



The Role of Computed Tomography Coronary Angiography in Kawasaki Disease: Comparison with Transthoracic Echocardiography in a 25-Case Retrospective Study

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Abstract

Although transthoracic echocardiography (TTE) is the first-line examination for the study of coronary lesions in Kawasaki disease, CT coronary angiography (CTCA) is increasingly used and showed good results. Our aim is to evaluate the contribution of CTCA in the detection of coronary lesions and to compare its results with those of TTE. Retrospective study that included 25 patients with Kawasaki disease enrolled in La Rabta University Hospital. The study was conducted over a 4-year period from January 2012 to May 2015. A TTE and a CTCA have been performed for all patients during KD first 3 months of evolution to investigate the coronary artery lesions. There were 23 lesions described on CTCA and not diagnosed with TTE: there were 16 aneurysms, 6 ectasia and 1 case of stenosis. The lesions concerned: LCX in eight cases, RCA in eight cases, LMCA in three cases, and LAD and PDA in two cases each. Differences of description between TTE and CTCA were identified in 14 cases. These discrepancies concerned the type of lesion in seven cases (50%), the size of the aneurysm in five cases (35%) and the shape of the aneurysm in two cases. The CTCA showed its superiority in detecting coronary lesions in our series especially fusiform ones and those interesting distal and posterior network. However, because of its radiating character and its availability, TTE should remain the first-line examination.

Keywords Kawasaki disease · Coronary artery aneurysms · Coronary arteries · Computed tomography coronary angiography · Transthoracic echocardiography

Abbreviations

CT	Computed tomography
CTCA	Computed tomography coronary angiography
TTE	Transthoracic echocardiography
KD	Kawasaki disease

Introduction

Kawasaki disease (KD) is a systemic vasculitis that affects small- and medium-sized vessels with significant affinity for the coronary arteries. This disease affects children younger

than 5 years of age and is the leading cause of acquired coronary artery disease in children [1].

Early detection of coronary involvement is crucial for initial and long-term management of these patients. Transthoracic echocardiography (TTE) has been the first-line examination for the detection of cardiac involvement [2]. However, it has some limitations, the main one being highly operator dependent. Computed tomography coronary angiography (CTCA) is a minimally invasive alternative for the study of the coronary arteries but has also some risks mainly related to radiation in a pediatric population. Its use remains none codified when it comes to KD and its indications seem variable between physicians.

The aim of this work was to evaluate the contribution of CTCA in the detection of coronary lesions and to compare its results with those of TTE.

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Materials and Methods

Retrospective study that included 25 patients with KD enrolled in pediatric and cardio-pediatric departments of the Rabta University Hospital. The study was conducted over a 4-year period from January 2012 to May 2015.

All patients were diagnosed with complete or incomplete KD based on the diagnostic criteria of the American Heart Pediatric Association (AHA) [2].

A TTE and a CTCA have been performed for all patients during KD first 3 months of evolution.

We had excluded patients whose delay between TTE and CTCA exceeded 1 month.

TTE was performed at the acute or subacute phase of KD by experienced pediatric cardiologists. All examinations included a 2D and time–motion (TM) study, a color Doppler study, and a pulsed Doppler study.

All CTCA have been preceded by the TTE. Other control TTE have been performed during the follow-up of patients but they have not been taken into account in this comparative study.

For each patient, the lesions sought on both TTE and CTCA were mainly ectasia, aneurism or stenosis of coronary arteries.

In all cases, we used General Electrics Medical Systems CT having 64 detectors with a minimum rotational speed of 0.35 s and a minimum collimation of 0.625 mm on a 40 mm detector support. This machine was equipped with an electrographic synchronization module and a high-power generator tube.

The examination was preceded by the control of renal function and sometimes premedication with B-blockers at the dose of 1 mg/kg half an hour before the exam to have a heart rate of 65–70 beats per minute. No sedation was needed in our series.

For older children and adolescents, the scout acquisition was followed by a helical acquisition from the sub-cranial level to the diaphragmatic after injection of the contrast media using “smart prep” or “test bolus”. The initiation of the acquisition was done manually from the detection of the contrast media in the ascending aorta to an optimal density (90–120 HU). The acquisition was made in calm breathing without apnea for most of the children.

For newborns, the scout acquisition was immediately followed by a helical acquisition, after manual injection of the contrast media, in the cranio-caudal direction followed immediately by an acquisition in the caudo-cranial direction covering the same volume.

The contrast media used was Iohexol (350 mg/L). The injection rate varied between 2.5 and 3.5 mL/s depending on the size of the approach used. The amount of the contrast medium injected depended on the weight (1.5–2 mL/

kg). The rotation time of the tube was 350 ms, the pitch was 0.2, the cutting thickness was 0.625 mm and collimation was fixed at 40.

The voltage (kV) was adapted to the body surface: fixed at 80 kV for patients with a weight of < 50 kg and 120 kV beyond. The acquisition was synchronized on all phases of the cardiac cycle with continuous monitoring of the electrocardiogram tracing. Different image reconstruction techniques were used to optimize interpretation: 2D reconstructions, MPR reconstructions, curvilinear reconstruction, lumen reconstruction, 3D reconstructions and MIP.

Data interpretation was done on a study console (advantage work station 4.5) by a trained radiologist. The study was mainly done on the mid (40–50%) and tele-diastolic (75%) phases.

A detailed study of the coronary arteries and major collaterals was performed on the native sections and the different 2D and 3D reconstructions were obtained.

Aneurysms were classified as saccular if axial and longitudinal diameters were nearly equal. They were classified as fusiform if there was concentric dilatation with gradual proximal and distal tapering. Aneurysms were also categorized using Z score and the classification of Manlihot et al. [3]. The aneurysm was considered small if the Z score is ≥ 2.5 to < 5.0, large if the Z score is ≥ 5.0 to < 10.0 and giant if the Z score is ≥ 10.0 .

When the whole segment of the coronary artery was larger than normal (internal segment measured ≥ 1.5 times that of an adjacent segment according to the Japanese Ministry of Health criteria), the segment was considered as ectatic [4]. For each coronary lesion, we noted the exact location of the lesion using the segmentation of the American Heart Association, the type (ectasia, stenosis or aneurysm), the form (saccular or fusiform aneurysm) and the size of the lesion (small, large or giant).

To assess the contribution of CTCA and TTE, we began by identifying each patient with a letter.

Each lesion is identified in the CTCA and then compared to the findings of the TTE.

We compared to the existence of the lesion in TTE report, the type, the shape and the size.

The statistical data were analyzed using the Microsoft Excel 2007 software.

Results

Population Studied

Twenty-five patients were enrolled with a clear masculine predominance (4 girls and 21 boys, i.e., a sex ratio of 5.2). Among the group of patients with coronary disease, there was 1 girl and 15 boys. Twelve patients in

our series presented with an incomplete form of KD (IKD) and 13 patients with a complete form (CKD) using AHA criteria. The average age of patients in our series was 3 years \pm 4 months with extremes of 11 months and 9 years. The average age of patients with CKD was 3 years \pm 6 months with extremes of 11 months and 9 years.

In our 25 patients, the diagnosis was made during an etiological assessment of an acute onset fever and in 23 patients fever was associated to extremity changes.

Transthoracic Echocardiogram (TTE)

A TTE was performed in all patients in the days preceding the CTCA with an average delay of 5 days and extremes ranging from 1 to 25 days.

In two cases, the TTE occurred during the acute phase, while the CTCA occurred during the subacute phase, respectively within 16 and 25 days after TTE.

One or more lesions of the coronary arteries were found during the initial assessment in only 14 patients (56% of patients). TTE was normal in the remaining 11 patients. A total of 29 coronary lesions were collected during this exploration. Among the patients with IKD, there were eight patients with coronary lesions. The echocardiographic findings of the various coronary lesions are summarized in Table 1. All data not specified on the TTE report are marked with a letter “X”. Each coronary lesion is indicated by a number corresponding to that assigned to the CTCA to facilitate the comparison of the results. The lesions discovered are divided into 21 aneurysms, and 8 ectasias. No cases of arterial stenosis were found at the TTE. Coronary abnormalities involved the right coronary artery (RCA) in 13 cases, the left anterior descending artery (LAD) in 7 cases, the left main coronary artery (LMCA) in 7 cases and the left circumflex artery (LCX) in 2 cases. The location was precised in only 10 cases out of the 29 lesions described.

Table 1 Characteristics of the coronary lesions detected on TTE

Patients	Number and type	Form	Segment	Artery	Size (mm)	Z score
Patient A	1 Aneurysm	X	X	LMCA	6	+7 (large)
	2 Aneurysm	X	X	LAD	3	+2.77 (small)
	38 Ectasia	–	X	RCA	4	–
Patient B	5 Aneurysm	X	X	LMCA	6	+7 (large)
Patient C	8 Aneurysm	Fusiform	X	RCA	5	+5.68 (large)
	9 Aneurysm	Fusiform	X	LAD	5	+5.57 (large)
Patient D	11 Aneurysm	Fusiform	X	LAD	5	+6.27 (large)
	13 Aneurysm	Fusiform	Proximal	RCA	7	+8.30 (large)
Patient E	15 Aneurysm	Fusiform	Proximal	RCA	5	+8.31 (large)
	19 Aneurysm	Fusiform	X	LAD	4.5	+4.13 (small)
Patient F	20 Aneurysm	Fusiform	X	RCA	3.5	+3.82 (small)
Patient G	21, 22 Ectasia	–	Proximal	LAD	X	–
Patient H	24 Aneurysm	X	Post–ostial	LMCA	X	X
	26 Aneurysm	X	X	RCA	5	+4.56 (small)
Patient I	29 Ectasia	–	X	LMCA	5	–
	31 Aneurysm	Fusiform	Proximal	RCA	4	+5.27 (large)
Patient J	48 Ectasia	X	X	LMCA	3	–
	Irregular wall					
	32 Aneurysm	Fusiform	Proximal	LAD	3.8	+4.56 (small)
	33 Aneurysm	X	Proximal	LCX	3.5	+3.97 (small)
Patient K	34 Aneurysm	Fusiform	Proximal	RCA	6	+7.06 (large)
	46 Ectasia	X	X	LMCA		–
	47 Ectasia	X	X	RCA		
Patient L	35 Aneurysm	Fusiform	X	LMCA	10	+12.49 (giant)
	39 Aneurysm	Fusiform	Proximal	LAD	5	+4.59 (small)
Patient M	40 Ectasia	–	X	RCA	X	–
Patient N	42 Ectasia	–	X	RCA	X	–
	43 Aneurysm	X	X	LMCA	X	X
	44 Aneurysm	X	Proximal	LAD	4	+4.39 (small)
	45 Aneurysm	X	X	LCX	X	X

It concerned the proximal segment in 100% of cases. The distance from the ostium has been specified in only one case.

TTE allowed in 12 cases to characterize the shape of the aneurysm. This description concluded in 100% of cases to a fusiform aneurysm. No form of saccular aneurysm was found at TTE.

For the eight cases of ectasia, the measurements of the internal diameter were specified in only three cases with a maximum of 5 mm. For the 21 aneurysms described, the TTE specified the diameter (D) in mm in only 18 cases. The extent of the lesion (L) in mm has been mentioned in only two cases. The size of the aneurysms varied between 3.5 and 10 mm diameter with an average of 5.4 mm. There were eight cases of small aneurysms, nine cases of large aneurysms and one case of giant aneurysm. No calcification of the wall was mentioned.

Computed Tomography Coronary Angiography

The quality of the exam was good in 8 patients, mediocre in 12 patients for both proximal and distal network while five examinations were judged of poor quality, not interpretable for the distal network as well as for the wall study.

The deterioration in examination quality was due to kinetic artifacts (phase shift, kinetic blur and jump images) related to an irregular heartbeat during acquisition in 13 patients. In only two cases, the exam quality deterioration was related to a fast respiratory rhythm and patient's agitation during injection of the contrast media.

The CTCA revealed 50 types of coronary lesions. Each lesion was identified by a number independently from the concerned patient. The different features of coronary lesions are described in Table 2.

There were 37 aneurysmal lesions, 12 ectasia (Fig. 1) and 1 stenosis (Fig. 2). No abnormal vascular wall morphology has been reported. There were 26 fusiform aneurysms (Figs. 3, 4, and 5a) and 11 saccular aneurysms (Figs. 5b, 6, 7, and 8). Among the aneurysmal lesions there were: 8 giant aneurysms (Fig. 3), 17 large aneurysms and 12 small aneurysms (Fig. 5b).

There were 20 lesions of the right network and 30 lesions of the left network. Proximal involvement accounts for 67% of all lesions. Two lesions were found on the posterior descending artery (PDA). No lesions were found on the diagonal arteries.

Analytical Study: TTE Versus CTCA

A number has been assigned to each coronary lesion discovered in the CTCA. These lesions are also identified on the TTE with the same number. A qualitative comparative study of the characteristics of coronary lesions reported by TTE

and CTCA was performed. At the end of this comparison three groups of lesions were identified:

- Group I: perfect agreement: these are lesions whose morphological characteristics have been reported identically by both exams.
- Group II: the unseen: these are the lesions discovered by CTCA and omitted by TTE.
- Group III: discordance: these are the lesions seen in both TTE and CTCA but have been described differently because of their morphological criteria.

There were 12 lesions (23% of all coronary lesions) detected in CTCA in group I: nine cases of aneurysm and three cases of ectasia. Group I lesions were proximal siege.

There were 23 lesions described on CTCA and not diagnosed with TTE (group II): there were 16 aneurysms, 6 ectasia and 1 case of stenosis. The lesions concerned: LCX in eight cases, RCA in eight cases, LMCA in three cases, LAD and PDA in two cases each.

Disagreements of description between TTE and CTCA were identified in 14 cases. These discrepancies concerned the type of lesion in seven cases (50%), the size of the aneurysm in five cases (35%) and the shape of the aneurysm in two cases (14%).

Discussion

The incidence of KD in our country has not been determined nationally to the present day. The annual incidence of this disease in Japan is estimated at 150 per 100,000 children under the age of 5 and 15 per 100,000 children of the same age in the United States. In our study, there was an average of eight cases of KD per year in a 4-year study in a single hospital. The age of onset of the disease is <5 years in 85% of cases, affecting more frequently male children [5]. The diagnosis of KD is based on the diagnostic criteria of the American Heart Pediatric Association (AHA) [6]. Whether it is the complete or incomplete form of KD, the damage to the coronary arteries makes it possible to affirm the diagnosis. This must be done quickly to start the treatment as soon as possible to avoid the evolution to coronary lesions. It is important to know that the absence of clinical and electrical cardiac symptomatology is not correlated with the absence of a coronary complication during the disease [7]. On the other hand, concerning patients with incomplete form of KD and no coronary lesion, the diagnosis remains uncertain and there is new evidence that there is a possible trend towards over-diagnosing. In our series, four patients were diagnosed with incomplete form of KD and no coronary involvement. Three of them had biological findings suggestive for the diagnosis but for one patient, the diagnosis was doubtful.

Table 2 Characteristics of the coronary lesions detected on CTCA

Number	Artery	Segment	Lesion	Form	Size (mm)	Z score
1	LMCA	5	Aneurysm	Saccular	8.5	+10.31 (giant)
1'	LMCA	5	Ectasia	–	3.8	X
2	LAD	6, 7	Ectasia	–	4.1	X
3	RCA	1	Aneurysm	Fusiform	4.7	+4.74 (small)
3'	RCA	1	Aneurysm	Saccular	3.7	+3.09 (small)
4	RCA	3	Aneurysm	Saccular	3.5	+3.82 (small)
5	LMCA	6	Ectasia	–	3.2	X
5'	LAD	5	Aneurysm	Fusiform	13	+12.53 (giant)
6	LCX	11	Aneurysm	Fusiform	6.4	+6.77 (large)
7	LCX	12	Ectasia	–	3.1	X
7'	LCX	13	Aneurysm	Saccular	4.7	+5.06 (large)
7''	LCX	13	Aneurysm	Saccular	5.3	+5.71 (large)
8	RCA	1	Aneurysm	Fusiform	8	+9.41 (large)
9	LAD	6	Aneurysm	Fusiform	10	+10.48 (giant)
10	LCX	11	Aneurysm	Fusiform	5	+5.39 (large)
11	LAD	6	Aneurysm	Fusiform	6.8	+8.58 (large)
12	LCX	11	Aneurysm	Saccular	12.5	+13.32 (giant)
13	RCA	1, 2	Aneurysm	Saccular	7	+8.30 (large)
15	RCA	1	Aneurysm	Fusiform	5.6	+9.60 (large)
16	RCA	1, 2	Aneurysm	Fusiform	3.4	+2.98 (small)
17	PDA	4	Aneurysm	Fusiform	3.3	Small
18	LAD	8	Stenosis		2.2	X
19	LAD	6, 7	Ectasia		3.2	X
20	RCA	2	Ectasia		3.1	X
21	LAD	6	Aneurysm	Fusiform	10	+10.48 (giant)
22	LAD	7	Aneurysm	Fusiform	6.6	+7.45 (large)
23	RCA	1	Aneurysm	Fusiform	4.6	+4.64 (small)
23'	RCA	1, 2	Aneurysm	Saccular	3.7	+3.15 (small)
24	LAD	6	Aneurysm	Saccular	9	+9.69 (large)
24'	LMCA	5	Ectasia	–	3.9	–
25	LCX	11	Aneurysm	Fusiform	5.4	+5.82 (large)
26	RCA	1	Aneurysm	Fusiform	7.7	+7.82 (large)
27	RCA	2	Ectasia	–	4	X
28	PDA	4	Aneurysm	Saccular	4	– Small
29	LMCA	5	Aneurysm	Fusiform	5	5.41 (large)
30	LCX	1	Ectasia	–	4	–
31	RCA	1	Aneurysm	Fusiform	5	7.44 (large)
32	LAD	6, 7	Aneurysm	Fusiform	6	7.86 (large)
32'	LMCA	5	Ectasia	–	5	–
33	LCX	1	Aneurysm	Fusiform	3.5	+3.97 (small)
34	RCA	1	Aneurysm	Fusiform	4, 1	+4.25 (little)
34'	RCA	2	Aneurysm	Fusiform	4.3	+4.58 (little)
35	LMCA	5	Aneurysm	Fusiform	18	+19.72 (giant)
36	LAD	3	Aneurysm	Fusiform	9	+10.80 (giant)
37	RCA	1	Aneurysm	Fusiform	10	+11.37 (giant)
39	LCX	11	Aneurysm	Fusiform	5	+5.39 (large)
42	RCA	2	Ectasia	–	3.4	–
42'	RCA	2	Aneurysm	Saccular	5	+6.25 (large)
43	LMCA	5	Aneurysm	Fusiform	5	+6 (large)
44	LAD	1	Ectasia	–	3.4	–

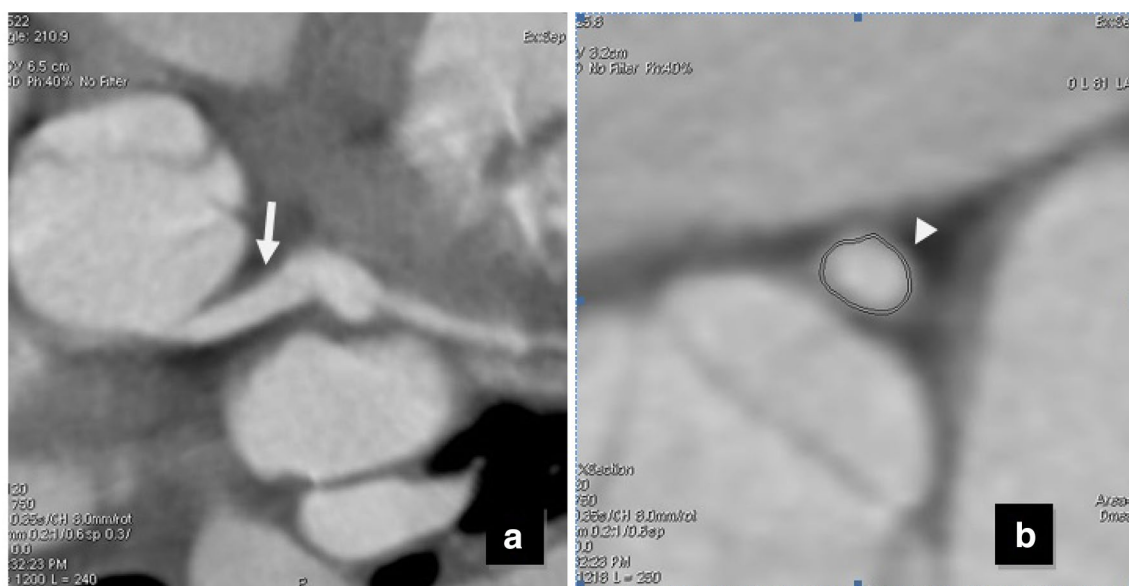


Fig. 1 Curvilinear reconstruction **a** showing an ectasia of the left main coronary artery (arrow). Note the mean diffuse dilatation of the coronary artery (head arrows). **b** Measurement on an axial view of the artery



Fig. 2 Curvilinear reconstruction showing a stenosis of the LCX after an aneurysmal lesion.

It is established that TTE is the first-line examination for any suspicion of KD. It could confirm the diagnosis [6] (especially in its incomplete form), establish a prognosis, adapt the treatment according to the discovered coronary lesions and follow-up of the patients in chronic phase [8].

It is a simple, noninvasive examination allowing a morphological study of the coronary network.

Several studies showed that TTE has an excellent sensitivity and specificity for detection of aneurysms [7]. The TTE is, however, limited by acoustic window narrowing during growth, low sensitivity and specificity when it comes to distal and inferior coronary network, the poor reproducible character, the agitation of young patients sometimes requiring restraint and low sensitivity and specificity for the detection of thrombosis and stenosis [1, 9].

The ISHIARA study demonstrated the limitations of TTE for exploration of distal and posterior segments of the coronary network [7].

In our series, segmental localization was specified in only 35% of cases and involved in 100% of these cases the proximal location.

Lesions omitted at TTE and found on CTCA have in 66% of cases a distal location. The two PDA lesions of our series were not found at TTE. These results are consistent with the data from the literature. It should be noted that the collection of data could be affected by the lack of details found in the reports of the ultrasound and the non-systematization of the reports.

Another shortcoming that must be taken into account in the data analysis: In two cases, the TTE occurred during the acute phase, while the CTCA occurred during the sub-acute phase (respectively within 16 and 25 days after ETT). This could influence the differences in results, although for these two specific cases they belonged to group I: perfect agreement.

Fig. 3 MIP mode showing a giant fusiform aneurysm of the LAD (a). Same aneurysm on a lumen mode (b)

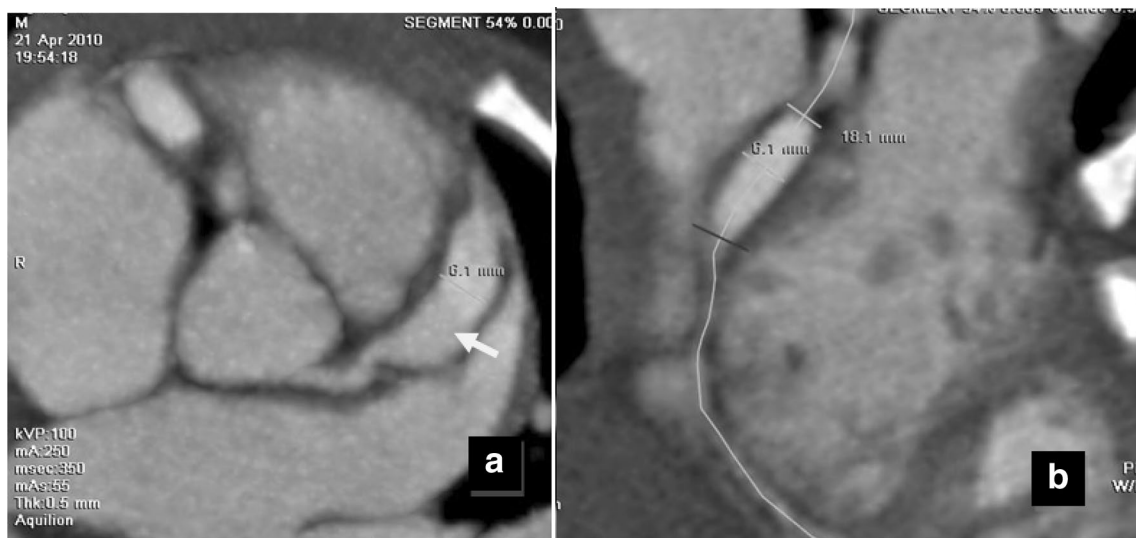
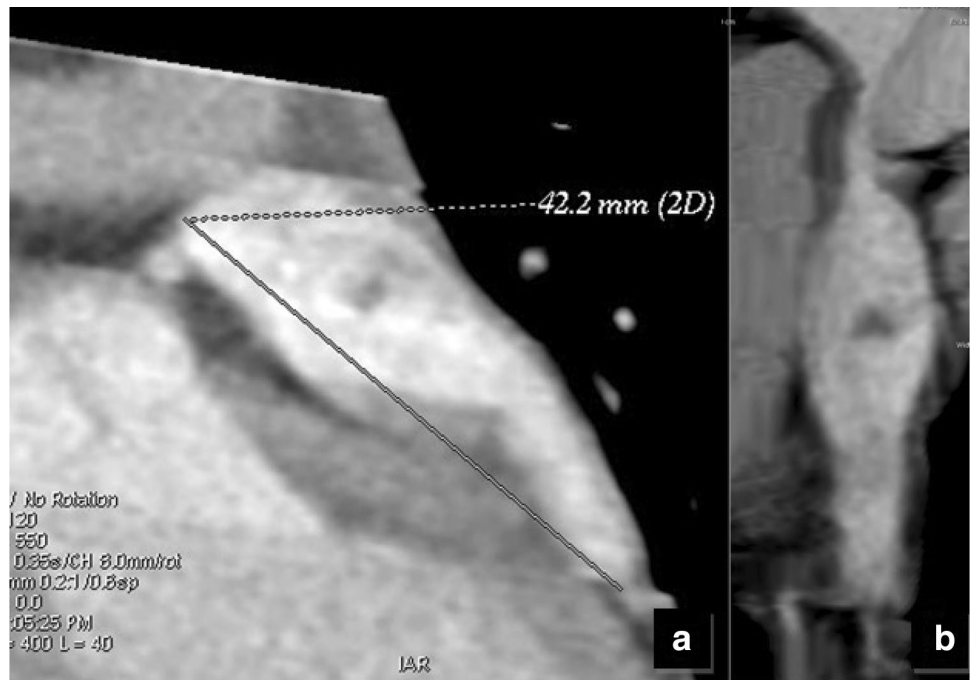


Fig. 4 MIP reconstruction **a** showing a fusiform aneurysm of the LDA (arrow). **b** Measurements on a curvilinear reconstruction

CTCA is a minimally invasive examination that allows almost all studies of the coronary tree to be able to replace angiography when it is indicated during KD [1, 8]. Some studies have demonstrated a good correlation between angiography and CTCA [6] but these comparative studies between CTCA and angiography remain limited in number because of the invasive nature of angiography.

The quality of the examination is judged by the radiologist according to his ability to evaluate in detail the 13 coronary segments defined by the AHA. In the Winnie study [2] conducted on six patients with complete form of KD the

CTCA allowed a correct study of an average of nine segments per patient. In the Peng et al. study [10], conducted on 12 patients followed for KD, the CTCA enabled a good quality diagnosis for 118 segments out of 156 with inter-observer reproducibility of 0.9. A study of the 13 arterial segments was possible in only 5 patients. Proximal and middle segments study was possible in all patients.

In our series, the examinations were classified by their quality: allowing a detailed study of the distal coronary network in 48% of cases, an average quality but interpretable for the proximal and middle network in 32% of cases and

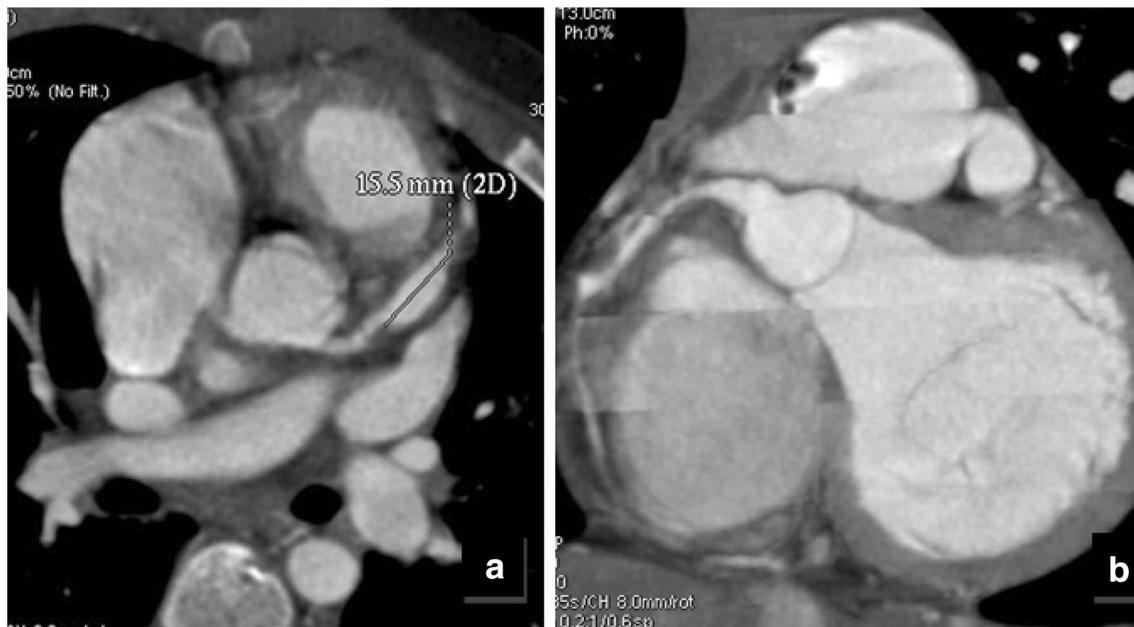


Fig. 5 MIP reconstruction showing. **a** A fusiform aneurysm of the LDA. **b** A little saccular aneurysm of the LCX

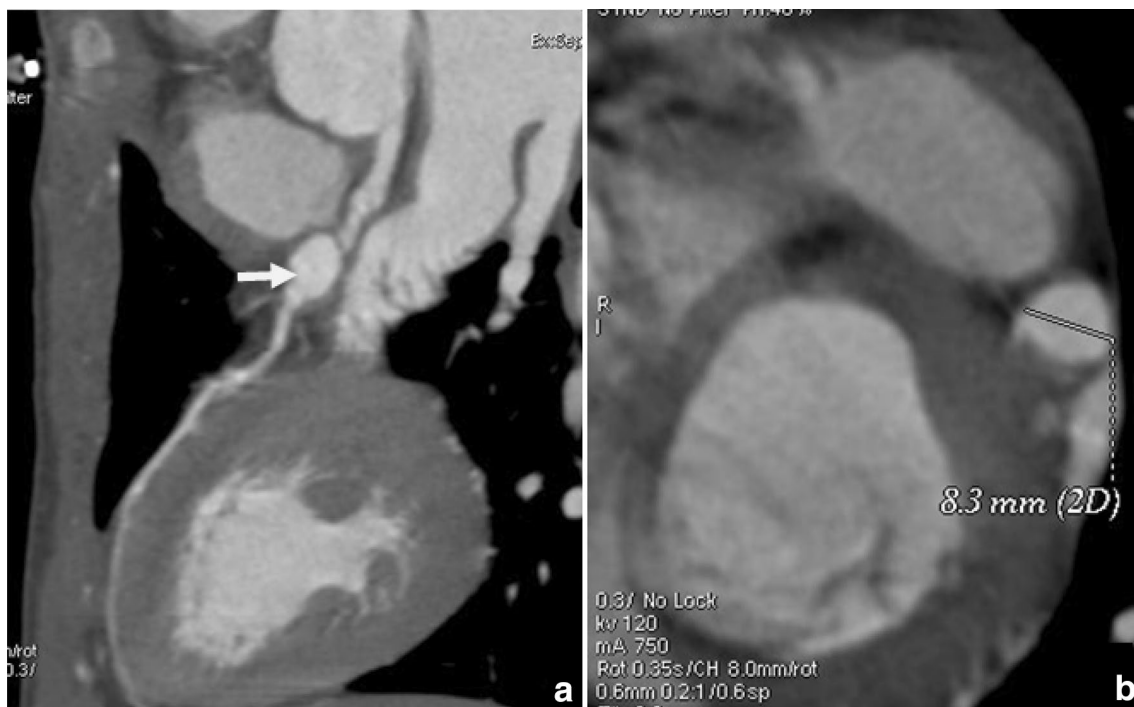


Fig. 6 Curvilinear reconstruction of the RCA **a** showing a saccular aneurysm (arrow). **b** Measurement of the transversal diameter

inconclusive examination for the study of the distal coronary network in 20% of cases.

Although several studies have demonstrated the value of CTCA in the monitoring of KD as a minimally invasive and reproducible technique in a pediatric population, very few

studies have examined its feasibility in young children who are unable to provide apnea during the examination [10–12]. Special attention should be paid to the pediatric population in terms of irradiation during cardiac imaging so that it is as minimal as possible [13]. This is why the acquisition

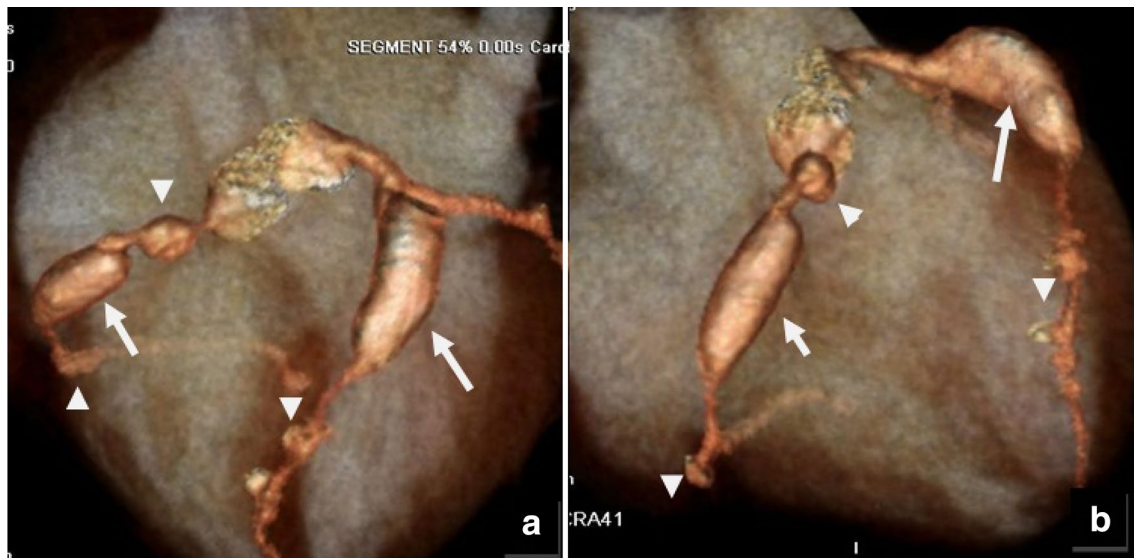


Fig. 7 3D VR Reconstruction of a 16-month boy showing two fusiform aneurysm of segments 2 and 6 (white arrows), and three saccular aneurysm of segments 1, 3 and 7 (head arrows) of segments 1, 3 and 7. Associated post-aneurysmal stenosis

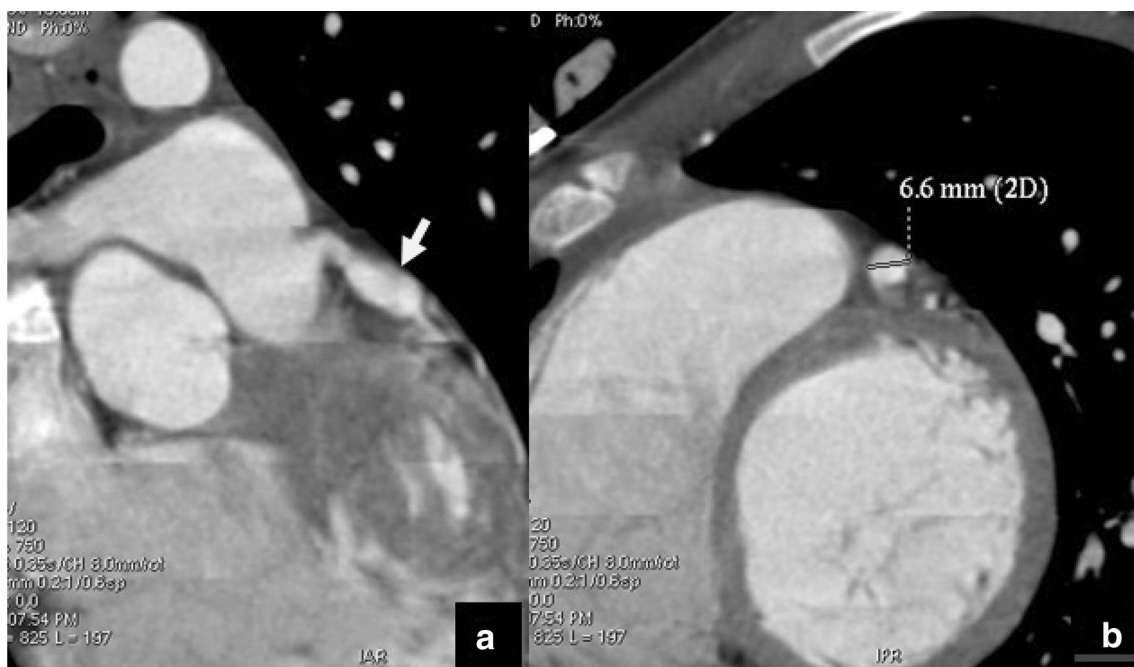


Fig. 8 Curvilinear reconstruction **a** showing a saccular aneurysm of the LCX (arrow). **b** Measurement on an axial view of the artery

protocol must be precise, limited, the shortest and the least irradiant possible. It should be noted that some radiologists are using prospective electrocardiographic gating getting lower irradiation [14].

Compared with TTE, ectasia is easily detectable by CTCA. The different reconstructions (lumen and curvilinear) make it possible to better visualize the ectasia showing a mean diffuse dilatation of a coronary artery [15].

The description of the aneurysms is more precise on CTCA. This is explained by the possibility of curvilinear reconstructions especially on sinuous or curved arteries.

The difficulty in detecting the progressive increase of the internal diameter of the arteries in fusiform aneurysms, particularly of small size, increases the risk of false negative on TTE [16]. In our series, 27% of the lesions described in the CTCA have been incorrectly described in TTE by

their shapes. The impact is not negligible in the prognostic evaluation since the sacciform aneurysms are more at risk of thrombosis than fusiform aneurysms.

There is no predilection of forms described in the literature, however, it is established that the more frequent usage of CTCA allowed more discovery of fusiform aneurysms compared with sacciform aneurysms [16]. It is important to note that, in our series, we found more fusiform than saccular aneurysms (73% fusiform and 28% saccular) and that 100% of the aneurysms described in the TTE were declared fusiform. The TTE did not diagnose nine aneurysms, eight of them were fusiform.

Measurements of aneurysmal lesions on CTCA are more reliable especially for large lesions [12]. For each aneurysm, it is important to specify the size and permeability to precise the risk of myocardial involvement, making it possible to adapt the treatment and follow-up of patients.

We should note also that detailed description of coronary lesions are important for prognosis: The aneurysms with no calcification, smaller diameter (<5.6 mm) and ectatic shape are more likely to regress [17].

CTCA also allows a combined study of the wall and the lumen to facilitate the diagnosis of thrombosis even in distortion [15]. It highlights the marginal or central thrombus as an endoluminal defect and the residual lumen in the absence of occlusion.

In our series, the CTCA made it possible to diagnose the single case of post-aneurysmal focal stenosis and to diagnose a giant aneurysm of the ascending aorta missed by TTE.

The CTCA showed 90% of saccular aneurysms that have not been missed or described as fusiform on TTE, 88% of giant aneurysms that have not been seen or underestimated in size in TTE and 100% distal lesions.

CTCA showed its importance particularly in group II patients revealing lesions missed on TTE. The clinical impact was crucial as for some patients it confirmed diagnostic and for other ones changed therapeutic strategy.

In our cohort, all patients received IVIG. For those with coronary lesions, all of them were put on oral aspirin and some of them especially with giant aneurysm received oral anti-coagulation.

No case of sudden death or coronary artery thrombosis have been noted.

Conclusions

The CTCA showed its superiority in detecting coronary lesions in our series especially fusiform ones and those interesting distal and posterior network.

However, because of its radiating character and its availability, TTE should remain the first-line examination.

Compliance with Ethical Standards

Conflict of interest Authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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