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Original Research Paper

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# SPONTANEOUS CORONARY ARTERY DISSECTION: AN EPIDEMIOLOGICAL AND ANGIOGRAPHICAL STUDY FROM A HIGH VOLUME TERTIARY CARE CARDIAC CENTRE

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## ABSTRACT

**CONTEXT:** Spontaneous coronary artery dissection (SCAD) is a non-atherosclerotic cause for acute coronary syndrome (ACS). Although a rare disease, due to increased awareness and early use of coronary angiography more cases are being picked up of late. Patient characteristics and management differ from those of typical ACS cases, hence recognition of SCAD is very important.

**AIM:** To identify epidemiologic and clinical characteristics of patients with SCAD and determine outcomes.

**DESIGN:** Data of 10002 patients who underwent coronary angiography (CAG) between 1st June 2018 and 31st May 2019 were retrospectively analysed to determine the cases of SCAD at Sri Jayadeva Institute of Cardiovascular Sciences & Research. Epidemiologic and clinical characteristics of 51 such patients with SCAD were then analysed.

**OUTCOME MEASURES:** Clinical characteristics, predisposing factors, angiographic findings

**RESULT:** In 51 patients (08 women and 43 men) who were hospitalized for ACS, spontaneous dissection of coronaries was detected. The mean age for women was 49.75 years & 48.27 for men. Precipitating factors were hypertension in 14 patients (27.45%), dyslipidemia in 3 patients (5%) and smoking in 10 patients (19.60%). Diabetes was noted in 6 patients (11%).

In 16 patients, the coronary angiography showed multivessel disease, while in 08 patients there were no significant lesions in the coronary vessels. The left anterior descending (LAD) artery was the most commonly affected coronary artery (56.9%, 29 of 51 cases) followed by right coronary artery (35.3%,18 of 51 cases. Mid & distal segments were the common sites for dissection (85%, 44 of 51).

**CONCLUSION:** SCAD was noted with similar incidence in our sample population as seen in previous studies. The incidence is more in men as opposed to other studies wherein females had a higher incidence. Risk factors like hypertension, dyslipidemia & diabetes were seen in a small percentage. LAD was the most common artery to be affected. Most patients were managed conservatively without the need for revascularization.

**KEYWORDS :** spontaneous coronary artery dissection, risk factors, epidemiological, angiographic data.

## INTRODUCTION:

Spontaneous coronary artery dissection (SCAD) is defined as an epicardial coronary artery dissection that is not associated with atherosclerosis or trauma and is not iatrogenic. Conservative management is the preferred option with spontaneous healing of the dissection in the majority of uncomplicated cases.

### Epidemiology:

Among patients undergoing coronary angiography, SCAD was diagnosed in only 0.2%–1.1% of angiograms; and it was also reported to be a rare cause of acute coronary syndrome (ACS) and sudden cardiac death, accounting for 0.1%–4% and 0.4%, respectively [1]. It is an important cause of ACS in young women, responsible for upto 25% of all ACS cases in women [2]. Triggers for SCAD are thought to increase shear stress on the coronary artery wall, often mediated by elevated catecholamine levels and intra-abdominal pressure [3].

Specific types have been linked to episodes of SCAD and provocation of myocardial ischemia. he identification, both clinically and with specific imaging studies, is the cornerstone for the management of the patients [4]. Diagnosis is made by coronary angiography with a classic finding of the intimal flap, which is often accompanied by a false lumen [5] The coronary arteriography (CAG), however , does not reflect the arterial walls.

Therefore intracoronary imaging optical coherence tomography (OCT) or intravascular ultrasound (IVUS) is needed, in order to confirm the SCAD in uncertain and ambiguous cases [6].

**Methods:**
We analysed retrospectively the epidemiological, clinical, and angiographic data of fifty-one patients (43 men and 08 women, mean age 49.01 ± 18.6 years) who were hospitalized in our institute from June 2018 to May 2019 with chest pain, who when subjected to coronary angiogram in the cath laboratory showed a spontaneous dissection of the coronary vessels.

Patients' demographics (age, gender), epidemiological data (risk factors for CAD – hypertension, smoking, diabetes mellitus, dyslipidemia), clinical data (HR, BP), and data of the coronary angiography were then analysed. The data were derived from the medical records section of the cardiology department.

The type of SCAD was defined according to the classification by Saw (6).

**Statistical Analysis:**
The discrete qualitative variables such as frequencies of different types of diseases among males and female proportions were analysed using the chi-square test. Continuous variables (quantitative) were recorded with the mean + SD values and the categorical variables (qualitative) as a percentage (%). Data were analysed using IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA).

**RESULTS:**
A total of 10002 patients underwent coronary angiogram between June 2018 to May 2019. Spontaneous coronary artery dissection was noted in 51 (43 male & 08 female) patients. Table 1 shows the basic epidemiological characteristics. Risk factors were diabetes mellitus in 6 patients (11%), hypertension in 14 patients (27.5%), dyslipidemia in 3 patients (5%), and smoking in 10 patients (19.60%). 39 patients had STEMI (76.5%), 10 patients had NSTEMI (19.6%), 02 patients had chronic coronary syndrome (3.9%).

The left anterior descending (LAD) artery was the most commonly affected coronary artery (56.9%, 29 of 51 cases) followed by the right coronary artery (35.3%, 18 of 51 cases). LCX including obtuse marginal (OM) artery dissection was seen in 4 patients.

In 16 patients there was multivessel disease whereas 08 patients showed no significant lesions in the coronary arteries. The angiographic findings are summarised in Table 2. The most common location of dissection was in mid & distal segments of the vessel (44 out of 51, 85%) which is similar to findings from other studies.

Type 1 was most commonly observed (45 – 88%) followed by type 2 (6 - 11%).

28 patients were treated with thrombolysis, 6 patients underwent PCI and 3 patients had CABG, the remaining patients were treated conservatively.

**DISCUSSION:**
This is a relatively large study where the incidence of SCAD is around 0.51% in patients presenting with chest pain. This result is similar to recent studies which showed comparable incidence [7,8]. Incidence was higher among men whereas most of the other studies showed higher incidence in women [7]. Traditional atherosclerotic risk factors (diabetes, hypertension, smoking, dyslipidemia) also were seen in significant number of patients [9]. This result is contrasting with few studies confirming and others disputing the finding [10-13].

Hypertension is an important risk factor for SCAD. Hypertension increases the shear stress on the arterial wall and induces remodeling of the vessel. This provokes the proliferation of smooth muscles in blood vessels, a reduction in elastin and an increase in the endothelial damage that can lead to SCAD [14].

Incidence being higher in women is related to hormonal factors and pregnancy is also an important risk factor. The clinical presentation is also more severe with more complications during pregnancy [15]. None of our female patients were pregnant.

The most involved artery is LAD in almost 75% of the cases described, followed by right coronary artery (RCA) in 20% of the cases, and the left main coronary artery in 6 to 12% of cases whereas the circumflex artery participates in it less frequently [16, 17]. In our study also LAD was the most commonly involved artery ( 56.9%) - Figure 1, followed by RCA ( 35.3%)- Figure 2 and LCX/OM (7.8%) – Figure 3.

The clinical presentation varies from simple angina to sudden cardiac death. It depends on the extent of the dissection, its location, and the degree of myocardial ischemia [18].

Saw proposed a classification system for SCAD based on angiographic findings [19]. Type 1 describes the pathognomonic multiple radiolucent lumen with contrast wall staining – Figure 1 to 4. In type 2 SCAD, a long diffuse (typically > 20mm) smooth stenosis is noted with an abrupt change in the calibre of the involved segment. There is smooth tapering followed by reverse tapering more distally – Figure 5. Type 3 describes focal or tubular stenosis that mimics atherosclerotic plaque. Intracoronary imaging is needed in type 3 cases to confirm SCAD [6, 19].

Modern imaging techniques can be useful in doubtful cases, such as IVUS, OCT or coronary CT angiography.

There are no randomized studies or subgroup analyses of treatment outcomes or comparisons between acute revascularization strategies for ACS caused by SCAD. Observational data have shown angiographic healing of SCAD in the majority of patients (70%–97%) who were selectively restudied months after a conservatively managed initial episode [20, 21]. Treatment options for SCAD include medical therapy, PCI, or CABG [22]. Medical treatment should be chosen in patients with dissection localized to the middle or distal segment of the coronaries [23]. Conservative management is similar to other ACS subsets and comprises antiplatelet agents, anticoagulation, statin, beta- blockers, ACEI/ARBs (especially in LV dysfunction)[16, 24]. There is no role for routine use of antianginals [25].

6 patients underwent PCI due to on-going ischemia or hemodynamic instability, 3 patients were sent for CABG due to multivessel disease and the remaining patients were managed conservatively. None of the patients managed conservatively needed revascularisation or had worsening symptoms during hospitalisation. Our approach is supported by Alfonso et al [26], who in their study conservative management had good long term follow up result. Only patients with high risk characteristics (diffuse ischemia and/or unstable) should be considered for immediate invasive treatment [26].

**CONCLUSION:**
Spontaneous coronary artery dissection is a rare and

often overlooked condition which can pose difficulty in management of high risk individuals. SCAD was noted with similar incidence in our sample population as seen in previous studies. Some peculiar findings being the incidence is higher in men as opposed to other studies wherein females had a higher incidence. Risk factors like hypertension, dyslipidemia & diabetes were seen in a small percentage. LAD was the most common artery to be affected. Most patients were managed conservatively without the need for revascularization. Long term outcomes are favourable in patients surviving SCAD.

- **Limitations of the study**: The study is retrospective and there is a selection bias of patients that had to be included.
  Another limitation is the lack of use of intracoronary imaging which would have helped us in further knowing the exact extent and type of dissection .
- **Declaration of patient consent**: The authors certify that they have obtained all appropriate patient consent forms.
- **Authors contribution**: All authors were included in all steps of preparation of this article. Final proof reading was made by the first author.
- **Conflict of interest**: The authors report no conflict of interests.
- **Financial Support**: None

**Table 1: Epidemiological Data**

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|---|---|
| Gender: Male n (%)<br>Female n (%) | 43 (84%)<br>08 (16%) |
| Age (Years) | Female 49.75, Male 48.27 |
| Hypertension n (%) | 14 (27.45%) |
| Smoking n (%) | 10 (19.60%) |
| Diabetes mellitus n (%) | 06 (11%) |
| Dyslipidaemia n (%) | 03 (5%) |
| Heart Rate | 84.2 ± 5.5 |
| Blood Pressure | 135.3 ± 14.4 |
| Family history of ischemic heart disease n(%) | 09 (17.65%) |

**Table 2: Coronary Angiographic Data. Lad: Left Anterior Descending, Lcx: Left Circumflex, Rca: Right Coronary Artery**

| | n = 51 |
|---|---|
| Left Main artery dissection n (%) | 0 (0) |
| LAD artery dissection n (%) | 29 (56.9%) |
| LCx artery dissection n (%) | 4 (7.8%) |
| RCA artery dissection n (%) | 18 (35.3%) |
| Single vessel disease n (%) | 27 (52.9%) |
| Multivessel disease n (%) | 16 (31.3%) |
| No significant lesions n (%) | 08 (15.7%) |

**Fig. 1: Spontaneous Dissection In Mid Lad.**

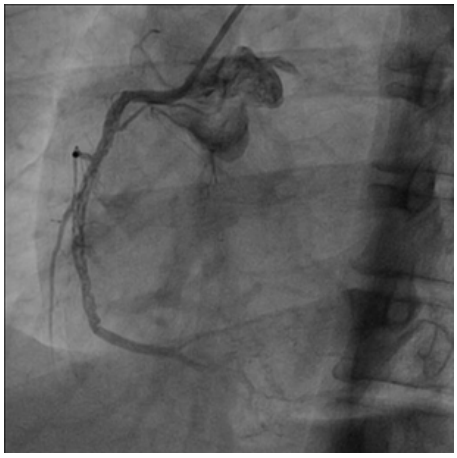

**Fig. 2: Long Segment Dissection In Rca**

**Fig. 3: Dissection Involving Proximal Obtuse Marginal Artery**

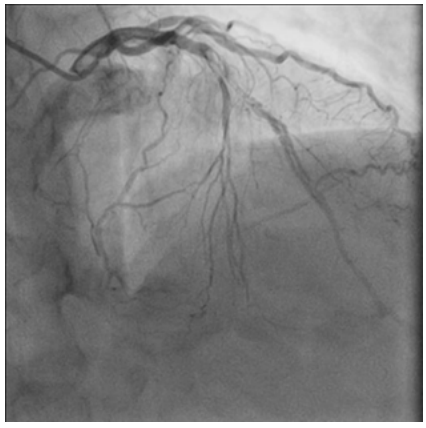

**Figure 4: Long Dissection Segment In Mid To Distal Lad.**

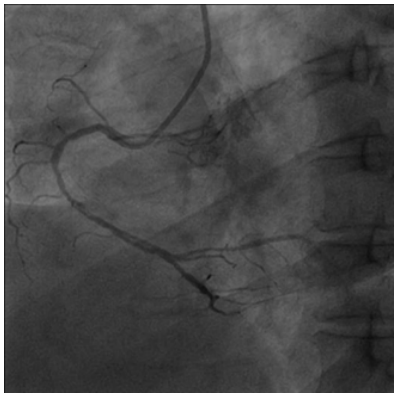

**Figure 5: Rca Showing Type 2 Dissection In Mid Rca & Type 1**

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