Anomalous Origin And Inter-Arterial Course of the Right Coronary Artery: A Case Series

Anormal Orjinli ve İnterarteryal Seyir Gösteren Sağ Koroner Arter: Olgu Serisi

Anomalous Right Coronary Artery Series

Hatice Kaplanoğlu[1], Osman Beton[2], Tolgahan Efe[3], Serra Özbal Güneş[1], Baki Hekimoğlu[1]
[1]Department of Radiology, Diskapi Yildirim Beyazit Research and Training Hospital, Ankara,
[2]Cumhuriyet University, Faculty of Medicine, Department of Cardiology, Heart Center Hospital, Sivas,
[3]Department of Cardiology, Diskapi Yildirim Beyazit Research and Training Hospital, Ankara, Turkiye

Öz

Radyoloji kliniğimizde, Kasım 2014 ve mayıs 2016 tarihleri arasında göğüs ağrısını, koroner revaskülarizasyon prosedüründen sonra koroner arteri ve olası koroner arter anomalilerini değerlendirmek için amacıyla refere edilen 1200 hastaya ÇKBT yapıldı. BT anjiyografi yapılan hastalar arasından koroner anomalisi olan hastalar değerlendirildi. Toplam x sayıda hastada koroner anomali olduğu gözlendi. Bu hastaların altısında (erkek:3, kadın:3) anormal orjinli RCA saptandı. Olguların özgeçmişinde anormal çıkışlı RCA kaynaklı MI veya iskemi nedenli hastaneye başvuru yoktu. Tüm hastaların ekokardiyografileri doğaldı. ÇKBT' de sol koroner arter orjinine yakın fakat ayrı olarak, sol sinüs valsalvadan orjin alan sağ koroner arter izlendi (resim 1). Tüm hastalarda RCA' nın proksimal kesimi, aorta ve pulmoner arter arasında interarteryal seyir göstermekteydi (resim 2). ÇKBT' de anormal orjinli RCA' da perkütan koroner girişim gerektirecek anlamlı stenoz saptanmadı. Olguların tamamı medikal olarak tedavi edildi ve yaklaşık yirmi dört aylık izlem sonrasında, kötü kardiyak bir olay görülmedi.

Anahtar Kelimeler

Koroner Arter Anomalisi; İnterarteryal Seyir; Koroner BT; Taşikardi

Abstract

In our radiology clinic, between November 2014 and May 2016, we obtained MSCT from a total of 1,200 patients who had presented with chest pain, and who had undergone coronary revascularization procedures, in order to evaluate coronary arteries and possible coronary artery anomalies. Among the patients who had computed tomography (CT) angiography, the patients with coronary anomalies were evaluated. In total, 10 patients with coronary anomalies were included. An anomalous origin of the RCA was detected in six of these patients (3 males and 3 females). None of the patients was admitted to hospital for myocardial infarction (MI) or ischemia caused by an anomalous origin of the RCA. The ECG findings of all patients were normal. Close to the origin of the left coronary artery, but separately, a right coronary artery originating from the left sinus of Valsalva was observed in the MSCT (Figure 1). The proximal part of the RCA had an interarterial course between the aorta and pulmonary artery in all patients (Figure 2). No significant stenosis in an anomalous origin of the RCA requiring percutaneous coronary intervention was detected in the MSCT. All patients were treated medically and no unfavorable cardiac event was observed during approximately two years of follow-up.

Keywords

Coronary Artery Anomaly; Interarterial Course; Coronary CT; Tachycardia

DOI: 10.4328/JCAM.4944 Received: 04.02.2017 Accepted: 18.02.2017 Printed: 01.02.2017 J Clin Anal Med 2017;8(suppl 1): 42-5
Corresponding Author: Hatice Kaplanoglu, Department of Radiology, Diskapi Yildirim Beyazit Training and Research Hospital, 06100, Ankara, Turkiye.
T.: +90 3125084443 F.: +90 31231866 E-Mail: hatice.altnkaynak@yahoo.com.tr

Introduction

A right coronary artery (RCA) originating from the left sinus of Valsalva is a rare congenital anomaly that accounts for 0.1% of patients undergoing angiography. There is an abnormal inter-arterial course in 99% of the patients with an anomalous origin of the RCA. An anomalous origin of the RCA can be benign and asymptomatic, but it can also be highly risky due to its anatomical characteristics [1]. Its clinical manifestations are quite variable and can be associated with sudden cardiac death, myocardial ischemia, and syncope [2]. The development of electrocardiography (ECG) gated multi-slice computed tomography (MSCT) enables detection of coronary anomalies definitively and in a non-invasive manner [3]. Herein, we present six RCA cases with left sinus of Valsalva origin and inter-arterial course in the light of the literature.

Case Report 1

A 72-year-old female patient presented with complaints of atypical chest pain and hypertension. Her medical history revealed hypertension and stent placement in the proximal part of the left circumflex (LCx) artery 20 years previously. Hypercholesterolemia was detected in the laboratory examination. The ECG findings were normal. Echocardiography (ECHO) showed segmental wall disturbance in the left ventricle and dilatations of the left atrium and left ventricle. In the MSCT, the right coronary artery originated from the left sinus of Valsalva and its proximal 2 cm segment with a thin calibration had a course between the pulmonary artery and the aorta. In the middle part of the left anterior descending (LAD) artery, there were mixed plaques causing moderate stenosis in the lumen. The patient was prescribed hypertensive and anti-hyperlipidemic drugs. She was followed at six-month intervals for 24 months, and no ischemic symptom was observed.

Case Report 2

A 26-year-old male patient was admitted to our cardiology outpatient clinic with a complaint of palpitation. On admission his heart rate was high and irregular, ranging between 90 and 120 bpm. There was no history of smoking, alcohol use, or comorbidity in his medical history. His laboratory test results were normal. Tachycardia was seen on the ECG and ectopic beats were noted. In the MSCT, the right coronary artery with a normal calibration originated with an acute angle from the left sinus of Valsalva and had a course between the pulmonary artery and aorta. No atherosclerotic plaques causing stenosis in the vessels were detected. Medical treatment was initiated, and he is still under follow-up.

Case Report 3

A 50-year-old female patient presented with complaints of dyspnea and chest pain. Her medical history revealed diabetes. Her laboratory analysis showed that the blood glucose was regulated and she had dyslipidemia. There was sinus rhythm on the ECG. The ECHO findings were normal. In the MSCT, the right coronary artery originated from the left sinus of Valsalva and its proximal 3 cm segment with a thin calibration had a course between the pulmonary artery and aorta. There were soft plaques that did not cause significant stenosis in the lumen of the LAD and LCx arteries. Medical treatment was initiated and she is still under follow-up.

Case Report 4

A 75-year-old female patient presented with complaints of dyspnea, fatigue, and atypical chest pain. Her medical history revealed hypertension and her coronary angiography showed non-critical stenosis. There was sinus rhythm on the ECG. The ECHO showed left ventricle hypertrophy and degenerative aorta stenosis. In the MSCT, the right coronary artery originated from the left sinus of Valsalva and its proximal 1.5 cm segment with a thin calibration had a course between the pulmonary artery and aorta. Also, there were multi-segmental mixed plaques causing mild-to-moderate stenoses along the lumen of the RCA. Medical treatment was initiated and she was followed at six-month

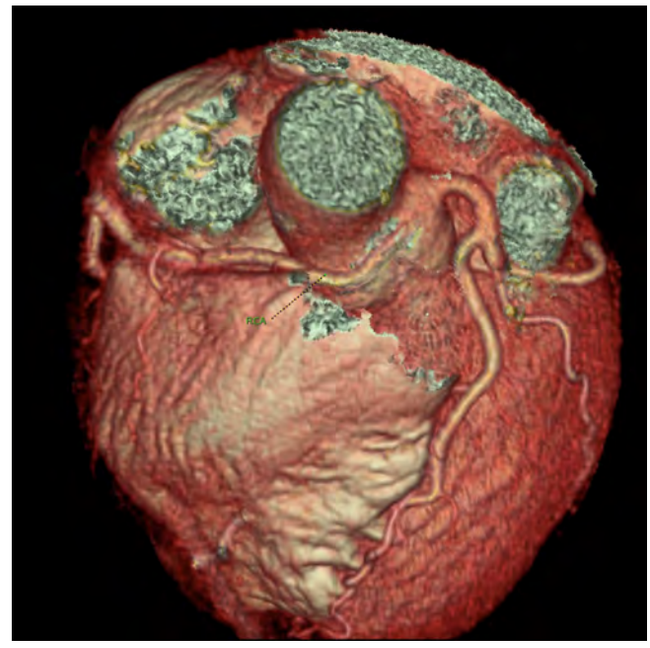

Figure 1. The right coronary artery origination from the left sinus of Valsalva was observed.

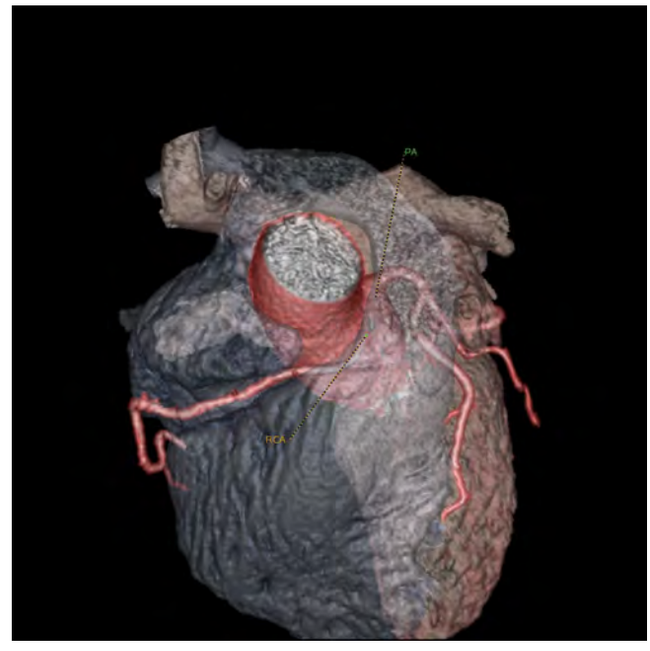

Figure 2. The proximal part of the RCA has an inter-arterial course between the aorta and pulmonary artery.

intervals. During 16-months of follow-up, no ischemic symptom was observed.

Case Report 5

A 65-year-old male patient presented with complaints of palpitation and dyspnea while climbing stairs. There were coronary heart disease and dyslipidemia in his medical history. The ECG and ECHO findings were normal. In the MSCT, the right coronary artery originated from the left sinus of Valsalva and its proximal 2 cm segment with a thin calibration had a course between the pulmonary artery and aorta. A stent was seen extending from the proximal origin of the RCA to 5 cm distally with a patent lumen. Also, there were stents in the distal parts of the LCx and LAD arteries with patent lumens. Medical treatment was initiated and he was followed at six-month intervals. During the 21-month follow-up, no ischemic symptom was observed.

Case Report 6

A 51-year-old male patient presented with complaint of palpitation and dyspnea during long distance walking. His medical history revealed diabetes. There was sinus rhythm on the ECG. The ECHO showed Grade 1 diastolic dysfunction. In the MSCT, an aberrant right coronary artery originated from the left sinus of Valsalva with an acute angle and its proximal 2.5 cm segment with a thin calibration had a course between the pulmonary artery and aorta. No atherosclerotic plaques causing significant stenosis within the lumens of coronary arteries were detected. Medical treatment was initiated and he was followed at six-month intervals. During 21 months of -month follow-up, no ischemic symptom was observed.

Discussion

Abnormal coronary arteries are rare and their clinical results may range from asymptomatic to sudden cardiac death [1]. The incidence of abnormal right coronary arteries in coronary angiography studies ranges from 0.06 to 0.5% [4]. In addition to this, the incidence of an anomalous origin of the RCA has been reported to be 0.92% in the overall population and is higher than the incidence of left main coronary artery origin [5].

The coronary artery with an anomalous origin may have an inter-arterial, retro-aortic, pre-pulmonic, or septal (sub-pulmonic) course. However, the most frequent course is inter-arterial [3]. The incidence of sudden death in patients with an inter-arterial course is 25-40%; half of the reported cases are associated with exercise [3]. In the literature, various anomalous origins of the RCA have been reported including the descending thoracic aorta, left main artery (LMA), LCx, from left sinus of Valsalva or above, from the pulmonary artery, or below the aortic valve [4]. Following its abnormal origin, the RCA lies in the anterior, posterior, or at the base of the heart between the great arteries. The course at the base of the heart between the great arteries is known as malignant type anomaly due to the risk of extrinsic compression and sudden death [4].

If coronary anomaly causes a complaint, the symptoms commonly occur before the age of 30 and its occurrence is strongly correlated with exercise [6]. The clinical manifestations can vary from angina, acute myocardial infarction, syncope, and heart failure to sudden death. Inter-arterial course of aberrant coronary arteries is a risk factor for sudden death [2]. In the anomalies without an inter-arterial course, sudden cardiac death results from the narrowed orifice or emergence of aberrant coronary artery with an acute angle [7].

The cardiac symptoms may be caused by pinching between the aorta and pulmonary artery or increased cardiac output during exercise [6]. A dilated aortic root or the compression of coronary artery lumen between the aorta and pulmonary artery restricts blood flow. Sudden arrhythmias such as paroxysmal supraventricular tachycardia are caused by these hemodynamic changes [6]. The intussusception of the origin part of the RCA into the aortic wall is described as the intramural part and it may be compressed by the dilated aorta during increased cardiac output [2]. The presence of abnormal slit-like ostium in the aortic wall and emergence of the RCA with an acute angle may restrict coronary blood flow [2]. The emergence of aberrant coronary artery with an acute angle from the aorta and a tortuous course of its proximal part accelerate atherosclerosis [2].

Most of the anomalous origins of the RCA are detected incidentally. Clinical presentation and disease course may substantially vary among asymptomatic patients. Clinical outcomes are usually benign, and the incidence of sudden death associated with coronary anomalies among these patients is very low. Conservative treatment is ideal particularly for those who do not have an inter-arterial course [4]. In young patients (<35 years) and for patients who have angina symptoms and ischemia during an exercise stress test, percutaneous coronary intervention (PCI) or surgical treatment is usually considered. Surgery is not needed in elderly patients without angina symptoms or ischemic findings [5]. Excellent results have been obtained with medical treatment in these patients in the long-term, and no cardiac ischemia was reported [8].

Treatment options include medical treatment in conjunction with restriction of high-force physical exercise, placement of a stent into the compressed vessel, or surgical treatment. Although medical treatment is effective and less invasive, high-force physical exercise should be avoided, since there is a potential risk for sudden cardiac death [8]. Suggested surgical treatment options are unroofing the coronary artery, re-implantation of the coronary ostium, and coronary artery bypass grafting [7]. In the presence of an intramural segment in the abnormal coronary artery, the intramural segment of the coronary artery is dissected and re-implanted into the correct sinus of Valsalva. Unroofing is a technically established and safe approach to correct the anomaly [8]. It can be also applied to abnormal arteries with slit-like ostium and a supracommissural intramural course. Vessel translocation or re-implantation is recommended as a treatment option in patients without an intramural segment [8]. The literature review showed that coronary artery bypass grafting would be the most appropriate choice of treatment in patients older than 60 years old in whom concomitant atherosclerotic stenosis is detected in the RCA, as assessed by angiography [8].

Conclusion

Coronary CT angiography is complementary to coronary angiography. The signs of various coronary arterial anomalies on CT and an under¬standing of the clinical importance of these

anomalies are es¬sential for an accurate diagnosis and for treatment planning for the patient.

Competing interests

The authors declare that they have no competing interests

References

1. Fuglsang S, Heiberg J, Byg J, Hjortdal VE. Anomalous origin of the right coro¬nary artery with an interarterial course and intramural part. Int J Surg Case Rep 2015;14:92-4.
2. Angelini P. Coronary artery anomalies: an entity in search of an identity. Circula¬tion 2007;115(10):1296–305.
3. -Satija B, Sanyal K, Katyayni K. Malignant anomalous right coronary artery detected by multidetector row computed tomography coronary angiography. J Cardiovasc Dis Res 2012;3(1):40-2.
4. Suryanarayana P, Lee JZ, Abidov A, Lotun K. Anomalous right coronary artery: case series and review of literature. Cardiovasc Revasc Med 2015;16(6):362-6.
5 Lee BY. Anomalous right coronary artery from the left coronary sinus with an interarterial course: is it really dangerous? Korean Circ J 2009;39(5):175-9.
6- Angelini P, Velasco JA, Flamm S. Coronary anomalies: incidence, pathophysiol-ogy, and clinical relevance. Circulation 2002;105(20):2449-54.
7. Fedoruk LM, Kern JA, Peeler BB, Kron IL. Anomalous origin of the right coronary artery: right internal thoracic artery to right coronary artery bypass is not the answer. J Thorac Cardiovasc Surg. 2007;133(2):456-60.
8. Matsumura K, Matsumoto H, Hata Y, Ueyama T, Kinoshita T, Kuwauchi S, et al. Anomalous Right Coronary Artery Arising from the Left Sinus of Valsalva in a Young Athlete. Intern Med 2016;55(1):55-8.

How to cite this article:
Kaplanoğlu H, Beton O, Efe T, Güneş SÖ, Hekimoğlu B. Anomalous Origin and Inter-Arterial Course of the Right Coronary Artery: A Case Series. J Clin Anal Med 2017;8(suppl 1): 42-5.