Kawasaki Disease

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Case Summary

An adolescent presented for follow up of aneurysms of the right coronary artery (RCA) and left anterior descending coronary artery (LAD). These were initially discovered when presenting as a baby with conjunctivitis, rash, skin desquamation, and diffuse erythema and swelling of the palms of the hands..

Imaging Findings

An echocardiogram (Figure 1) showed an aneurysm arising from the proximal LAD measuring 12 x 13.7 mm and another measuring 5.9 mm arising from the RCA.

Cardiac MRI (Figure 2) showed interval enlargement of the LAD aneurysm, with mural thrombus.

Cardiac catheterization (Figure 3) performed one year later showed no flow distal to the LAD aneurysm. Multiple collateral vessels were observed. Additionally, a new 9 mm aneurysm was present in the circumflex artery. The aneurysm arising from the RCA had enlarged considerably. The remainder of the vessel was tortuous, and a stenosis was suggested. The findings were confirmed on CT angiography (Figure 4).

Diagnosis

Kawasaki disease with coronary artery aneurysms.

Discussion

Kawasaki disease (KD) is an inflammatory condition that primarily affects small to medium-sized blood vessels in children under 5 years old, more common in boys. It is the leading cause of acquired heart conditions in children from developed nations.[1] Although the cause of the disease is unknown, various theories center on its pathogenesis. These include an unknown, seasonal, airborne infectious agent or genetic abnormalities such as changes in *caspase 3, inositol 1,4,5, trisphosphate kinase C, DC40, FCGR2a,* and B cell lymphoid kinase that increase the risk of KD. The infectious and seasonal etiologies are supported primarily by clusters of epidemics that seem to have followed wind patterns occurring in Eastern Asia and several Western countries. The genetic theory is supported by variations associated with KD development, prognosis, and coronary artery aneurysm development.[2]

The epidemiology of KD is highly dependent on geographic location and ethnicity. The highest incidence of KD occurs in Japan, where 264 per 100,000 children are affected. This high incidence raises awareness and the associated mortality rate in Japan is less than 0.02%.[2] In the continental United States, the incidence is notably lower, affecting 13-21 children per 100,000.[2,3]

Kawasaki disease is diagnosed on the basis of five clinical signs: 1) mucocutaneous changes such as erythema of the tongue (ie, “strawberry tongue”) and severe cheilitis (lip swelling and cracking); 2) nonexudative conjunctivitis with limbic sparing; 3) a polymorphous rash; 4) extremity changes such as edema and periungual desquamation; and 5) cervical lymphadenopathy.[1,3,4]

Patients must exhibit a fever for ≥ 5 days and at least four of the above signs for KD to be diagnosed. Other notable potential cardiac complications include myocarditis, valvular

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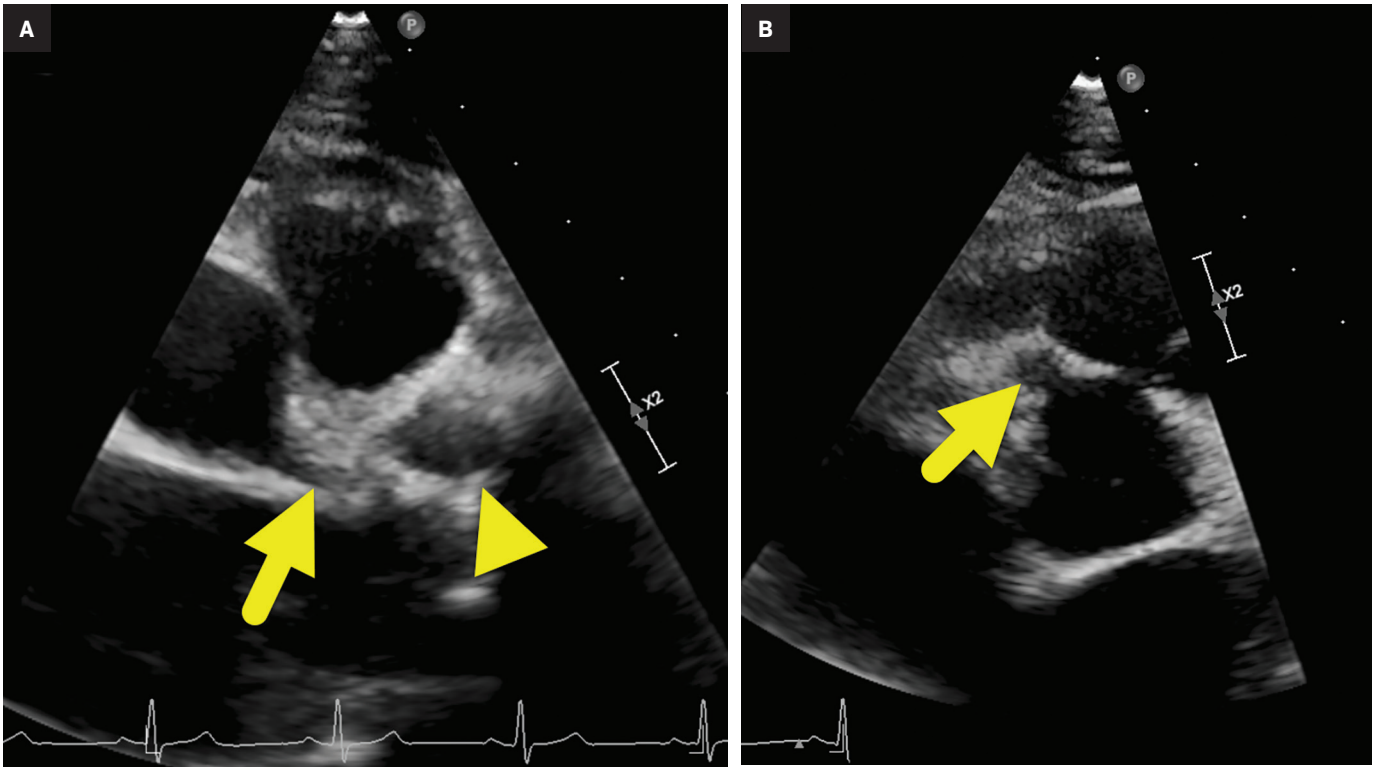
Figure 1. Echocardiogram shows (A) an aneurysm (arrowhead) arising from the proximal aspect of the LAD coronary artery near the origin of the left main coronary artery (arrow). (B) A smaller fusiform aneurysm (arrow) is present at the origin of the RCA.



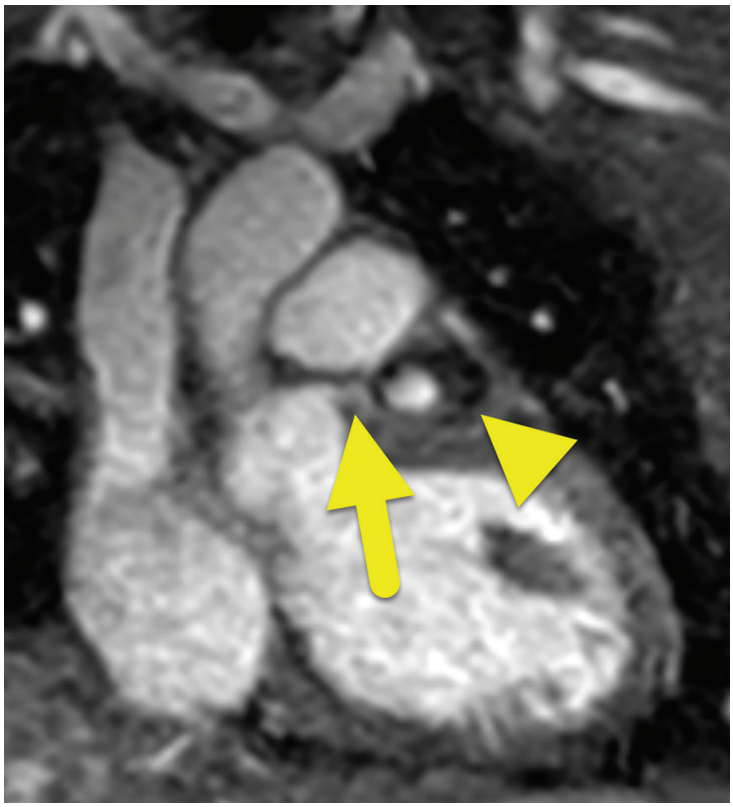


Figure 2. Coronal 3D balanced turbo field echo sequence cardiac MRI demonstrates a largely thrombosed aneurysm (arrowhead) arising from the proximal aspect of the LAD coronary artery near the origin of the left main coronary artery (arrow).

regurgitation, and coronary artery abnormalities. Incomplete (atypical) KD occurs when not all classic KD criteria are met; however, the children remain at risk for cardiovascular complications.[5] Kawasaki disease is most often diagnosed when screening echocardiography reveals dilated coronary arteries. Patients with incomplete KD will often follow the same clinical course as classic KD.

Kawasaki disease generally presents in three phases: acute (1-2 weeks); subacute (2-4 weeks); and convalescent (4-8) weeks.[4] The acute phase is associated with a high fever and the classic symptoms listed above. The subacute phase is usually asymptomatic. During this phase, the patient is at high risk of developing associated cardiac complications such as coronary artery dilation and subsequent aneurysm formation. Approximately 25% of untreated and 5% of treated patients will develop coronary abnormalities.

Figure 3. Cardiac catheterization (A) aortogram shows an aneurysm (arrow) of the LAD coronary artery. The larger, thrombosed portion of the aneurysm (arrowhead) is partially calcified. There is no flow in the more distal portion of the vessel. A fusiform aneurysm (dashed arrow) arises from a branch of the left circumflex coronary artery. (B) Left main coronary artery injection highlights the same aneurysm (arrow) of the LAD coronary artery, thrombosed portion of the aneurysm (arrowhead), and fusiform aneurysm (dashed arrow) of the left circumflex coronary artery. (C) RCA injection shows an aneurysm (arrow).

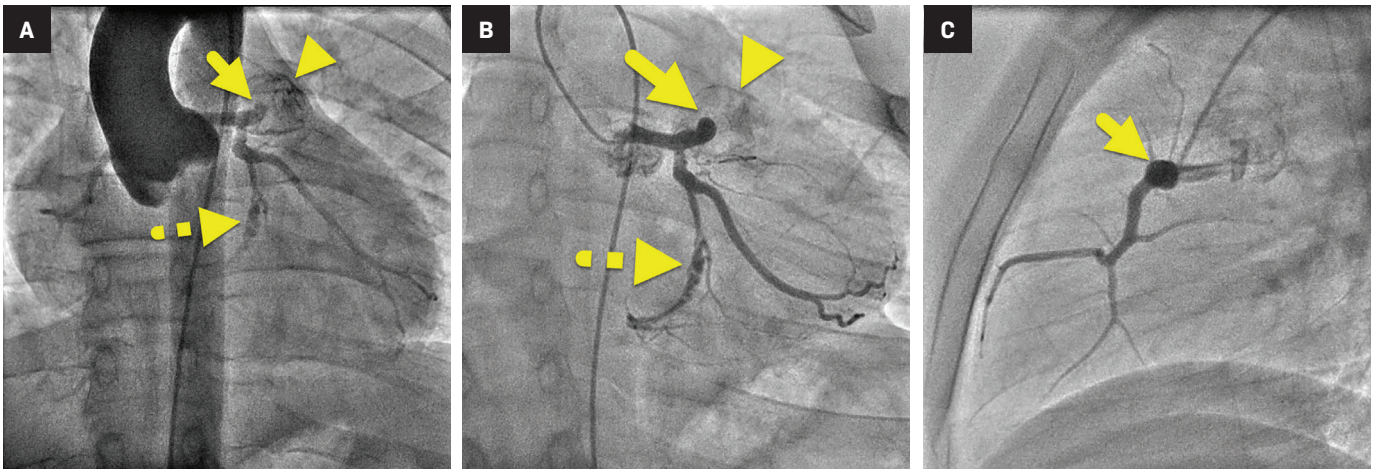
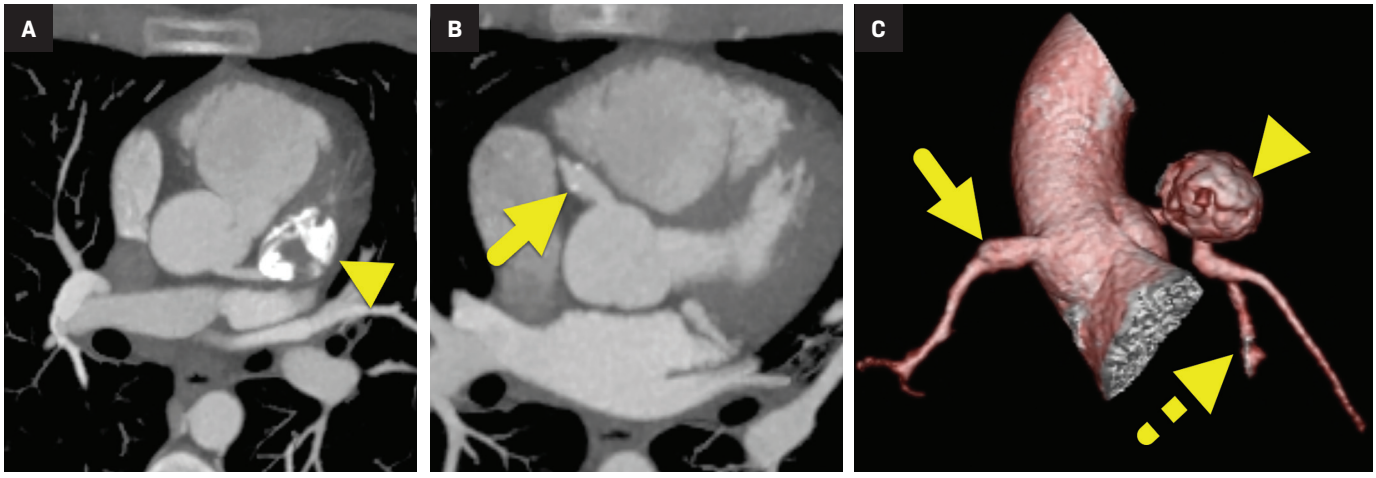


Figure 4. Cardiac CT axial maximum intensity projection image at the level of (A) the left main coronary artery and (B) the right main coronary artery shows a thrombosed aneurysm (arrowhead) at the origin of the LAD coronary artery and a fusiform aneurysm (arrow) of the RCA. (C) 3D reconstructed image shows an aneurysm (arrowhead) of the left anterior descending coronary artery. Fusiform aneurysms are present arising from a branch of the left circumflex coronary artery (dashed arrow) and right coronary artery (arrow).



The convalescent phase is also usually asymptomatic, but patients are now at a lower risk for developing cardiac symptoms owing to increased surveillance (including close clinical monitoring for fever recurrence) and a low threshold for treatment.

Laboratory findings, though nonspecific, can aid in making the diagnosis. Children can present with neutrophilia > 15,000 per mm;[3] anemia; thrombocytosis > 450,000 per mm;[3] and elevated ferritin, ALT, GGT, ESR, and C-reactive protein. Sterile pyuria of >10 WBCs per high powered field may also occur.[5]

During all phases of KD, imaging is used to detect potential cardiac anomalies. Echocardiography remains the imaging modality of choice.[4] It is performed at the time of suspected KD diagnosis, up to 14 days later, and 6-8 weeks after that to survey for any cardiac abnormalities. If they are observed, imaging can be used for a longer duration to assess severity and prognosis.

Other potential studies that can be valuable are MR angiography, CT angiography, and cardiac catheterization. Cardiac catheterization may be warranted if coronary artery aneurysms are suspected.

Kawasaki disease is treated with intravenous immunoglobulin (IVIG) at a dose of 2 g/kg. Ideally, children should be treated within 10 days of the onset of fever. Effective IVIG therapy reduces the risk of a coronary artery lesion from 20-25% to 3-5%. However, up to 20% of patients will be termed “IVIG-resistant” and will experience recurrent fevers. A moderate dose (30-50 mg/kg/day)

of acetylsalicylic acid (ASA) is also given. In Japan and the United States, treatment with ASA is continued until the fever abates.[6]

Patients with coronary artery aneurysms are also treated with antithrombotic agents. The medication used is dependent on the size of the lesion. Patients with small aneurysms are continued on ASA for a period after the initial 6–8-week treatment regimen. Patients with aneurysms with an internal diameter >8 mm are generally started on anticoagulant therapy with warfarin or low molecular weight heparin.[6]

Conclusion

Kawasaki disease is an inflammatory vasculitis that primarily affects small to medium-sized vessels and is predominantly seen in male children under the age of 5 years. Those of Japanese ethnicity are at highest risk for the condition, which is associated with mucosal changes such as erythema and "strawberry tongue," conjunctivitis, a polymorphous rash, extremity changes such as edema and periungual desquamation, and lymphadenopathy.

Coronary artery aneurysms are the feared sequelae of KD. Echocardiography is frequently used to assess for aneurysm development. The diseaes are generally treated with IVIG and ASA. Patients with aneurysms with an internal diameter greater than 8 mm are also treated with anticoagulant therapy.

References

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