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ORIGINAL PAPER

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Spontaneous Dissection of the Coronary Vessels. Epidemiological and Coronary Angiographic Study

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ABSTRACT

Introduction: Spontaneous dissection of the coronary arteries is relatively rare and usually does not affect life expectancy. However specific types have been implicated to episodes of sudden cardiac death and myocardial ischemia. The recognition of both clinical and imaging characteristics contributes to appropriate decision and patient management. **Aim:** The aim of the study is the epidemiological and Coronary Angiographic (CA) estimation of patients with spontaneous dissection of the coronary arteries, who were hospitalized in the cardiology department with Acute Coronary Syndrome or were submitted to coronary angiographic examination in the laboratory. **Material and Methods:** The epidemiological, clinical and angiographic data of 31 patients who were hospitalized in our department and suffered from spontaneous dissection of the coronary vessels were studied retrospectively. **Results:** In 31 patients (11 men and 20 women, mean age 52.8±18.6 years) who were hospitalized for acute coronary syndrome (ACS), spontaneous dissection of coronary arteries was detected. Precipitating factors were hypertension in 12 patients (38.71%), dyslipidemia in 13 patients (42%) and smoking in 17 patients (54.84%). Among the women, 13 (65%) had a history of hypertension in pregnancy, preeclampsia or/and gestational diabetes. In 8 patients, the coronary angiography showed multivessel disease, while in 12 patients there were no significant lesions in the coronary vessels. Fourteen women (70%) reported a history of depression compared to none in men. **Conclusion:** The incidence of spontaneous dissection of the coronary vessels in this sample of patients from northern Greece is similar to that of the other centers. The incidence is greater in females with hor-

monal changes and depression. In a large number there were no significant atherosclerotic lesions.

Keywords: spontaneous coronary artery dissection, acute coronary syndrome, risk factors, epidemiological, angiographic data.

1. INTRODUCTION

Spontaneous dissection of the coronary vessels (SCAD) is caused by a sudden intimal tear and subsequent bleeding in the blood vessels of the media. As a consequence, a true and a false lumen are formatted, an intramural hematoma is originated, and as a result there is a clinical symptomatology of Acute Coronary Syndrome (ACS) (1).

It is relatively rare (1-4% of ACS) and usually does not affect life expectancy. However, it is the most common cause of ACS in pregnant women (43%) and in women ≤ 50 years old (35%), in the absence of traditional risk factors (2).

Specific types have been linked to episodes of SCAD and provocation of myocardial ischemia. The identification, both clinically and with specific imaging studies, is the cornerstone for the management of the patients (3).

Diagnosis is made by coronary angiography with a classic finding of the intimal flap, which is often accompanied by a false lumen (4). The Coronary Arteriography (CA), however, does not reflect the arterial walls. Therefore intracoronary image (OCT) or intravascular ultrasound (IVUS) are needed, in order to confirm the SCAD in uncertain and ambiguous cases (5).

2. AIM

The aim of the study is the epidemiological and Coronary Angiographic estimation of patients with spontaneous dissection of the coronary arteries, who were hospitalized in the cardiology department with Acute Coronary Syndrome or were submitted to coronary angiographic examination in the laboratory.

3. METHODS

We studied retrospectively the epidemiological, clinical and imaging data of thirty-one patients (11 men and 20 women, mean age 52.8 ± 18.6 years) who were hospitalized in our clinic from August 1999 to August 2017 for an acute episode of a coronary syndrome. They were submitted for immediately CA in the cath laboratory and the results showed a spontaneous dissection of the coronary vessels.

We assessed 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. The data were derived from medical records in the archive of patients of the cardiology department.

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

Statistical analysis

Initially, an estimation of the normality of the distribution of quantitative variables was made using the Shapiro test (sample < 50 patients). Continuous variables (quantitative) were recorded with the mean $\pm$ SD values and the categorical variables (qualitative) as percentage (%). The t-Test (Student test) was used to compare the continuous variables and the χ^2 test or Fischer test to compare the categorical variables. Probability $p < 0.05$ (2-way) was considered statistically significant. The study protocol was approved by the Scientific Council of the Hospital. The statistical analysis was made using the SPSS.19 for Windows statistical package.

4. RESULTS

Patients who were hospitalized in our Cardiology clinic from August 1999 to August 2017 for an acute episode of a coronary syndrome was 4468. In 31 patients (11 men and 20 women, mean age 52.8 ± 18.6 years) spontaneous dissection of the coronary arteries was detected.

The basic characteristics of the patients (demograph-

	n=31
Gender: Men n (%)	11 (35.48)
Women n (%)	20 (64.52)
Age (years)	52.8 ± 18.6
Hypertension n (%)	12 (38.71)
Smoking n (%)	17 (54.84)
Diabetes Mellitus n (%)	2 (6.45)
Dyslipidemia n (%)	13 (42)
Depression–Anxiety n (%)	14 (45.16)
Heart rate	87.3 ± 9.8
Blood Pressure (mmHg)	148.8 ± 32.6

Table 1. Demographic and Epidemiological data

	n=31
Physical stress n (%)	11 (35.48)
Isometric exercise n (%)	4 (12.9)
Emotional stress n (%)	10 (32.26)
Pregnancy n (%)	2 (6.45)

Table 2. Precipitating factors

	n=31
Left Main artery dissection n (%)	0 (0)
LAD artery dissection n (%)	4 (12.9)
LCx artery dissection n (%)	10 (32.26)
RCA artery dissection n (%)	5 (22.3)
Single artery dissection n (%)	13 (41.9)
Multiple artery dissection n (%)	2 (6.45)
No significant lesions n (%)	5 (16.13)

Table 3. Coronary angiographic data. LAD: Left anterior descending, LCx: Left Circumflex, RCA: Right Coronary Artery

	Men n=11	Women n=20	P
Depression–anxiety n (%)	0	14 (45.16)	0.001
Emotional stress n (%)	2 (18.18)	11 (55)	0.01
Exercise n (%)	2 (18.18)	10 (32.26)	0.02
Multivessel disease n (%)	4 (36.4)	9 (45)	0.04
Type I dissection n (%)	7 (63.6)	15 (75)	0.04

Table 4. Sex differences in SCAD

Figure 1. Coronary Arteriography (CA) 48 hours after presentation (29/3/2016). The arrow points a dissection in the middle portion of Left Anterior Descending (LAD) Artery.

ic–epidemiological) are presented in Table 1. Risk factors were hypertension in 12 patients (38.71%), dyslipidemia in 13 patients (42%) and smoking in 17 patients (54.84%). Most patients (19 patients–61.3%) had one or no risk factors. Precipitating factors and predisposing stressors were present, as physical stress (5 patients–16.12%), emotional stress (19 patients–61.29%) and pregnancy (multiparous in 1 case). In Table 2 precipitating factors are displayed. The majority of patients were women (13–65%), younger than men, with a history of hypertension in pregnancy

(12–38.7%), preeclampsia (5–16.12%) or/and gestational diabetes (6–19.35%). They had higher heart rate and an elevated rate of depression or/and anxiety (14–45.16%) among patients with SCAD. Symptoms that lead them to the hospital was chest pain (>90%), nausea–vomiting (25%), dyspnea (10%). All had ACS (STEMI 18 patients–58.06%, NSTEMI 13 patients–41.94%).

In 8 patients, the coronary angiography showed multi-vessel disease, while in 12 patients there were no significant lesions in the coronary vessels. The findings of CA are summarized in Table 3. In Figure 1 the CA from a 45-year-old man with SCAD type I is displayed.

Twenty patients (64.5%) treated conservative and with a scheduled follow – up. Four patients (12.9%) treated with thrombolysis. Nine patients (29.3%) with PCI and 2 patients (6.2%) underwent CABG due to diffuse ischemia, or/and persistence of symptomatology. In Table 4 the differences between the 2 genders are recorded.

5. DISCUSSION

In this relatively large study, the incidence of SCAD was 0.69% in patients with ACS. Similar results were reported in recent studies (7, 8). Women formed the greater part of the population (20 individuals – 64.52%) (7). Also, it was found that the traditional risk factors (hypertension, smoking, dyslipidemia, etc) existed in a significant proportion of patients with SCAD (2). This fact in other studies is confirmed and in others is disputed (9–12). However, it is not clear if hypertension contributes in the same proportion to SCAD, such as in aortic dissection (9).

The history of hypertension is a factor of recurrent SCAD. Hypertension increases the stress of the arterial wall and induces the remodeling of the vessel. It is provoked by a proliferation of smooth muscle fibers in blood vessels, a decrease of elastin and an increase in the endothelial damage that could lead in SCAD (13).

It should be thinking about SCAD in the differential diagnosis of young men, but particularly women with ACS, even if traditional risk factors are present. Younger patients and especially women are at risk for SCAD (14). Small studies indicate, and determine the age at 40 years, but it has not been confirmed (15, 16). In our study, the mean age was 53 years.

In women, the relationship between hormonal alterations or treatments, and SCAD has been observed but has not been sufficiently explained. Studies indicate that patients with SCAD in pregnancy often have a more severe clinical presentation and more serious complications (17). The same it was observed in our patient, a woman pregnant, in a triplet pregnancy.

LAD was the artery most frequently affected (12.9%), while multivessel disease was observed in 6.45%. These data are approximately the same with those of other studies (14, 18). Even SCAD is considered to be a disease of 1 vessel, dissection in small, peripheral blood vessels or branches are due to type II, diagnosed only by CT (19).

There are no instructions for the appropriate treatment in SCAD. Treatment is individualized to each patient and depends on the symptoms and the stability of the patient (BP,HR, SPO₂, etc.). Conservative treatment is the same as

that of the ACS, i.e. b-blockers, antiplatelet agents (has to be considered the bleeding risk), ACE inhibitors or ARBs, statins (20).

Thrombolysis is under discussion in patients with STEMI and diagnosis of SCAD. Studies indicate that 60% of patients with SCAD treated with thrombolysis deteriorated and needed immediate revascularization with PCI and CABG (21). However, others argue that successful revascularization was evident with thrombolysis (22).

Only 8 were thrombolysed from the patients of our study, even though our department did not have an active catheterization laboratory until 2015. Obviously, SCAD was suspected due to the evidence of medical history (young women, pregnancy, intense physical stress).

Revascularization with PCI or CABG different results. PCI should be tried with caution, as there is a risk of extension of the dissection with the insertion of the wire in the false lumen. In addition, repeated contrast injections induce further hydraulic dissection and extension of the hematoma (20).

In a clinical study of 87 patients with SCAD, 43 were revascularized with PCI with a success of 65%.³ IVUS and OCT are used in the diagnosis of SCAD and estimation of the true lumen (23). In our study, a small number of patients was submitted to PCI due to haemodynamic instability or active ischemia. No patient treated conservatively with medication needed revascularization during hospitalization. This is supported by Alfonso et al (24) presented acute and chronic favorable clinical results. Other studies findings confirm the recommendations for conservative treatment as a first option (25). Only high risk patients (unstable or/and diffuse ischemia) should be considered for immediate invasive treatment (24).

Two patients were submitted to CABG. It is recommended to patients with left main artery disease or multiple artery disease. However, it is rigorous for the surgeon to manage the true lumen (3).

6. CONCLUSION

The incidence of automatic dissection of the coronary vessels in this sample of patients from northern Greece is similar to that of the other centers. The incidence is greater in females with hormonal changes and depression. In a large number, there were no significant atherosclerotic lesions.

Predisposing stress factors were mentioned in our study, among them is the emotional factor and physical stress. These factors increase catecholamines and the pressure in the thoracic and abdominal cavity altering the arterial shear stress. It should be taken into account in treatment and in lifestyle modifications in order to avoid intense weight lifting (up to 30 lbs.), competitive sports and to seek psychosocial support.

The existence of FMD (16) needs to be investigated, although in our sample there was not.

- **Limitations of the study:** The sample of patients in the study is small. It derives from a center in a period of 15 years. Also, the study is retrospective and there is a selection bias of patients that had to be included. Most patients, at least until August 2015, referred to other centers with

cath lab for the CA, and as a result, it may have been a referral and survival biases. Another limitation is the lack of measurements of catecholamines (direct or indirect) that may be combined with the SCAD.

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- **Conflict of interest:** The authors report no conflict of interests.
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