CASE STUDY

Spontaneous Coronary Artery Dissection: A Case Study with Nursing Implications

Genevieve Romano-Helm

Decker College of Nursing and Health Sciences, Binghamton University, Binghamton, NY USA
Corresponding Author: Genevieve Romano-Helm, Binghamton University,
Binghamton, NY USA Email: gromano2@binghamton.edu
doi: https://dx.doi.org/10.47988/janany.19644764.1.2

Abstract

Spontaneous coronary artery dissection (SCAD) is a nontraditional cause of acute myocardial infarction found typically in younger women who have little to no cardiac risk factors. Once thought to be a rare disease process, there is now an increase in the diagnosis of spontaneous coronary artery dissection because of improved awareness and education. Registered nurses play an important role in the identification and management of this young and otherwise healthy population. Through interdisciplinary collaboration, nurses can facilitate providing standardized care to these patients. This article presents a real-life case study of a patient who experienced the trajectory of diagnosis, treatment, and long-term management of SCAD and the related nursing care implications.

Keywords: SCAD, spontaneous coronary artery dissection

Acknowledgment: The author is grateful to Dr. Ann Fronczek, Director, PhD Program, Decker College of Nursing and Health Sciences, Binghamton University, for providing mentorship and support throughout the publication process.

Funding: The author did not receive any funding from the public, commercial, or not-for-profit sector.

Conflict of Interest: The author declares no actual or potential conflicts of interest with respect to the authorship and publication of this manuscript.

Date Submitted: May 9, 2021 Date Accepted: June 21, 2021 Date of Publication: August 15, 2021

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Spontaneous Coronary Artery Dissection (SCAD) is a life-threatening and often under-recognized cause of myocardial infarction among young, otherwise healthy women. Registered nurses are often the first point of contact for patients with cardiac symptoms, making it exceedingly important to be familiar with risk factors and pattern recognition of cardiac diseases. Providing adequate care to this population is paramount, including proper management, psychosocial support, and assistance in finding much needed resources in recovery. In addition, patients often seek knowledge of their new diagnosis and might lack access to specialists in their hometowns. Using a case study approach, this report will review some of the basics of SCAD and the aspects of patient care, including identification of risk factors, rehabilitation, and ongoing management. Nurses can help identify young patients who might otherwise be missed and ensure that they are provided with the support and resources they need after this life-threatening cardiac event.

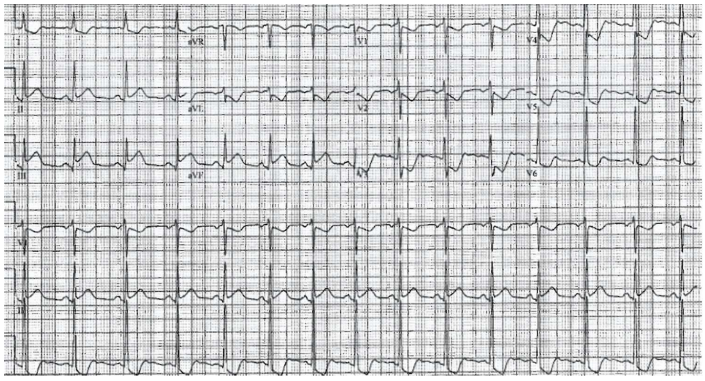
Case Presentation

GR, a 39-year-old female, mother of four, started her day like any other, dropping her kids off at school. She then headed to her primary care office where she worked as a Family Nurse Practitioner. While walking back to her vehicle, she developed a sudden onset of substernal chest pain which radiated to her neck and left arm. Blowing off the pain as anxiety related to her upcoming birthday or possibly gastrointestinal origin, she continued to her office, with the pain subsiding shortly thereafter. She was able to complete her full day of seeing patients without any personal health concerns. It had been a typical day with a packed schedule and no time for a lunch break. After returning home from her day at the office, she started making dinner when the chest pain returned but was more intense than previously experienced in the morning. She continued to think of it as anxiety-related or perhaps an esophageal spasm. She was healthy, physically fit, of normal weight, exercised 5 days a week, had no significant medical history, non-smoker, and had no indicators for atherosclerotic cardiovascular disease. However, the pain continued, so she returned to her clinic, which was a short drive from her home, and an EKG was performed. She was shocked by the EKG findings, which showed apparent ST elevation. A co-worker contacted EMS services. On the way to the hospital, paramedics administered 324 mg. of chewable aspirin and 3 sublingual nitroglycerin with no alleviation or resolution of symptoms.

On arrival to the hospital, the physical exam was unremarkable, as well as her vital signs (blood pressure (BP) 117/66 mm Hg, heart rate 81/min, respirations 10/min, and temperature 97.9 F). She continued to complain of substernal pain radiating to the neck and left arm which had intensified. A repeat EKG showed ST elevation in leads II, III, and aVF, ST depression in leads aVL, V2, V3, V4, and V6 (Figure 1), which are all consistent with an inferior wall infarction with reciprocal changes. An ST elevation myocardial infarction (STEMI) code was called, paging the on-call cardiologist and the cardiac catheterization staff. As part of the facility's acute coronary syndrome protocol, she was given ticagrelor 180 mg., heparin 5000 units IV bolus, diphenhydramine 50 mg., and IV fluids in preparation for a cardiac angiogram and possible percutaneous coronary intervention. Morphine 2 mg. IV was administered to help relieve her pain, which caused her to become hypotensive (BP = 89/50), requiring an IV fluid bolus.

Figure 1

Initial EKG Findings



Initially, her troponin level was indeterminate at 0.044. However, it peaked at 46.00 over the next 6 hours. All other lab work was unremarkable at that time. Her chest x-ray showed no active disease. She had no risk factors for coronary artery disease, including obesity, smoking, previous drug use, hypertension, hyperlipidemia, diabetes, or cardiac family history.

GR was transferred to the cardiac catheterization lab for diagnostic cardiac angiogram. During the transport, she developed nausea and vomiting. Coronary angiogram showed a left dominant system, left anterior descending artery with severe tortuosity, left circumflex coronary artery stenosis starting proximally and extending the length of the artery, with 90% occlusion and faint collateral arteries (Figure 2). Imaging of the right coronary artery showed no obvious stenosis. The initial impression was that of vasospasm due to the exceptionally long segmental area of the circumflex artery. The physician administered multiple doses of intracoronary adenosine and nitroglycerin with no improvement. Angioplasty and stenting were initiated, and three drug-coated stents were placed in the distal, mid, and proximal aspects of the circumflex artery. Development of a brief run of ventricular fibrillation occurred, requiring defibrillation. The results of the intervention were good with zero residual stenoses and resolution of ST segment elevation on EKG.

Figure 2

Coronary Angiogram with Left Circumflex Coronary Artery Stenosis

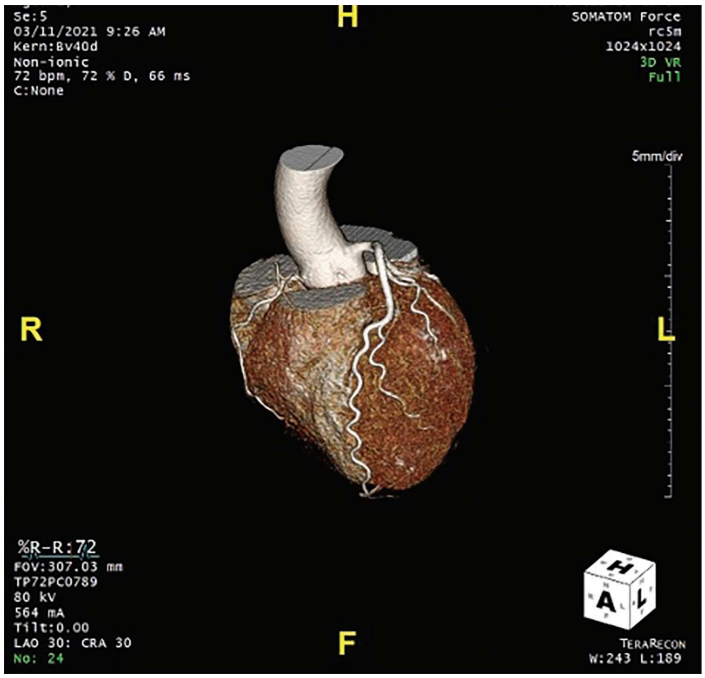
Unfortunately, GR had a difficult recovery course because of findings consistent with hypoxemic respiratory failure, secondary to flash pulmonary edema, and severe hypotension (systolic BP between 60 and 80) requiring norepinephrine, which necessitated admission to the cardiovascular intensive care unit. Post-event echocardiogram showed moderate to severe mitral valve regurgitation, secondary to ischemia, with an ejection fraction of 35-40%, and moderate to severe inferior wall hypokinesis. After 6-days of recovery, she was able to be discharged in stable condition and to follow up with cardiology as an outpatient.

Spontaneous Coronary Artery Dissection

Spontaneous coronary artery dissection is a nontraditional cause of acute myocardial infarction found typically in younger women with little to no cardiac risk factors (Wagers et al., 2018). Often underdiagnosed, SCAD occurs when a tear or hematoma develops in the lumen of a coronary artery blocking the flow of blood to the heart, causing an acute myocardial infarction and cardiac ischemia (Wagers et al., 2018). Clinical presentation depends on the severity and location of dissection and the degree of blockage preventing blood flow. These patients can present from a range of being asymptomatic to becoming critically ill, with acute coronary syndrome, ventricular arrhythmias, or sudden cardiac death (Mokhberi et al., 2015). Cases are 2:1 female, with one-third of these occurring in women in the peripartum period (Tweet et al., 2011). In addition, inflammatory and connective disease disorders (Ehlers-Danlos, Marfan syndrome, and Fibromuscular Dysplasia), excessive exercise, and the use of hormone therapy are considered risk factors (Eleid et al., 2014; MacDonald, 2020). Saw et al. (2017) reported that uncontrolled hypertension had been found to increase the risk of SCAD by exerting pressure on the vessel walls making them more susceptible to damage. Atherosclerotic changes seen in the traditional myocardial infarction are absent in SCAD patients, often leading to late diagnosis or mismanagement of the disease process (Adlam et al., 2019). Previous research shows that SCAD has high recurrence rates of up to 20% and a high incidence of major adverse cardiovascular events, including heart failure, ischemic cardiovascular events, stroke, or cardiac death (Adlam et al., 2019). Coronary artery tortuosity (Figure 3) is a common finding in the SCAD population and could be one of the best predictive indicators for recurrence (Eleid et al., 2014). Arterial tortuosity is defined by the number of curvatures present and the degree of each curvature within a vessel (Eleid et al., 2014).

Figure 3

Arterial Tortuosity on CT Cardiac Angiogram



Pathophysiology

Spontaneous coronary artery dissection continues to be poorly understood in terms of pathophysiology. Arterial walls, including the coronary arteries, contain three layers: the tunica adventitia (outer layer), tunica media (middle layer), and the tunica intima (inner layer). Spontaneous coronary artery dissection occurs when there is a separation between these layers or a rupture of the arterial wall creating a false lumen. As blood fills this lumen, an intramural hematoma develops, compressing the true vessel lumen, obstructing blood flow to parts of the myocardium (MacDonald, 2020).

In comparison, atherosclerotic coronary artery disease is typically seen in individuals with well-known risk factors such as obesity, smoking, high blood pressure, high cholesterol, diabetes, and family history. Atherosclerotic deposits build up on the inner arterial lumen over time and limit blood flow to the myocardium.

These buildups can lead to plaque ruptures within the arterial lumen creating platelet aggregation, causing obstruction and cardiac ischemia.

Disease Management

In the past, general cardiologists could go a lifetime without seeing a SCAD patient in their practice. When they did have these patients, they were often treated by standard acute coronary syndrome guidelines, which do not always apply to the SCAD population. This led patients seeking SCAD specialists to endure considerable travel for appropriate management. However, many patients do not have the time or financial means to travel extensively for specialty care. Many patients voice frustrations in their providers for not having answers to complex questions.

The patient in the above case study received follow-up treatment at the SCAD Mayo Clinic in Minnesota and was medically managed on bisoprolol, lisinopril, clopidogrel, and aspirin. Atorvastatin was removed from her management, as her lipid profile was unremarkable, and statins are not recommended in SCAD patients without the presence of hypercholesterolemia.

Medical Management

Medical management is recommended as first-line treatment in SCAD, except in cases of ongoing ischemia, ventricular arrhythmias, dissection of the left main coronary artery, or hemodynamically unstable patients (Hassan et al., 2019). Percutaneous coronary intervention is controversial in this population. There are concerns of rupturing the already damaged vessel wall, further expansion of the dissection from angioplasty balloons, or accidental insertion of the guidewire into a false lumen (Hayes et al., 2018). Although randomized trials of SCAD patients do not currently exist, prospective data show that the use of beta-blockers appears to decrease recurrence rates in this population by reducing the stress and pressure exerted on the vessel's walls by the heart (Saw et al., 2017). Although standardized SCAD guidelines have yet to be established, the use of beta-blockers for treatment and recovery appears to have a strong agreement among SCAD specialists (Hayes et al., 2018; MacDonald, 2020; Tweet et al., 2018).

Cardiac Rehabilitation

Cardiac rehabilitation (CR) has been shown to reduce mortality after an acute myocardial infarction by up to 25% and has a national Class-1 indication, meaning it is strongly recommended (Grace et al., 2009; Krittanawong et al., 2016). Yet, women are less likely to attend CR, and when they do, they are less likely to complete the program than men (Krittanawong et al., 2016). Research involving SCAD and CR is limited, but Krittanawong et al. (2016) found that the lack of a referral from providers is the primary reason women did not attend CR. Women are also more likely to cite barriers that keep them from participating, such as children, household obligations, lack of insurance, and the lack of transportation (Grace et al., 2009).

Nursing Implications

Nurses are often the first point of contact for patients and their families when suffering medical emergencies. Nurses must identify evolving disease processes to initiate care pathways and notify providers of possible life-threatening conditions. It is critical to consider and identify SCAD as a cardiac phenomenon among young and healthy individuals with little to no cardiac risk factors. Nurses should provide much-needed education to patients and families to inform and provide support on the diagnosis of SCAD and its future repercussions to health. This includes discussing physical limitations, such as avoiding excessive physical exercise, weight restrictions, and lifestyle modifications.

Standard treatment guidelines do not exist for SCAD, and each patient is unique. Therefore, medications should be prescribed according to the patient's diagnosis and sequela. Nursing staff should advocate for the use of appropriate individualized medication management plans, such as the use of beta-blockers to reduce recurrence when appropriate. The use of angiotensin-converting enzyme inhibitors may be appropriate to minimize cardiac remodeling when faced with left ventricular systolic dysfunction (Martinez, 2012). Unlike atherosclerotic coronary artery disease, statins are not recommended routinely in SCAD patients and have been associated with higher recurrence rates (Hayes et al., 2018).

Spontaneous coronary artery dissection is a sudden and often traumatic event in the young female population, some of whom have recently delivered babies. Although SCAD is often seen in the post-partum population, it is not exclusive and can be found in any healthcare setting where nurses work.

Survivors express feelings of depression and anxiety after a SCAD event, and patients often lack understanding from their support systems. In the role of patient advocate, nurses can provide education to support systems, connect patients with counseling services and guide them to attend SCAD support groups. Through education and counseling, nurses offer support through the recovery period, including encouragement to participate in cardiac rehabilitation and not miss referrals to medical providers. Nurses must continue to act as patient advocates and support the delivery of quality and safe care, which will improve patient outcomes among SCAD patients.

Conclusion

Spontaneous coronary artery dissection was believed to be a rare disease in the past. Recently, however, there is an increase in diagnosis and recognition of SCAD through improved awareness and education. This medical condition has high mortality and recurrence rates, resulting in life-altering physical and psychosocial effects on patients. Registered nurses play an important role in the care of SCAD patients by providing much-needed support and education. In addition to encouraging appropriate management of the disease process, nurses must stress the importance of attending and completing cardiac rehabilitation, and directing patients to much-needed psychosocial support systems. Through increased education, continued research, establishing standardized guidelines, and interdisciplinary collaboration, nurses can pave the way to providing appropriate care to SCAD patients.

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