

SPONTANEOUS RECANALIZED CORONARY THROMBUS AS AN UNEXPECTED FINDING ON CORONARY ANGIOGRAPHY

MILENKO ČANKOVIĆ^{1,2}, VANJA DRLJEVIĆ TODIĆ¹, TEODORA PANTIĆ¹, MILA KOVAČEVIĆ^{1,2},
VLADIMIR IVANOVIĆ^{1,2}, MILOVAN PETROVIĆ^{1,2}

¹Institute of Cardiovascular Diseases of Vojvodina, Department of Cardiology, Sremska Kamenica, Serbia; ²University of Novi Sad, Faculty of Medicine, Novi Sad, Serbia

Introduction: Spontaneous recanalized coronary thrombi (SRCT) are a rare condition characterized by multiple channels divided by thin septa, communicating with each other, proximally and distally, with the normal coronary lumen. High-resolution intracoronary imaging techniques such as intravascular ultrasound or optical coherence tomography (OCT) enable routine study of the coronary artery lumen and wall. **Case report:** A 73-year-old male presented to the intensive care unit due to the loss of consciousness and transient extreme bradycardia recorded on electrocardiogram. Coronary angiogram revealed contrast defect on the right coronary artery (RCA). For better assessment of the angiographic finding, OCT was performed and confirmed a honeycomb-like structure starting from medial RCA and propagating up to the distal part. As a result of the data acquired, the diagnosis of SRCT in the RCA was established. It was decided not to treat the RCA with stent implantation, and it was proceeded with optimal medicament therapy and pacemaker implantation. At three-month follow up, the patient reported no subjective symptoms and SPECT showed no signs of ischemia. **Conclusion:** While there are no appropriate recommendations for the treatment of SRCT yet, decision on treatment is based on imaging techniques findings and physician's experience. Adequate follow up of these patients can provide important data needed for future guiding of the SRCT treatment.

Key words: honeycomb-like structure, thrombus recanalization, interventional cardiology, intravascular imaging, optical coherence tomography, coronary artery disease

Address for correspondence: Vanja Drljević Todić, MD
Institute for Cardiovascular Diseases of Vojvodina
Dr Goldman Way 4
21204 Sremska Mitrovica
Vojvodina, Serbia
E-mail: vanja.drljevic@mf.uns.ac.rs

SRCT - Spontaneous recanalized coronary thrombi; HLS - honeycomb-like structure; IVUS - intravascular ultrasound; OCT - optical coherence tomography; RCA - right coronary artery; LCA - left coronary artery; SPECT - Single photon emission computed tomography

INTRODUCTION

Spontaneous recanalized coronary thrombi (SRCT) are a rare condition. It was for the first time observed on histopathology findings in an autopsy series, and characterized by multiple channels divided by thin septa, communicating with each other, proximally and distally, with the normal coronary lumen (1). SRCT can often be misdiagnosed with spontaneous artery dissection, plaque rupture, calcium, etc. The *in vivo* appearance of SRCT was first described by Terashim

et al. in 2002 using intravascular ultrasound (2). Several terms have been proposed for this structural abnormality, including 'honeycomb-like structure' (HLS), 'lotus root-like appearance' or 'Swiss cheese pattern' (3). High-resolution intracoronary imaging techniques such as intravascular ultrasound (IVUS) or optical coherence tomography (OCT) enable routine study of the coronary artery lumen and wall. Because of its higher resolutions, OCT remains the imaging technique of choice for diagnosing SRCT and can help decide among different treatment modalities (4).

We present a case of a 73-year-old male with SRCT treated with optimal medicament therapy.

CASE REPORT

A 73-year-old male presented to the intensive care unit due to the loss of consciousness and transient extreme bradycardia recorded on electrocardiogram (ECG). Previous medical history of the patient included paroxysmal atrial fibrillation, essential thrombocythemia and hypertension. In addition, the patient reported regular usage of the prescribed therapy. The patient reported chest discomfort, dizziness, and an episode of loss of consciousness, about 4 hours before admission. Cranial computed tomography (CT) scan was performed at admission and showed no acute cerebral ischemia or hemorrhage.

On examination, the patient was alert and orientated, normotensive (BP 120/80 mmHg), heart rate 80/min, cardiopulmonary status stable. ECG showed sinus rhythm, normal heart rate, and no signs of ischemia. Blood examinations at admission showed increased platelet count (563×10^9). Red blood cells, white blood cells, biochemical examinations including cardiac enzymes were within the reference values. Echocardiogram showed normal sized left ventricle, with no contractility impairment and valvular disease. Further diagnostic workup included coronary angiography where left coronary artery (LCA) was without significant lesions. On the right coronary artery (RCA), contrast defect was detected, starting from medial part of the artery and propagating to the distal segment, almost to the crux, with TIMI 3 flow (Figure 1A). For better assessment of the angiographic finding, OCT was performed. OCT pullback recorded a honeycomb-like structure in the length of 70 mm, starting from medial RCA and propagating up to the distal part (Figure 1B, 1C, 1D, Figure 2B). Proximal part of the RCA was without significant lesions; however, some fibro-calcified plaques were found (Figure 1A). Better understanding of the HLS was achieved by using 3D reconstruction on the OCT (Figure 2A). As a result of the data acquired, the diagnosis of SRCT in the RCA was established. It was decided not to treat the RCA with stent implantation but to proceed with optimal medicament therapy and pacemaker implantation. At three-month follow up, single photon emission computed tomography (SPECT) showed no signs of ischemia. The patient reported no subjective symptoms, including chest pain and discomfort, dizziness, or loss of consciousness.

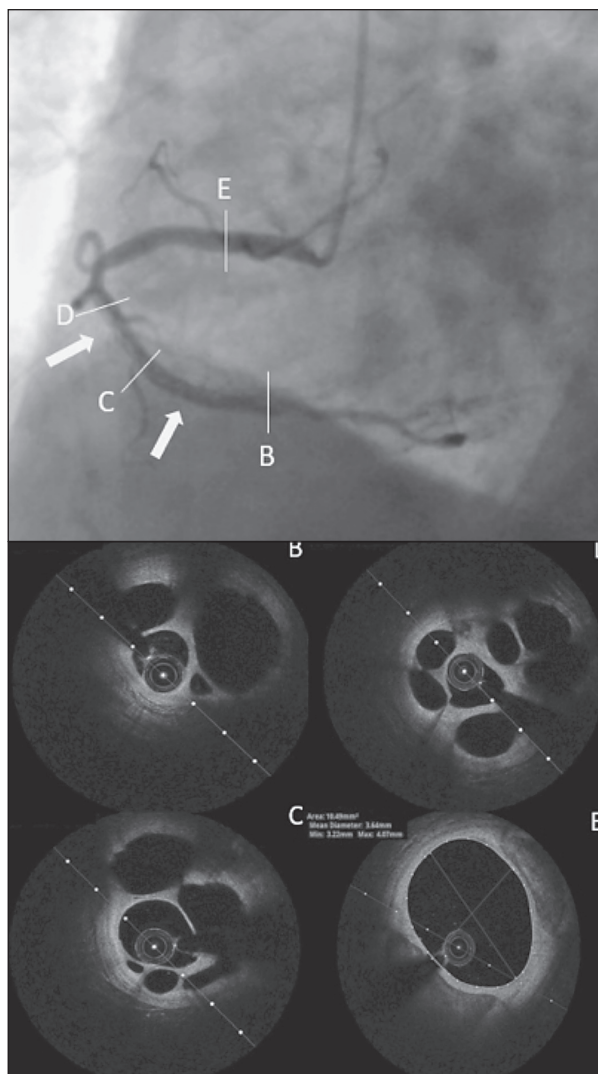


Fig. 1. Arrows pointing to the haziness in RCA (A); honeycomb-like structure in different segments of RCA (B, C, D); proximal part of RCA, minimum lumen area 10.41 mm², fibro-calcified plaques are detected (E).

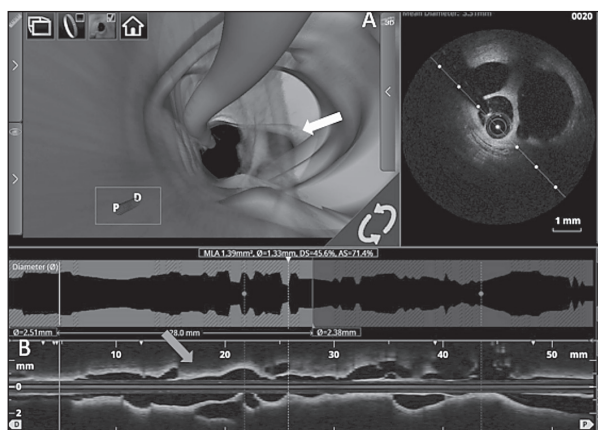


Fig. 2. 3D reconstruction, fly through mode on optical coherence tomography: white arrow pointing to the septa (A); red arrow pointing to the longitudinal section of the right coronary artery, honeycomb-like structure is detected through entire pullback (B).

DISCUSSION

Although recanalization of coronary thrombi is a well-described pathology in the literature, it is rarely recognized in clinical routine. Because of angiographic haziness and filling defects, which are common but nonspecific findings, it is speculated that a recanalized thrombus is often misdiagnosed, comparing to other pathologic conditions, such as fresh thrombosis caused by plaque rupture/erosion, spontaneous dissection, aneurysm, or heavy calcification (5).

Many characteristics of the HLS remain unknown. The etiology of HLS is not completely understood. Recanalization of an *in situ* thrombus has been considered by many researchers to be the pathogenesis of HLS. Moreover, recanalization of an embolic thrombus and coronary vasculitis, such as that seen in Kawasaki disease, has also been proposed as a potential mechanism of HLS (3,6).

There are several case reports on HLS (or the lotus root-like appearance) observed in the coronary artery of patients with Kawasaki disease, antiphospholipid syndrome, embolic stroke, atrial fibrillation, and acute coronary syndrome. However, its structural mechanisms and response to the interventional therapy remain unknown (7).

Advances in the high-resolution imaging modalities such as IVUS and OCT have provided new insights into evolving thrombotic lesions. As the angiographic haziness does not always indicate a fresh thrombus, intravascular imaging is necessary to differentiate the causative mechanisms *in vivo* and may provide information, thus allowing an appropriate treatment approach specific to the underlying etiology (5).

To date, no large cohort study or clinical trial of the HLS has been reported. Moreover, no treatment guideline or consensus for the HLS has been proposed. As a result, the management of HLS is mainly determined by the treating physicians and depends on the presence of ischemia. Stress tests, nuclear myocardial imaging, and fractional flow reserve are helpful to assess ischemia in patients with HLS. According to the literature, most cases of HLS are functionally significant and require intervention (3).

In our case, we report on SRCT. OCT easily revealed the HLS, but unfortunately, it could not confirm its true etiology. We hypothesized that the origin of thrombus was from an embolic event, which could have occurred during atrial fibrillation paroxysm, rather than from a plaque rupture or erosion. Furthermore, the patient did not have symptoms of angina and acute coronary syndrome was excluded. Also,

the flow through the RCA was not compromised with the HLS. As a result, it was decided not to treat the patient with stent implantation, but with the optimal medication treatment and pacemaker implantation. At three-month follow up, the patient reported no subjective symptoms and SPECT showed no signs of ischemia.

In conclusion, while there are still no appropriate recommendations for the treatment of SRCT, the treatment decision is based on the findings of imaging techniques and physician's experience. Adequate follow up of these patients can provide important data needed for future guiding of the SRCT treatment.

REFERENCES

1. Spinu M, Homorodean C, Ober MC *et al*. Optical coherence tomography for *in vivo* identification, characterization and optimal treatment of spontaneous recanalization of coronary thrombus. *In Vivo* 2020; 34: 745-56.
2. Terashima M, Awano K, Honda Y *et al*. Images in cardiovascular medicine. "Arteries within the artery" after Kawasaki disease: a lotus root appearance by intravascular ultrasound. *Circulation* 2002; 106: 887.
3. Lin M, Su Z, Li J, Nie R, Wang J. Honeycomb-like structure in the right coronary artery treated with a drug-eluting stent: a case report and literature review. *J Int Med Res* 2018; 46: 2008-13.
4. Souteyrand G, Valladier M, Amabile N *et al*. Diagnosis and management of spontaneously recanalized coronary thrombus guided by optical coherence tomography – lessons from the French "Lotus Root" Registry. *Circ J* 2018; 82: 783-90.
5. Kang SJ, Nakano M, Virmani R *et al*. OCT findings in patients with recanalization of organized thrombi in coronary arteries. *JACC Cardiovasc Imaging* 2012; 5: 725-32.
6. Suzuki S, Sotomi Y, Nakatani S *et al*. Histopathologic insights into the honeycomb-like structure in the coronary artery: *in vivo* multimodality imaging assessment with directional coronary atherectomy. *JACC Cardiovascular Interv* 2018; 11: e157-e9.
7. Haraki T, Uemura R, Masuda S, Kobayashi N, Lee T. A honeycomb-like structure in the left anterior descending coronary artery treated using a scoring device and drug-eluting stent implantation: a case report. *J Med Case Rep* 2016; 10: 80.

SAŽETAK

SPONTANA REKANALIZACIJA TROMBA: NEOČEKIVANI NALAZ NA KORONARNOJ ANGIOGRAFIJI

M. ČANKOVIĆ^{1,2}, V. DRLJEVIĆ TODIĆ¹, T. PANTIĆ¹, M. KOVAČEVIĆ^{1,2}, V. IVANOVIĆ^{1,2}, M. PETROVIĆ^{1,2}

¹Institut za kardiovaskularne bolesti Vojvodine, Klinika za kardiologiju, Sremska Kamenica, Srbija; ²Univerzitet u Novom Sadu, Medicinski fakultet, Novi Sad, Srbija

Uvod: Spontana rekanalizacija koronarnih tromba (SRKT) rijetko je stanje i karakteriziraju ga višestruki kanali podijeljeni tankim pregradama, koji međusobno komuniciraju, proksimalno i distalno, s normalnim lumenom koronarne krvne žile. Intrakoronarne slikovne tehnike visoke rezolucije poput intravaskularnog ultrazvuka ili optičke koherentne tomografije (OCT) omogućavaju rutinsko proučavanje lumena i zida koronarne arterije. **Prikaz bolesnika:** 73-godišnji muškarac primljen je u jedinicu intenzivne njege zbog gubitka svijesti i prolazne ekstremne bradikardije registrirane na elektrokardiogramu. Koronarni angiogram otkrio je kontrastni defekt na desnoj koronarnoj arteriji (RCA). Radi bolje procjene angiografskog nalaza provedena je OCT i potvrđena struktura nalik na saće, počevši od medijalnog segmenta RCA i šireći se do distalnog dijela. Kao rezultat prikupljenih podataka postavljena je dijagnoza SRKT u RCA. Odlučeno je da se RCA ne liječi implantacijom stenta, nego se nastavilo s optimalnom terapijom lijekovima i implantacijom elektrostimulatora srca. Nakon tri mjeseca praćenja bolesnik nije prijavio nikakve subjektivne simptome, a SPECT nije pokazivao znakove ishemijske bolesti. **Zaključak:** Iako još uvijek ne postoje odgovarajuće preporuke za liječenje SRKT-a, odluka o liječenju temelji se na nalazima slikovnih tehnika i iskustvu liječnika. Odgovarajuće praćenje ovih bolesnika može pružiti važne podatke potrebne za buduće smjernice u liječenju SRKT-a.

Ključne riječi: struktura nalik na saće, rekanalizacija tromba, interventna kardiologija, intravaskularne slikovne pretrage, optička koherentna tomografija, bolest koronarnih arterija