

CASE REPORT

INTERMEDIATE

CLINICAL CASE

Rapid Formation of an Infected Coronary Artery Aneurysm With Stent Fracture



Kensuke Fujioka, MD,^a Yuji Nishida, MD,^b Keinosuke Higashi, MD,^c Yuya Eguchi, MD,^a Takashi Fujita, MD,^a Katsuharu Uchiyama, MD,^a Manabu Fujimoto, MD^a

ABSTRACT

Infected coronary artery aneurysm (ICAA) is a rare but fatal disease. We describe a case of rapid formation of ICAA with fracture of an intracoronary stent observed on coronary angiography and cardiac computed tomography. Surgery with resection of the aneurysm and coronary artery bypass grafting was performed successfully. (Level of Difficulty: Intermediate.) (J Am Coll Cardiol Case Rep 2023;6:101660) © 2023 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

A 74-year-old man who had previously undergone stenting of the right coronary artery (RCA) presented with fever, dysstasia, and mild disorientation. Vital signs were as follows: body temperature 38.2 °C, respiratory rate 20 breaths per minute, pulse rate 95 beats per minute, and blood pressure 103/65 mm Hg. Physical examination of the chest and abdomen was normal other than edema and erythema affecting the buttocks. Electrocardiography demonstrated inferior abnormal Q waves without ST-segment deviation (Figure 1). Laboratory data were as follows: leukocyte count 12,240/μL,

serum C-reactive protein 8.27 mg/dL, and serum troponin I 0.03 ng/mL. Thoracic and abdominal computed tomography demonstrated no abnormal findings that could explain the presence of fever. As a result, folliculitis was diagnosed and antibiotic therapy was initiated accordingly. The next day, shock developed associated with chest pain and diffuse ST-segment elevation on electrocardiography (Figure 2). Because acute coronary syndrome was suspected, 5,000 U intravenous unfractionated heparin was administered and emergency coronary angiography (CAG) was performed. Although severe in-stent restenosis was observed in the distal RCA, there was no flow limitation (Figure 3, Video 1). Moreover, the state of shock and ST-segment elevation on electrocardiography were improved after fluid resuscitation and administration of catecholamine. Accordingly, septic shock due to folliculitis with secondary myocardial ischemia was diagnosed, and conservative treatment was initially provided. The next day, methicillin-sensitive *Staphylococcus aureus* (MSSA) was isolated from peripheral blood cultures.

LEARNING OBJECTIVES

- To be able to make a differential diagnosis of coronary artery aneurysm with the use of multimodality imaging.
- To understand the management of infected coronary artery aneurysm, including antibiotic therapy, surgery, and percutaneous coronary intervention.

From the ^aDepartment of Cardiovascular Medicine, Kouseiren Takaoka Hospital, Takaoka, Japan; ^bDepartment of Thoracic and Cardiovascular Surgery, Kouseiren Takaoka Hospital, Takaoka, Japan; and the ^cDepartment of General Medicine and Infectious Disease, Kouseiren Takaoka Hospital, Takaoka, Japan.

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**ABBREVIATIONS
AND ACRONYMS****CAG** = coronary angiography**CCT** = cardiac computed tomography**ICAA** = infected coronary artery aneurysm**IE** = infectious endocarditis**MSSA** = methicillin-sensitive *Staphylococcus aureus***PCI** = percutaneous coronary intervention**RCA** = right coronary artery**TEE** = transesophageal echocardiography

Infectious endocarditis (IE) was therefore suspected. However, transesophageal echocardiography (TEE) demonstrated minimal pericardial effusion without evidence of IE. A 4-week course of antibiotic therapy with 2 g intravenous cefazolin every 8 hours was provided for the treatment of sepsis. The maximum body temperature was 38.6 °C on the first day of the admission but improved in response to antibiotic therapy.

Percutaneous coronary intervention (PCI) for the RCA lesion was planned after recovery from the infection. Elective CAG performed 7 weeks after the initial admission demonstrated de novo aneurysm of the target lesion (Figure 4, Video 2). PCI was therefore abandoned.

PAST MEDICAL HISTORY

Past medical history included hyperlipidemia, stage 3a chronic kidney disease, and angina pectoris due to chronic total occlusion of the middle to distal RCA. PCI with implantation of paclitaxel-eluting stents had

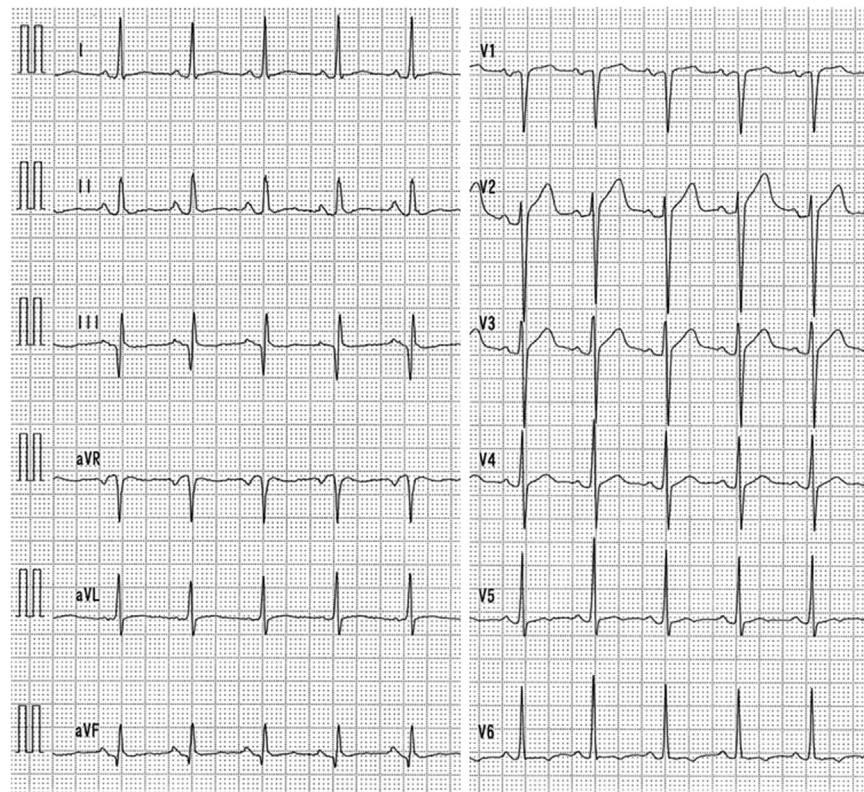
been performed 13 years earlier. The patient had a gait disorder due to ossification of the posterior longitudinal ligament. He denied tobacco use and intravenous drug abuse. Regular medications included atorvastatin, aspirin, and isosorbide dinitrate.

DIFFERENTIAL DIAGNOSIS

Expansive vascular remodeling associated with atherosclerosis is the most common etiology of acquired coronary artery aneurysm or ectasia in adults. Kawasaki disease, infectious septic emboli, connective tissue disease, arteritis, cardiac lymphoma, and previous coronary intervention are alternative causes.

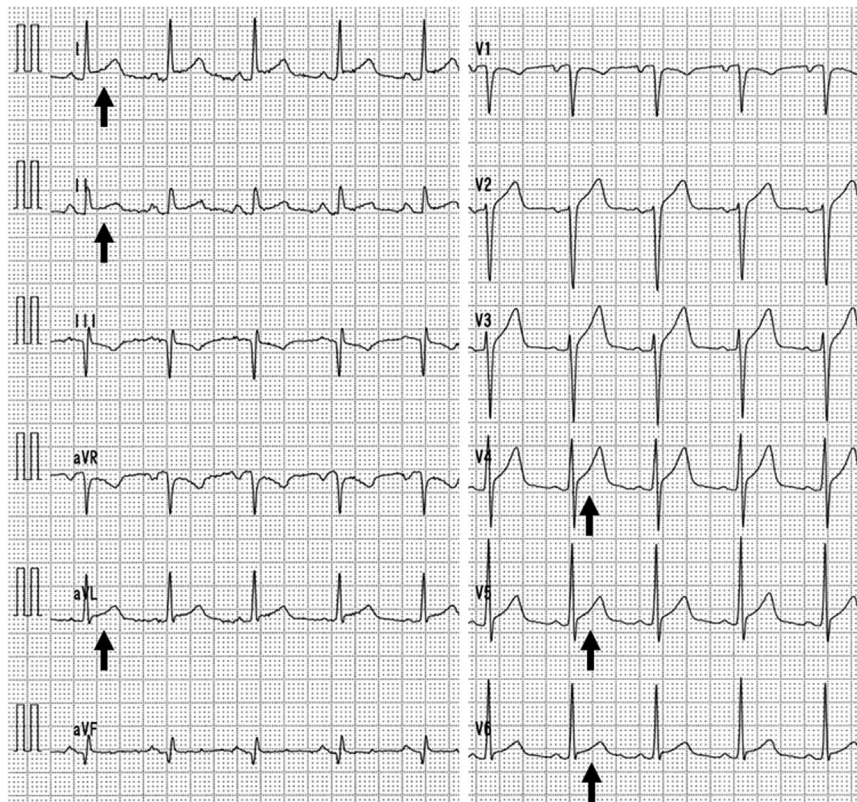
INVESTIGATIONS

TEE repeated after detection of the coronary artery aneurysm demonstrated no evidence of IE. Cardiac computed tomography (CCT) demonstrated the presence of aneurysm with a diameter of 13 mm (Figure 5). In consideration of the history of recent sepsis and rapid formation of the aneurysm, a

FIGURE 1 Electrocardiography on Admission

Absence of ST-segment deviation.

FIGURE 2 Electrocardiography on the Second Day of the Admission



Presence of diffuse ST-segment elevation (arrows).

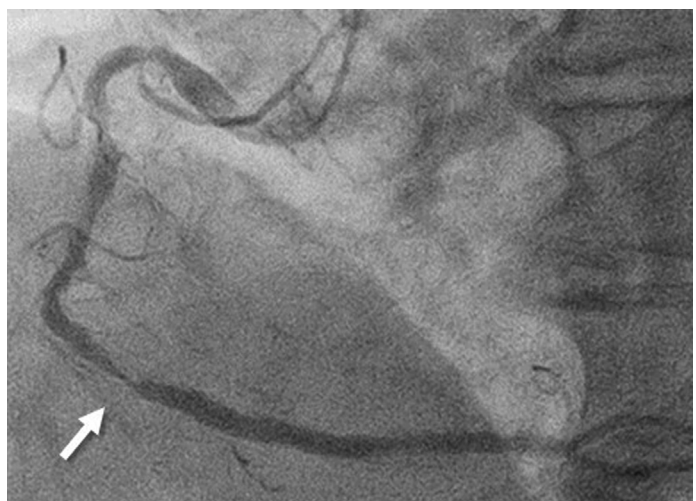
diagnosis of infected coronary artery aneurysm (ICAA) was made. In addition, CCT demonstrated a defect in the stent structure in the region of the aneurysm (Figure 5D). Because several stents had previously been consecutively implanted from the middle to distal part of the RCA, the CCT findings were interpreted as a stent fracture.

MANAGEMENT

After the diagnosis of ICAA, surgery with resection of the aneurysm and coronary artery bypass grafting was considered to be the best treatment option. Several days later, the surgery was performed successfully (Figure 6). Stent fracture was confirmed intraoperatively.

On histopathologic examination, the resected sample was found to be a pseudoaneurysm consisting of necrotic and granulation tissue with increased vascularity and hemosiderin deposition. Inflammatory infiltrates were predominantly composed of lymphocytes and plasmocytes, indicating subacute or chronic inflammation. These findings indicate that the

FIGURE 3 Emergency Coronary Angiography Performed on the Second Day of the Admission



Severe in-stent restenosis was observed in the distal right coronary artery (white arrow) without flow limitation.

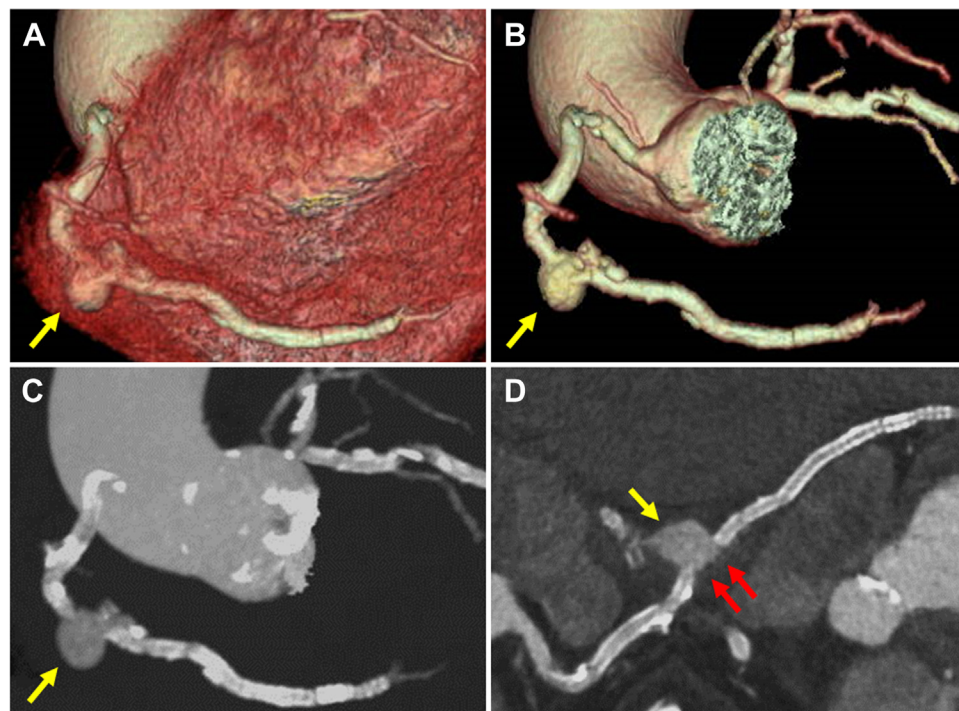
FIGURE 4 Elective Coronary Angiography Performed 7 Weeks After the Initial Admission

De novo aneurysm was observed in the distal right coronary artery lesion (yellow arrow).

destruction of the vascular structure and formation of the pseudoaneurysm occurred because of inflammation after bacterial infection, although the presence of bacteria in pathologic samples was not observed.

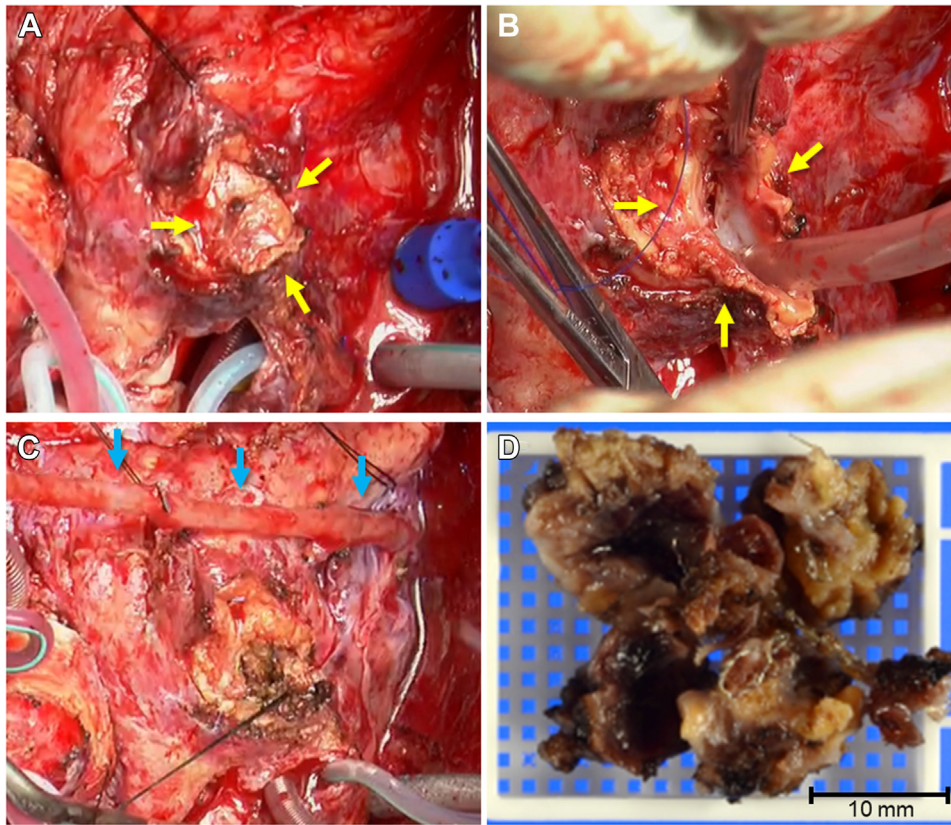
DISCUSSION

ICAA is a rare but fatal disease, particularly in cases where the diagnosis is delayed. The most common causative agent is *Staphylococcus aureus* (53.3%), followed by *Streptococcus* species (20%). The most commonly affected vessel is the RCA (40.0%). Atherosclerotic disease, IE, and previous PCI are known risk factors for ICAA. Regarding PCI, the implantation of drug-eluting stents is an important risk factor because the associated drug or polymer can impair local host defenses and delay arterial endothelialization.¹ Pericardial effusion, aneurysm rupture, myocardial ischemia, and myocardial infarction are recognized complications of ICAA.² Echocardiography has utility in detecting IE, pericardial effusion, and abnormal pericardial appearances associated with ICAA.¹ CCT and CAG are important for informing

FIGURE 5 Cardiac Computed Tomography

(A to D) The aneurysm was observed in the distal right coronary artery (yellow arrows). (D) A defect in the stent structure was found in the region of the aneurysm (red arrows). The stent was intact at the proximal and distal regions of the lesion.

FIGURE 6 Intraoperative Images



(A) Coronary artery aneurysm (arrows). **(B)** Incision of the aneurysm (arrows). **(C)** The aneurysm was resected and a great saphenous vein was used for right coronary artery bypass grafting (arrows). **(D)** Resected aneurysm.

the diagnosis of ICAA and deciding on treatment strategies. In particular, CCT is increasingly recognized as a valuable tool in the diagnosis of ICAA because it is less invasive than CAG and provides comprehensive evaluations of the thorax including the coronary arteries, myocardium, pericardium, mediastinum, and lungs.^{1,3}

There are no established guidelines for the management of ICAA. Antibiotic therapy specific to the identified organism should be administered for at least 4 weeks. In addition, surgical intervention with resection of the aneurysm and coronary artery bypass grafting may be required in cases of ICAA larger than 10 mm in diameter because continuous growth and rupture of the aneurysm can occur even after antibiotic therapy.¹⁻³ Though PCI with covered stents or coiling in combination with long-term antibiotics can be considered as an alternative treatment method in patients who would be poor surgical candidates, the

risks of recurrent infection should be carefully considered.^{1,2,4}

In the present case, rapid formation of an ICAA was observed on CAG repeated twice over a short period and stent fracture was confirmed by CCT. Because the stent fracture was not observed on the review images from the previous CAG, it was not possible to determine when the fracture had occurred. We postulate that damage to the stent may have been present and caused the severe in-stent restenosis before the bacterial infection. Blood flow can be disturbed owing to the severe in-stent restenosis, thereby allowing colonization of MSSA and destruction of the adjacent vascular structures. Pseudoaneurysm formation and complete stent fracture can occur despite eradication of MSSA with antibiotic therapy. The findings of histopathologic examinations in the present case corroborated the above theory. Although drug-eluting stents are a risk factor for the development

of ICAA, we considered this to be a less likely cause in the present case because a considerable number of years had passed before presentation.

FOLLOW-UP

The ability to perform activities of daily living had significantly decreased postoperatively and approximately 3 months of rehabilitation were required before the patient was discharged home. He was asymptomatic with preserved cardiac function at a 1-year follow-up clinic visit.

CONCLUSIONS

ICAA should be considered in the differential diagnosis in cases of bacteremia accompanied by pericardial effusion or myocardial ischemia, particularly in patients with risk factors for ICAA, such as

atherosclerotic disease or history of PCI. Early diagnosis with multimodality imaging is important for reducing the mortality associated with ICAA.

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ADDRESS FOR CORRESPONDENCE: Dr Kensuke Fujioka, Department of Cardiovascular Medicine, Kouseiren Takaoka Hospital, 5-10 Eirakucho, Takaoka 933-8555, Japan. E-mail: fjokknsk@gmail.com. Twitter: [@fjokknsk](https://twitter.com/fjokknsk).

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KEY WORDS aneurysmal resection, computed tomography, coronary angiography, coronary artery bypass, in-stent restenosis, stents

 **APPENDIX** For supplemental videos, please see the online version of this paper.