

Multimodality imaging of multiple giant right coronary artery aneurysms combined with anomalous aortic origin of left coronary artery

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Abstract

We report a rare case of multiple giant coronary artery aneurysms combined with anomalous aortic origin of left coronary artery in a 30-years old man precisely diagnosed by multimodality imaging, including echocardiography, coronary computed tomographic angiography (CCTA), cardiac magnetic resonance imaging (CMR) and selective coronary angiography. The imaging results were finally confirmed by surgery. We present the clinical value of multimodality imaging in diagnosing coronary artery aneurysm and anomalous origin.

Introduction

Coronary artery aneurysm(CAA)is defined as a local dilatation in the coronary artery which is 1.5 times greater than the adjacent normal segment, with the prevalence of 0.3-5% in patients undergoing coronary angiography^[1]. The giant CAA is defined as CAAs over 20mm with an incidence of 0.02% to 0.2% in cardiac surgical population ^[2]. Anomalous aortic origin of a coronary artery (AAOCA) is a rare congenital abnormality of the origin or course of a coronary artery that arises from the aorta with the prevalence of 0.1%-1% in both the adult and pediatric populations^[3]. However, the optimal treatment of CAA and AAOCA based on detailed information of coronary arteries^[1, 3]. Multimodality imaging, including echocardiography, coronary artery angiography, coronary computed tomographic angiography (CCTA), cardiac magnetic resonance imaging (CMR), has been suggested in diagnosing CAA and AAOCA^[4]. We report a rare case of multiple giant CAAs combined with anomalous aortic origin of left coronary artery, presenting the vital role of multimodality imaging in diagnosing and developing optimal individualized treatment strategies.

Case report

A 30-years old man was presented with exertional chest pain repeatedly, without hypertension and dyslipidemia. On physical examination, his blood pressure was 105/55mmHg, heart rate is 70 bpm, cardiac murmur was not obvious. Electrocardiogram showed the sign of ischemia in inferior wall and previous infarction in interventricular septum. Hypersensitive troponin I level was 37.5 ng/L, the blood NT-ProBNP level was 376.0 pg/ml, the inflammatory markers were normal. Transthoracic echocardiography(TTE) found an enlarged mass (5.1×4.3cm) close to right coronary artery opening, with thrombus contained probably and no flow signal inside, compressing the anterior part of tricuspid annular and right ventricle without abnormal hemodynamics (Figure 1A and B). Besides of that, the decreased motion of middle segment anterior septal wall was detected by TTE. Coronary angiography showed that there were multiple aneurysms in proximal and middle part of right coronary artery (RCA), but distal part of RCA can't be displayed (Figure 2A). The left anterior descending (LAD) and left circumflex artery (LCX) were occluded in proximal part, and collateral circulation was developed around (Figure 2B). To clearly displaying the distal part of

RCA, CCTA was performed and found a string of aneurysms distributed in distal part of RCA (Figure 3A). Unexpectedly, CCTA found the origin of left coronary artery was abnormal, which arising from left side of sinotubular junction and part of left main coronary arteries distributing between the ascending aorta and the main pulmonary artery (Figure 3B). CMR found some of aneurysms had thromboses inside (Figure 3C), and distinctly displayed the course of left main coronary arteries distributing between two arteries (Figure 3D). Taken imaging characteristics of coronary artery into consideration, the diagnosis mostly be suspected as multiple giant right coronary artery aneurysms with thrombus combined with anomalous aortic origin of left coronary artery. Finally, coronary artery bypass graft surgery was performed, and intraoperative finding demonstrated the suspected diagnosis. In the intraoperative view, there were two giant coronary artery aneurysms with thrombus adjacent to each other in proximal and mid part of right coronary artery (Figure 4).

Discussion

The pathogeny of coronary artery aneurysm includes atherosclerosis, Kawasaki disease, inflammation, trauma, infection, connective tissue disease and so on^[5]. Even though atherosclerosis is the most common cause of CAA in adult^[5], the patient in this case has no evidence of atherosclerosis. The cause of CAA in this patient may mostly be Kawasaki disease or congenital abnormality, with the evidence of the multiple coronary artery aneurysms and the negative serology investigations.

Anomalous origin of the coronary artery (AOCA) associated with sudden cardiac death and myocardial ischemia^[3]. The presented hypotheses about sudden cardiac death were based on anatomic and physiologic properties of the anomalous coronary, while the triggering factors of the myocardial ischemia may be the insufficient coronary reserve^[3].

The CAA and AOCA, both of the coronary anomalies are asymptomatic usually, just abnormal electrocardiogram was shown^[2, 3]. In this case, the patient has chest pain symptom and abnormal electrocardiogram. Multimodality imaging plays a vital role in developing optimal management by revealing giant CAAs combined with anomalous aortic origin of left coronary artery, but also providing detailed information of coronary artery, myocardial wall contraction and the cardiac hemodynamics. Coronary angiography is useful in evaluating stenosis degree of coronary artery and compensative collateral circulation, while the overlook of CAAs and its relationship with adjacent constitution was not clear. CTA displayed multiple CAA scattered throughout the right coronary artery and anomalous origin of the left coronary artery arises from sinotubular junction. In delayed enhancement sequence, CMR detects the thrombus contained in some coronary artery aneurysms. Transthoracic echocardiography provides information about the change of cardiac hemodynamics, abnormal motion of ventricular wall, and the effects of giant CAAs on cardiac structure and function.

Based on the anatomic subtypes of AAOCA and characteristics of giant CAAs, it is necessary to develop individualized treatment plan based on the detailed information of coronary artery. In this case, multimodality imaging indicated that the patient had intervention indication. Then, coronary artery bypass graft surgery was performed, and he recovered uneventfully and no major adverse cardiac events were reported during the 6-months follow-up.

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Conflict of interest:

The authors declare that they have no conflict of interest.

Consent:

Informed consent was obtained from the patient for the publication of this article.

Ethical approval:

This study was approved by the Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology.

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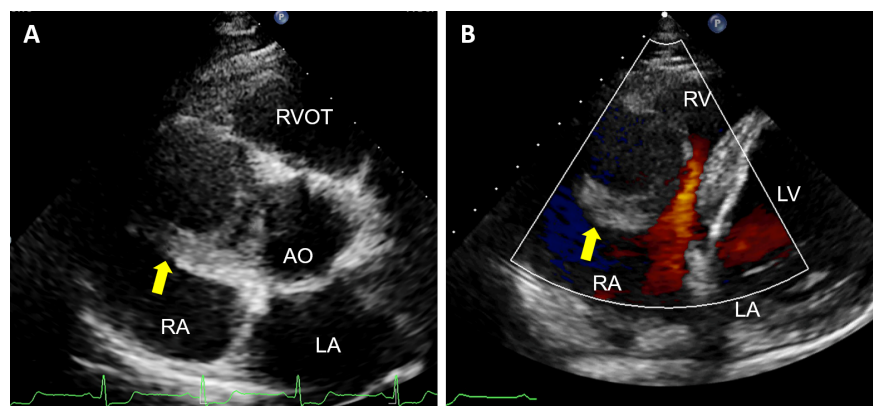


Figure 1. Transthoracic echocardiography found that the giant aneurysm (yellow arrows) close to right coronary artery opening (A), with thrombus contained and no flow signal inside, compressed the anterior part of tricuspid annular and right ventricle, but the diastolic flow velocity at tricuspid valve orifice and middle part of right ventricular cavity was normal (B).

(LA:left atrium; LV: left ventricle; RA: right atrium; RV: right ventricle; RVOT: right ventricular outflow tract; AO: aorta)

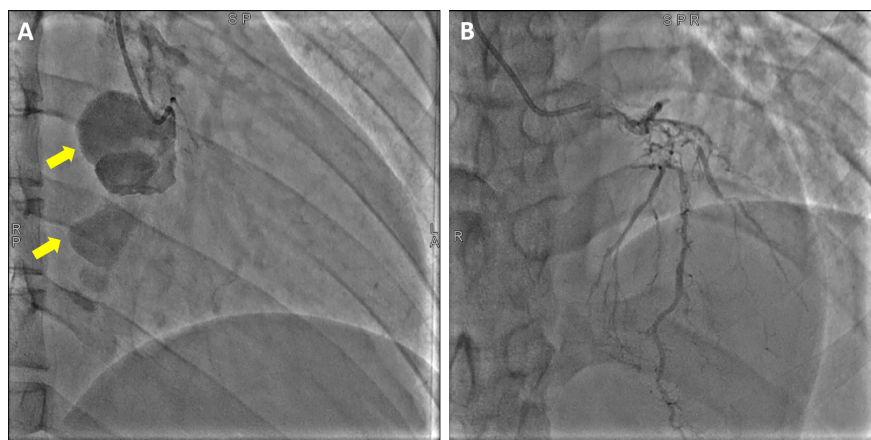


Figure 2. Coronary angiography presented two giant coronary artery aneurysms (yellow arrows) in proximal and middle part of RCA (A). The proximal part of LAD and LCA were nearly occluded and plenty of collateral circulation was around (B).

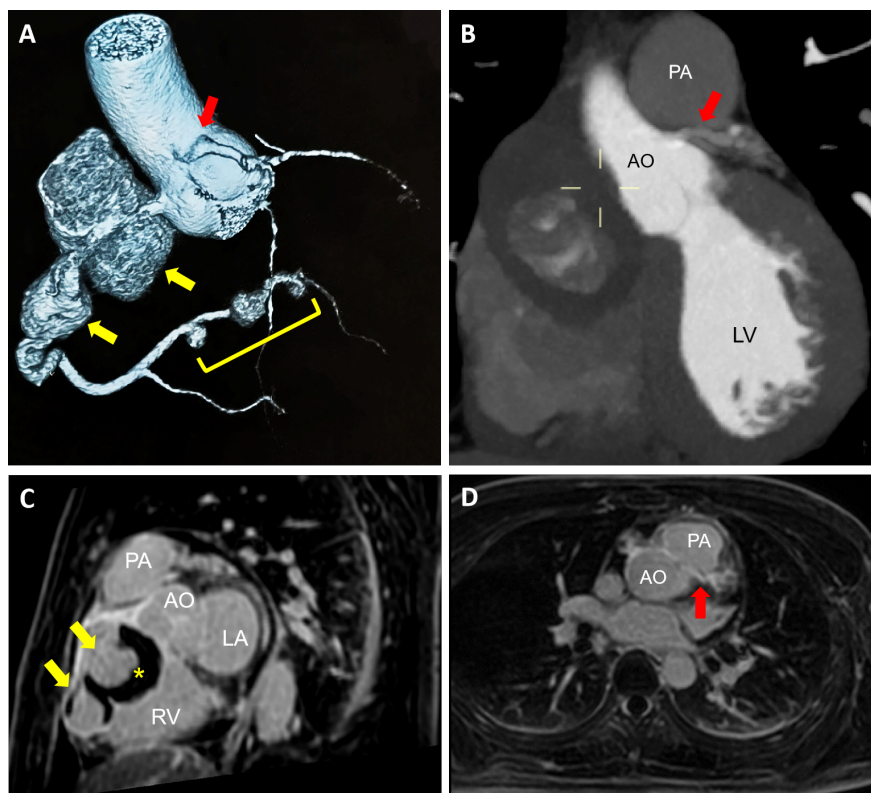


Figure 3. Coronary computed tomographic angiography showed two adjacent giant CAAs (yellow arrows) in proximal and middle part of RCA, and multiple CAAs in the distal part (yellow rectangle) (A). The left coronary artery (red arrow) originated from aortic sinotubular junction (B). Cardiac magnetic resonance imaging found thrombus (yellow asterisk) in those CAAs (C), and part of left main trunk (red arrow) distributing between the aorta and the main pulmonary artery (D).

(LA:left atrium; LV: left ventricle; RV: right ventricle; AO: aorta; PA: pulmonary artery)

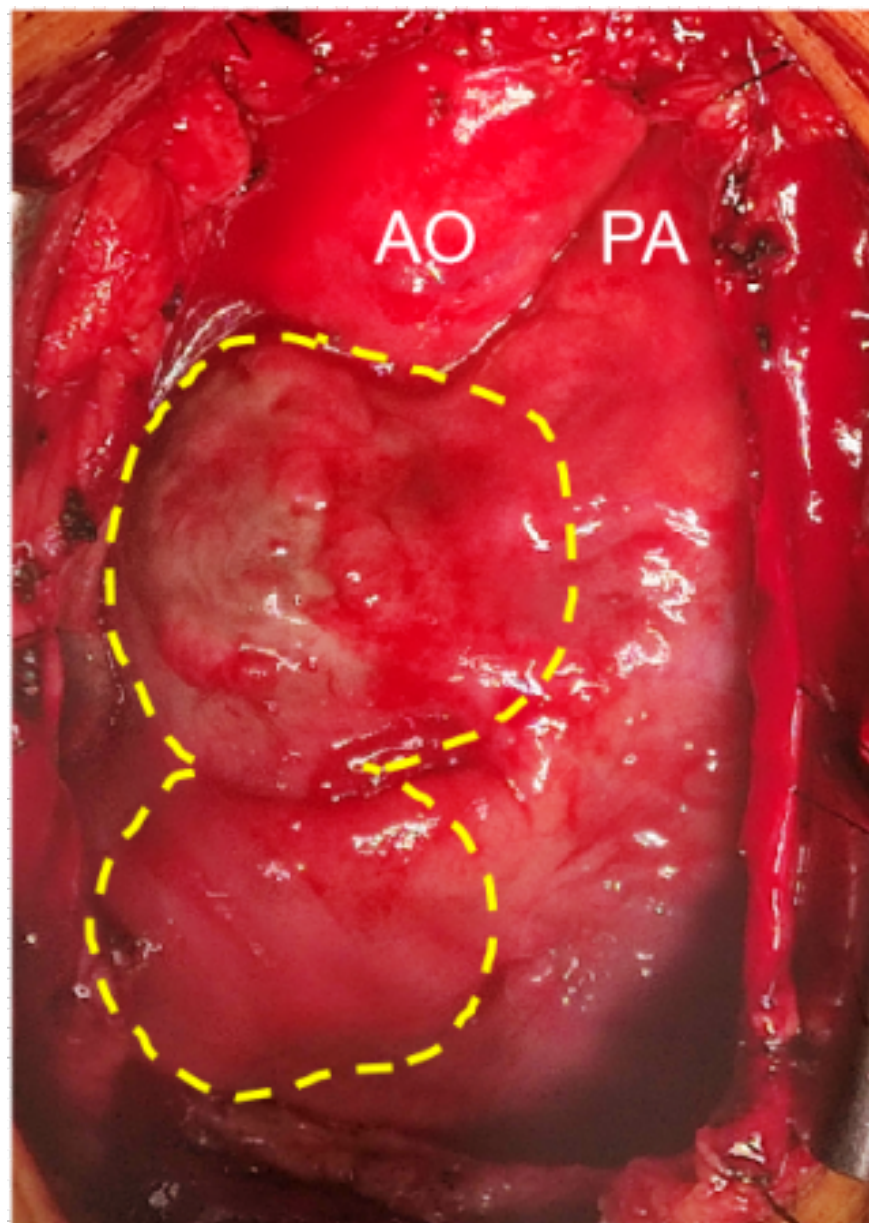


Figure 4. Intraoperative view of two giant right coronary artery aneurysm (yellow dotted line).
(AO: aorta; PA: pulmonary artery)

