CASE REPORT

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Spontaneous coronary artery dissection – rare but challenging

Spontana disekcija koronarne arterije – neuobičajeni izazov

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Abstract

Introduction. Spontaneous coronary artery dissection (SCAD) is a rare cause of the acute coronary syndrome. It occurs mostly in patients without atherosclerotic coronary artery disease, carrying fairly high early mortality rate. The treatment of choice (interventional, surgical, or medical) for this serious condition is not well-defined. **Case report.** A 41-year old woman was admitted to our hospital after the initial, unsuccessful thrombolytic treatment for anterior myocardial infarction administered in a local hospital without cardiac catheterization laboratory. Immediate coronary angiography showed spontaneous coronary dissection of the left main and left anterior descending coronary artery. Follow-up coronary angiography performed 5 days after, showed extension of the dissection into the circumflex artery. Because of preserved coronary blood flow (thrombolysis in myocardial infarction – TIMI II-III), and the absence of angina and heart failure symptoms, the patient was treated medicaly with dual antiplatelet therapy, a low molecular weight heparin, a beta-blocker, an angiotensin-converting enzyme (ACE) inhibitor and a statin. The patient was discharged after 12 days. On follow-up visits after 6 months and 2 years, the patient was asymptomatic, and coronary angiography showed the persistence of dissection with preserved coronary blood flow. **Conclusion.** Immediate coronary angiography is necessary to assess the coronary anatomy and extent of SCAD. In patients free of angina or heart failure symptoms, with preserved coronary artery blood flow, medical therapy is a viable option. Further evidence is needed to clarify optimal treatment strategy for this rare cause of acute coronary syndrome.

Key words:
acute coronary syndrome; dissection; coronary angiography; diagnosis; treatment outcome.

Apstrakt

Uvod. Spontana koronarna disekcija predstavlja neuobičajen uzrok akutnog koronarnog sindroma. Uglavnom nastaje kod bolesnika koji nemaju aterosklerotsku koronarnu bolest i nosi značajan rani mortalitet. Metoda izbora za lečenje ovog ozbiljnog stanja (interventno, hirurško ili medikamentno) još uvek nije jasno definisana. **Prikaz bolesnika.** U radu je prikazana bolesnica stara 41 godinu, primljena u našu bolnicu nakon neuspešne trombolitičke terapije akutnog anteriornog infarkta, iz lokalne bolnice bez sale za kateterizaciju srca. Hitan koronarni angiogram prikazao je spontanu koronarnu disekciju glavnog stabla i prednje silazne grane leve koronarne arterije. Kontrolna koronarografija nakon pet dana pokazala je proširenje disekcije u cirkumfleksnu arteriju. Zahvaljujući očuvanom koronarnom protoku (*thrombolysis in myocardial infarction* – TIMI II-III), odsustvu angine i simptoma srčane insuficijencije, bolesnica je medikamentno lečena dvojnom antiagregacionom terapijom, niskomolekularnim heparinom, beta blokatorom, ACE inhibitorom i statinom. Bolesnica je otpuštena nakon 12 dana lečenja. Na kontrolnim pregledima nakon šest meseci i dve godine, bolesnica je bila bez tegoba i koronarni angiogram je pokazao prisustvo disekcije uz očuvan koronarni protok krvi. **Zaključak.** Kod bolesnika sa spontanom koronarnom disekcijom, hitna koronarna angiografija je potrebna radi procene koronarne anatomije i zahvaćenosti disekcijom. Kod bolesnika koji nemaju anginozne smetnje ili simptome srčane insuficijencije, sa očuvanim koronarnim protokom, medikamentna terapija može biti prihvatljiv način lečenja. Dalja istraživanja su potrebna da bi se utvrdila optimalna strategija lečenja ovog retkog uzroka akutnog koronarnog sindroma.

Ključne reči:
akutni koronarni sindrom; disekcija; angiografija koronarnih arterija; dijagnoza; lečenje, ishod.

Introduction

Spontaneous coronary artery dissection (SCAD) is an infrequent cause of acute myocardial ischemia manifesting as acute myocardial infarction, unstable angina, cardiogenic shock or sudden cardiac death [1]. It has been reported to occur more often in women with or without risk factors for coronary artery disease (CAD). It can also occur in children, as

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well as in patients with risk factors or proven CAD [2]. The SCAD is commonly associated with atherosclerosis and peripartum vascular changes. It can be caused by connective tissue diseases (Ehlers Danlos type IV, Marphan's syndrome), systemic lupus erythematosus, cocaine abuse, use of oral contraceptives, vigorous exercise and prolonged sneezing. It can occur in patients without any of the conditions usually associated with SCAD – idiopathic SCAD [3–5]. Since this is a rare clinical entity, appropriate treatment strategy (interventional, surgical, or medical) is still unknown. Based on retrospective analysis of large data-bases of coronary angiograms, long-term survival of these patients, after initial event, is quite good, despite dramatic initial presentation and high early mortality rate. High early mortality rate is usually a consequence of myocardial infarction complications and unsuccessful revascularization procedures [6–8].

Case report

A 41-year-old female was admitted from a local hospital without cardiac catheterization facility less than 12 hours after the onset of chest pain at rest. There she was diagnosed with acute anterior myocardial infarction with ST elevation, and treated with thrombolysis. She had the history of smoking and childbirth 10 months earlier. She denied any previous hormonal disturbances.

On admission she complained of mild chest pain. Her body mass index (BMI) was 21.7 kg/m^2, blood pressure was 125/80 mmHg, pulse 80/min. ECG showed Q waves in leads V1-3, ST segment elevation of 2 mm in leads V1-4, and negative T waves in leads V1-6 (Figure 1). Laboratory analyses revealed creatine kinaze (CK) 1051 U/L, troponin T 3.4 ng/mL, alanine aminotransferase (ALT) 258 U/L, aspartate aminotransferase (AST) 256 U/L, total cholesterol 4.6 mmol/L, triglycerides 0.9 mmol/L. Other laboratory analyses were normal. Transthoracic echocardiography (TTE) showed decreased left ventricular systolic function due to akinesia of apex, distal two thirds of septum and anterior wall, and distal half of lateral wall, with ejection fraction of 35%. No valvular abnormality was noted.

Urgent coronary angiography (CAG) showed coronary dissection type B (National Heart, Lung and Blood Institute – NHLBI classification) of the distal left main (LM), and proximal, medial and initial segment of the distal left anterior descending (LAD) artery, with preserved blood flow (thrombolysis in myocardial infarction – TIMI III). Type C dissection was seen in the first diagonal (D1) coronary artery, with reduced blood flow (TIMI II). The left circumflex (Cx) and the right coronary artery (RCA) were normal (Figure 2).

The patient was presented to interventional cardiologists and cardiac surgeons who concluded that the lesions were not suitable for either percutaneous or surgical intervention. Medical therapy with oral aspirin, clopidogrel, metoprolol, captopril, high dose of simvastatin, and subcutaneous enoxaparin was initiated. On the day 5, CAG was repeated, and besides the persistence of coronary artery dissection in the LM and LAD, it revealed dissection type B in the proximal and distal part of circumflex artery (Cx); obtuse marginal (OM) branches were not involved (Figure 3).

These findings did not change already initiated medical therapy. During hospitalization, the patient was free of symptoms of angina or heart failure. The patient was discharged on the day 12, and was advised to continue with dual antiplatelet therapy, nitrates, beta-blocker, ACE inhibitor, and high dose of simvastatin.

After 6 months, the patient was still asymptomatic, without signs of ischemia on ECG. Transthoracic ultrasoho-

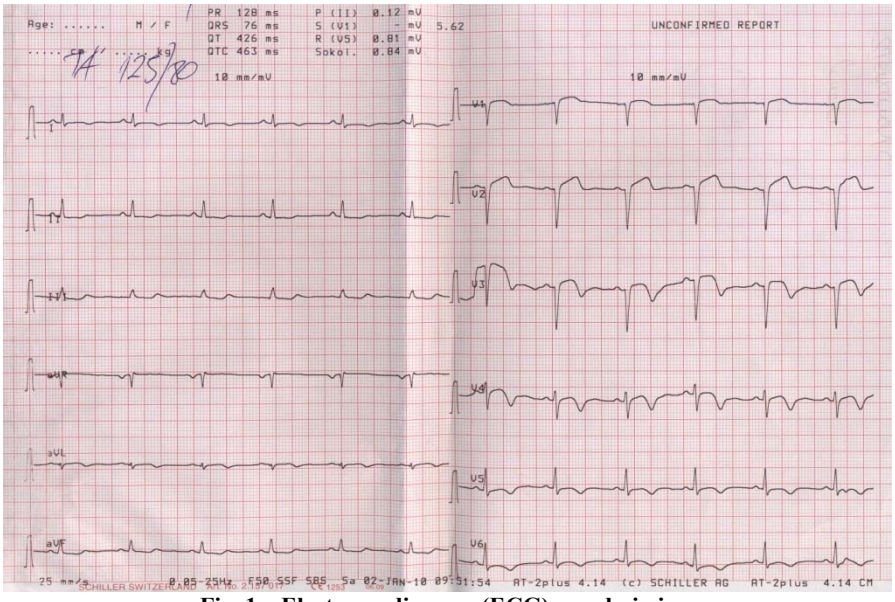

Fig. 1 – Electrocardiogram (ECG) on admission.

graphy showed a significant recovery of left ventricular systolic function, with hypokinesia restricted to distal half of the septum only. CAG revealed persistent dissection type B of LAD, and occlusive dissection type F of the second diagonal branch, with aneurysmatically changed proximal and medial

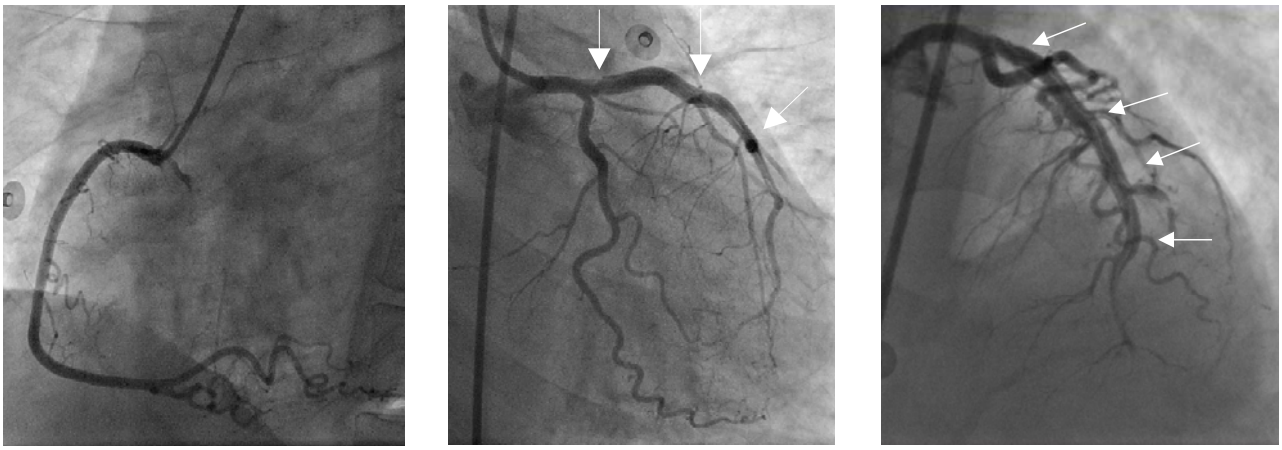

Fig. 2 – Coronary angiogram on the day 1 after admission (arrows indicating dissection line).

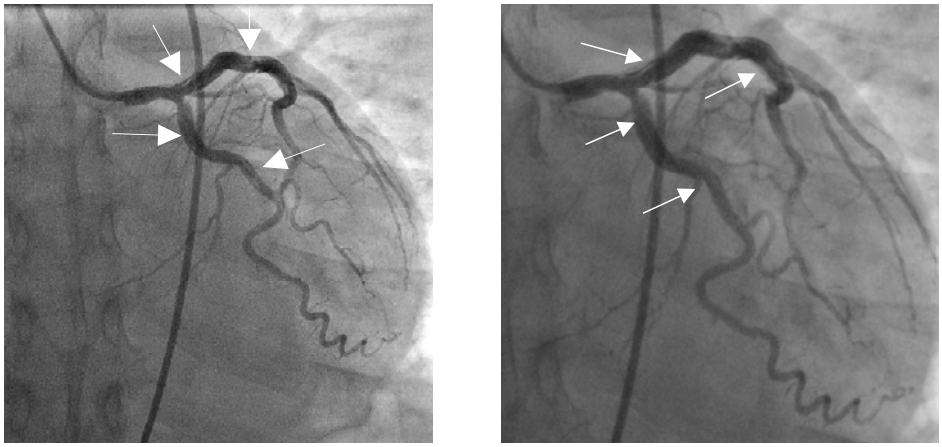

Fig. 3 – Coronary angiogram of the left coronary artery on the day 5 after admission (arrows indicating the dissection line).

segments of the LAD, and decreased coronary blood flow (TIMI II). There was no dissection in the LM and Cx. The right coronary artery was normal as on previous angiograms (Figure 4). Two years from the initial event, the patient was still asymptomatic, active, with good functional capacity, normal TTE findings, on the same medication except clopidogrel, which was stopped after one year.

Discussion

The first case of SCAD was described by Pretty [9] in 1931, the autopsy on a 42-year-old woman, who died suddenly after experiencing chest pain. The overall incidence of SCAD has reported to vary from 0.1% to 1.1% in angiographic studies [10–14]. The only study that reported on a lower

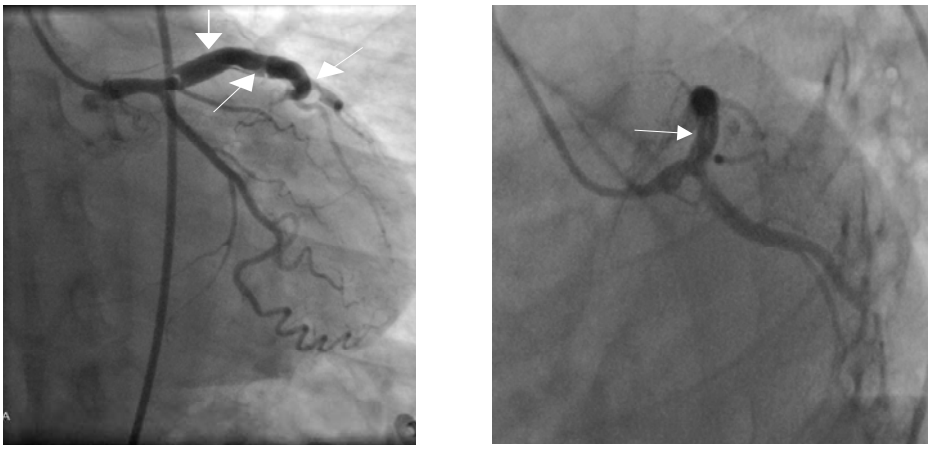

Fig. 4 – Coronary angiogram of the left coronary artery after 6 months (arrows indicating the dissection line).

incidence of SCAD is by Mortensen et al. [6], being only 0.07%. It affects predominantly women, with the reported ratio of 3:1 in large series of patients [1, 6, 7]. The mean age of SCAD patients is 44 years (range 17–69 years) in women, and 47 years (range 18–63 years) in men [6, 10–14]. There is also a case report of SCAD in a 14-year-old boy [2].

The cause of SCAD remains unknown. The most common conditions associated with SCAD are atherosclerosis and peripartum period. Rupture of atherosclerotic plaque can cause dissection of coronary artery. In autopsy studies, eosinophilic infiltrates have been described in *adventitia* of coronary arteries of SCAD patients, without coronary atherosclerosis [15]. During childbirth and peripartum period, eosinophils infiltrate the uterus, and serum collagenase levels increase. The presence of eosinophils in dissected coronary arteries may be local manifestation of systemic process. The occurrence of SCAD in peripartum women is explained by hormonal changes influencing collagen composition in arterial wall, which makes it weaker and ease to rupture [16]. A currently accepted theory considers the rupture of *vasa vasorum* causing haemathoma inside the media of the coronary artery, which spreads into intima. This may result in the rupture of the intima and lead to coronary artery dissection. Emotional or physical stresses, prolonged sneezing, use of oral contraceptives or cocaine abuse have been reported as precipitating factors [2, 3,11].

Angiographic findings of dissection in patients with SCAD can be classified according to the classification system of the National Heart, Lung and Blood Institute developed by the Coronary Angioplasty Registry. This classification has been used in everyday practice of percutaneous coronary interventions. Type A and B dissections demonstrate filling defects on contrast injection but have no or minimal persistence of contrast after the dye has cleared, type C dissections appear as dye staining in an extraluminal cap, type D as a spiral luminal defect, type E as persistent luminal defects and type F as total luminal occlusion [8].

Clinical presentation of SCAD is also variable. Sudden cardiac death occurs frequently, and it has been reported in around 75% of patients [17]. On the other hand, a recent "A Western Denmark Heart Registry Study" did not identify patients with SCAD that died suddenly, although the LAD was the predominant site of dissection [6]. Other clinical presentations include the entire spectrum of acute coronary syndromes. There are few reports on patients with SCAD who are entirely asymptomatic [18].

The optimal treatment strategy for SCAD remains unknown. In large angiographic cohorts, patients are treated with either percutaneous or surgical, but many patients are also treated with medical therapy only. The role of thrombolytic therapy is debatable. There are evidence for both successful and deleterious effects of thrombolytic therapy [19–21]. In series of Vanzetto et al. [7], only 4 patients presenting with ST segment elevation acute coronary syndrome underwent prehospital thrombolysis, which failed to achieve successful reperfusion in three of the cases. However, the severity and extent of coronary dissection was not found to be greater in patients treated with thrombolysis. In earlier studies, patients were mostly treated with medical therapy or coronary artery bypass grafting (CABG) [12–14]. CABG is challenging since grafting of the arterial "true lumen" is not always achievable, especially if dissection extends distally. With the development of percutaneous coronary interventions (PCI) more patients are treated with coronary angioplasty and stenting [6, 7, 11]. In the study by Hering et al. [11], the use of intravascular ultrasound (IVUS) lead to more PCI procedures (74%). There are case reports on patients with SCAD complicated by end- stage heart failure treated successfully with mechanical support devices or heart transplantation [22, 23].

Long-term prognosis in patients with SCAD is generally good. One-year survival in a large series ranges from 76% to 100% [3, 10–14]. In the study by Mortensen et al. [6] the mean follow-up time was 2.9 + 2.5 years, with major adverse cardiac event (MACE) free survival of 81% after 2 years. Meta-analysis by Thompson et al. [24] of the pooled data of 222 patients with SCAD, finds that after 2 years follow-up 95% of patients are still alive.

The largest registry of patients with SCAD has been recently reported by Tweet et al. [25] Their cohort consists of 87 patients with angiographically confirmed SCAD. The mean age was 42.6 years, and most of them were women (82%) while the initial presentation in 49% was ST elevation myocardial infarction. Conservative management was the treatment of choice in 31 patients and was associated with an uncomplicated in-hospital course, the same is true for coronary artery bypass grafting (7 of 87). Percutaneous coronary intervention was initially performed in 43 patients and technical success was achieved in only 28 (65%) and one patient died. During an average follow-up of 47 months (intequartile range 18–106) 5 persons developed heart failure, 16 had myocardial infarction and 3 had died at 10 years. Notably, from the group treated by CABG, 8 patients underwent repeated CAG. Of the 15 bypass grafts that had been placed, 11 were found to be occluded, 6 arterial and 5 venous grafts. This study found an unexpected association between fibromuscular dysplasia in non-coronary arterial trees and SCAD, which warrants further investigation.

Lately, patients with atherosclerotic risk factors presenting with coronary artery dissection are excluded from the group of patients with SCAD. Patients with associated atherosclerosis tend to be older, more frequently male, and have a higher prevalence of coronary risk factors. The reason for this division is different pathophysiological mechanism causing dissection [26].

There are some details regarding the patient in this case report that should be clarified. The patient was initially treated with thrombolysis. In our opinion, it might have preserved coronary blood flow and stabilized patients haemodynamics, allowing for transfer to the hospital with cardiac catheterization laboratory for further diagnostics. On the other hand, thrombolytics or therapy for acute coronary syndrome consisting of aspirin, clopidogrel and enoxaparine could have caused the spread of dissection into Cx by preventing occlusion of the false lumen. In our opinion, the possibility of atherosclerotic coronary artery lesion causing myocardial infarction is less likely, due to patient's profile without atherosclerotic risk factors and previous delivery 10

months ago. On the same track with this, would be a possibility of dissection caused by thrombolytic agent.

A decision to initiate medical therapy has been primarily based on the fact that the patient was asymptomatic, without signs of persistent ischemia, heart failure or arrhythmias, which would probably lead us to consider revascularization procedures. Furthermore, the extent of dissection would make PCI complex because of LM involvement, with the possibility of unsuccessful "wiring" of the true arterial lumen, and the need for stent implantation in very long coronary artery segments. All the mentioned imply a poor long-term outcome. Most importantly, TIMI III coronary blood flow secures perfusion of the myocardium, despite SCAD.

A decision to proceed with medical therapy after follow-up visits after 6 months and 2 years after initial event was based on the facts that the patient remained asymptomatic, with improvement of cardiac function assessed by TTE, despite CAG findings (regression, or "sealing" of dissection in LM and Cx, but persistent dissection in LAD causing aneurysmatic changes, coronary blood flow of TIMI II, and occlusion of diagonal branch).

Conclusion

Spontaneous coronary artery dissection is an infrequent cause of acute coronary syndrome. It affects mostly patients that do not have traditional risk factors for coronary atherosclerosis. Despite the presence of symptoms, coronary angiography is essential in making the diagnosis, as well as in initiating proper treatment strategy. The use of thrombolytic therapy is debatable, because it may preserve blood flow in the infarct related artery, but on the other hand, it may promote spreading of dissection into distal segments of coronary arteries. Depending on angiographic findings, short dissections probably should be treated by revascularization procedures, preferably PCI that can be preceded by imaging modalities like intravascular ultrasound or optical coherence tomography which should help in defining the extent of dissection into the coronary artery. Dissections that extend into distal segments of the coronary arteries may be treated with medical therapy only since the success of revascularisation procedures in these cases is highly uncertain.

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