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Case Report

Aortic Valve Replacement Challenge in a Patient With a High Take-off Right Coronary Artery

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ABSTRACT

High take-off right coronary artery (RCA) is a rare coronary variation with an incidence rate of 0.019% to 0.17% that can make disturbances during cardiac surgery. This abnormality may be silent clinically and diagnosed during the surgical repair of coexisting anomalies such as aortic valve abnormalities and ventricular or atrial septal defects or at autopsy evaluation of an athlete with sudden cardiac death. We herein describe a middle-aged man who suffered from exertional dyspnea. The patient had no history of concurrent diseases. Echocardiography revealed a left ventricular ejection fraction of 50% and severe stenosis in the aortic valve (gradient =70 mm Hg). He was scheduled for aortic valve replacement. However, during preoperative angiographic assessments, attempts to cannulate the right coronary ostium were unsuccessful. During surgery, a high take-off RCA was incidentally found with a long intramural course. The artery was saved and internally fenestrated into the right sinus after a modified aortotomy along with aortic valve replacement. ***(Iranian Heart Journal 2021; 22(4): 145-147)***

KEYWORDS: Anomalous origin, Open-heart surgery, High take-off, Right coronary artery

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High take-off right coronary artery (RCA) is a rare coronary variation that can make disturbances during cardiac surgery. [1-5, 7] In this anomaly, the RCA courses above the sinotubular junction. [5] Most of these configurations can be silent clinically, and they may be diagnosed incidentally during surgery or autopsy. [6, 8] Nevertheless, if they remain unnoticed, the condition may lead to serious problems such as myocardial infarction and sudden cardiac death, especially in the course of physical exertion. [1-4] Herein, we describe a middle-aged man with a high take-off RCA, which was incidentally discovered during aortic valve replacement with a mechanical ATS prosthesis. We planned to save the high take-off RCA.

Case Report

A 62-year-old man was admitted to our department for aortic valve replacement due to symptomatic severe aortic valve stenosis. Transthoracic echocardiography showed severe calcified aortic valve stenosis with a peak gradient of 70 mm Hg. Ejection fraction was 50% with moderate left ventricular hypertrophy. During diagnostic coronary angiography, the left coronary territory was normal; however, repeated attempts to cannulate the right coronary ostium were

unsuccessful. The patient was scheduled for mechanical aortic valve replacement.

During surgery, we encountered a band-like bulge (Fig. 1), coursing downward from the high midline within the ascending aorta (3 cm above the sinotubular junction) with a long intramural course to the point where the RCA was expected to originate. Distal to that was a normal RCA course and branching.

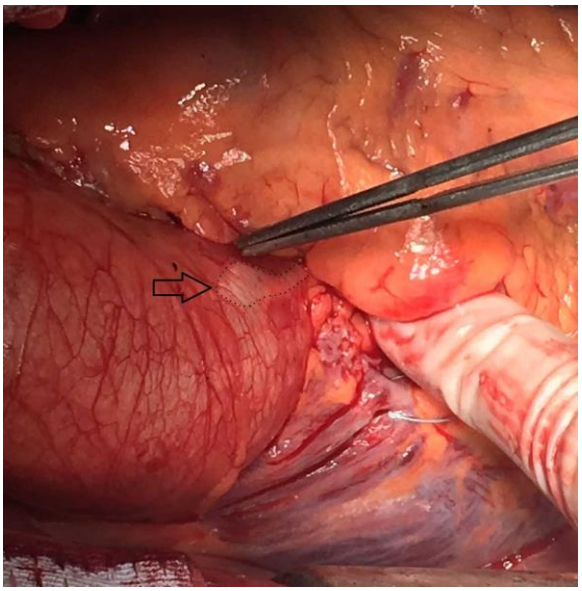

Figure 1. The intraoperative picture shows a high take-off right coronary artery, marked with dotted outlines and arrows.

During surgery, we planned to save the high take-off RCA. Thus, after the establishment of cardiopulmonary bypass and under moderate hypothermic arrest with antegrade cold blood cardioplegia, a modified aortotomy was performed. An oblique aortotomy was made starting just beside the right side of the RCA ostium extending down to the right and posterior portion of the aorta. The calcified aortic cuspal structures were excised thoroughly via the aortotomy. Aortic valve replacement was performed with a mechanical ATS prosthesis (No. 20), and the intramural course of the RCA was fenestrated within the right Valsalva sinus to obviate any possible coronary stenosis. The aortotomy was closed while caution was exercised so as not to injure the ostium and course of the high take-off RCA (Fig. 2). The patient was weaned off the cardiopulmonary bypass after the warming and de-airing processes. The postoperative course was uneventful, and the patient was discharged on postoperative day 5 with a target international normalized ratio (INR) of 2.6.

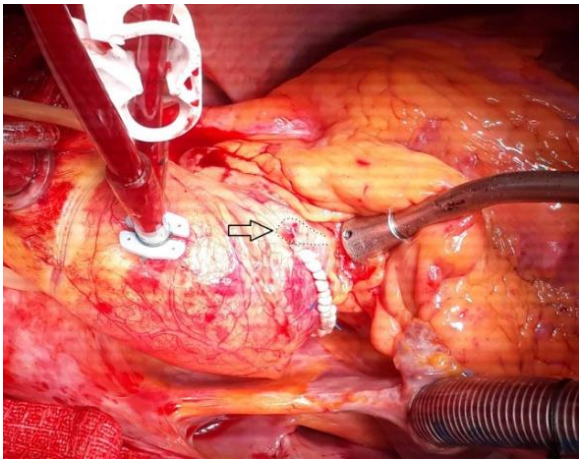

Figure 2. The picture shows the closure of aortotomy while caution is exercised so as not to injure the ostium and course of the high take-off right coronary artery.

DISCUSSION

The second common cause of sudden cardiac death among young athletes is coronary artery anomaly. Although it exists from birth, it is incidentally diagnosed during angiography or at autopsy. [2, 8]

The reported incidence rate of high take-off RCA is 0.019% to 0.17%. [1, 3] The most important concern is decreased coronary perfusion, which may result in myocardial ischemia and angina, syncope, dizziness, dyspnea, and sudden cardiac death. [6] Physical activities intensify the clinical symptoms. [6, 8] The compression of the RCA at the point where it arises between the aorta and the right ventricular outflow tract may lead to ischemia and infarction. The long course of the RCA with an acute angle of the origin and a slit-like shaped ostium can also result in the disturbance of myocardial perfusion.

Associations with bicuspid aortic valve and [1, 5] coexisting ventricular [5] and atrial septal defects [3] have been reported. These variations cause technical challenges during the injection of cardioplegia and, thus, the risk of undesirable trauma to the abnormal RCA increases. [3]

We herein described a middle-aged male candidate for aortic valve replacement due to symptomatic severe aortic valve stenosis. During surgery, a high take-off RCA was incidentally found with a long intramural course, which was saved and internally fenestrated into the right sinus after modified aortotomy along with aortic valve replacement.

Arif Tarhan et al [1] reported a case with high take-off RCA originating 5 cm above the normal location and a long transmural course. The anomaly was discovered incidentally during aortic valve replacement, which is similar to our patient. Nonetheless, in our case, this distance was 3 cm.

Xicheng Deng et al [3] described a 9-year-old boy, whose RCA originated 2 cm above the sinotubular junction. The authors also discovered this variation incidentally during surgery, but their patient was scheduled for a secundum atrial septal defect repair. They also did not repair the variation, in contrast to Arif Tarhan et al, [1] who repaired the RCA by saphenous vein graft bypass.

Bülent Eren et al [5] reported a high take-off RCA situated 17 mm above the sinotubular junction. They found the anomaly in the autopsy evaluation of a 46-year-old woman with sudden cardiac death.

It is imperative to be aware of coronary anatomy. Misdiagnosis can result in unexpected injury. Angiographic evaluation is essential before different cardiac surgeries. Multidetector computed tomography has been successfully used to determine the accurate anatomy of the RCA. [4]

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