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Case Report

# SPONTANEOUS CORONARY ARTERY DISSECTION: CASE REPORTS OF THREE TYPES OF DISSECTION

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ABSTRACT – Spontaneous coronary artery dissection (SCAD) is defined as a nonatherosclerotic, nontraumatic or iatrogenic tear within the epicardial coronary artery wall creating a false lumen or hematoma. It is more common in younger patients and women and it can cause acute coronary syndrome (ACS) in 0.1 to 4 percent of cases. We described three cases of different types of SCAD. In the first case, we described a male patient admitted due to chest pain after excessive physical activity. Electrocardiogram (ECG) showed inferior ST-elevation myocardial infarction (STEMI). SCAD of left anterior descending (LAD) was found by coronary angiography. Because of chest pain and signs of ischemia on ECHO, a stent was implanted. After procedure, the patient was pain-free and hemodynamically and rhythmically stable. In the second case, we presented a young multiparous woman with signs of acute coronary syndrome (ACS). A coronary angiogram showed a homogeneous stenosis of proximal LAD. Optimal medical therapy (OMT) was the initial therapy of choice. After a few days due to the recurrence of chest pain and an increase in troponin level, recoronarography was performed. It showed a dissection of the left main (LM), left circumflex artery (LCx) and LAD. It was treated with the two-stent technique procedure, after which, the patient was stable and pain free. In the third case, we showed a postmenopausal patient with subclinical hypothyroidism. In this case, it is difficult to say whether the dissections of LCx, LM and LAD that occurred after the balloon dilatation of LCx and the stent implantation in the right coronary artery (RCA) were result of atherosclerotic lesions or hormonal changes that can cause SCAD.

Key words: *spontaneous coronary artery dissection, acute coronary syndrome*

## Introduction

Spontaneous coronary artery dissection (SCAD) is defined as a nonatherosclerotic, nontraumatic or iatrogenic tear within the epicardial coronary artery wall creating a false lumen or hematoma (1,2,3). It is more common in younger patients and women and it can cause tacute coronary syndrome (ACS) in 0.1 to 4 percent of cases (4,5,6). The growth and improvement of cardiology diagnostic tools and invasive procedures may lead to a higher diagnosis rate, increased number of diagnoses and a better understanding of this pathophysiological process (7,8,9,10).

Here, we present three case reports of different types of SCAD.

## 1. Case report

A 50-year-old previously healthy male with a long-standing history of smoking was admitted to the Emergency Department due to acute coronary syndrome. The patient had previously had a very strong physical activity at the gym (he was running on the running machine and weightlifting). Echocardiography (ECHO) showed an anterolateral wall hypokinesia with

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signs of ischemia (Figure 1). Electrocardiogram (ECG) showed anteroseptal ST elevation. Coronary angiography was performed revealing a spontaneous dissection of the proximal left anterior descending (LAD) artery (Figure 2A). Precordial oppressions persisted, and due to their persistence, percutaneous coronary intervention (PCI) LAD with stent implantation was performed (Figure 2B). The patient was rhythmically stable and pain-free during the hospitalization. He was discharged from the hospital with aspirin, beta blocker, prasugrel, statin and strongly recommendation for the target exercise heart rate ranging from 50 to 70% of heart rate reserve, and systolic blood pressure during exercise <130 mmHg.

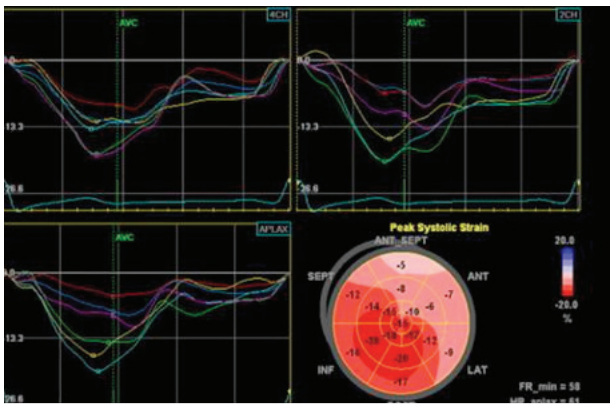


*Figure 1. Left ventricular global longitudinal strain showing reduced values of the supply territory of the anterior descending artery*

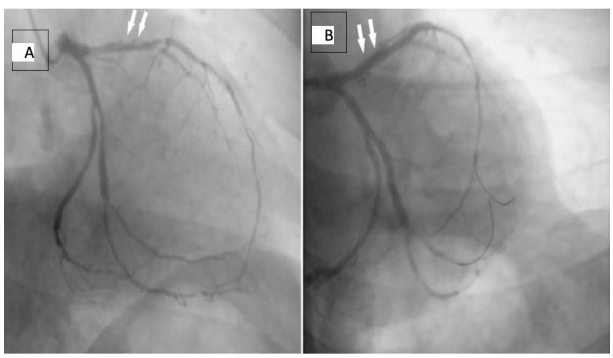


*Figure 2. Coronary angiography showing a short dissection at the proximal portion of the left anterior descending artery (A) (arrows), and the left anterior descending artery after stent implantation (B) (arrows).*

## 2. Case report

A 38-year-old thin multiparous female patient (3 kids) was hospitalized at the Department of Cardiology due to clinical presentation of ACS. She was a young widow on permanent stress and a non-smoker. Coronary angiography revealed a homogenous stenosis of the proximal LAD starting from the ostium and continuing up to bifurcation, with a diagonal branch (Figure 3). Later on, she was stable, without chest discomfort and without ECG changes, and we decided to treat her with optimal medical therapy (OMT). However, on the third day, the patient experienced strong chest pain and her troponin levels increased significantly. Coronary angiography showed spontaneous dissection of LAD, left main (LM), and left circumflex artery (LCx) (Figure 4 and B). PCI of LM, LAD and LCx (bifurcation) with the two-stent technique was performed (Figure 5). Neither immunological nor hormonal tests pointed toward a likely etiological base of the dissection. The patient was discharged from the hospital with aspirin, beta blocker, ticagrelor, sta-

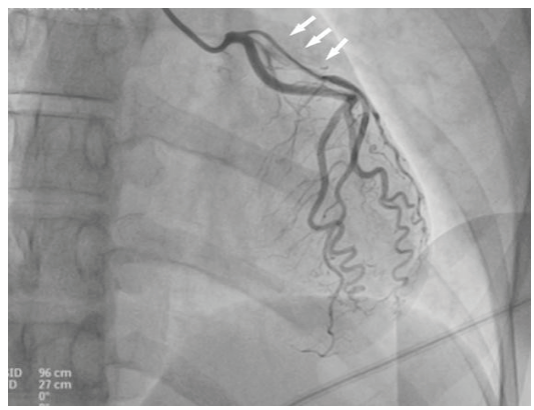

*Figure 3. Coronary angiography showing a homogenous stenosis of the proximal LAD starting from the ostium and continuing up to bifurcation, with a diagonal branch (arrows).*

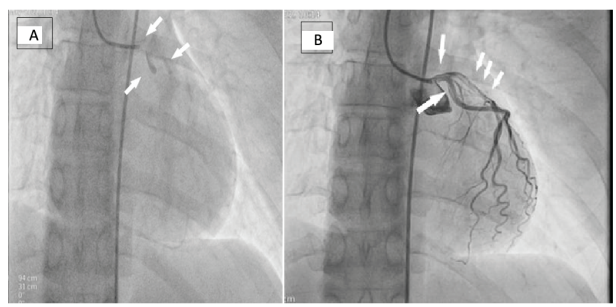


*Figure 4. Coronary angiography showing dissection of the left main, LAD and LCx (arrows).*

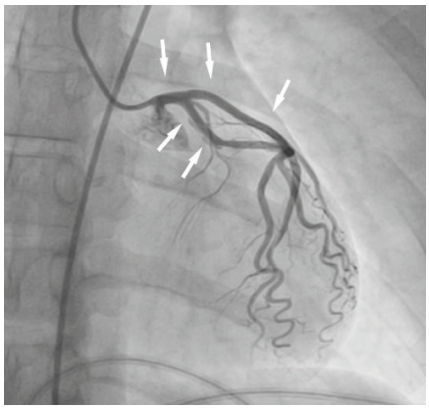

*Figure 5. Coronary angiography showing left coronary angiogram after the stent implantation with the two-stent technique (arrows).*

tin and recommendation to join cardiac rehabilitation programme, including psychological support.

### 3. Case report

A 61-year-old female patient with a medical history of hypothyroidism and asthma was hospitalized due to non-ST elevation-acute coronary syndrome (NSTE-ACS). Diffuse coronary artery disease as well as significant LCx stenosis were identified using coronary angiography (Figure 6). Lesion predilatation resulted in LAD, LM, and LCx dissection (Figure 7) that was ultimately resolved with stent implantations. Four months later, she was readmitted to the hospital due to chest pain. ECG showed inferior STEMI. Thrombus was found in the right coronary artery (Figure 8) and PCI with stent implantation was performed. Two days later, she had chest pain again, and coronary

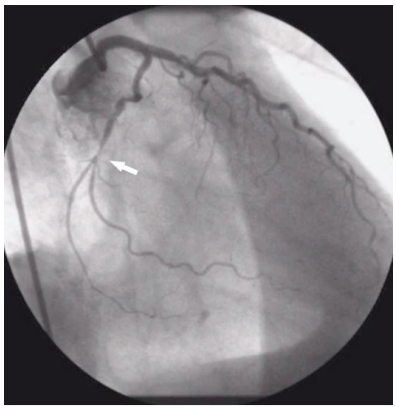

*Figure 6. Coronary angiogram showing a significant stenosis in bifurcation LCx/OM (arrow).*

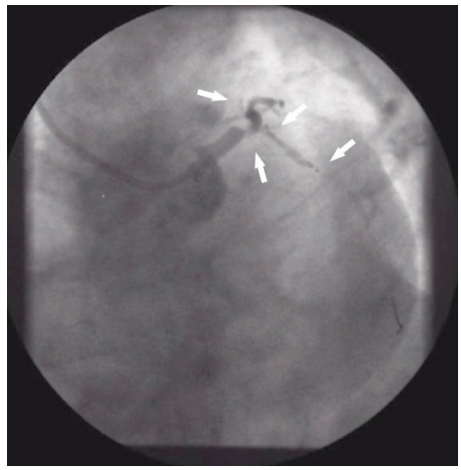

*Figure 7. Coronary angiography showing dissection of LCx, LM et LAD (arrows).*

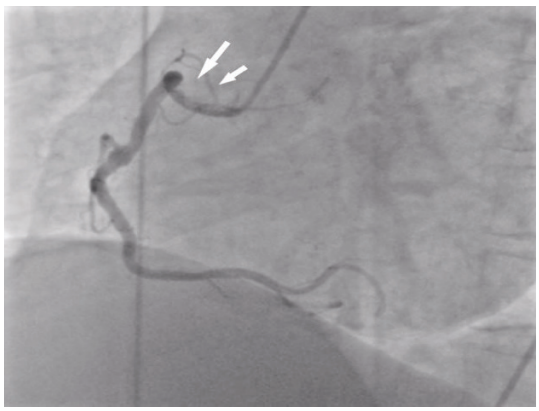

*Figure 8. Showing thrombus in the proximal segment of the right coronary artery (RCA) (arrows).*

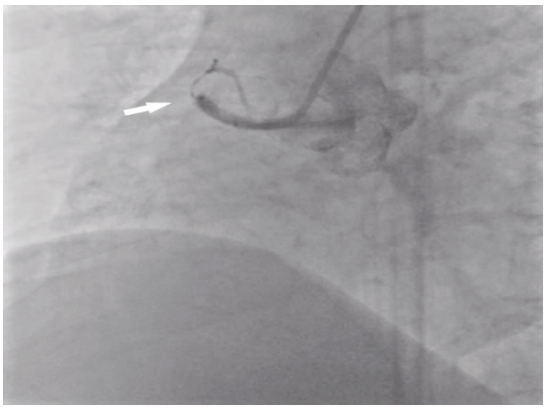

*Figure 9. Coronary angiography showing a dissection at the distal stent edge (arrow).*

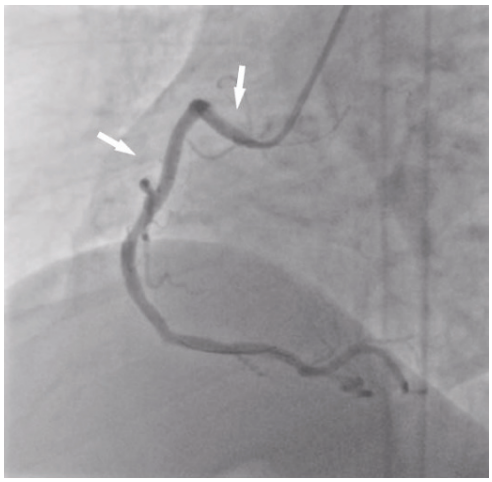

*Figure 10. Coronary angiography showing the final result after stent implantation from the distal edge of proximal stent with the stent overlapping (arrows).*

angiography showed dissection of the distal stent edge (previously implanted in RCA) (Figure 9), which was treated with another stent implantation (Figure 10).

The patient was discharged from the hospital with a therapy for ACS and strong recommendation to keep focusing on the thyroid gland and hormonal status as well.

**Discussion**

The first description of SCAD was Pretty's autopsy in 1931 (4). Since then, this condition has been underdiagnosed for decades and primarily associated with pregnancy and the peripartum period. Recent large observational cohorts demonstrated that pregnancy-associated SCAD shows less than 10% of all SCAD cases (7,13,14,15).

Two potential mechanisms for SCAD were proposed: (i) 'inside-out' model – endothelial and intimal discontinuity or tear allows blood to cross the internal elastic lamina and accumulate in the media, and (ii) 'outside-in' model (more likely) – disruption of vasa vasorum (micro- vessel) leads to haemorrhage into the tunica media (13,14,15,16). Most SCAD cases can be diagnosed based on coronary angiography findings and according to it, there are three types of SCAD (3,17).

The first type with a classically visible radiolucent flap, dual lumen, and contrast hold-up characteristics is rare.

The second and the most common type presents as homogeneous, long, diffuse (usually >30 mm) lesion with abrupt changes in the arterial calibre from its normal diameter to diffuse smooth narrowing with (2a) or without (2b) the involvement of the terminal part of the artery.

The third type mimics an atherosclerotic plaque which is why IVUS or OCT is required to differentiate it (3,18).

Potential risk factors include fibromuscular dysplasia, postpartum status, connective tissue disorders, and systemic inflammatory conditions (19,20). A combination of predisposing factors most likely increases the possibility of SCAD (14). Systemic inflammatory conditions, mechanical stressors (Case 1), previous emotional stress, multiparity (Case 2), hereditary disorders of connective tissue and hormonal therapy (Case 3), and genetics may increase the risk for acute SCAD events (3,21).

SCAD management, due to disrupted and friable coronary artery wall, revascularization is very challenging and associated with an increased risk of complications and adverse outcomes. Thus, although further research regarding establishing the optimal treatment approach is still needed. STEMI, and high-risk anatomy, TIMI flow 0-1, left main dissection, and proximal dissection (Case 1), should be treated immediately (21).

If coronary artery flow is maintained and there is no demonstrable ongoing ischemia or infarction, conservative approach, followed by a period of patient observation, should generally be prioritised. However, in some situations, revascularization should be considered due to the high risk of further clinical deterioration. These are cardiogenic shock, active/ongoing ischemia with persistent compromise in coronary blood flow, hemodynamic instability, and ventricular arrhythmias (Case 2). In patients in whom the diagnosis is not confirmed by coronary angiography, intracoronary imaging with OCT or IVUS may be helpful. Alternatively, coronary angiography may be repeated four to six weeks later to assess the condition of the injured segment (22,23,24).

SCAD may occur in older and postmenopausal women due to sex hormone disbalance and can be related with hypothyroidism as well (25). Interstitial retention of water and sodium in the vascular wall has been described in hypothyroidism. Deposition of hydrophilic mucopolysaccharides and increase in hyaluronic acid has also been postulated in the initial phases of plaque erosion (17). These changes may have a place in endothelial dysfunction and could explain

the relationship between hypothyroidism and SCAD. On the other hand, hypothyroidism has been associated with a higher frequency of iatrogenic coronary artery dissection during angioplasty (26,27).

Media weakness and hyaluronic acid accumulation as well as damaged microcirculation due to hormonal disbalance were pointed out as potential reasons for latter dissection (Case 3). Furthermore, temporal resolution of intramural hematoma in the previously stented segments may increase the risk of late stent mal-apposition and stent thrombosis (Case 3).

In this case, it is very difficult to say whether the dissection of the left and right coronary arteries after the balloon dilatation (ACx) and stent implantation (RCA) was a consequence of atherosclerotic disease and stent implantation, or whether it was a mechanically provoked dissection on the altered coronary vessel due to the changes, which occur in hypothyroidism and may be associated with SCAD.

Coronary artery bypass grafting (CABG) is typically performed as a last resort in cases of PCI failure with persistent ischaemia or significant at-risk myocardial territory infarction (28,29,30,31). There are still no randomized clinical studies on individual pharmacotherapeutic modalities when it comes to SCAD, and thus no adequate evidence to judge the real need and benefit of that/those medications. This refers to antiplatelet therapy, statins, RAAS blockade, etc. (32).

## Conclusion

Spontaneous coronary artery is a rare cause of ACS, but should be considered as a differential diagnosis, especially in young patients with low cardiac risk factors and perimenopausal women. Patients should be carefully monitored and, in addition to standard cardiological examinations, tests should be expanded according to potential risk factors to prevent the recurrence of future unwanted events. Patient education about the risk factors and modifications in lifestyle is very important.

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Sažetak

SPONTANA DISEKCIJA KORONARNIH ARTERIJA: PRIKAZI SLUČAJEVA TRI VRSTE DISEKCIJA

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Spontana disekcija koronarne arterije (SCAD) definira se kao neaterosklerotsko, netraumatsko ili nejatrogeno razdvajanje stijenke epikardijalne koronarne arterije koje stvara lažni lumen ili hematom unutar stijenke. Češća je u mlađih pacijenata i žena, a može izazvati akutni koronarni sindrom (AKS) u 0,1 do 4 posto slučajeva. U ovom članku smo prikazali tri slučaja različitih tipova SCAD-a. U prvom slučaju smo prikazali mlađeg bolesnika koji je zaprimljen zbog bolova u prsima nakon snažne fizičke aktivnosti. Elektrokardiogram (EKG) je pokazao akutni infarkt miokarda s elevacijom ST spojnice (STEMI) inferiorne regije. Koronarografijom se nađe SCAD lijeve silazne koronarne arterije (LAD) te se zbog bolova i znakova ishemije na ultrazvuku srca (UZV) implantira stent. U daljnjem tijeku je bio bez bolova, hemodinamski i ritmički stabilan. U drugom slučaju je pokazana SCAD kod mlade žene, višerotke, koja se prezentirala s AKS. Na koronarogramu je nađena homogena stenoza proksimalne LAD. Bolesnica je početno liječena optimalnom medikamentnom terapijom (OMT), međutim nakon par dana je zbog ponovnog javljanja bolova i porasta troponina učinjena rekoronarografija, koja je pokazala disekciju glavnog stabla (LM), arterije cirkumflekse (LCx) i LAD koja je liječena implantacijom stentova, s tehnikom dva stenta. U daljnjem tijeku je bila stabilna. U trećem slučaju je prikazana postemenopauzalna pacijentica s hipotireozom. U ovom slučaju je teško reći jesu li disekcije LCx, LM i LAD koje su nastale nakon balon dilatacije lezije na LCx i disekcija nakon implantacije stenta u desnu koronarnu arteriju (RCA) posljedica aterosklerotskih lezija ili hormonskih promjena koje mogu dovesti do SCAD-a.

Ključne riječi: *spontana disekcija koronarnih arterija, akutni koronarni sindrom*