



Does thrombolytic therapy harm or help in ST elevation myocardial infarction (STEMI) caused by the spontaneous coronary dissection?

Da li trombolitička terapija utiče negativno ili pozitivno na infarkt miokarda sa ST-elevacijom (STEMI) nastao spontanom disekcijom koronarne arterije?

Zoran Jović*†, Slobodan Obradović*‡, Nemanja Djenić†, Zorica Mladenović*†,
Predrag Djurić*†, Marijan Spasić*, Dragan Tavčiovski*†

*Clinic for Cardiology, ‡Clinic for Emergency and Internal Medicine,
Military Medical Academy, Belgrade, Serbia; Faculty of Medicine of the Military
Medical Academy, University of Defence, Belgrade, Serbia

Abstract

Introduction. Spontaneous coronary artery dissection (SCAD) is a very rare disease with poor prognosis. It mainly affects young women free of risk factors for coronary artery disease (CAD) and women during the peripartum period. The prognosis for myocardial infarction caused by SCAD is poor, management is often difficult and guidelines still missing. **Case report.** We presented a woman with acute myocardial infarction of anterior wall of the left ventricle, caused by spontaneous dissection of medial segment of the left anterior descending coronary artery. We treated the patient with thrombolytic therapy and performed coronary angiography after that. Finally we decided to do nothing more. Two years later we performed coronary angiography again and founded the coronary artery normal. We also analyzed 19 cases published from 1996 to 2012 when coronary artery dissection had been treated with thrombolytic agent. Analysis revealed only one case of 19, with complication after treating SCAD with thrombolysis. **Conclusion.** Sometimes, regarding myocardial infarction in young women with no risk factors for CAD, especially in young women in peripartum, we should think about SCAD. The presented case, like eight others, demonstrates that good clinical outcomes can be achieved with thrombolysis. In spite of all this, we still need more data to verify that thrombolysis does not have to harm the therapy for SCAD. For the time being thrombolytic therapy could be an option.

Key words:

acute coronary syndrome; aneurysm dissecting; myocardial infarction; fibrinolytic agents; treatment outcome.

Apstrakt

Uvod. Spontana disekcija koronarne arterije (SDKA) predstavlja veoma retku bolest sa lošom prognozom. Obično se javlja kod mladih žena bez faktora rizika od koronarne arterijske bolesti (KAB) i kod žena za vreme periporodajnog perioda. Prognoza infarkta miokarda uzrokovanog SDKA je loša, lečenje je često teško i preporuke još uvek ne postoje. **Prikaz bolesnika.** Prikazali smo ženu sa akutnim infarktomiokarda prednjeg zida leve komore, prouzrokovanog spontanom disekcijom medijalnog segmenta prednje descendente arterije. Lečenje smo započeli trombolitičkom terapijom i urađena je koronarna angiografija nakon toga. Dve godine kasnije na ponovljenoj koronarnoj angiografiji nađene su normalne koronarne arterije. Takođe, analizirani su prikazi 18 bolesnika objavljeni u periodu od 1996. do 2012. godine, zajedno sa prikazom našeg bolesnika, kod kojih je disekcija koronarne arterije lečena trombolitičkom terapijom. Ustanovljeno je da je samo kod jednog bolesnika, od njih 19, opisana komplikacija nakon primene trombolitičke terapije u lečenju SDKA. **Zaključak.** Ponekad, kad imamo infarkt miokarda kod mladih žena bez faktora rizika od KAB, posebno kod žena u periporodajnom periodu, treba misliti na SDKA. Primer naše bolesnice, kao i osam drugih, pokazuje da se dobri klinički rezultati mogu postići trombolizom. Uprkos svaemu tome, još uvek je potrebno više podataka kako bi se potvrdilo da tromboliza ne šteti u terapiji SDKA. Za sada, trombolitička terapija može biti jedna od opcija.

Ključne reči:

akutni koronarni sindrom; aneurizma, disekantna; infarkt miokarda; fibrinolitički; lečenje, ishod.

Introduction

Spontaneous coronary artery dissection (SCAD) is a rare, underdiagnosed pathology with a very poor prognosis. The first report on SCAD was by Pretty in 1931, while the first an-

giographic diagnosis was made in 1978. Fewer than 400 cases have been reported in the literature¹. SCAD is a poorly understood cause of myocardial infarction. It occurs in relatively young persons and represents a tiny proportion (0.07–1.1%) of patients undergoing angiography in most registries and series.

Among reported case series ranging from 3 to 47 cases, there is the approximate 2 : 1 female predominance. About one third of the cases in women occur in the peripartum period. The clinical presentation of SCAD depends on the extent and the flow limiting severity of the coronary dissection, and ranges from asymptomatic to unstable angina, acute myocardial infarction, and ventricular arrhythmias to sudden cardiac death, and may be responsible for as many as 1 of 10 episodes of acute coronary syndrome in women younger than 50 years^{2,3,4}. Currently, clinical recognition of SCAD has increased as coronary angiography is utilised frequently in the clinical evaluation of patients with acute coronary syndromes. Moreover, intracoronary imaging techniques such as intravascular ultrasound (IVUS) and optical coherence tomography (OCT) have enabled a more detailed clinical assessment of SCAD^{3,4}.

The etiology of SCAD is unclear. Approximately one third of women with SCAD are pregnant or peripartum. Hormonal effects in the vessel wall such as reduced collagen synthesis, smooth muscle cell proliferation, and abnormalities in the proteoglycan matrix are implicated and may also explain cases of SCAD seen with oral contraceptive pill use⁴⁻⁶. Dissection is caused when there is bleeding into the media of the artery, separating the vessel layers with subadventitial hematoma in the false lumen, compressing the true lumen to varying degrees⁷.

The left anterior descending (LAD) coronary artery is the most frequently involved vessel in autopsy and angiographic series of the LAD artery accounts on average for 60% of cases^{3,6,7}. Patients have been treated successfully with medical therapy, coronary stenting, and coronary artery by-

pass grafting, depending on the extent and location of disease. In patients who have completed infarctions without residual ischemic symptoms medical therapy has been associated with good long-term outcomes. The role of thrombolysis in patients with ST elevation myocardial infarction (STEMI) is controversial^{3,4,8}.

In this article, we reported the case of STEMI caused by spontaneous coronary artery dissection, showing regression after conservative medical treatment. The management options and complications were discussed.

Case report

A 48-year-old female was admitted to the Emergency Department because of intense retrosternal pain of one hour duration and an electrocardiographic pattern of acute ST elevation anterior myocardial infarction (Figure 1). The patient was admitted to the intensive care unit and treated with intravenous thrombolysis (t-PA). We also administered glycoprotein IIb/IIIa inhibitor (tirofiban), aspirin, clopidogrel, heparin, nitrates, and beta-blocker, and the patient's clinical status progressively improved. After the given therapy there was more than 50% resolution of ST segment elevation in leads V3, V4 and V5. Serial measurement of biochemical markers was consistent with myocardial necrosis. One day after admission we performed coronary angiography and found SCAD of the medial part of the LAD artery (Figure 2) with TIMI I-II flow in distal part of LAD. Neither were there atherosclerotic lesions in the affected vessel nor in the other coronary arteries and we decided to do nothing except medical therapy. After 5 days

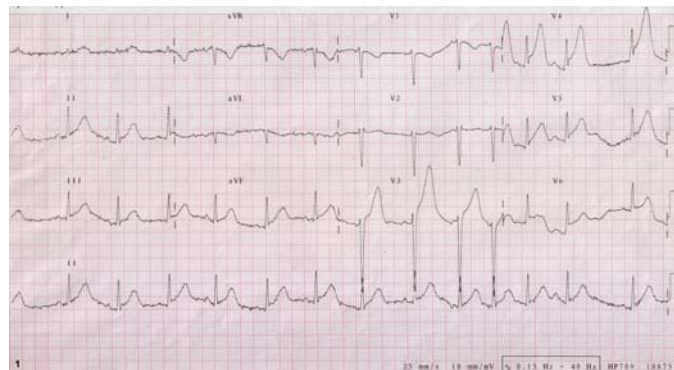
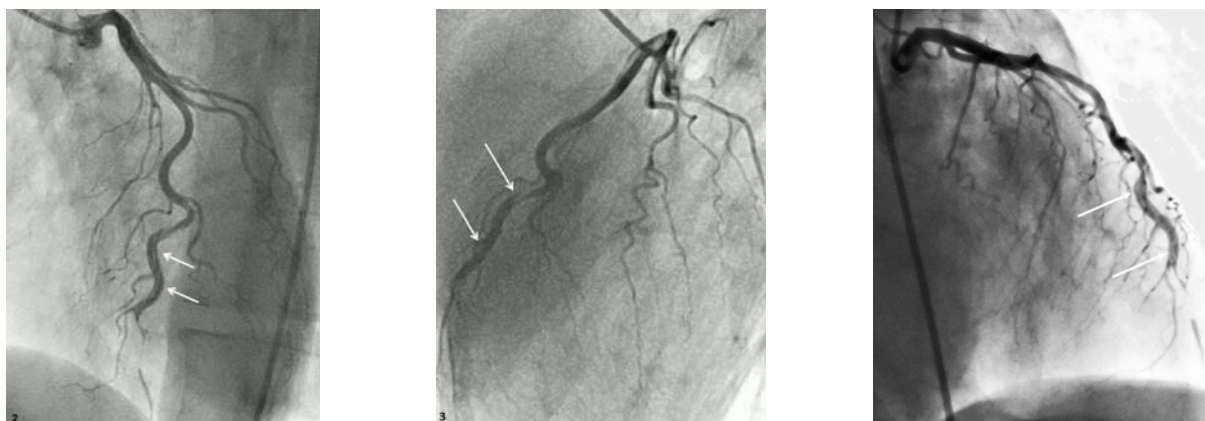


Fig. 1 – ECG record during myocardial infarction.



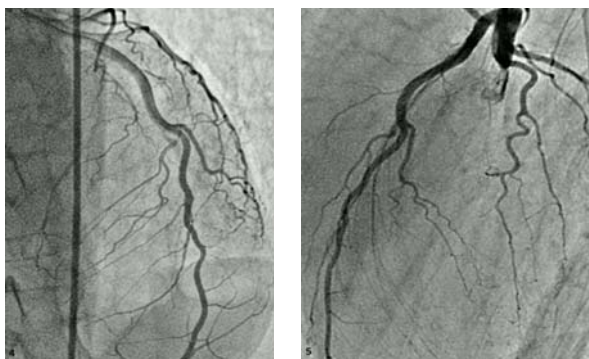
Figs. 2 – Coronary angiography of the left anterior descending coronary artery during myocardial infarction (arrows point dissection).

brain (B-type) natriuretic peptide (BNP) was highly elevated. Echocardiography performed two weeks post-admission revealed the akinetic apex and apical segments of the anterior and the inferior wall of the left ventricle. The global systolic performance of the left ventricle was satisfactory with the estimated ejection fraction of 45–50%. The patient was a smoker without any other conventional cardiovascular risk factor for coronary artery disease. In the thirteenth year of life she had infective endocarditis. She suffered from obsessive compulsive disorder and regularly visited the psychiatrist. Her past medical history was unremarkable and she denied any use of vasoconstricting or recreational drugs. She took no oral contraceptives (estrogen plus progestin) and had no a history of thromboembolic disease. All laboratory inves-

tigations performed in order to assess the inflammatory risk, coagulation abnormalities, as well as autoimmune disorders were found to be within normal limits. The patient had an uneventful clinical course and was discharged on a beta-blocker, aspirin, clopidogrel, statin and an ACE inhibitor.

The patient remained asymptomatic and 2 years later was subjected to second coronary angiography, which showed complete healing of the previous LAD dissection (Figure 3). There was normal sinus rhythm on ECG, with micro R wave in V2 and V3 with slightly negative T wave in D2, D3, aVF and from V4 to V6 (Figure 4).

We also retrieved literature (source PubMed) dealing with thrombolytic therapy of SCAD. The retrieving process is presented in Figure 5. We identified 18 case reports in which



Figs. 3 – Coronary angiography of the left anterior descending coronary artery 2 years after myocardial infarction.

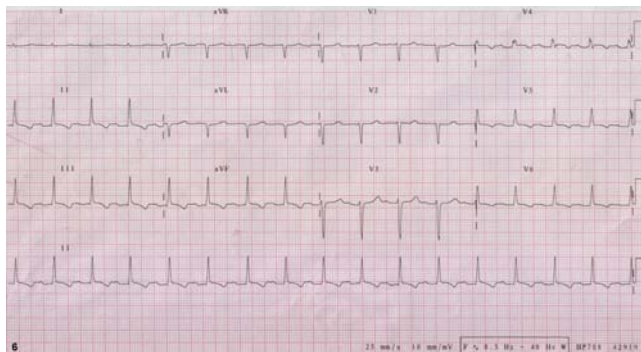


Fig. 4 – ECG record 2 years after myocardial infarction.

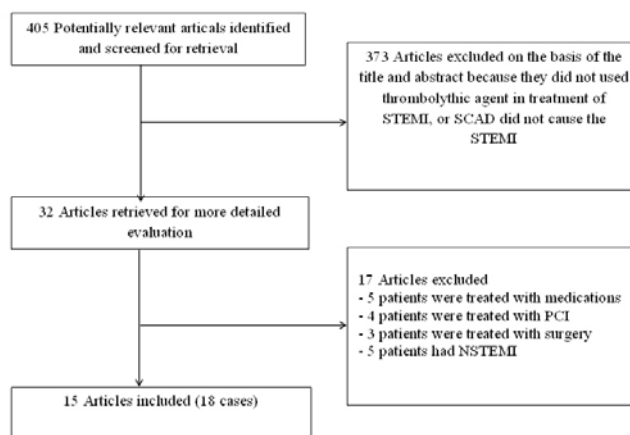


Fig. 5 – Flow chart of the case selection process.

SCAD – spontaneous coronary artery dissection; STEMI – ST segment elevation myocardial infarction; NSTEMI – non ST segment elevation myocardial infarction.

trombolytics had been used in treatment of SCAD. Analysis of these cases including own one (this case) revealed only one case with complications as a consequence of thrombolytic use (Table 1).

Discussion

SCAD is a very rare disease with poor prognosis occurring more commonly in women, particularly in the peripartum period^{1,6-8}. The majority of affected individuals (approximately 75%) are young women without risk factors for athero-

men^{1,11}. Secondly, thrombolysis treatment may be effective in lysis thrombi in the false lumen, allowing the true lumen to re-expand^{7,12,13} and finally, thrombolysis may aggravate bleeding and the dissection^{4,6,12}.

We analyzed 19 cases reports published from 1996 until 2012 with coronary artery dissection treated with thrombolytic agent. Successful use of thrombolytic agents have been published in eight cases including our^{6-8,13-15}. In 11 cases^{1,4,11,16,17}, thrombolytic agents did not help to re-establish coronary flow, but only in one case complications were described that may be associated with thrombolytic therapy¹⁸. Two patients

Table 1

Thrombolytic treatment in patients with coronary artery dissection

Case report	Year	Journal	Thrombolytic	Successful	Complication
Leclercq F, et al. ¹³	1996	Eur Heart J.	rt-PA	yes	no
Mahenthiran J, et al.	2000	J Natl Med Assoc	rt-PA	yes	no
S. Narasimhan, et al.	2004	IJTCVS	Streptokinase + rt-PA	no	yes? (dead)
Maeder M. et al. ⁴	2005	Intern Journal of Cardiology	Retepase	no	no
Maeder M, et al. ⁴	2005	Intern Journal of Cardiology	rt-PA	no	no
Evangelou D, et al. ⁶	2006	Intern Journal of Cardiology	Tenecteplase	yes	no
Pierre-Justin G, et al.	2007	Intern Journal of Cardiology	rt-PA	yes	no
Cano O, et al. ¹¹	2009	Intern Journal of Cardiology	Tenecteplase	no	?
T. Karaahmet T, et al. ¹⁵	2009	Anadolu Kardiyol Derg	?	yes	no
Saadat H, et al. ²¹	2009	Int J Angiol	?	no	?
Andreou AY, et al. ²²	2009	Exp Clin Cardiol	?	no	?
Andreou AY, et al. ²²	2009	Exp Clin Cardiol	?	no	?
Motreff P, et al. ¹	2010	Cardiology	?	no	yes?(dead)
Motreff P, et al. ¹	2010	Cardiology	?	no	no
Almafragi A, et al. ¹⁸	2010	Cardiol J	?	no	?
Ito H, et al. ⁸	2011	Am J Cardiol	?	yes	no
Ito H, et al. ⁸	2011	Am J Cardiol	?	yes	no
Hidalgo-Urbano RJ, et al. ¹⁷	2011	Rev Esp Cardiol	?	no	yes
Jović Z, et al.	2015	Vojnosanit Pregl (this issue)	rt-PA	yes	no

rt-PA – recombinant tissue plasminogen activator

sclerosis, of whom approximately 30% are in the peripartum period. SCAD usually involves a single vessel (*ie*, the LAD artery in women and the right coronary artery in men)^{1-6,8}. There is no consensus on the treatment of SCAD. All three, medical, percutaneous coronary interventions and surgical approaches have been employed, but no randomized control trials have compared the three approaches. However, coronary dissection may regress spontaneously^{1,8-10}.

The role of thrombolytic therapy is controversial, but there are more cases in the literature with successful thrombolysis than with complications from thrombolysis. There are several different outcomes when treating a SCAD with thrombolytic agent: firstly, thrombolytics have been accused of favoring intramedial hematoma extension and compression of the true lu-

died, not from the effects of thrombolytic therapy, but from large myocardial infarction^{1,16}.

The presented case was conservatively managed, including thrombolysis^{4,6}, glycoprotein IIb/IIIa inhibitor^{9,19} and clopidogrel^{4,13,20-23}, and the patient had no recurrence of chest pain in a long-term follow-up of two years. Also, control coronary angiography after two years was normal.

Conclusion

SCAD dissection is a rare and uncommon cause of acute coronary syndrome that should be considered in young patients, particularly women, which is presented with myocardial infarction. It is known that thrombolytic therapy can

lead to complications when applying for SCAD, but there is still no clear evidence of this. In the analysis that we conducted, there was only one case of 18 previously published and this our case, which demonstrated complications after treating SCAD with thrombolysis. The presented case, like

eight others, confirm that good clinical outcomes can be achieved with thrombolysis, glycoprotein IIb/IIIa inhibitors and long-term dual antiplatelet therapy. In spite of all this, we still need more data to verify that thrombolysis does not harm the therapy for SCAD.

R E F E R E N C E S

1. Motreff P, Sonteyrand G, Dauphin C, Eschalièr R, Cassagnes J, Lusson JR. Management of spontaneous coronary artery dissection: review of the literature and discussion based on a series of 12 young women with acute coronary syndrome. *Cardiology* 2010; 115(1): 10–8.
2. Tweet MS, Gulati R, Aase LA, Hayes SN. Spontaneous coronary artery dissection: a disease-specific, social networking community-initiated study. *Mayo Clin Proc* 2011; 86(9): 845–50.
3. Vrints CJ. Spontaneous coronary artery dissection. *Heart* 2010; 96(10): 801–8.
4. Maeder M, Ammann P, Angehrn W, Rickli H. Idiopathic spontaneous coronary artery dissection: incidence, diagnosis and treatment. *Int J Cardiol* 2005; 101(3): 363–9.
5. McCann AB, Whitbourn RJ. Spontaneous coronary artery dissection: a review of the etiology and available treatment options. *Heart Vessels* 2009; 24(6): 463–5.
6. Evangelou D, Letsas KP, Korantzopoulos P, Antonellis I, Siorus E, Kardaras F. Spontaneous coronary artery dissection associated with oral contraceptive use: a case report and review of the literature. *Int J Cardiol* 2006; 112(3): 380–2.
7. Mahenthiran J, Revankar R, Koka V, Hoo J, Shenoy M. Spontaneous coronary artery dissection presenting as acute myocardial infarction. *J Natl Med Assoc* 2000; 92(2): 87–90.
8. Ito H, Taylor L, Bowman M, Fry ET, Hermiller JB, van Tassel JW. Presentation and therapy of spontaneous coronary artery dissection and comparisons of postpartum versus nonpostpartum cases. *Am J Cardiol* 2011; 107(11): 1590–6.
9. Erdim R, Gormez S, Aytekin V. Spontaneous healing of spontaneous coronary artery dissection: a case report. *J Invasive Cardiol* 2008; 20(8): E237–8.
10. Kalra N, Greenblatt J, Ahmed S. Postpartum spontaneous coronary artery dissection (SCAD) managed conservatively. *Int J Cardiol* 2008; 129(2): e53–5.
11. Cano O, Almenar L, Chirivella M, Martínez L. Idiopathic spontaneous coronary artery dissection. Clinical and pathological correlate. *Int J Cardiol* 2009; 133(1): e18–9.
12. Irani F, Coher WR Jr, Tinkel J. Spontaneous coronary artery dissection: to treat or not to treat-2 atypical cases and a review of the literature. *Am J Ther* 2012; 19(1): e62–5.
13. Ledezq F, Messner-Pellenc P, Carabasse D, Lucke N, Rivalland F, Grolleau R. Successful thrombolysis treatment of a spontaneous left main coronary artery dissection without subsequent surgery. *Eur Heart J* 1996; 17(2): 320–1.
14. Pierre-Justin G, Pierard LA. Spontaneous coronary artery dissection in an antilles man with acute inferior myocardial infarction. *Int J Cardiol* 2007; 118(2): 237–40.
15. Karaahmet T, Tigen K, Gürel E, Cevik C, Mutlu B, Başaran Y. Spontaneous dissection of the left main coronary artery regressed with thrombolytic therapy: evaluation with multislice computed tomography angiography. *Anadolu Kardiyol Derg* 2009; 9(1): E2–3.
16. Narasimhan S. Spontaneous coronary artery dissection. *IJTCVS* 2004; 20: 189–91.
17. Hidalgo-Urbano RJ, Almendro-Delia M, Villar-Rodríguez JL. Haemopericardium in a fibrinolysis in acute myocardial infarction secondary to a spontaneous coronary artery dissection. *Rev Esp Cardiol* 2011; 64(6): 539–40.
18. Almafragi A, Convens C, van den Heuvel P. Spontaneous healing of spontaneous coronary artery dissection. *Cardiol J* 2010; 17(1): 92–5.
19. Choi JW, Davidson CJ. Spontaneous multivessel coronary artery dissection in a long-distance runner successfully treated with oral antiplatelet therapy. *J Invasive Cardiol* 2002; 14(11): 675–8.
20. Cheung S, Mithani V, Watson RM. Healing of spontaneous coronary dissection in the context of glycoprotein IIb/IIIa inhibitor therapy: A case report. *Cathet Cardiovasc Interv* 2000; 51(1): 95–100.
21. Saadat H, Taberkhani M, Safi M, Vakili H, Namazi MH, Poorboseini HR, et al. Percutaneous treatment of spontaneous left main coronary artery dissection extending to the left anterior descending and circumflex arteries possibly triggered by thrombolytic therapy. *Int J Angiol* 2009; 18(3): 151–4.
22. Andreou AY, Georgiou PA, Georgiou GM. Spontaneous coronary artery dissection: Report of two unsuspected cases initially treated with thrombolysis. *Exp Clin Cardiol* 2009; 14(4): 89–92.
23. Dakik HA, Nader GA, Arja WA, Sawaya J, Gharzuddine W. Asymptomatic spontaneous coronary artery dissection. *Clin Cardiol* 2010; 33(7): E40–2.

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