



## A Case Report: A Child's Left Coronary Artery Abnormality Originating from the Right Coronary Sinus with Intramural Walk and Surgical Treatment Under Extracorporeal Membrane Oxygenation

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### Abstract

**Objective:** To investigate the diagnosis and treatment of anomalous origin of left coronary artery from the right sinus in children.

**Methods:** Retrospectively analyzing a case of coronary artery abnormalities origin with cardiogenic shock and acute heart failure in a short time and died for pneumonia. Review the literature on anomalous aortic origin of a coronary artery.

**Results:** A child, male, 9 years old, syncope after exercise, coronary angiography showed that left coronary artery originated from the right sinus and the stenosis of the left main stem, treat with extracorporeal membrane oxygenation and surgery, but died for pneumonia.

**Conclusion:** The children with anomalous origin of left coronary artery from the right sinus and abnormal path had the possibility of sudden changes and adverse consequences. Vigorous exercise should be avoided. The early application of extracorporeal membrane oxygenation plays an important role in protecting heart and extending the surgery time of the children, and early surgery is a radical cure method.

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**Keywords:** Coronary vessel anomalies; Extracorporeal membrane oxygenation and surgery; Fulminant myocarditis

### Introduction

Anomalous Aortic Origin of a Coronary Artery (AAOCA) is with a frequency around 0.3% to 1.5% in the general [1]. Although AAOCA has a low incidence, it is the second leading cause of cardiac arrest and sudden cardiac death in young athletes. The highest risk is the Anomalous Origin of Left Coronary Artery from the right sinus (AOLCA), which walk between the aorta and pulmonary arteries is the most dangerous and has the highest rate of sudden death.

We report a case of AOLCA with cardiogenic shock and acute heart failure in a short time and review relevant literature to guide diagnosis, treatment and postoperative recovery.

### Case Presentation

A 9-year-old boy with dizziness and chest tightness for 3 h after running coughed pink foamy sputum on the way to our hospital. He had a history of "syncope after exercise" twice in the past, accompanied incontinence, and had to wake up after a rest. There was no similar symptom in the family.

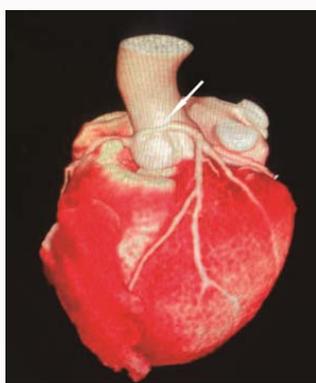
**Electrocardiogram:** Ventricular tachycardia. Oxygen saturation lower than 93%. His hemodynamics is unstable, transferred to ICU for tracheal intubation; ventilator assisted breathing, and treated with Extracorporeal Membrane Oxygenation (ECMO) for 4 days.

**Magnetic-Resonance Imaging (MRI):** Left ventricular wall, forearm and side wall myocardial necrosis, and pericardial effusion (Figure 1).

**Coronary Computed Tomography (CT) and three-dimensional reconstruction:** The left main stem originates from the right coronary sinus and walks between the aorta and pulmonary artery (Figure 2, 3).



**Figure 1:** Cardiac MRI.  
**Note:** The arrow points to the diffuse T2W1 signal increase of left ventricular partition, anterior wall, side wall, prompt acute myocardial infarction anterior

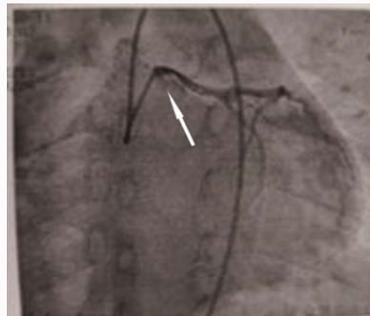


**Figure 2:** Three-dimensional reconstruction of coronary arteries.  
**Note:** The left coronary artery indicated by the arrow starts from the right coronary sinus.

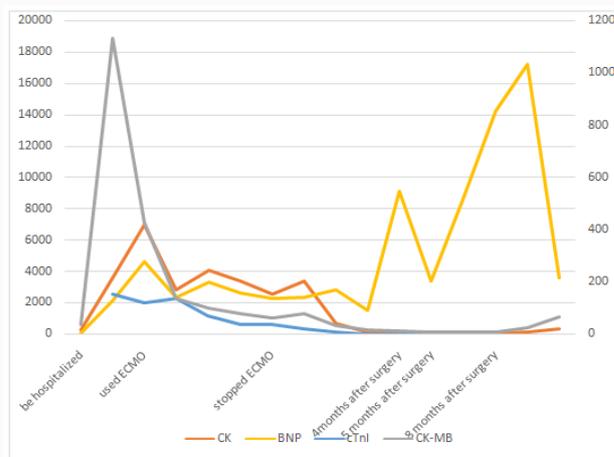


**Figure 3:** Coronary angiography.  
**Note:** The coronary artery indicated by the arrow runs between the aorta and pulmonary arteries.

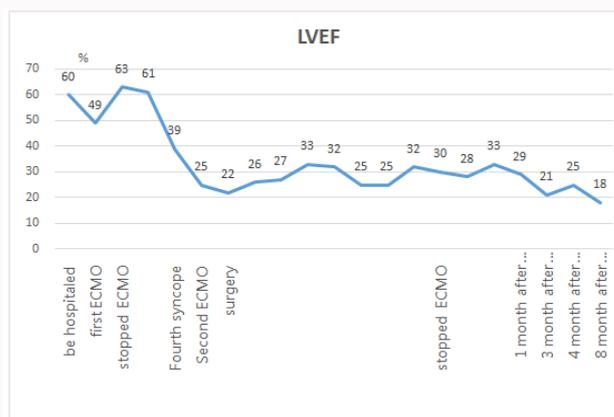
**Coronary angiography:** About 40% stenosis can be seen in the left main stem (Figure 4). Diagnosis: AAOCA. 2 months later, he went to a specialized hospital due to recurrence of syncope after exercise, Echocardiography showed Left Ventricular Ejection Fraction (LVEF) 39%. Three days later ECMO supports descending coronary artery exploration and left coronary artery correction surgery. During the operation, we saw the patient's coronary artery anatomy is that the left and right coronary arteries originate from the



**Figure 4:** Coronary angiography.  
**Note:** Coronary angiography shows stenosis, the arrow points to about 40% stenosis of the left main body.



**Figure 5:** Myocardial damage.  
 CK: Creatine Kinase, CK-MB: Creatine Kinase Isoenzymes-MB, BNP: Pre-Brain Natriuretic Peptide, cTnI: Troponin I.



**Figure 6:** ECMO follow-up.  
 ECMO: Extracorporeal Membrane Oxygenation; LVEF: Left Ventricular Ejection Fraction.

right coronary sinus, with a single opening about 3 mm, and the left coronary artery is intramural walking. It goes up posteriorly beyond the junction of the left and right coronary valves to the left coronary sinus.

His LVEF did not improve significantly during the 4-month follow-up due to hadn't stay home but went to school and did exercise (Figure 5, 6). Otherwise the echocardiography showed pulmonary

hypertension. (Pulmonary artery systolic pressure was about 52 mmHg). Eight months after the operation, he died of lung infection and heart failure.

## Discussion

The most likely to cause sudden death type of AOLCA is sandwich deformity". However, most domestic AOLCA studies on children are small sample studies [2,3]. The clinical manifestations are not specific, and it is easy to be misdiagnosed as endocardial elastofibrosis [4], myocarditis, etc. The detection methods of coronary artery origin abnormalities include: exercise test, echocardiography, intravascular ultrasound, coronary angiography, CT angiography, cardiac MRI and so on.

Regarding treatment, the guidelines for the management of adult congenital heart disease published by the American College of Cardiology (AHA/ACC) recommend surgical intervention by this case.

The incidence of AOLCA is low. Clinical workers have little clinician experience. The clinical manifestations are not specific, which caused confusing with common diseases and frequently-occurring diseases, and is easy to cause misdiagnosis and missed diagnosis. This child has a left coronary artery anomaly originating from the right coronary sinus, with one exit, and intramural walking. It is a dangerous coronary artery abnormality. He has a history of syncope after exercise, accompanied by incontinence, presented with acute heart failure and respiratory failure this time. CMR suggested a combined old myocardial infarction. And myocardial damage occurred within 12 h. Such reports are relatively rare [5]. This child is also the first case of coronary artery exploration + left coronary artery correction with ECMO support.

The main cause of death of the child is not strict immobilization and has not early attention to abnormal post-exercise syncope. This case shows coronary artery origin abnormalities can cause serious adverse effects such as acute myocardial damage, acute heart failure, acute respiratory failure, affect heart function, even death. Accordingly, coronary angiography, CT angiography, and CMR should be actively used to determine whether there are abnormal origins, intramural walking or between the aorta and pulmonary artery walking and myocardial ischemia. Once the diagnosis is confirmed, timely operation should be carried out to prevent irreversible damage occur [6].

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