Single coronary artery anomaly: a report of three cases

Tek koroner arter anomalisi: Üç olgu sunumu

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We presented three cases of anomalous single coronary artery detected incidentally during routine coronary angiography. The presenting symptoms were chest pain, angina pectoris, and exertional chest pain, respectively. In one case (male, 69 years), the single coronary artery gave off branches to the left anterior descending artery, left circumflex (LCx) artery, and right coronary artery (RCA) (type L-I). There were no atherosclerotic lesions. The patient's chest pain was thought to have a noncardiac origin and it did not recur during a 12-month follow-up. In another case (male, 65 years), the single coronary artery originated from the right sinus of Valsalva, and gave off branches to the RCA and the left coronary system (type R-I). The patient underwent coronary artery bypass surgery for significant stenotic lesions in the LCx and RCA. He was free of angina pectoris within 12 months after surgery. In the third case (female, 48 years), a single coronary ostium gave branches to the right and left coronary systems (type R-II-B). As the course of the coronary artery was between the aorta and pulmonary artery, surgery was recommended, but the patient refused surgery.

Key words: Angina pectoris/etiology; coronary angiography; coronary vessel anomalies; sinus of Valsalva/abnormalities.

Rutin koroner anjiyografi sırasında raslantısal olarak tek koroner arter anomalisi saptanan üç olgu sunuldu. Başvuru yakınmaları sırasıyla göğüs ağrısı, angina pektoris ve egzersizle ortaya çıkan göğüs ağrısıydı. Bir olguda (erkek, yaş 69) tek koroner arterden, sol ön inen arter, sol sirkumfleks (LCx) arter ve sağ koroner arter (RCA) çıkım göstermekteydi (tip L-I). Hastada aterosklerotik lezyon saptanmadı. Göğüs ağrısı yakınmasının kardiyak kökenli olmadığı düşünüldü. On iki aylık izlemi sırasında da göğüs ağrısı tekrarlamadı. Bir diğer olguda (erkek, yaş 65), tek koroner arter sağ Valsalva sinüsünden çıkmakta ve RCA ve sol koroner sisteme dallanmaktaydı (tip R-I). Anjiyografide LCx ve RCA'da önemli darlık görülmesi nedeniyle hastaya koroner arter baypas cerrahisi yapıldı ve 12 aylık izlemi sırasında angina pektoris semptomları izlenmedi. Üçüncü olguda (kadın, yaş 48), tek koroner ostium sağ ve sol koroner sistemlere dal vermekteydi (tip R-II-B). Koroner arter aort ve pulmoner arter arasında seyrettiğinden, hastaya ameliyat önerildi; ancak hasta cerrahiyi kabul etmedi.

Anahtar sözcükler: Angina pektoris/etyoloji; koroner anjiyografi; koroner damar anomalisi; Valsalva sinüsü/anormallik.

Single coronary artery is a rare coronary anomaly which may present as myocardial ischemia and sudden cardiac death especially in young adults. Attentive evaluation and management is needed for this anomaly. Herein, we presented three cases of solitary coronary artery detected incidentally during routine coronary angiography.

CASE REPORT

Case 1– A 69-year-old man was admitted to the cardiology department with chest pain. Smoking was the only risk factor for atherosclerosis. Physical examination was normal. Electrocardiography showed nonspecific ST-T changes in leads V1-V6 and echocardiography was nonspecific. On coronary angiography, only a solitary ostium could be cannulated, giving off branches to the left anterior descending (LAD) artery, left circumflex (LCx) artery, and right coronary artery (RCA) (Fig. 1a). There were no atherosclerotic lesions in the coronary arteries. The single coronary artery was classified as type L-I. We thought that his chest pain did not originate from a cardiac cause. He was free of chest pain during a 12-month follow-up.

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Case 2– A 65-year-old man presented to the emergency room with angina pectoris. Physical examination was normal. He did not have any risk factors for atherosclerosis. On his electrocardiogram, there were negative T waves in leads V1-V4. The patient was admitted to the coronary care unit for further evaluation. Cardiac biomarkers were not significant. Following medical treatment with aspirin, beta-blocker, statin, angiotensin-converting enzyme, and nitrate, his angina pectoris was resolved. Transthoracic echocardiography demonstrated hypokinesia of the anterior wall of the left ventricle. Ejection fraction was estimated as 47% by the modified Simpson's method. Coronary angiography was performed. The left coronary artery ostium could not be cannulated selectively. Selective cannulation of the right sinus of Valsalva demonstrated a single coronary artery originating from the right sinus of Valsalva, and giving off branches to the RCA and the left coronary system (Fig. 1b). The single coronary artery was classified as type R-I. There were significant stenotic lesions in the LCx and RCA. The patient underwent coronary artery bypass surgery. He remained free of angina pectoris within 12 months after the surgical procedure.

Case 3– A 48-year-old female patient was examined for chest pain that occurred during exercise electrocardiographic test. Coronary angiography revealed a single coronary ostium giving branches into the right coronary system and left coronary system (Fig. 1c). The single coronary artery was classified as type R-II-B. No significant stenotic lesions were noted in the coronary arteries. As the course of the coronary artery was between the aorta and pulmonary artery, surgical procedure was recommended, but the patient refused surgery.

DISCUSSION

Single coronary artery is a coronary artery anomaly that describes the origin of both the RCA and left main coronary artery from a single aortic sinus. It is usually diagnosed incidentally during coronary artery angiograms or on postmortem evaluations.

In a large series of 126,595 patients undergoing coronary angiography, a solitary coronary artery from the right sinus of Valsalva was found in 0.019%.[1] Shirani and Roberts[2] reviewed the literature and reported 97 cases of solitary coronary artery, 46 and 51 of which originated from the left and right sinus of Valsalva, respectively.

The current classification system of solitary coronary arteries was proposed by Lipton et al.[3] in 1979,

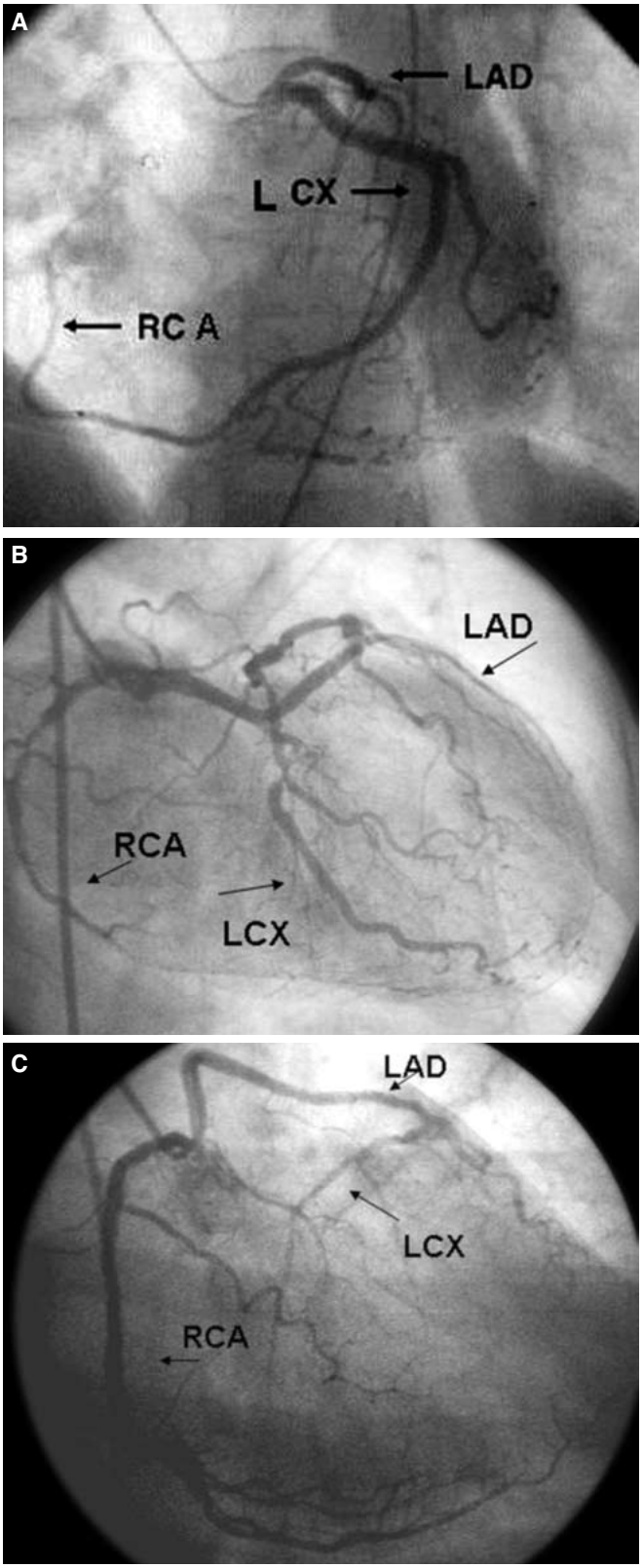

Figure 1. (A) The single coronary artery gives branches to the left anterior descending (LAD) artery, left circumflex (LCx) artery, and right coronary artery (RCA) (Case 1, type L-I). **(B)** The single coronary artery originates from the right sinus of Valsalva and gives branches to the RCA and the left coronary system (Case 2, type R-I). **(C)** The single coronary artery gives branches into the right and left coronary systems (Case 3, type R-II-B).

who incorporated two previous systems defined by Smith in 1950 and Ogden and Goodyer[4] in 1970, respectively, into one final system.

The Smith's system was based on three groups according to the types of the coronary arteries involved: In type I, either a single coronary artery courses as the RCA, LCx, and finally as the LAD, or a single left main (LM) artery gives off two branches as the LAD and LC, and RCA is formed by the extension of the LC across the crux. In type II, the main single artery either divides into the right and LM arteries, or into a RCA, LAD, and LC, which then course on their original locations. In type III, the single coronary artery exhibits an atypical branching that shows significant differences from the original coursing of the three main coronary arteries.

Ogden and Goodyear's system offered five letters to classify the single coronary artery, two of which represented the side of the ostial origin, and three of which represented the anatomic course and distribution of the branches.

Finally, Lipton et al.[3] used the letters R and L to denote the origin as the right and left sinus of Valsalva, respectively, then added a group according to the Smith's classification, followed by the three letters A, P and B, to describe the course of the anomalous artery to the pulmonary artery, where A stands for an anterior course, P stands for a posterior course, and B represents a course between the aorta and pulmonary artery.

In the first two cases, we did not attempt to determine the course of the coronary artery, because one patient did not have recurrent chest pain, and the other with atherosclerosis was already submitted to surgery.

The single coronary artery anomaly is usually asymptomatic, but may present as myocardial ischemia, syncope, or sudden cardiac death depending on its course and the presence and severity of atherosclerosis. Myocardial ischemia or sudden cardiac death are usually associated with its course between the aorta and main pulmonary artery.[2]

In general, pulmonary artery catheterization is performed to determine the course of the single coronary artery. However, a new and emerging diagnostic tool, multislice computed tomography, offers a noninvasive way of determining coronary anomalies. It has been reported that, in some cases, multislice computed tomography is more effective than coronary angiography in determining coronary anomalies.[5,6] Patients with the single coronary artery anomaly and having recurrent chest pain without atherosclerosis must be evaluated by computed tomography or pulmonary catheterization to determine the course of the artery. In addition, as the single coronary artery anomaly may coexist with aortic valve anomalies, diagnostic studies should also include transthoracic echocardiograhy.[7]

The treatment strategy for single coronary artery is not clear. The course and associated coronary atherosclerosis should guide the therapy. Coronary artery bypass surgery may be beneficial in patients whose anomalous coronary artery courses between the aorta and main pulmonary artery or/and patients with atherosclerosis may benefit from revascularization strategies. Successful percutaneous coronary intervention has also been reported in some cases.[8,9]

REFERENCES

1. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. Cathet Cardiovasc Diagn 1990;21:28-40.
2. Shirani J, Roberts WC. Solitary coronary ostium in the aorta in the absence of other major congenital cardiovascular anomalies. J Am Coll Cardiol 1993;21:137-43.
3. Lipton MJ, Barry WH, Obrez I, Silverman JF, Wexler L. Isolated single coronary artery: diagnosis, angiographic classification, and clinical significance. Radiology 1979;130:39-47.
4. Ogden JA, Goodyer AV. Patterns of distribution of the single coronary artery. Yale J Biol Med 1970;43:11.
5. Ichikawa M, Komatsu S, Asanuma H, Iwata A, Ishiko T, Hirayama A, et al. Acute myocardial infarction caused by "malignant" anomalous right coronary artery detected by multidetector row computed tomography. Circ J 2005;69:1564-7.
6. Sato Y, Ichikawa M, Komatsu S, Matsuo S, Kunimasa T, Honye J, et al. Multidetector row computed tomographic findings in a patient with anomalous origin of the right coronary artery from the left sinus of Valsalva. Cardiovasc Revasc Med 2007;8:60-2.
7. Morimoto K, Taniguchi I, Miyasaka S, Marumoto A. Bicuspid aortic valve stenosis with single coronary artery. Ann Thorac Cardiovasc Surg 2005;11:267-9.
8. Raddino R, Pedrinazzi C, Zanini G, Leonzi O, Robba D, Chieppa F, et al. Percutaneous coronary angioplasty in a patient with anomalous single coronary artery arising from the right sinus of Valsalva. Int J Cardiol 2006; 112:60-2.
9. Mirchandani S, Phoon CK. Management of anomalous coronary arteries from the contralateral sinus. Int J Cardiol 2005;102:383-9.