

## The contribution of MR coronary angiography to the diagnosis of a left anterior descending artery aneurysm in a patient with Kawasaki disease

Kawasaki hastalığı olan bir olguda MR koroner anjiyografinin sol ön inen arter anevrizması tanısına katkısı

Dilek Öncel, M.D., Güray Öncel, M.D.

Department of Radiology, Şifa Hospital, İzmir

We present a 4-year-old boy with a diagnosis of Kawasaki disease of six-month history. At the time of diagnosis, no significant coronary artery aneurysm was detected by transthoracic echocardiography. On his routine follow-up echocardiography, dilatation of the left anterior descending (LAD) artery was suspected, but an exact diagnosis could not be made. He underwent magnetic resonance (MR) coronary angiography which showed a large fusiform aneurysmatic dilatation in the proximal segment of the LAD with a diameter of 9 mm. Coronary angiography performed to plan surgical repair confirmed the findings of MR angiography. The patient's parents refused surgical repair, so antiplatelet therapy was started to prevent thrombosis. No complications occurred during seven months of follow-up after detection of the aneurysm.

**Key words:** Coronary aneurysm/etiology/radiography; coronary angiography; magnetic resonance angiography; mucocutaneous lymph node syndrome/complications.

Kawasaki disease is an acute, self-limiting, medium-vessel vasculitis that affects children between the ages of 6 months to 5 years. It is characterized by mucosal inflammation, skin rash, and cervical lymphadenopathy, with potential for cardiac sequelae. It is the most common cause of acquired coronary artery disease in childhood.<sup>[1-4]</sup> Acute myocardial infarction and coronary artery aneurysm are major complications.<sup>[5,6]</sup> Symptoms, if present, are usually related to myocardial ischemia. Thromboembolic complications and spontaneous rupture may also occur.<sup>[1-5]</sup> Conventional coronary angiography is considered to be the gold standard for diagnosis and follow-up of coronary

Bu yazıda altı ay önce Kawasaki hastalığı tanısı konan 4 yaşında bir erkek çocuk sunuldu. Tanı sırasında yapılan transtorasik ekokardiyografide koroner arter anevrizmasına rastlanmamıştı. Rutin ekokardiyografik kontrolde sol ön inen arterde genişlemeden şüphelenildi; ancak, kesin tanıya ulaşılamadı. Manyetik rezonans (MR) koroner anjiyografi ile incelenen hastada, sol ön inen arterin proksimal segmentinde 9 mm çapında fuziform anevrizmatik genişleme görüldü. Cerrahi tedaviyi planlamak için yapılan koroner anjiyografi MR anjiyografi bulgularını doğruladı. Hastanın ebeveynlerinin cerrahi onarım önerisini kabul etmemesi üzerine, tromboz oluşumunun önlenmesi için antitrombotik tedaviye başlandı. Anevrizma tanısından sonraki yedi ay içinde hastada herhangi bir komplikasyon görülmüdü.

**Anahtar sözcükler:** Koroner anevrizma/etyoloji/radyografi; koroner anjiyografi; manyetik rezonans anjiyografi; mukokütan lenf nodu sendromu/komplikasyon.

artery aneurysms, thrombosis, and stenosis in patients with Kawasaki disease.<sup>[7]</sup> However, conventional coronary angiography is an invasive procedure using iodinated contrast agents and radiation. These disadvantages are more critical in the case of Kawasaki disease because the affected patient population is mainly children.<sup>[7]</sup> Therefore, a noninvasive modality which can be used for diagnosis and follow-up is of great clinical importance. Magnetic resonance (MR) imaging can be a valuable tool because it is free of radiation and does not need the use of intravascular contrast agents. Therefore, it can easily be applied to children with simple sedation.<sup>[2,7-12]</sup>

Received: February 19, 2008 Accepted: April 30, 2008

Correspondence: Dr. Dilek Öncel, Fevzipaşa Bulvarı, No: 172/2, 35040 Basmane, İzmir, Turkey.  
Tel: +90 232 - 446 08 80 / 5531 e-mail: dilekoncel@hotmail.com

In this report, we present a child with Kawasaki disease in whom a left anterior descending (LAD) artery aneurysm was detected with MR angiography.

### CASE REPORT

A 4-year-old boy had a diagnosis of Kawasaki disease of six-month history. At the time of diagnosis, no significant coronary artery aneurysm was detected by transthoracic echocardiography. He was admitted to the hospital for routine follow-up control. His ECG was normal. On echocardiographic examination, dilatation of the LAD was suspected but an exact diagnosis could not be made. To rule out a coronary artery aneurysm, the patient was referred to MR angiography.

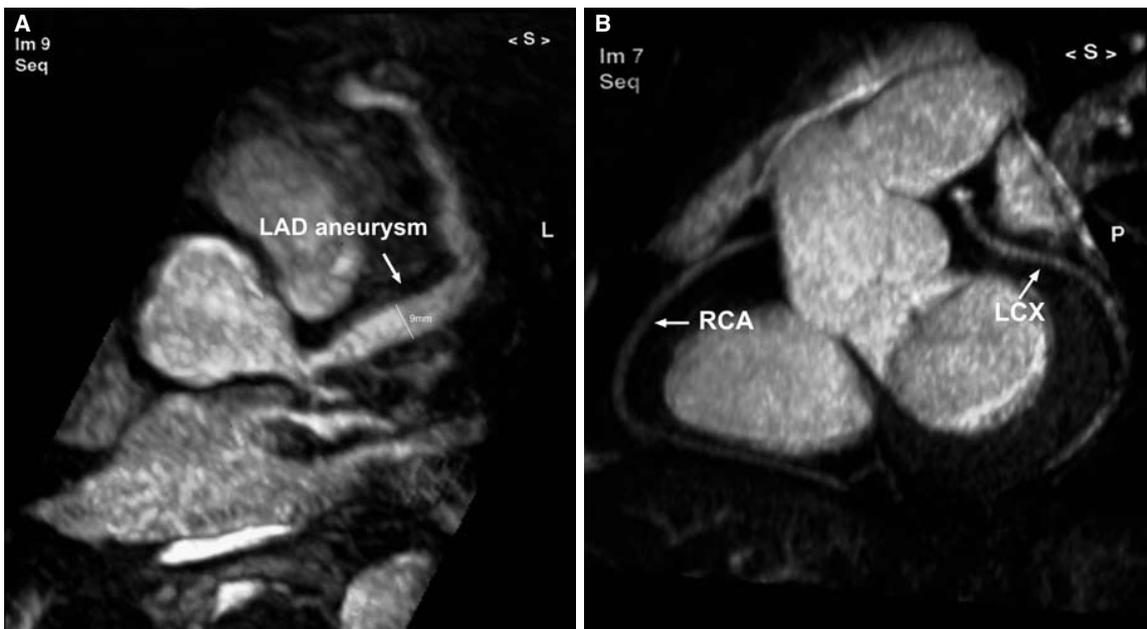
Magnetic resonance angiography was performed in the supine position with a 1.5 T Gyroscan NT (Philips Medical Systems, Netherlands) scanner with Powertrak 6000 gradients and 23 mT/m slew rate. A five-element cardiac phased array receiver coil was used. No contrast material was administered. The overall scan time was 25 minutes. The pulse sequence was an ECG-triggered, T2 prepared, fat suppressed, and 3D segmented K-space turbo gradient-echo sequence with navigator respiratory gating. The sequence parameters for 3D acquisition were as follows: TR/TE/Flip angle: 9.6/3.5/20; FOV: 250 mm; RFOV: 75; matrix: 512x512. Slice thickness was 1.5 mm with 50% overlapping. The 3D slabs were orient-

ed axially covering the whole heart. ECG triggering was done with the R wave and the trigger delay was adjusted to the heart rate of the patient. Respiratory triggering was done with the navigator-echo technique, whereby the information about the diaphragm motion was used to set the criteria for accepting or rejecting scan data and only the data acquired in a certain diaphragmatic position were used for image reconstruction. This technique obviated the need for the patient's breath-holding and patient cooperation was not obligatory. Thus, only simple sedation was enough for the procedure.

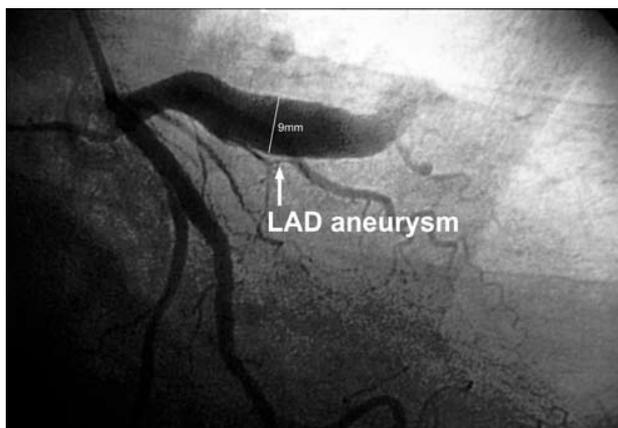
The data sets were processed on an external workstation (Easy Vision, Philips) with multiplanar reformation (MPR) and maximum intensity projection (MIP) techniques.

On MR images, the proximal segment of the LAD demonstrated a large fusiform aneurysmatic dilatation with a diameter of 9 mm (Fig 1a). The mid-segment was also observed to be dilated with slight tapering. The left circumflex artery (LCx) and the right coronary artery (RCA) were normal (Fig 1b).

After the demonstration of the LAD artery aneurysm, the patient was referred to conventional coronary angiography to plan a surgical operation. Angiography was performed with standard techniques and showed the same findings as MR coronary



**Figure 1.** (A) An axially oriented maximum intensity projection image of MR angiography demonstrating an aneurysmatic dilatation of the left anterior descending artery (LAD) (white arrow). The diameter of the aneurysmatic dilatation was measured as 9 mm (white line). (B) The right coronary artery (RCA) and left circumflex artery (LCx) appear to be normal on a paracoronal maximum intensity projection image (arrows).



**Figure 2.** A right anterior oblique view of conventional coronary angiography confirmed the aneurysmatic dilatation of the LAD (white arrow). The diameter of the dilatation was measured as 9 mm (white line).

angiography. The fusiform aneurysmatic dilatation of the LAD was verified (Fig 2) and LCx and RCA were shown to be normal.

An arteriotomy for the repair of the aneurysmatic segment combined with bypass grafting was planned. However, the parents of the patient rejected surgical treatment. Antiplatelet therapy was started to prevent thrombosis and frequent follow-up controls were recommended. The patient was free of complications during seven months of follow-up after detection of the LAD artery aneurysm.

## DISCUSSION

Kawasaki disease is an acute systemic vasculitis. Coronary artery involvement is regarded as a major complication of the disease, significantly affecting morbidity and mortality.<sup>[1]</sup>

Invasive coronary angiography is considered to be the gold standard for the diagnosis and follow-up of coronary artery abnormalities in patients with Kawasaki disease. However, X-ray coronary angiography is invasive, exposes both the patient and operator to potentially harmful ionizing radiation, and carries a small risk for serious complications due to arterial intervention and the use of iodinated contrast material.<sup>[7-9]</sup> Recent technical advances in coronary MR angiography have enabled the use of this noninvasive imaging method as an alternative to invasive diagnostic catheter angiography in evaluating coronary artery abnormalities, such as aneurysms, stenoses, and occlusions.<sup>[2,8,11]</sup> Coronary MR angiography has several advantages. It is noninvasive and does not involve the use of possibly harmful ionizing

radiation or iodinated contrast material. In addition to providing a high degree of spatial resolution, MR is not associated with any known short- or long-term side effects.<sup>[2,8]</sup>

Echocardiography and multislice computed tomography (MSCT) are also noninvasive diagnostic modalities, but echocardiography may fail to detect coronary abnormalities,<sup>[6,12]</sup> and MSCT is of limited value for follow-up because of high radiation doses, it uses iodinated contrast material, and requires patient's breath-holding.<sup>[7,13,14]</sup>

In our case, echocardiography was not sufficient for an accurate diagnosis and MR coronary angiography clearly depicted the coronary artery aneurysm. The examination time was 25 minutes with only simple sedation. In addition, the patient was not exposed to iodinated contrast material or ionizing radiation. Therefore, the examination was simple, harmless, and effective for diagnosis. These advantages are important particularly in pediatric patients who require sequential follow-up examinations.

In conclusion, MR coronary angiography represents an alternative non-invasive imaging modality for the diagnosis and follow-up of coronary arterial complications of Kawasaki disease, thereby avoiding invasive coronary imaging, and its use in the management algorithm should be considered.

## REFERENCES

- Hibbard JU, Fajardo JE, Briller J. Kawasaki disease with coronary artery sequelae. *Obstet Gynecol* 2007; 109(2 Pt2):517-9.
- Goo HW, Park IS, Ko JK, Kim YH. Coronary CT angiography and MR angiography of Kawasaki disease. *Pediatr Radiol* 2006;36:697-705.
- Yavuz T, Nişli K, Öner N, Ömeroğlu RE, Dindar A, Aydoğan Ü ve ark. Kawasaki hastalığı: 34 olgu sunumu. *Türk Pediatri Arşivi* 2006;41:197-200.
- Aydoğdu SA, Ünüvar T, Levent E, İnan G. Kawasaki hastalığı: İki olgu sunumu. *Adnan Menderes Üniversitesi Tıp Fakültesi Dergisi* 2005;6:39-42.
- Pahlavan PS, Niroomand F. Coronary artery aneurysm: a review. *Clin Cardiol* 2006;29:439-43.
- Mavrogeni S, Papadopoulos G, Karanasios E, Cokkinos DV. How to image Kawasaki disease: a validation of different imaging techniques. *Int J Cardiol* 2008;124: 27-31.
- Okutan V, Yozgat Y, Lenk MK, Kurşaklıoğlu H, Varan B, Tokel K. Koroner arter "bypass graft" uygulaması ile tedavi edilen Kawasaki hastalıklı bir olgu. *Gülhane Tıp Dergisi* 2007;49:114-7.
- Gomaa O, Tangcharoen T, Kokocinski T, Schnackenburg

- B, Fleck E, Nagel E. Evaluation of multiple coronary artery aneurysms in Kawasaki's disease by whole heart non-contrast enhanced MRI. *Int J Cardiovasc Imaging* 2006;22:807-10.
9. Flacke S, Setser RM, Barger P, Wickline SA, Lorenz CH. Coronary aneurysms in Kawasaki's disease detected by magnetic resonance coronary angiography. *Circulation* 2000;101:E156-7.
  10. Greil GF, Seeger A, Miller S, Claussen CD, Hofbeck M, Botnar RM, et al. Coronary magnetic resonance angiography and vessel wall imaging in children with Kawasaki disease. *Pediatr Radiol* 2007;37:666-73.
  11. Takemura A, Suzuki A, Inaba R, Sonobe T, Tsuchiya K, Omuro M, et al. Utility of coronary MR angiography in children with Kawasaki disease. *AJR Am J Roentgenol* 2007;188:W534-9.
  12. Katayama H, Shimizu T, Tanaka Y, Narabayashi I, Tamai H. Three-dimensional magnetic resonance angiography of vascular lesions in children. *Heart Vessels* 2000;15:1-6.
  13. Chu WC, Mok GC, Lam WW, Yam MC, Sung RY. Assessment of coronary artery aneurysms in paediatric patients with Kawasaki disease by multidetector row CT angiography: feasibility and comparison with 2D echocardiography. *Pediatr Radiol* 2006;36:1148-53.
  14. Arnold R, Ley S, Ley-Zaporozhan J, Eichhorn J, Schenk JP, Ulmer H, et al. Visualization of coronary arteries in patients after childhood Kawasaki syndrome: value of multidetector CT and MR imaging in comparison to conventional coronary catheterization. *Pediatr Radiol* 2007;37:998-1006.