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Anomalous Right Coronary Artery Origin in a High School Athlete

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Abstract

Coronary anomalies are the cause of 12% of sudden deaths among athletes. Similarly anomalous coronary origin from the opposite sinus is often found at autopsy. The use of echocardiography to screen for these types of defects may provide a potentially life-saving diagnosis. The authors present a case that highlights the utility of echocardiography as part of a comprehensive screening program for athletes.

Keywords

sudden cardiac death; anomalous origin of right coronary artery; anomalous coronary arteries; athlete screening; congenital heart disease

Using echocardiography for the screening of athletes to prevent sudden death on the playing field is controversial.^{1,2} Presently in the United States, there is no required protocol for screening athletes for cardiac anomalies. Although rare, the sudden death of an apparently healthy young athlete is shocking. Coronary artery anomalies account for approximately 12% of sports-related cardiac deaths³ and the diagnosis is usually not known beforehand. Last year in Houston, Texas, two 13-year-old girls died in separate events while involved in playing basketball. Both were found to have anomalous coronary arteries. Due to our interest in the screening of athletes, in order to prevent such tragedies, we have been making a special effort to locate the coronary artery origins.

Case Report

A 16-year-old high-school football player was referred for a stress echocardiogram. He had a 1-year history of right-sided chest pain which occurred while running. The pain was thought to be of noncardiac etiology however the stress echocardiogram was ordered because of the patient's participation in competitive sports. The young man had a history of asthma and a BMI of 34.6 kg/m². His blood pressure and electrocardiogram (EKG) were normal, and there was no family history of acute myocardial infarction. The baseline echocardiogram was normal except for a structure appearing over the aorta in the short axis view, raising the possibility of an anomalous coronary artery (Fig. 1).

The patient exercised for 12 minutes and 15 seconds following the Bruce Protocol, and chest pain occurred when his heart rate was at or above 190 beats per minute. The stress EKG was completely normal. The postexercise portion of the stress echocardiogram was also normal, except for a suspicion of septal flattening in the left ventricular short-axis views.

Shortly after the stress echocardiogram, the patient was sent for a computed tomography (CT) angiogram, where it was confirmed that his right coronary artery (RCA) emerged from the left coronary cusp, coursing between the aorta and the right ventricular outflow tract (Fig. 2). It was a nondominant RCA. In addition to CT, transesophageal echo is another modality that may be used for determining the coronary artery anatomy as demonstrated by Ohta et al.⁴

Discussion

There are several minor coronary artery malformations which are harmless at rest, but can become fatal with exercise.⁵ It is challenging to image the coronary origins with echocardiography in adolescents and adults and not all coronary variations lend themselves to echo imaging. Anomalous coronary origin from the opposite sinus appears to be the most common malformation found when an anomalous coronary is the cause of sudden death in athletes.⁶ Echocardiographic imaging of this variation is generally achievable with practice. In the case of the 16-year-old, part of the anomalous right coronary was relatively easy to image as it coursed from its origin on the left to its destination on the right, providing a potentially life-saving diagnosis. Adding color Doppler to the coronary artery exam was not done here but it could be used to add information as to the course and direction of flow in the anomalous vessel.

Coincidentally, a 45-year-old man was sent for a bicycle stress echo shortly after the above patient was seen. This asymptomatic man had gone for a screening CT study with his friends where he was found to have an anomalous right coronary artery originating from the left coronary os. His only complaint was a long term history of shortness of breath whenever he quickly walked up one flight of stairs. His echo image below was nearly identical to that of the 16-year-old. It is interesting to note that although a lower frequency probe was used with this older patient, the anomalous coronary could still be visualized (Fig. 3).

Screening athletes before they engage in competitive sports may help to lessen the incidence of sudden death in this group of young and apparently healthy individuals. Coronary anomalies occur in only 0.2–1.2%³ of the general population, yet they are the cause of 12% of sudden deaths in athletes. Imaging the origins of the coronary arteries can be done in the parasternal short-axis view of the aorta using a high frequency transducer. The coronaries generally move in and out of view during each cardiac cycle and are best seen during late systole and early diastole, so freezing a cine loop and scrolling through it is a good way of analyzing the images. If a small vessel appears to be coursing around the aorta in the short-axis view, this raises a high index of suspicion that it has an anomalous origin. The right coronary artery is harder to image than the left, so imaging its origin in the parasternal long axis aortic view is another possibility.

Management decisions in patients with anomalous coronaries are not always easy. In the case of the 16-year-old, surgery was not recommended at this time. Instead he is being treated medically and has been restricted from strenuous sports activities. The 45-year-old is also being treated medically since he has been working long hours for many years and is not symptomatic.

In summary, cases such as these emphasize the need for, and the utility of limited echo imaging in a cost effective manner as part of a quick and comprehensive screening program for athletes.

References

1. Pelliccia A, Fagard R, Bjornstad HH, et al. Recommendations for competitive sports participation in athletes with cardiovascular disease. A consensus document from the Study Group of Sports Cardiology of the Working Group of Cardiac Rehabilitation and Exercise Physiology, and the Working Group of Myocardial and Pericardial diseases of the European Society of Cardiology. *Eur Heart J*. 2005; 26:1422–1445. [PubMed: 15923204]
2. Maron BJ, Zipes DP. 36th Bethesda Conference: Eligibility recommendations for competitive athletes with cardiovascular abnormalities. *J Am Coll Cardiol*. 2005; 45:2–64.
3. von Kodolitsch Y, Fanzen O, Lund GK, et al. Coronary artery anomalies. Part II: Recent insights from clinical investigations. *Z Kardiol*. 2005; 94:1–13. [PubMed: 15668824]
4. Ohta Y, Ohta T, Kobayashi S, et al. Anomalous origin of the right coronary artery from the left sinus of valsalva. *Echocardiography*. 2002; 19:2, 161–163.
5. Thiene G, Carturan E, Corrado D, et al. Prevention of sudden cardiac death in the young and in athletes: Dream or reality? *Cardiovascular Pathology*. (in press). 10.1016/j.carpath.2009.04.001
6. Basso C, Maron BJ, Corrado D, et al. Clinical profile of congenital coronary artery anomalies with origin from the wrong aortic sinus leading to sudden death in young competitive athletes. *J Am Coll Cardiol*. 2000; 35:1493–1501. [PubMed: 10807452]

Figure 1.
Parasternal short-axis view of aorta in a 16-year-old male.

Figure 2.
CT angiogram images demonstrating the common origin of both coronary arteries.

Figure 3.
Parasternal short-axis view of aorta in a 45-year-old male.