

Case Report

A large spontaneous coronary artery dissection in the bifurcation causing an acute myocardial infarction in a young male: a case report and mini literature review

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Abstract: Spontaneous coronary artery dissection (SCAD) at the bifurcation is a rare cause of acute myocardial infarction (AMI). The pathophysiology of SCAD is poorly understood with its diagnosis and management remaining challenging. Here we describe a case of a 22 year old man presenting with acute antero-lateral ST segment depression and raised levels of plasma troponin and creatine kinase caused by a large spontaneous dissection in the bifurcation of the left main coronary artery, left anterior descending artery and circumflex artery (CX) with the initial part of CX occluded by the dissecting aneurysm. The patient underwent urgent coronary artery bypass grafting (CABG) with great effect. Follow up coronary angiography at 5 months post the insult revealed decreased coronary artery ectasia along with recovery of CX blood flow. Since SCAD commonly occurs in otherwise healthy individuals, angiography serves as a critical tool in early diagnosis and management of this life-threatening condition.

Keywords: Spontaneous coronary artery dissection, coronary artery bypass grafting, acute myocardial infarction, angiography

Background

Spontaneous coronary artery dissection (SCAD) is a highly unusual case and extremely rare clinical entity with an estimated incidence of approximately 0.1-0.2% in patients with acute coronary syndrome [1]. Since SCAD obstructs coronary perfusion distal to the lesion and acute myocardial infarction (AMI) is a life-threatening condition, any occurrence of SCAD should be suspected as early as possible in patients with acute coronary syndrome of unknown etiology. Currently, the exact etiology and pathogenesis related to SCAD are not well understood. However, it is thought that the pathophysiology of this condition may be related to connective tissue defects, coronary arthritis and underlying atherosclerosis [2]. Coronary angiography remains the gold standard for the diagnosis and assessment of SCAD. Other intracoronary imaging including intra-vascular ultrasound and optical coherence tomography can provide incremental value in terms of diagnosis and management

[3]. Management of SCAD includes pharmacological reperfusion strategies and surgical interventions [4]. Here we report a case of SCAD in the bifurcation in a 22-year-old man who presented with acute myocardial infarction. The clinical presentation, diagnosis, and management of SCAD are described and discussed. This case report highlights the importance of prompt diagnosis and subsequent life-saving strategies employed for this condition. The latest updates in the diagnosis and management of SCAD were also summarized in this article.

Case presentation

At July 19th, 2011, a 22-year-old man (Han, from China) presented with 3 day history of sudden onset retrosternal pain radiating to the anterior chest shortly after having a shower. Symptoms continued for 3 days despite the patient having ongoing periods of rest. The pain was exacerbated by exertion. The patient reported a history of smoking but was otherwise well with no

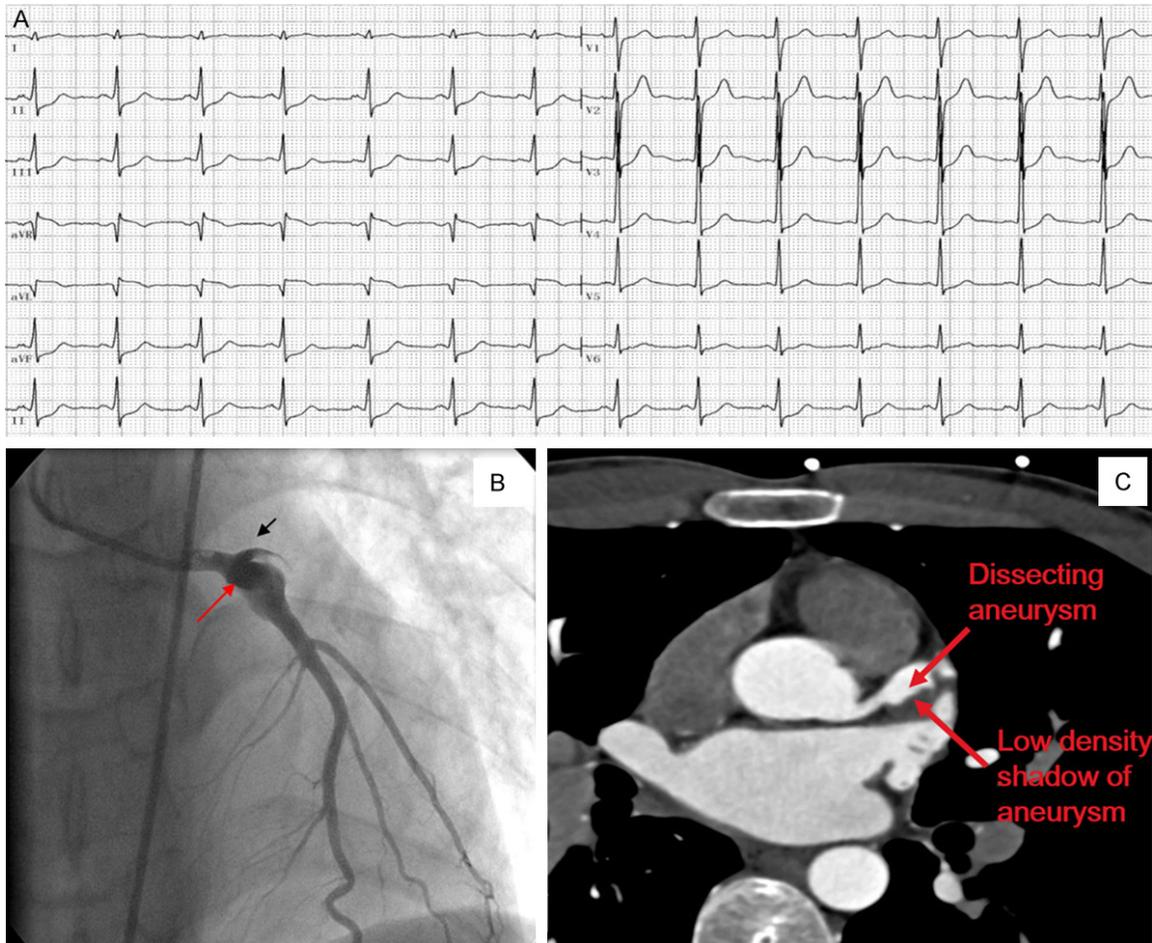


Figure 1. ECG, angiography and Computed Tomography images before operation. A. The patient's 12-lead electrocardiogram on admission, showing ST-segment depression in the II, III aVF and V4-6 lead and minimal ST-segment elevation in leads aVL. B. The coronary angiography image of spontaneous dissection of the left coronary artery and the anterior descending branch of the left coronary artery with acute occlusion of the left circumflex branch. Red arrow: The branch of the circumflex branch occlusion. Black arrow: dissecting aneurysm. C. Computed Tomography image of the dissecting aneurysm.

significant medical or surgical history. He did not take any regular medication on a regular basis. Initial electrocardiography (ECG) (**Figure 1A**) demonstrated ST depression in Leads II, III and AVF. Elevation of blood troponin and creatinine kinase was observed in our patient. Coronary angiography and Computed Tomography (CT) demonstrated a large dissection in the bifurcation of the left main coronary artery, left anterior descending artery and circumflex artery (CX). Furthermore, the initial section of the CX was occluded by the dissecting aneurysm (**Figure 1B, 1C**). Due to the thin wall of the aneurysm, the occlusion from the percutaneous coronary intervention (PCI) had a greater risk of rupture of the aneurysm wall. In addition, the clinical status of the patients was relatively stable, so we did not proceed to PCI treatment,

instead electing for emergency coronary artery bypass graft (CABG) treatment. The patient underwent urgent CABG the following day and was subsequently commenced on clopidogrel and β -blockers therapy. During a five-month follow-up, the patient reported no further episodes of chest pain. A follow up ECG was unremarkable (**Figure 2A**). Follow up coronary angiography revealed decreased coronary artery ectasia along with recovery of CX blood flow (**Figure 2B**). Subsequent yearly telephone follow up over the next 6 years did not demonstrate any recurrence of disease.

Discussion

This case demonstrates an example of SCAD occurring in a young male patient with no clear

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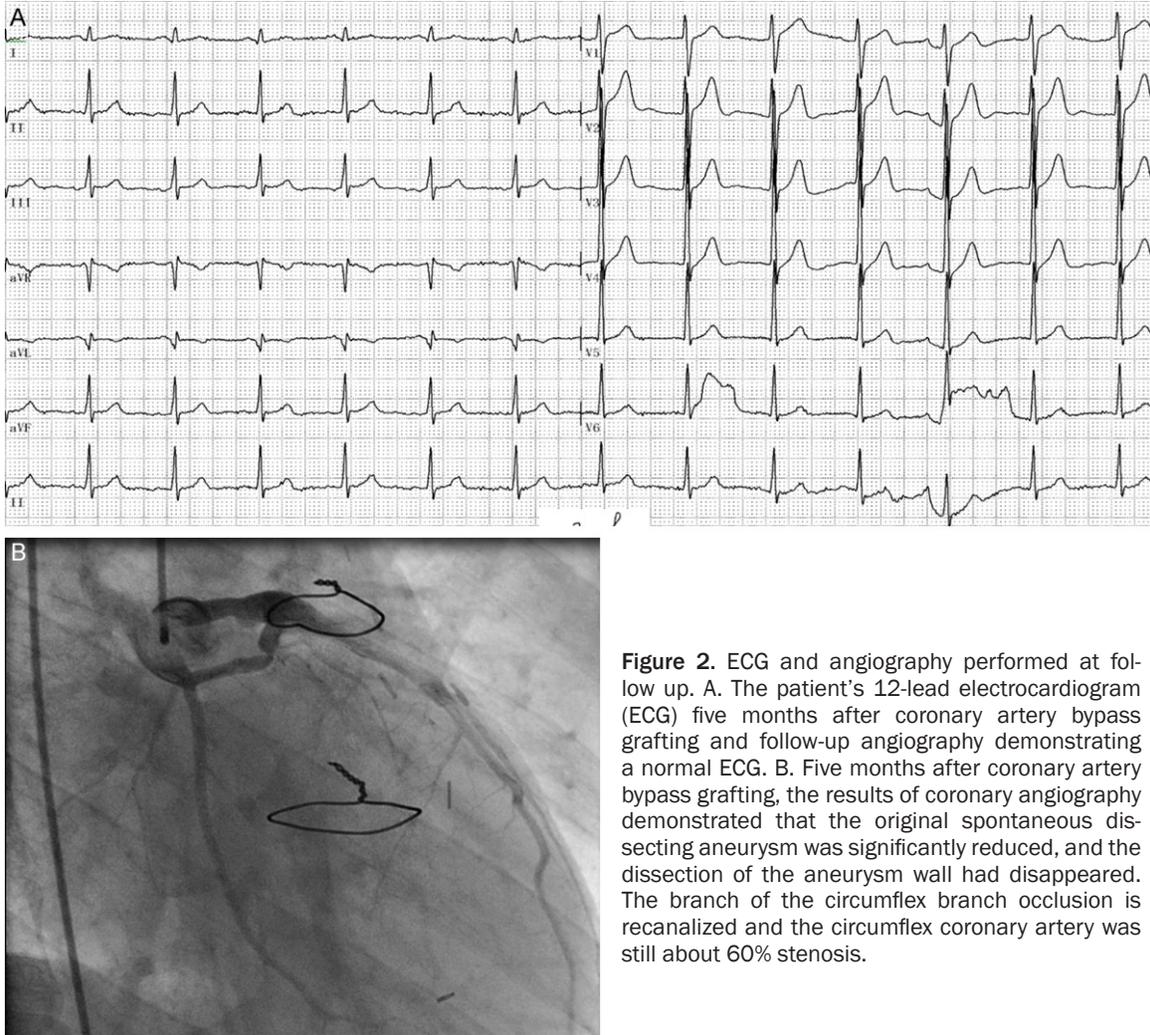


Figure 2. ECG and angiography performed at follow up. A. The patient's 12-lead electrocardiogram (ECG) five months after coronary artery bypass grafting and follow-up angiography demonstrating a normal ECG. B. Five months after coronary artery bypass grafting, the results of coronary angiography demonstrated that the original spontaneous dissecting aneurysm was significantly reduced, and the dissection of the aneurysm wall had disappeared. The branch of the circumflex branch occlusion is recanalized and the circumflex coronary artery was still about 60% stenosis.

precipitating factors. SCAD typically affects young and healthy individuals [5]. Males are more likely to have right coronary artery dissection involvement, whereas females are more likely to have involvement of the left anterior descending (LAD) artery and left main stem. The circumflex artery is rarely involved in either genders [6]. There are very limited case reports demonstrating large spontaneous coronary artery dissection in the bifurcation associated with AMI.

SCAD is defined as hemorrhagic separation of the media of the coronary artery wall with the formation of a false lumen with or without an associated intima tear. There are two types of SCAD: (a) intimal tear and propagation of medial dissection, (b) medial dissection with hematoma formation but no intimal tear [7]. When the separated intima-media layer extends

towards the true lumen of the vessel, insufficient flow from the coronary artery leads to distal myocardial ischemia.

There are multiple risk factors for SCAD including atherosclerosis, hypertension, diabetes mellitus, hypercholesterolemia and connective tissue disorders. One of the main causes for SCAD is plaque inflammation and rupture, which leads to disruption of the intima-media junction. This leads to formation of an intima flap and subsequent hematoma formation in atherosclerosis [2]. However, several studies have reported SCAD occurs in previously healthy young people with no apparent risk factors [8, 9]. Notably, many of these cases have been reported to occur following a period of heavy exercise (aerobic exercise, running, weight-lifting) [9, 10]. In the present study, there were no identifiable risk factors in our

patient except for smoking. It should be noted that SCAD has a weak association with smoking compared with other typical risk factors for SCAD (for example, genetic predispositions to arterial weakening or fragility) [11].

The clinical presentation of SCAD is related to the extent and severity of coronary artery occlusion, as well as the degree of myocardial ischemia. Clinical presentation can manifest in the form of unstable angina, myocardial infarction, cardiogenic shock, or sudden cardiac death. Sudden cardiac death occurs mainly in patients with left main coronary artery dissection. Diagnosis is usually made via emergency coronary angiography. This is essential to assess the extent of the disease and the possibility for percutaneous transluminal coronary angioplasty. Multimodality intracoronary imaging such as trans-esophageal ultrasound, intravascular ultrasound, optical coherence tomography, and coronary computed tomography angiography can also be used in instances where the diagnosis is unclear [12]. In this case, the diagnosis of SCAD was made through coronary angiography. We demonstrated that when performed correctly within an adequate time frame, coronary angiography demonstrated high sensitivity for the diagnosis of SCAD in patients with atypical chest pain and low cardiovascular risk. In addition, CT angiography may also be considered as an alternative diagnostic method. As SCAD represents an extremely rare but life-threatening condition, early diagnosis and intervention is mandatory.

The management of SCAD is based on the patient's hemodynamic status, the site of dissection, and the extent of vessel involvement. Initial management consists of a combination of aspirin, clopidogrel, ACE inhibitors, heparin and β -blockers [13]. This is similar to treatment initiated for coronary artery disease without dissection. The condition can be managed medically for the stable patient with single-vessel dissection, without progression or hemodynamic compromise, and without left main coronary artery involvement or an otherwise large area of myocardium in jeopardy. Such patients usually have favorable long-term outcomes [14]. Aspirin and heparin are purported to decrease thrombus formation in the false lumen, in turn promoting regular flow through the true lumen. If medical treatment is un-

successful, stenting and angioplasty can be utilized to achieve excellent therapeutic results, especially in single-vessel disease with short-segment involvement [15]. Percutaneous transluminal coronary angioplasty and coronary artery bypass grafting can also be considered as other therapeutics means [16]. In this case, the patient underwent CABG and was commenced on medical treatment consisting of oral clopidogrel and β -blockers. At the time of discharge, there was absence of chest pain and a normal ECG was recorded.

Conclusion

SCAD is a rare and poorly understood cause of acute coronary syndrome in young patients without risk factors. We were able to diagnose this case through the use of coronary angiography. Although coronary angiography is the gold standard for the diagnosis of SCAD, CT angiography may also be considered as an alternative diagnostic method. Early bypass intervention is a lifesaving intervention for large SCADs in the bifurcation with acute myocardial infarction.

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Disclosure of conflict of interest

None.

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