

# Six Months Follow Up of Patients Presented with Spontaneous Coronary Artery Dissection

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## Abstract

**Background:** Spontaneous coronary artery dissection (SCAD) remains a rare, but challenging entity. SCAD may occur as an isolated phenomenon or associated with coronary artery disease. **Aim:** The aim of our study is to determine early outcomes in patients with SCAD. **Methods:** Prospective descriptive study, 44 patients were diagnosed as SCAD with angiographic assessment, presentation and early mortality. **Results:** Mean age was  $49.3 \pm 10.4$  years and 66% were women with 1 or fewer cardiovascular risk factors. Most patients presented with STEMI (39%) versus 30% for NSTEMI, 9% UA and 4% presented by heart failure. The most frequent culprit lesion was the left anterior descending (LAD) artery (70%); proximal to mid segments were the most affected (80%). Majority of patients were treated conservatively without revascularization. The in-hospital and 30-day mortality was about 7%. **Conclusion:** SCAD varies according to clinical presentation and mostly found in females. Medical treatment offers a valuable alternative in low-risk cases.

**Key words:** Myocardial Infarction, Woman, Acute Coronary Syndrome, Coronary Artery Disease

## Introduction

Spontaneous coronary artery dissection (SCAD), an uncommon but dangerous disease, can lead to Acute Coronary Syndrome (ACS). In SCAD, a transient dissection in one of the coronary arteries might obstruct blood flow to the myocardium, causing ACS<sup>(1-3)</sup>. SCAD differs from other causes of ACS because it frequently affects people who do not have typical risk factors for coronary artery disease (CAD), such as atherosclerosis. It is more common among women, especially those who are younger and in good condition. SCAD's specific cause is unknown; however, it has been linked to hormonal variables, vascular wall alterations, and, in certain cases, underlying connective tissue problems.

A position paper on the diagnosis and management of SCAD from North America and Europe was produced, revealing that

women without traditional risk factors for CAD are more likely than men to develop SCAD<sup>(4-7)</sup>.

In SCAD, an intimal rupture can result in a twofold lumen (actual and false lumens) and subsequent vessel wall breakdown. In contrast, an intramural haematoma may be generated by bleeding within the vasa vasorum<sup>(8)</sup>. True lumen compression can cause myocardial ischaemia or infarction, but gradual, pressure-driven enlargement of the falselumen or intramural haematoma may encourage further separation of the dissected layers.<sup>(9)</sup> SCAD can manifest as either an independent occurrence (I-SCAD) or in conjunction with CAD (A-SCAD)<sup>(10-12)</sup>.

Clinical presentation can vary from single vessel to multi-vessel coronary artery involvement, as well as symptoms of chest pain alone to ST-segment-elevation myocardial infarction (STEMI), ventricular

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arrhythmia (ventricular tachycardia or fibrillation), and sudden cardiac death.<sup>(13–16)</sup> Invasive coronary angiography is the main technique used to diagnose SCAD, even though additional imaging modalities such as computed tomography angiography, intravascular ultrasound, and optical coherence tomography may increase the diagnostic yield.<sup>(17–19)</sup>

The severity of the symptoms, the extent of the dissection, and the involvement of the coronary arteries all affect how SCAD is treated. Conservative treatment may be successful in some circumstances, while percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) may be necessary in others.<sup>(20,21)</sup>

This study's goal was to ascertain the clinical manifestations and early results of SCAD patients who were seen at the Aljouf Cardiac Centre in Saudi Arabia and the Suez Canal University Hospital in Ismailia City.

## Methods

To ensure that the research complies with ethical guidelines, the project started with approval from the Ethics Committee. Every participant provided written informed permission. The consent process likely included an explanation of the study's purpose, methods, potential risks, and benefits. 44 adult patients who were at least 18 years old were included in the study. Patients were selected based on their presentation to the invasive cardiology unit at Suez Canal University Hospital and King Abdulaziz cardiac center in Aljouf with acute coronary syndrome and confirmation of SCAD through coronary angiography. The patients' basic clinical information was gathered using a standardized questionnaire. Medical history, demographics, and other pertinent information were probably addressed in this questionnaire. To evaluate their general health and cardiac status, each patient had a general and local cardiac examination.

## Diagnostic Procedures:

Coronary angiography was performed to confirm the presence of SCAD.

Resting 12-lead electrocardiography (ECG) was conducted to assess the electrical activity of the heart.

Echocardiography was performed to obtain detailed images of the heart's structure, functions and possible complications.

The collected data, including clinical information and diagnostic results, was analyzed to draw conclusions about the characteristics and outcomes of SCAD in the population studied.

## Patient Monitoring:

Because the trial involved patients with ACS, the study design included continued monitoring and follow-up assessments to measure short-term clinical outcomes via index admission and patient outpatient clinic visits.

## Laboratory diagnosis:

Cardiac troponin-i was critical in establishing a diagnosis and risk stratification for our patients, allowing us to differentiate between NSTEMI and unstable angina.

## Coronary angiography assessment:

To minimize missing cases, a prospective patient collection and follow-up was carried out, with two experienced interventional cardiologists reviewing matching coronary angiograms and approving SCAD presence separately. SCAD on angiography is defined by the existence of a dissection plane and the absence of coronary atherosclerosis observed by angiography in at least two orthogonal projections, as confirmed by two trained observers.

Vessels with previous coronary intervention or iatrogenic coronary dissection were eliminated. Patients who had a previous myocardial infarction with linear intracoronary filling deficits suggestive of residual thrombus were also excluded.

Coronary angiography was conducted utilizing a femoral approach. A 6 Fr sheath was inserted in either the right common femoral or right radial artery. A selective

coronary angiography was conducted with standard Judkin left and right catheters. All patients received intracoronary nitroglycerin, and several angulated angiographic projections were produced. SCAD lesions were classified using the National Heart, Lung, and Blood Institute (NHLBI) classification.

Associated CAD was defined as at least 1 coronary lesion (different from the SCAD lesion) with a diameter stenosis  $\geq 50\%$  on visual assessment.

Proximal and distal reference vessel diameter, minimal lumen diameter, and percent diameter stenosis were used to determine the characteristics of coronary arteries and the presence of SCAD.

The Thrombolysis In Myocardial Infarction (TIMI) flow grade classification distal to SCAD was utilized to characterize SCAD lesions<sup>(22)</sup>.

The event type was reported as UA, NST-ACs, or STEMI.

The serious adverse cardiac events will be followed up for one month (to detect early outcomes) via telephone, visits to outpatient clinics, and a study of the hospital's databases and medical records.

All patients will be followed up to detect any major adverse cardiac events (MACE)<sup>(23)</sup> Including:

1. Reinfarction.
2. Heart failure.
3. Arrhythmia.
4. Revascularization including PCI and CABG.
5. Early Outcomes: The study seeks to evaluate outcomes in the initial stages following SCAD manifestation. Early results could include instant procedural success, difficulties, and short-term clinical improvement or deterioration.
6. Six months follow up: Mortality, hospitalization, recurrent ischemic events (MI and ACS)

### Statistical analysis

The data was collected using Microsoft EXCEL and analysis was performed using Statistical Package for Social Sciences (SPSS)

version 24.0. Statistical significance tests were used and probability value (P value) of less than or equal (0.05) was considered statistically significant (At 95% level of confidence). Descriptive statistics were presented as (Means  $\pm$  Standard Deviation) for quantitative variables and as (Percent) for qualitative variables. Quantitative variables were compared using unpaired t-test between the 2 groups. Qualitative variables were compared using Chi-Square test/Fisher's exact test.

Personal, clinical, and imaging data was collected and relationship between different factors were done then the results of management was represented in tables and graphs.

### Ethical consideration

The Suez Canal University Ethical Committee amended and approved the study protocol. An informed written permission form was signed by each study participant. The World Medical Association's Code of Ethics (Declaration of Helsinki) for human subjects' research has been followed in this work.

### Results

Baseline demographic characteristics, risk factors, and clinical, laboratory, and echocardiographic characteristics are presented in Table 1 showing that the mean age was  $49.3 \pm 10.4$  years and the majority were women ( $n = 29.66\%$ ) with 1 or fewer cardiovascular risk factors ( $n = 22.78\%$ ). 39% of cases presented with STEMI versus 30% for NSTEMI, 9% UA and 4% presented by heart failure. Arrhythmia ratio reveals that only 7% has sustained ventricular tachycardia with clinical significance that needs treatment (Figure 1).

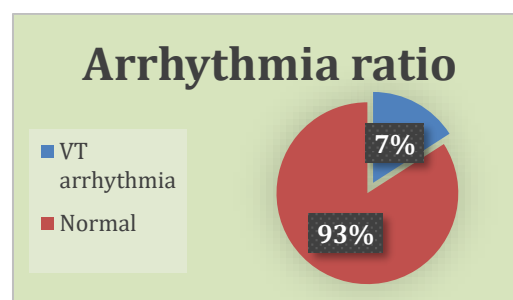


Figure (1): Ratio of the arrhythmia among SCAD Cases

| <b>Table (1): The Baseline Demographic and clinical Characteristics of the studied population</b> |             |
|---------------------------------------------------------------------------------------------------|-------------|
|                                                                                                   | n=44        |
| Age, years                                                                                        | 49.4 ± 10.3 |
| Female                                                                                            | 66 (%)      |
| Body Mass Index (Kg/m <sup>2</sup> )                                                              | 26.1 ± 2.4  |
| Smoking                                                                                           | 12 (27%)    |
| Hypertension                                                                                      | 13 (30%)    |
| Diabetes                                                                                          | 6 (14%)     |
| Dyslipidemia                                                                                      | 15 (34%)    |
| Previous stroke                                                                                   | 3 (7%)      |
| <b>Clinical presentation</b>                                                                      |             |
| STEMI                                                                                             | 17(38.6%)   |
| NSTEMI                                                                                            | 13(29.5%)   |
| UA                                                                                                | 9(20.5%)    |
| Cardiogenic shock                                                                                 | 1(2.3%)     |
| Heart Failure                                                                                     | 4(9.1%)     |
| <b>Left Ventricular Ejection Fraction, %</b>                                                      | 49.7% ± 4.5 |
| <b>Concomitant Atherosclerotic CAD</b>                                                            | 32(72%)     |
| <b>Regional wall motion abnormality</b>                                                           | 27(61%)     |
| <b>Ventricular aneurysm</b>                                                                       | 4(9%)       |

-The majority of patients n = 25 (65.8%) were treated conservatively without revascularization and have evidence of

spontaneous healing (Picture 1 and 2), 75% of SCAD lesions were less than 20 mm (Figure 2).

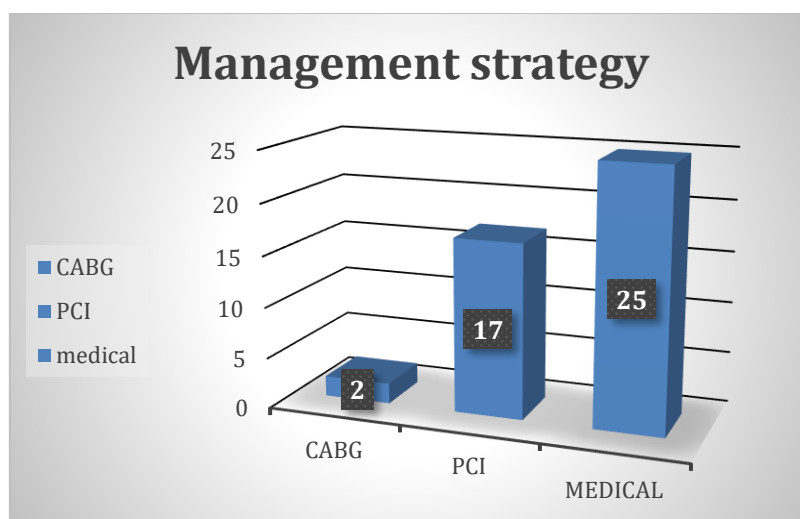


Figure (2): The Management Strategies used to manage SCAD Cases

In table 2, there was statistically significant difference between groups of treatment as regard SCAD Distribution as 1 patient had left

main affection and received conservative treatment, 42% of LAD affection did PCI and

6% CABAG, while segment showed insignificant difference in treatment.

**Table (2): The Angiographic findings among SCAD cases:**

| SCAD Information  | Total (n=44) | Conservative (n=25) | PCI (n=17) | CABG (n=2) | P Value |
|-------------------|--------------|---------------------|------------|------------|---------|
| SCAD Distribution |              |                     |            |            |         |
| Left Main         | 1 (2%)       | 1 (100%)            | 0 (0%)     | 0 (0%)     | <0.001* |
| LAD               | 31 (70%)     | 16 (52%)            | 13 (42%)   | 2 (6%)     |         |
| LCX               | 7 (16%)      | 5 (70%)             | 2 (30%)    | 0(0%)      |         |
| RCA               | 5(11%)       | 3 (60%)             | 2 (40%)    | 0 (0%)     |         |
| SCAD segment      |              |                     |            |            |         |
| Proximal          | 24 (47%)     | 10 (31%)            | 11 (78%)   | 3 (60%)    | 0.092   |
| Mid               | 17 (33%)     | 14 (44%)            | 2 (14%)    | 1 (20%)    |         |
| Distal            | 10 (20%)     | 8 (25%)             | 1 (8%)     | 1 (20%)    |         |

### **The 30-Day Results:**

Three instances total—two with ventricular fibrillation and one with cardiogenic shock—had an index admission death rate of about 7% of all presenting cases. Due to ongoing chest pain during the index stay, one patient underwent conservative treatment for recurrent MI, while the other underwent revascularization. A stroke occurred in one patient. In one instance, thrombolysis for STEMI resulted in a fatal hemorrhagic stroke. 8.0% was the 30-day MACE. Compared to STEMI patients, NSTEMI patients had a significantly reduced frequency of 30-day MACE (3.0% vs. 22%,  $p=0.004$ ). Furthermore, compared to patients treated with PCI, those treated conservatively had a significantly reduced incidence of thirty-day (30-day) MACE (5% vs. 20%,  $p=0.005$ ).

### **The 6-month outcome follow up:**

After a follow-up of six months, the cumulative MACE was 6.0%. Each MACE's six-month cumulative components included 1.5% death, 5.0% non-fatal MI, 1.0% non-fatal stroke, and 4.5% heart failure. Four patients passed away during follow-up, and one patient passed away in the hospital during

their index SCAD. Among those who died throughout the follow-up period, one died of acute pulmonary oedema and heart failure.

### **Regression analysis for major adverse cardiac events (MACE) in SCAD:**

Extracoronary fibrodysplasia, proximal LAD SCAD, female gender, and other independent predictors have been reported to be significantly linked with MACE in SCAD. There is no statistically significant correlation between MACE and medical therapy (beta-blockers, statins, calcium channel blockers, nitrates, renin-angiotensin-aldosterone inhibitors). However, there was an inverse connection with angina hospitalization that was statistically significant ( $p < 0.05$ ). Additionally, the frequencies of DAPT and MACE showed a marginally significant connection ( $p = 0.066$ ). There were no other relationships discovered with the other study variables.

Lesion length: More than 2 halves of patients had lesion length > 20 mm (Figure 3).

Six months mortality for SCAD ( $n = 41$ , 93%) with 3 cardiac deaths (Figure 4).

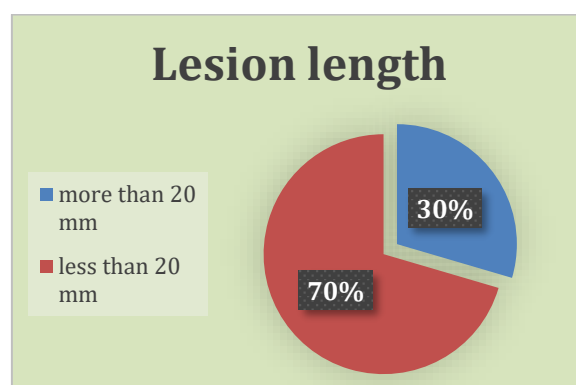


Figure (3): The lesion length among the study patients.

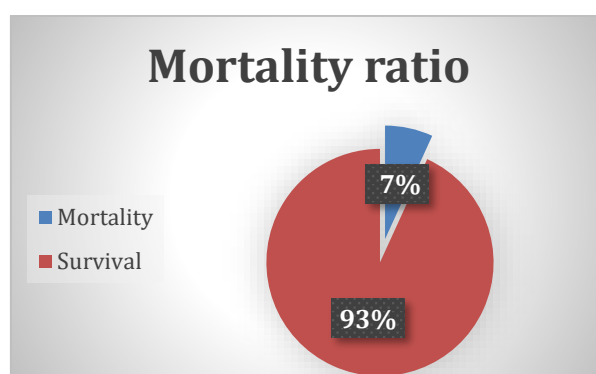


Figure (4): Mortality ratio among the study patients

Table 3 compare acute management and medications between patients had MACE

and patients without MACE, as it showed statistical insignificant differences.

| Table (3): Acute management and medications according to incidence of MACE or not (n = 105) |                         |               |               |         |
|---------------------------------------------------------------------------------------------|-------------------------|---------------|---------------|---------|
|                                                                                             | All patients<br>(n= 44) | MACE<br>(n=8) | NO MACE(n=36) | P Value |
| Initial management strategy                                                                 |                         |               |               |         |
| Medical therapy                                                                             | 39 (89%)                | 7 (87.5%)     | 30 (83%)      | 0.431   |
| Percutaneous coronary intervention                                                          | 4 (9%)                  | 1(12.5%)      | 5 (14%)       |         |
| Bypass surgery                                                                              | 1(2%)                   | 0 (0%)        | 1(3%)         |         |
| Discharge Medication                                                                        |                         |               |               |         |
| Aspirin                                                                                     | 43                      | 7 (87.5%)     | 36 (100%)     | 0.71    |
| Any dual anti-platelet therapy                                                              | 42                      | 6 (75%)       | 36 (100%)     | 0.63    |
| Type of dual antiplatelet therapy                                                           |                         |               |               |         |
| Aspirin + Clopidogrel                                                                       | 25 (57%)                | 5 (63%)       | 20 (56%)      | 0.46    |
| Aspirin + Ticagrelor                                                                        | 15 (34%)                | 2 (25%)       | 13 (36%)      | 0.51    |
| Oral Anticoagulation                                                                        | 4 (9%)                  | 1(12.5%)      | 3 (8%)        | 0.72    |
| Statin                                                                                      | 37 (84%)                | 6 (75%)       | 29 (81%)      | 0.83    |
| Beta Blockers                                                                               | 35(80%)                 | 5 (62.5%)     | 30 (83%)      | 0.54    |
| ACEi or ARBs                                                                                | 29 (66%)                | 3 (37.5)      | 26 (72%)      | 0.08    |
| Calcium Channel Blockers                                                                    | 7(16%)                  | 1(12.5%)      | 6 (17%)       | 0.39    |
| ACEI: angiotensin converting enzyme inhibitor; ARB: angiotensin receptor blocker            |                         |               |               |         |

## Discussion

We discovered the following in our investigation: First, a typical SCAD patient is a lady in her 50s who has a myocardial infarction and certain cardiovascular risk factors. Second, the majority of SCADs can be treated medically, as evidenced by the short follow-up period and the healing of SCAD in the follow-up angiography. Third, incorporating catastrophic and life-threatening situations, we discovered an early MACE rate of 7%. Our population's demographics are consistent with other research, particularly the Canada/US multicenter cohort (n = 750), which is by far the biggest cohort in the field <sup>(8)</sup>. The majority are women, with a mean age of about 50 years on average. While coronary arteries are usually normal aside from the dissection or have relatively mild atherosclerosis, the presence of certain cardiovascular risk factors is prevalent (with the exception of diabetes) <sup>(24,25)</sup>.

Since the majority of low-risk SCAD patients recover on their own, conservative treatment is the recommended first course of action. PCI is reserved for high-risk patients who come with unstable symptoms such as persistent chest discomfort, evidence of heart failure, haemodynamic instability, or a severe blockage in a major artery, such as the left main. While conservative treatment has a high incidence of spontaneous healing in low-risk patients, PCI is an option for high-risk cases to obtain favorable outcomes, but with a higher risk of complications in SCAD patients. The same approach yielded similar results after a 6-month follow-up <sup>(26)</sup>.

Five cases of spontaneous coronary artery dissection (SCAD) are reported, three in women and two in males (mean age 44 years; range 28-65), all of whom experienced a myocardial infarction, in line with earlier case series. The two men had common risk factors for coronary artery disease, while one patient in the female

group was smoking, one was in the postpartum phase, and one was using an oral contraceptive. The ejection fraction of the three women who got intravenous alteplase was normal, while the left ventricular function of the two men was compromised. Three individuals had SCAD of the right coronary artery and two of the left anterior descending coronary arteries. Only the 2 men had angiographic features of coronary atherosclerotic involvement. No patients required surgical revascularization or percutaneous transluminal coronary angioplasty. At a mean follow up of 27 months (range 6 to 40) all patients were alive and all but 1 were asymptomatic <sup>(19)</sup>.

There have been many hypothesized risk factors for SCAD, although the data for these is sparse and mostly derived from case reports <sup>(27,28)</sup>.

## Conclusions

SCAD presents a wide spectrum of clinical manifestations, both acutely and in the long term. While the majority of SCAD patients can be treated conservatively, with surgical healing and favorable clinical results, there are several notable exceptions.

The complexity of SCAD, as well as the significance of ongoing research to establish the most effective medical treatments and suitable follow-up and surveillance measures, must be described. The highly varied clinical course of SCAD needs an individualized approach to patient therapy based on clinical presentation and accessible Cath lab capabilities.

## limitation of the study

This was a study of a relatively small sample size which might limit the generalizability of the findings to a larger population.

## Conflict of Interest:

The authors declared that the research was conducted in the absence of any commercial

or financial relationships that could be construed as a potential conflict of interest.

### Funding:

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