Cardiology in the Young

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Coronary artery bypass grafting in adolescent with myocardial infarction complicating undiagnosed Kawasaki disease

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Brief Report

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Abstract

Although Kawasaki disease is often self-limiting, significant cardiovascular sequelae may occur in the acute or late stage. The most common late complication is persistent coronary artery aneurysm, which can lead to myocardial ischaemia and even myocardial infarction. We report a case of coronary artery bypass grafting in a 16-year-old boy with a history of undiagnosed Kawasaki disease. Increased awareness of Kawasaki disease, especially among children between the ages of 6 months and 5 years, can increase early treatment and prevent serious complications that may occur in the future.

Introduction

Kawasaki disease typically presents as a febrile illness characterised by mucocutaneous changes in children under the age of 5 years, with up to 25% of untreated children developing permanent damage to the coronary arteries due to inflammatory cell infiltration into the artery wall, destruction of the inner elastic lamina, smooth muscle cell necrosis, myointimal proliferation, and subsequent aneurysm formation.[1] The disease was first identified in Japan and is significantly more prevalent in the Japanese race.[2]

Giant coronary artery aneurysms in Kawasaki patients are among the most serious complications associated with acute myocardial infarction.[2] Cases of myocardial infarction have been reported in young adults in populations where the disease is common.[3–5] The first successful coronary artery bypass grafting surgery for this disease, performed using a saphenous vein graft, was reported from Japan in 1976.[6]

In this case report, we present the first documented children in Turkey to develop coronary artery involvement of Kawasaki disease and associated myocardial infarction and undergo coronary artery bypass grafting. This case highlights the importance of diagnosing and providing timely treatment to patients with Kawasaki disease during the acute phase.

Case presentation

A 16-year-old boy presented to the paediatric emergency department with complaints of chest pain and numbness in his left arm. He denied any alcohol or illicit drug use. His medical history included a 27-day hospitalisation due to prolonged fever and the presence of unexplained skin, oral mucosal, and conjunctival findings at the age of 9 months. There was no family history of known heart disease or early myocardial infarction. On physical examination, his weight was 84 kg (90th percentile) and height was 175 cm (50th percentile), his general condition was good, he was oriented and cooperative, oxygen saturation was 100%, blood pressure was 116/76 mmHg, peripheral pulses were strong, heart rate was 71 beats/min and regular, temperature was 36.7°C, and respiratory rate was 24/minute. Cardiovascular system and other physical examination findings were unremarkable. Electrocardiogram showed sinus rhythm, ST elevation in leads II, III, aVF, and V_6, and ST depression in leads V_1–V_3 (Fig 1). In the initial evaluation of cardiac enzymes, troponin-T level was 310 ng/L (normal: 0–14), CK-MB level was 300 µg/L (normal: 0–5), and lactate dehydrogenase level was 422 U/L (normal: 135–225). Lipid panel was normal. Echocardiography revealed borderline impaired left ventricular function (left ventricular ejection fraction of 55%) and global hypokinesis. The proximal coronary arteries were dilated, and an aneurysmal dilation 10 mm in diameter was observed in the right coronary artery. Urgent coronary CT angiography demonstrated an aneurysmal enlargement with a maximum diameter of 17 mm in a 2.5 cm segment of the right coronary artery, with total occlusion of the right coronary artery distal to the aneurysm. In addition, the left main coronary artery was dilated and there was an aneurysmal enlargement in the left anterior descending

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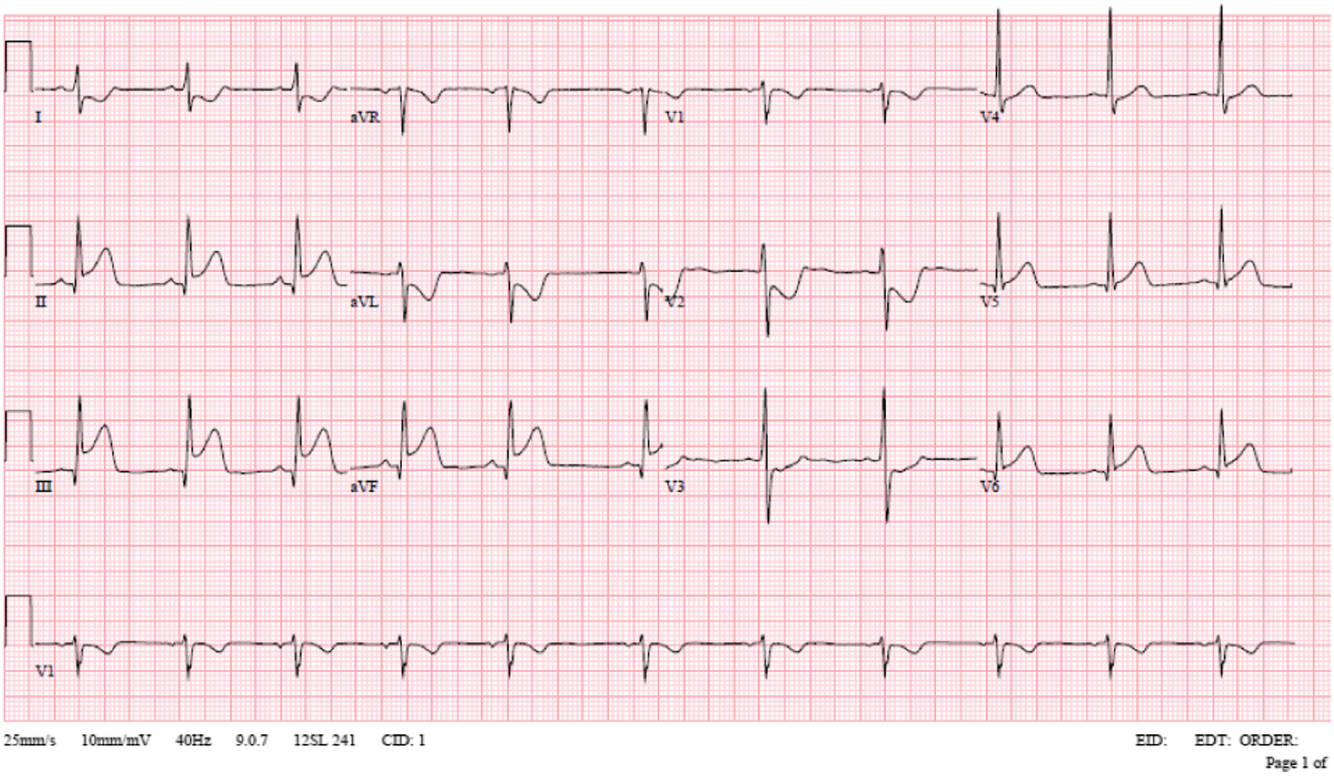

Figure 1. Electrocardiogram. Electrocardiogram at admission showed sinus rhythm, ST elevation in leads II, III, aVF, and V_6, and ST depression in leads V_1–V_3.

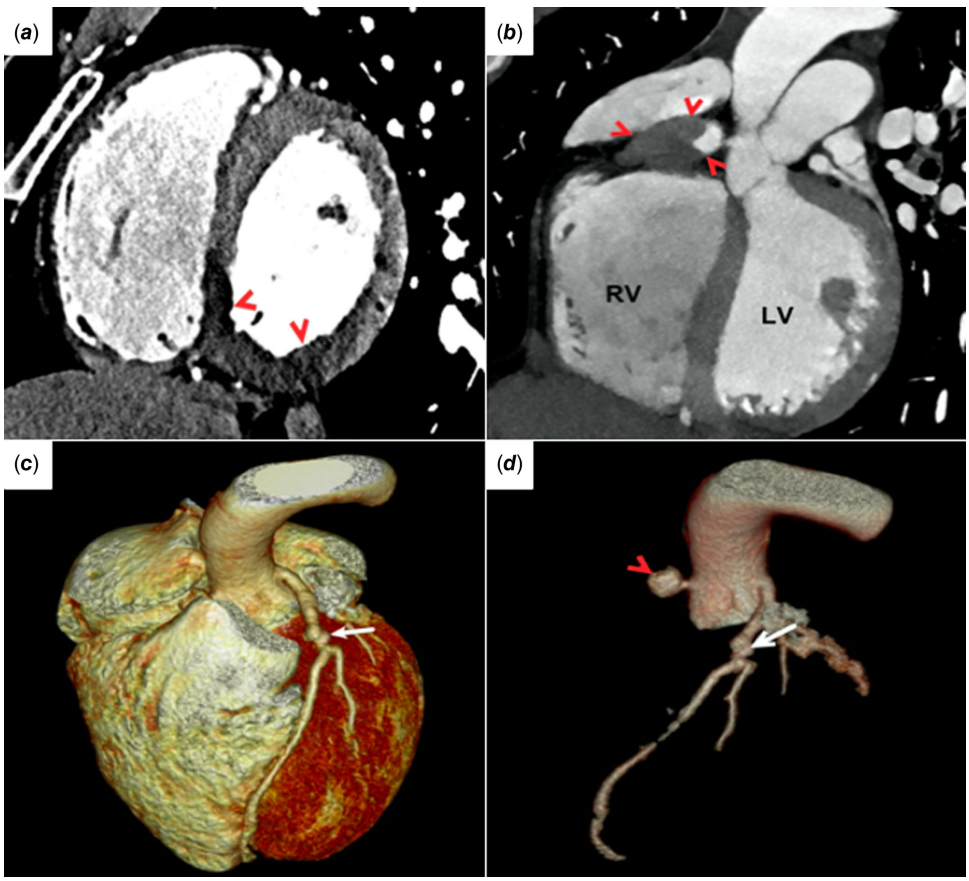

Figure 2. Coronary CT angiography. (***a***): Short-axis midventricular view of coronary CT angiography image shows hypodensity in the inferior and inferoseptal wall (arrowheads), consistent with right coronary artery ischaemia. (***b***): Multiplanar reformatted coronary CT angiography image shows a thrombosed right coronary artery aneurysm (arrowheads). RV = right ventricle, LV = left ventricle. (***c***): Three-dimensional volume rendering coronary CT angiography image shows a left anterior descending coronary artery aneurysm (arrow). (***d***):Three-dimensional volume rendering coronary CT angiography image of the coronary tree shows a thrombosed right coronary artery aneurysm (arrowhead) and a left anterior descending coronary artery aneurysm (arrow).

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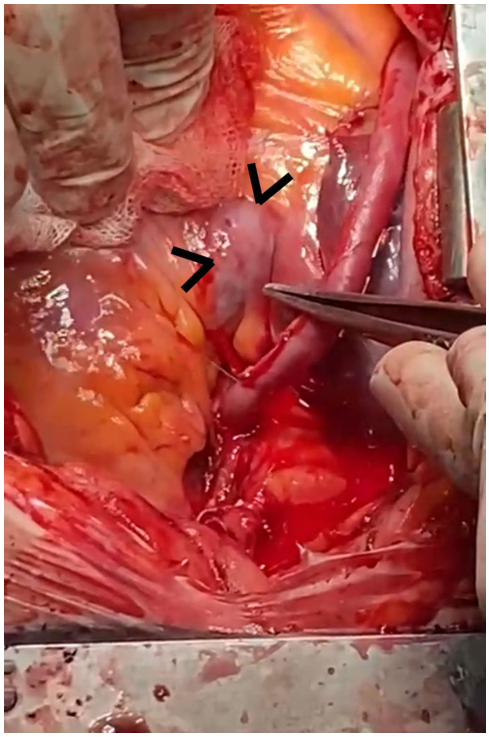

Figure 3. The view of the operating area. Thrombosed right coronary artery aneurysm.

coronary artery (Fig 2). The patient was diagnosed with acute myocardial infarction secondary to Kawasaki disease. After a multidisciplinary assessment to improve cardiac circulation, it was decided to perform right coronary artery bypass grafting. The operation was performed through standard median sternotomy. Operative findings included a 25 mm thrombotic right coronary artery aneurysm extending up to the mid-right coronary artery (Fig 3). Internal thoracic artery grafts could not be used, because their length was not sufficient to reach the right coronary artery. The saphenous vein was harvested from the patient's lower leg with split incisions via a no-touch technique. Heparinised blood was used to dilate the diameter of the saphenous vein graft. He underwent on-pump beating heart revascularisation procedure with interposition saphenous graft to distal right coronary artery. The surgery was uneventful, and the patient smoothly weaned from cardiopulmonary bypass. The post-operative period was also uneventful, and the patient was discharged home 2 weeks after surgery with a left ventricular ejection fraction of 60% on post-operative echocardiography. The patient remains under outpatient follow-up with dual antithrombotic therapy.

Discussion

Kawasaki disease is a self-limiting vasculitis of unknown aetiology that emerges in childhood.[7] Diagnosis depends on recognising the clinical syndrome. It can cause various complications, with cardiac complications such as coronary artery aneurysm, heart failure, myocardial infarction, and arrhythmia leading to significant morbidity and mortality. Coronary artery aneurysms are reported to occur in 25% of untreated patients, while this rate decreases to 5% in patients who receive intravenous immunoglobulin.[8]

There is clearly a growing population of teenagers with potentially significant coronary artery disease following childhood Kawasaki disease. The annual risk of coronary complications in Kawasaki disease is 2.4%, and the incidence of acute myocardial infarction is 1.52%.[9] There is limited experience with percutaneous coronary interventions in children, especially those with chronic total occlusion of the coronary artery. Coronary artery bypass grafting is the main treatment for such patients because of the complexity and severity of coronary artery disease caused by Kawasaki disease.[10] Kitamura et al reported 25-year outcomes of paediatric coronary bypass surgery for Kawasaki disease. Of 114 children aged 1–19 years, they reported a 25-year survival rate of 95%, and percutaneous coronary intervention was not the first option in most cases due to large coronary aneurysms.[11] Based on the excellent long-term results, coronary artery bypass surgery remains the primary treatment option for symptomatic patients.

Our patient had a clinical history consistent with undiagnosed Kawasaki disease. At the age of 16 years, he was diagnosed with myocardial infarction secondary to Kawasaki disease and underwent successful coronary revascularisation surgery. Although common in the Japanese race, Kawasaki disease is less common in our country, leading to diagnostic and treatment delays and serious complications as a consequence. Increased awareness of Kawasaki disease, especially among children between the ages of 6 months and 5 years, can increase early treatment and prevent serious complications that may occur in the future.

Competing interests. The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

References

1. Gordon JB, Kahn AM, Burns JC. When children with Kawasaki disease grow up: myocardial and vascular complications in adulthood. J Am Coll Cardiol 2009; 54: 1911–1920.
2. McCrindle BW, Rowley AH, Newburger JW, et al. Diagnosis, treatment, and long-term management of Kawasaki disease: a scientific statement for health professionals from the American Heart Association. Circulation 2017; 135: e927–e999.
3. Tsuda E, Hirata T, Matsuo O, Abe T, Sugiyama H, Yamada O. The 30-year outcome for patients after myocardial infarction due to coronary artery lesions caused by Kawasaki disease. Pediatr Cardiol 2011; 32: 176–182.
4. Victor S, McKillion KC, Puette JA, McKillion P, Ellison MB. Unexpected evolution after multivessel coronary artery bypass grafting in a patient with Kawasaki disease. Cureus 2021; 13: e15927.
5. Kato H, Ichinose E, Kawasaki T. Myocardial infarction in Kawasaki disease: clinical analyses in 195 cases. J Pediatr 1986; 108: 923–927.
6. Kitamura S, Kawashima Y, Fujita T, Mori T, Oyama C. Aortocoronary bypass grafting in a child with coronary artery obstruction due to mucocutaneous lymph node syndrome: report of a case. Circulation 1976; 53: 1035–1040.
7. Lee J, Seo J, Shin YH, Jang AY, Suh SY. ST-segment elevation myocardial infarction in Kawasaki disease: a case report and review of literature. World J Clin Cases 2022; 10: 9368–9377.

https://doi.org/10.1017/S1047951123004080 Published online by Cambridge University Press

8. Daniels LB, Tjajadi MS, Walford HH, et al. Prevalence of Kawasaki disease in young adults with suspected myocardial ischemia. Circulation 2012; 125: 2447–2453.
9. Wu MH, Chen HC, Yeh SJ, Lin MT, Huang SC, Huang SK. Prevalence and the long-term coronary risks of patients with Kawasaki disease in a general population <40 years: a national database study. Circ Cardiovasc Qual Outcomes 2012; 5: 566–570.
10. Zhao L, Xie LP, He L, Liang XC, Chu C, Liu F. Case report: interventional therapy for coronary artery occlusion in a 6-year-old child with Kawasaki disease. Front Pediatr 2022; 10: 1048178.
11. Kitamura S, Tsuda E, Kobayashi J, et al. Twenty-five-year outcome of pediatric coronary artery bypass surgery for Kawasaki disease. Circulation 2009; 120: 60–68.

https://doi.org/10.1017/S1047951123004080 Published online by Cambridge University Press