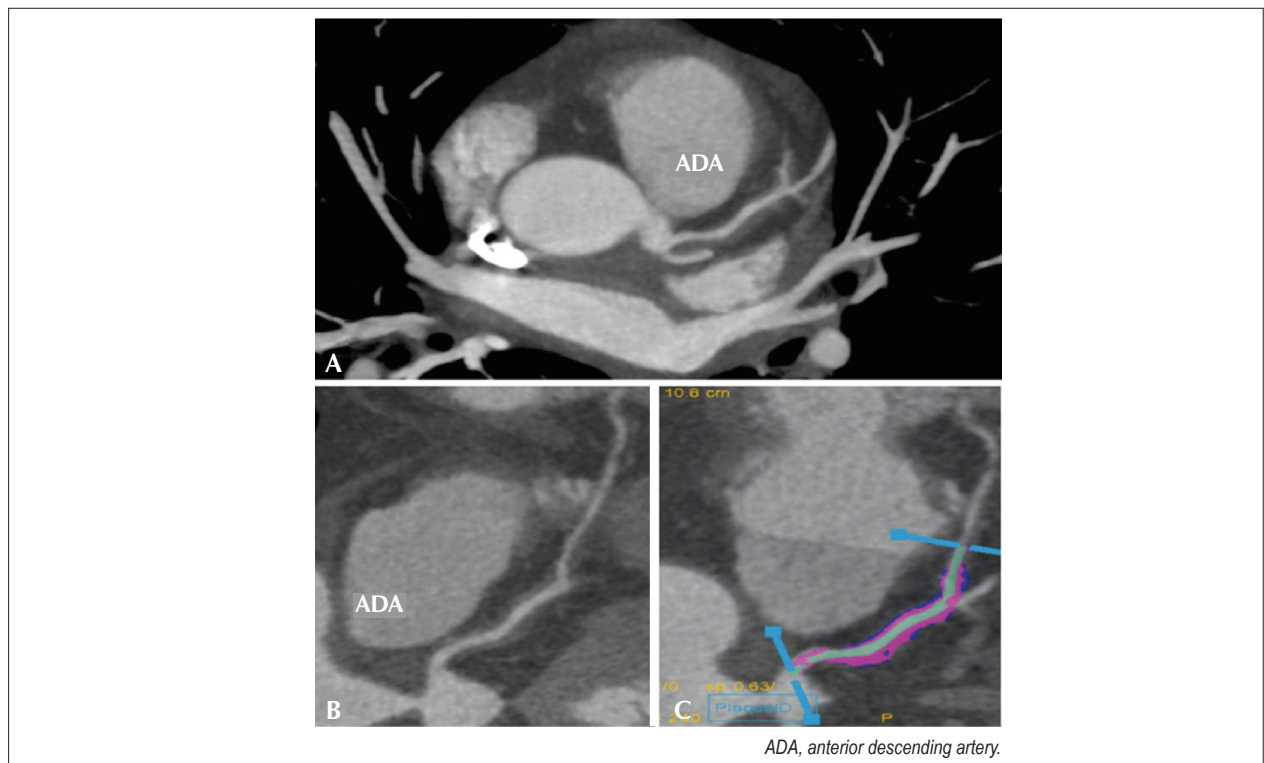


Figure 3 – Coronary computed tomography angiography demonstrating parietal thickening in the left anterior descending artery involving the proximal and middle segments, without luminal reduction, compatible with intramural hematoma. Axial reconstruction in maximum intensity projection (A), in curved plane (B), and plaque analysis (C) with pink and blue areas, related to parietal thickening.

event in the following decade, 35% due to SCAD, as well as depression and nonischemic chest pain.⁶ As recurrence is common, periodic follow-up is necessary and non-invasive tests, such as CCTA, are viewed with optimism in this scenario, with little evidence presented in the literature to date.^{2,7}

Therefore, the diagnosis of SCAD should be suspected in cases of ACS without obstructive lesions on coronary angiography, especially in young women with few or no cardiovascular risk factors. This study examined the growing importance of CCTA in this scenario, corroborating the most recent scientific evidence and highlighting the value of non-invasive imaging methods as diagnostic tools.

References

1. Gilhofer TS, Saw J. Spontaneous coronary artery dissection: update 2019. *Curr Opin Cardiol*. 2019;34(6):594-602. doi: 10.1097/HCO.0000000000000671
2. Adlam D, Alfonso F, Maas A, Vrints C; Writing Committee. European Society of Cardiology, acute cardiovascular care association, SCAD study group: a position paper on spontaneous coronary artery dissection. *Eur Heart J*. 2018;39(36):3353-68. doi: 10.1093/eurheartj/ehy080
3. Maeder M, Ammann P, Angehrn W, Rickli H. Idiopathic spontaneous coronary artery dissection: incidence, diagnosis and treatment. *Int J Cardiol*. 2005;101(3):363-9. doi: 10.1016/j.ijcard.2004.03.045
4. Tamis-Holland JE, Ineid H, Reynolds HR, Agewall S, Brilakis ES, Brown TM, et al.; American Heart Association Interventional Cardiovascular Care Committee of the Council on Clinical Cardiology; Council

Authors' contributions

Research conception and design and manuscript writing: MS Brida, GP Postinger; data collection: MS Brida, GP Postinger, FV Caovilla, JN Barbisan; data analysis and interpretation: MS Brida, GP Postinger, FV Caovilla, JN Barbisan; critical review of the manuscript for important intellectual content: MS Brida, GP Postinger, FV Caovilla, JN Barbisan.

Conflict of interest

The authors have declared that they have no conflict of interest.

on Cardiovascular and Stroke Nursing; Council on Epidemiology and Prevention; and Council on Quality of Care and Outcomes Research. Contemporary diagnosis and management of patients with myocardial infarction in the absence of obstructive coronary artery disease: a scientific statement from the American Heart Association. *Circulation*. 2019;139(18):e891-e908. doi: 10.1161/CIR.0000000000000670

5. Hayes SN, Kim ESH, Saw J, Adlam D, Arslanian-Engoren C, Economy KE, et al.; American Heart Association Council on Peripheral Vascular Disease; Council on Clinical Cardiology; Council on Cardiovascular and Stroke Nursing; Council on Genomic and Precision Medicine; and Stroke Council. Spontaneous coronary artery dissection: current state of the science: a scientific statement from the American Heart Association. *Circulation*. 2018;137(19):e523-57. doi: 10.1161/CIR.0000000000000564

Case Report

6. Saw J, Mancini GBJ, Humphries KH. Contemporary review on spontaneous coronary artery dissection. *J Am Coll Cardiol*. 2016;68(3):297-312. doi: 10.1016/j.jacc.2016.05.034. Erratum in: *J Am Coll Cardiol*. 2016;68(14):1606.
7. Saw J, Humphries K, Aymong E, Sedlak T, Prakash R, Starovoytov A, et al. Spontaneous coronary artery dissection: clinical outcomes and risk of recurrence. *J Am Coll Cardiol*. 2017;70(9):1148-58. doi: 10.1016/j.jacc.2017.06.053
8. Tweet MS, Eleid MF, Best PJ, Lennon RJ, Lerman A, Rihal CS, et al. Spontaneous coronary artery dissection: revascularization versus conservative therapy. *Circ Cardiovasc Interv*. 2014;7(6):777-86. doi: 10.1161/CIRCINTERVENTIONS.114.001659
9. Saw J. Coronary angiogram classification of spontaneous coronary artery dissection. *Catheter Cardiovasc Interv*. 2014;84(7):1115-22. doi: 10.1002/ccd.25293
10. Paulo M, Sandoval J, Lennie V, Dutary J, Medina M, Gonzalo N, et al. Combined use of OCT and IVUS in spontaneous coronary artery dissection. *JACC Cardiovasc Imaging*. 2013;6(7):830-2. doi: 10.1016/j.jcmg.2013.02.010
11. Gupta S, Meyersohn NM, Wood MJ, Steigner ML, Blankstein R, Ghoshhajra BB, et al. Role of coronary CT angiography in spontaneous coronary artery dissection. *Radiol Cardiothorac Imaging*. 2020;2(6):e200364. doi: 10.1148/ryct.2020200364
12. Pozo-Osinalde E, García-Guimaraes M, Bastante T, Aguilera MC, Rodríguez-Alcudia D, Rivero F, et al. Characteristic findings of acute spontaneous coronary artery dissection by cardiac computed tomography. *Coron Artery Dis*. 2020;31(3):293-99. doi: 10.1097/MCA.0000000000000819
13. Tweet MS, Akhtar NJ, Hayes SN, Best PJ, Gulati R, Araoz PA. Spontaneous coronary artery dissection: Acute findings on coronary computed tomography angiography. *Eur Heart J Acute Cardiovasc Care*. 2019;8(5):467-75. doi: 10.1177/2048872617753799