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NAVIGATING ACUTE MYOCARDIAL INFARCTION: INSIGHTS FROM A CASE OF SPONTANEOUS CORONARY DISSECTION

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ABSTRACT:

Introduction: Acute myocardial infarction (AMI) rarely occurs due to spontaneous coronary dissection (SCD), predominantly affecting young to middle-aged adults without traditional cardiovascular risk factors. Clinical presentations range from pericardial tamponade to sudden death, with ventricular arrhythmias and chest discomfort being common manifestations.

Case Presentation: We present a case of a patient experiencing ST-elevation acute coronary syndrome (STEACS) precipitated by SCD during physical exercise, resulting in cardiac arrest. This highlights the importance of recognizing SCD as a potential cause of AMI, particularly in atypical patient demographics.

Discussion: Predisposing factors for SCD include fibromuscular dysplasia, connective tissue disorders (such as vascular Ehlers-Danlos syndrome and Marfan syndrome), female sex, pregnancy, age <50, and hormone therapy. Triggers such as weightlifting, extreme isometric training, and emotional stress have been identified. Coronary angiography remains the preferred diagnostic modality.

Conclusion: Conservative management may be preferable over revascularization in stable patients with SCD-associated AMI. Clinicians should be vigilant for SCD in young to middle-aged patients presenting with AMI, especially in the context of physical exertion. Early recognition and appropriate management are crucial for optimizing outcomes in such cases.

Keywords: Coronary artery, Cardiac, Acute coronary syndrome, coronary artery disease, and spontaneous coronary dissection

INTRODUCTION:

Acute myocardial infarction has an uncommon cause: spontaneous coronary artery dissection (SCD). It is typified by a separation of the wall of the coronary artery and is unrelated to atherosclerotic plaque, iatrogenesis, or trauma. There are known cases of fibromuscular dysplasias, primarily affecting young people. Mental and physical stress, rigorous isometric training, and weightlifting are associated triggers. We describe a patient who suffered from cardiac arrest due to spontaneous coronary dissection during physical activity and ST-segment elevation acute coronary syndrome (STEACS) (Van Iterson et al., 2022).

Condition	Description	Reference
Cause	Spontaneous Coronary Artery Dissection (SCD)	Van Iterson et al., 2022
	- Separation of coronary artery wall	
	- Unrelated to:	
	- Atherosclerotic plaque	
	- Iatrogenesis	
	- Trauma	
Risk Factors	- Fibromuscular dysplasias (primarily affecting young people)	Van Iterson et al., 2022
	- Mental and physical stress	
	- Rigorous isometric training	
	- Weightlifting	
Clinical Presentation	- Cardiac arrest during physical activity	Van Iterson et al., 2022
	- ST-segment elevation acute coronary syndrome (STEACS)	

PRESENTATION OF CASE

Male patient, 49 years old, with no prior medical history. The patient showed signs of altered awareness while engaging in aerobic physical exercise at the gym, running on a band, and was subsequently sent to a health centre, where he experienced cardiorespiratory arrest with ventricular fibrillation as his initial rhythm. After receiving advanced cardiopulmonary resuscitation, he was sent to a more sophisticated centre and was able to regain sinus rhythm (Kaddoura et al., 2023).

Hemodialysis was performed on the patient.

Steady and has an 8/15 Asia Coma Scale. After a 12-lead ECG was recorded, it was determined that there was the involvement of the left main coronary artery based on the pattern of ST-segment elevation in aVR and ST segment depression in DI, DII, DIII, aVL, and V2-V6 (Figure 1). Acetylsalicylic acid (300 mg) was given as a single-loading dose to start medical treatment. And after that 100 mg daily, one loading dose of 600 mg clopidogrel, one loading dose of 40 mg subcutaneous nadroparin daily, one dose of 80 mg atorvastatin followed by 40 mg daily, one loading dose of 50 mg metoprolol daily, and one infusion of amiodarone at 1 mg/min for six hours before switching to 0.5 mg/min because of the arrest rhythm that was observed (Saleem et al., 2022).

Following the procedure, coronary angiography revealed an extensive intramural hematoma (IMH), an obtuse second marginal artery (OM2) with residual TIMI 3 flow, and type 2a spontaneous coronary dissection of the distal part of the circumflex artery (Figure 2). His treatment was continued in the special therapy unit, where he showed no signs of arrhythmia recurrence and remained stable. The abnormalities were resolved after an ECG was performed for control (Figure

3). With modification of the inferior wall's basal section, transthoracic echocardiogram showed akinesia and a somewhat lower ejection fraction (50%) but no other noteworthy findings. After performing abdominal magnetic resonance angiography, there was no indication that fibromuscular dysplasia had altered the intra-abdominal visceral arteries (Dotka & Małek, 2023).

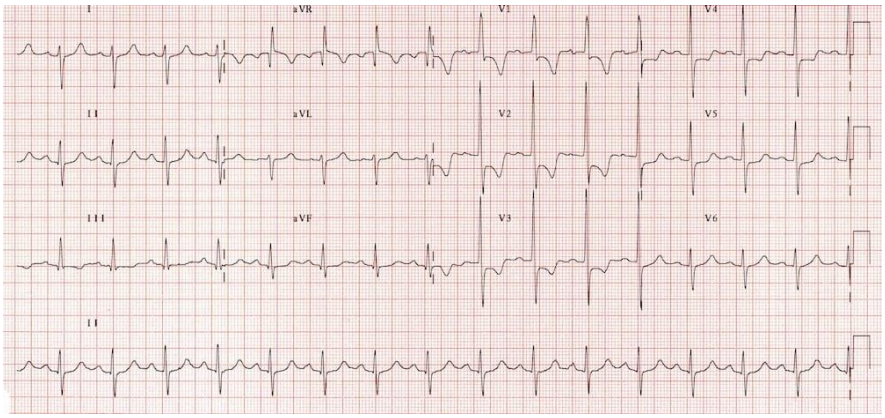

Figure 1 shows ST-segment depression in V2-V6, aVL, DI, DII, DIII, and the resultant aVR.

After starting in-hospital cardiac rehabilitation, he was released on the fifth day with instructions to take 100 mg of acetylsalicylic acid, 75 mg of clopidogrel, and 50 mg of metoprolol succinate every 24 hours, as well as 20 mg of omeprazole and 200 mg of amiodarone every 24 hours and 24 sessions of cardiac rehabilitation (Apostolović et al.).

DISCUSSION:

Dr. Harold C. Pretty initially documented SCAD in 1931 when he characterized it from the autopsy of a woman who had died abruptly at the age of 42 (Cano-Castellote et al., 2022). It can occur between the adventitia and the media or between the intima and the media. It is described as a non-traumatic, non-iatrogenic separation of the coronary artery wall that results in ischemia and a false lumen with an intramural hematoma. Its incidence varies between 0.1 and 0.28%; nonetheless, several current instances indicate a prevalence of 0.1–0.24% (Apostolović et al.; Denq & Oshlag, 2023).

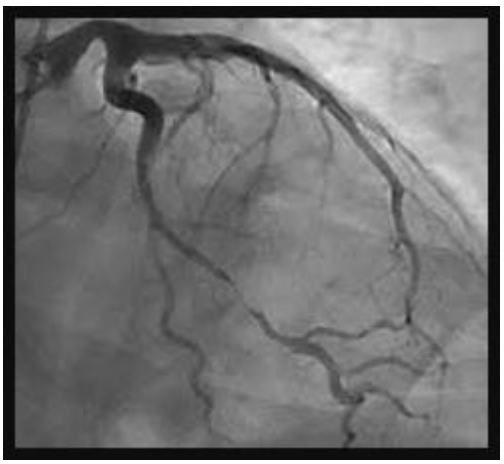

Figure 2: The second obtuse marginal artery and the distal part of the circumflex artery are examples of type 2a spontaneous coronary dissection.

Acute myocardial infarction is one of its most common symptoms, occurring in over 90% of patients; of these, 20–50% have STEACS, and fewer than 5% have ventricular arrhythmias and cardiogenic shock. Although the exact cause of SCAD is unknown, several predisposing factors

may be present, including fibromuscular dysplasia, the peripartum period, connective tissue diseases like Ehlers-Danlos vascular syndrome, Loeys-Dietz syndrome, and systemic inflammatory diseases like polyarteritis nodosa, Crohn's disease, systemic lupus erythematosus, and sarcoidosis. Nonetheless, reports of inflammatory illnesses in SCAD patients represent less than 5% of cases, indicating a low incidence of these conditions (Burke, 2022).

Similar triggering events have also been linked, including the Valsalva manoeuvre, labour, drug usage (e.g., cocaine), hormone therapy, and physical and emotional stress (e.g., intense exercise). The preferred diagnostic test is coronary angiography. It is employed to identify the dissection site and specify its features and degree of severity. It also enables us to detect other structural changes and perform percutaneous coronary intervention if required. A categorization system was developed based on the angiographic appearance, and the criteria were the presence of intramural hematoma with diffuse narrowing > 20 mm and the existence of intimal laceration with false lumen (type 1) (Barbieri et al., 2022).

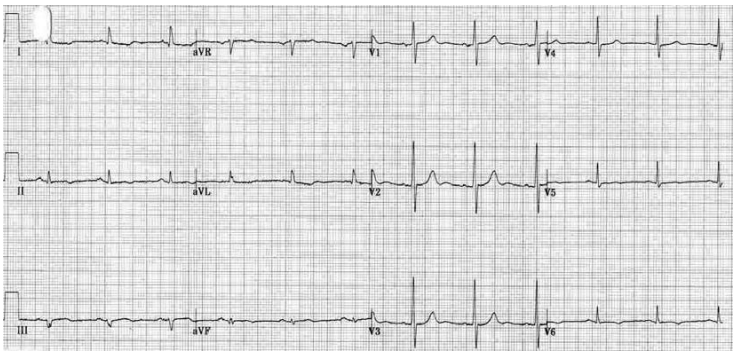

Figure 3: A control ECG was conducted two days after coronary angiography.

That either recovers size up to the distal coronary artery (type 2b) or does not (type 2a), focal stenosis (type 3), or abrupt blockage without lesion proximal to it (type 4). With 67% of instances, type 2 dissection is the most often reported type, followed by type 1 in 29.1% of cases and type 3 in 3.4%. Regarding management, multiple studies suggest that percutaneous coronary intervention (PCI) for SCAD is linked to worse short- and long-term outcomes than PCI for atherosclerotic lesions, notwithstanding the lack of a solid consensus in this regard. Technically, PCI can be difficult in these patients because of the possibility of many stents being needed for long lesions, the possibility of coronary wires entering the false lumen and obstructing a vessel, or the possibility of iatrogenic damage due to twisted coronary arteries (Heidbuchel et al., 2021).

Similarly, a hematoma may enlarge and result in retrograde extension to more proximal arteries or a loss of distal patency. In cohort studies, these characteristics account for between 47% and 72% of PCI success rates. As a result, it is only administered to individuals who meet certain high-risk criteria, such as involvement of several proximal vessels, the left coronary artery trunk, or the anterior descending artery ostium. In addition to those above, a high probability of spontaneous healing under medical therapy is characterized as the return of blood flow and a reduction in the angiographically measured severity of the stenosis, which varies from 70 to 97% of patient cases.8 Antiplatelet medicines and beta-blockers are the cornerstones of said medical therapy (Čulić et al., 2023).

Beta-blockers are advised for all patients, particularly those with high blood pressure, as they lessen shear stress and dramatically lower the chance of recurrence. Because there aren't enough reliable clinical studies, there is still debate on the optimal course of action for antiplatelet therapy. In patients having PCI, double antiplatelet treatment is advised for a maximum of 12 months, according to current evaluations. However, the advice in this case is supported by professional advice. Clopidogrel and acetylsalicylic acid should be taken if this action is taken. Randomized clinical trials are being carried out to identify the most effective therapy approach. Statins are not advised unless the patient meets another criteria because certain studies have demonstrated that they

raise the risk of SCAD recurrence and that the rupture of atherosclerotic plaque is not the pathophysiology of these drugs (Erickson et al., 2021).

It is unclear which individuals should receive medical attention; however, since intramural hematomas, or IMHs, can extend in 5–10% of instances, it has been suggested that candidates have a TIMI flow >2 and hemodynamic stability with hospital surveillance between 5-7 days. In our instance, we have a type 2a SCD of the second obtuse marginal artery (OM2) and the distal third of the circumflex artery. This results in lengthy tubular stenosis, 91% in certain parts, with TIMI three residual flow and a large intramural hematoma. According to studies that demonstrate a presentation of 44% vs 2.8% in women, our data confirms the literature findings, which indicate that physical activity is the primary precipitating factor in men. In line with multiple findings that suggest a mere 9% of cases involve the proximal coronary artery, our patient also displayed involvement in the distal third of the circumflex artery (Delise et al., 2021).

Our patient had ventricular arrhythmia and sudden death; this is an uncommon presentation that happens in less than 5% of instances since the triggering event has only been linked to aerobic exercise in two other cases that have been documented in the literature.

CONCLUSION:

When a patient presents with suspected ACS and has no cardiovascular risk factors, they should consider ECD. The predisposing factors and conditions that have been previously reported must be identified. Conservative care is favoured in terms of management, and individuals with high-risk characteristics should only undergo revascularization. A thorough understanding of this entity will enable improved patient care, preventing the recurrence of fresh, significant cardiovascular events.

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