Isolated single coronary artery originating from a single right coronary ostium in a patient with acute myocardial infarction

Akut miyokard infarktüsü ile başvuran bir hastada sağ koroner ostiumdan çıkan tek koroner arter anomalisi

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Single coronary artery in which all three coronary arteries originate from the right sinus of Valsalva through a single ostium is a rare anomaly and its association with acute myocardial infarction (AMI) is even rarer. A 63-year-old female patient was admitted with severe chest pain of sudden onset, radiating to the neck and the left arm. Electrocardiographic findings were consistent with inferior lateral AMI. Coronary angiography demonstrated that the left anterior descending (LAD), the left circumflex (LCx) and the right coronary (RCA) arteries originated from the right sinus of Valsalva through a single ostium. There was severe discrete stenosis (95%) in the mid-portion of the RCA, and severe segmental stenosis (90%) in the proximal portion of the LCx, without any occlusion in the LAD. The patient refused recommendations for elective percutaneous coronary intervention or coronary bypass surgery and was discharged one week after angiography.

Key words: Coronary angiography; coronary stenosis; coronary vessel anomalies/classification; myocardial infarction/etiology.

Her üç koroner arterin tek ostiumla sağ koroner Valsalva'dan köken aldığı tek koroner arter anomalisi nadirdir; akut miyokard infarktüsü ile birlikteliği oldukça az görülür. Altmış üç yaşında kadın hasta ani başlayan, sol koluna ve boynuna yayılan şiddetli göğüs ağrısıyla acil servise başvurdu. Elektrokardiyografide akut inferior lateral miyokard infarktüsü ile uyumlu bulgular saptandı. Koroner anjiyografide, sol ön inen koroner arter ve sol sirkumfleks koroner arterin sağ koroner arterle birlikte sağ sinüs Valsalva'dan tek ostiumdan köken aldığı görüldü. Sağ koroner arterin orta kısmında ciddi ve kısa (%95), sirkumfleks arterin başlangıç kısmında ciddi ve uzun (%90) darlık vardı; sol ön inen koroner arterde herhangi bir darlık izlenmedi. Perkütan koroner girişim veya koroner artar baypas cerrahisi önerilerini kabul etmeyen hasta anjiyografiden bir hafta sonra taburcu edildi.

Anahtar sözcükler: Koroner anjiyografi; koroner stenoz; koroner damar anomalisi/sınıflandırma; miyokard infarktüsü/etyoloji.

Congenital anomalies of coronary arteries occur in 0.2-1.2% of the general population.[1] Isolated single coronary artery is a rare anomaly, with an incidence of 0.044% to 0.23%.[2-4] In this coronary anomaly, only one coronary artery arises from the aortic trunk by means of a single coronary ostium supplying the entire heart. Isolated single coronary artery anomaly coexisting with acute myocardial infarction (AMI) is very rare. Angiographic recognition of this anomaly is important because of its clinical significance in patients undergoing coronary angioplasty or cardiac surgery.

In this report, we presented a case of an isolated single coronary artery originating from a single right coronary ostium and coexisting with AMI.

CASE REPORT

A 63-year-old woman was admitted to emergency department because of severe chest pain of sudden onset, radiating to the neck and the left arm. The patient had several coronary risk factors including diabetes, hypertension, age, and dyslipidemia. On admission, physical examination revealed no pathological findings other than increased blood pressure and bradycardia. Her blood pressure was 150/110 mmHg, and heart rate was regular with a mean of 55 beat/minute. Electrocardiogram showed marked ST elevation in leads II, III, aVF, and V5 to V6, confirming the diagnosis of acute inferior lateral myocardial infarction (Fig. 1). The delay between the

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onset of pain and admission was one hour. The patient was taken to the coronary intensive care unit for close follow-up and therapy. In the absence of contraindications and after obtaining informed consent, thrombolytic therapy was immediately instituted (1.5 million units STX).[5] It was accompanied by standard treatment with heparin, aspirin, nitrate, beta-blockade, analgesics, and sedatives.[5] Additionally, insulin therapy was continued because of diabetes. Cardiac enzyme levels including CK and CKMB were high (1,848 mg/dl, 354 mg/dl, respectively), Total cholesterol, LDL cholesterol, and fasting glucose levels were elevated (237 mg/dl, 161 mg/dl, and 170 mg/dl, respectively). HDL cholesterol was low (32 mg/dl). Chest pain persisted after the patient had been taken to the coronary intensive care unit. Coronary angiography was immediately carried out by the Judkins technique. Selective coronary angiography showed a single coronary artery, with the left anterior descending (LAD) coronary artery and the left circumflex (LCx) coronary artery originating separately from the proximal part of the normal right coronary artery (RCA), which arose

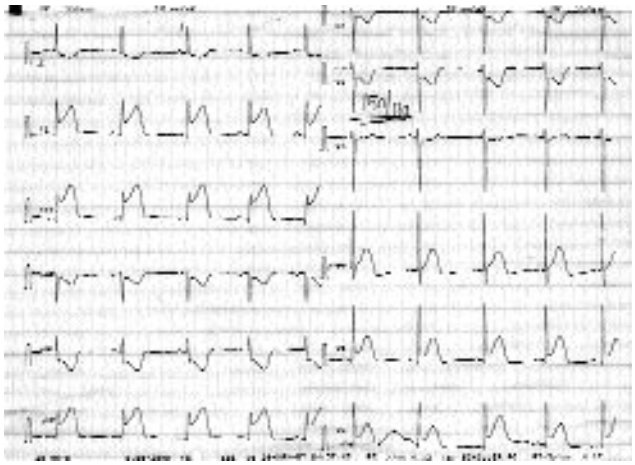

Fig. 1. The patient's electrogram consistent with marked ST elevation in leads II, III, aVF, and V3 to V6.

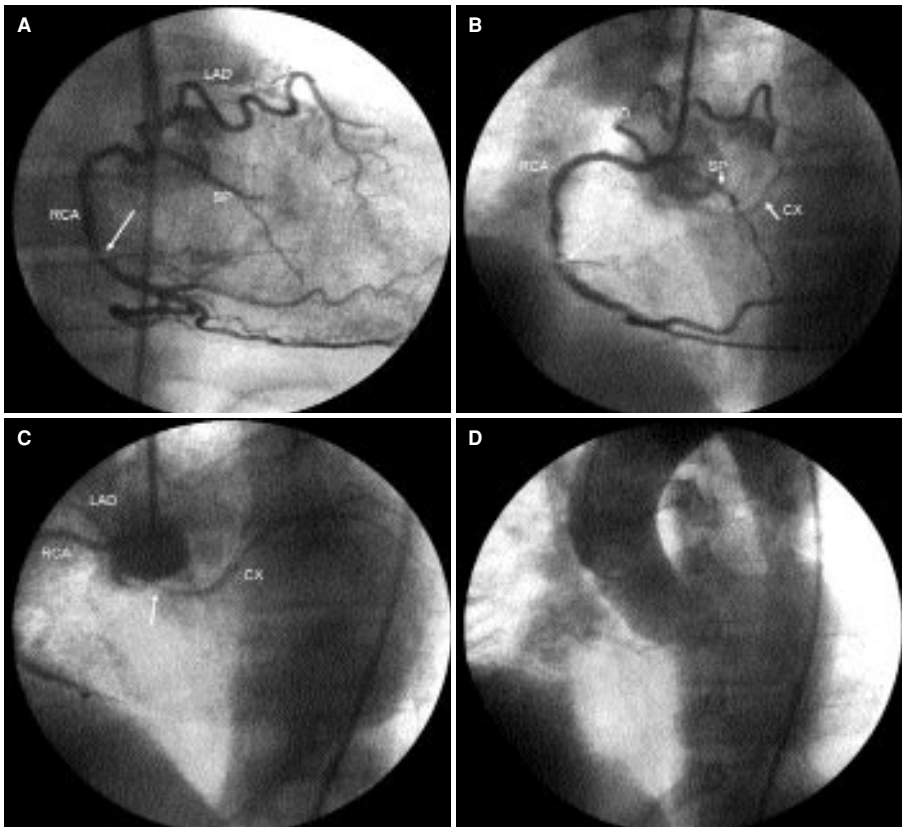

Fig. 2. (A) Selective right coronary angiography in the left anterior oblique projection, showing a single right ostium giving rise to the right coronary artery (RCA), left anterior descending artery (LAD), and septal perforator (SP). White arrow shows 95% stenosis in the mid-segment of the RCA. **(B)** The right anterior oblique projection showing a single coronary artery with the LAD and the left circumflex coronary artery (LCx), originating separately from the proximal part of the RCA. **(C)** White arrow shows 90% stenosis in the proximal segment of the LCx. **(D)** An aortogram confirming the absence of a left coronary artery.

Table 1. Angiographic types of isolated single coronary artery (modified Lipton classification)[3]

	Code	Description
Ostial location	R	Right sinus of Valsalva
	L	Left sinus of Valsalva
Anatomical distribution	I	The solitary dominant vessel follows the course of either a normal right or left coronary artery (RI or LI)
	II	One coronary artery arises from the proximal part of the normally located another coronary artery (RII or LII)
	III	LAD and LCx arise separately from a common trunk originating from the right sinus of Valsalva (RIII)
Course of the transverse trunk	A	Anterior to the great vessels
	B	Between the aorta and pulmonary arteries
	P	Posterior to the great vessels
	S	"Septal type": A part of the route passes through the interventricular septum
	C	"Combined type": Combination of diverse routes

LAD: Left anterior descending artery; LCx: Left circumflex artery; RCA: Right coronary artery.

from its normal ostium in the right sinus of Valsalva (Fig. 2a-c). An aortogram confirmed the absence of a left coronary artery (Fig. 2d). There was severe discrete stenosis (95%) in the mid-portion of the RCA (Fig. 2a, b) and severe segmental stenosis (90%) in the proximal portion of the LCx (Fig. 2c). No evidence for luminal narrowing or occlusion was noted in the LAD (Fig. 2a). The presence of a single coronary artery originating from the right sinus of Valsalva is illustrated in Fig. 3. Percutaneous coronary intervention (PCI) was recommended to the patient, but she rejected an invasive intervention and was taken to the coronary intensive care unit for close follow-up and further therapy. She was discharged healthy from hospital one week after angiography with recommendations for elective PCI or coronary bypass surgery.

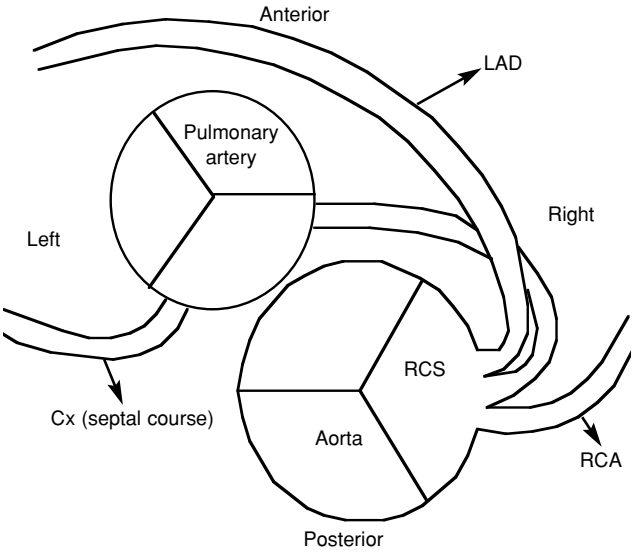

Fig. 3. Illustration of the coronary arteries originating from the right sinus of Valsalva (top view). LAD: Left anterior descending artery; Cx: Circumflex artery; RCA: Right coronary artery. RCS: Right coronary sinus.

DISCUSSION

Single coronary artery has been defined angiographically by Lipton[2] and Yamanaka and Hobbs.[3] The latter modified the Lipton classification with delineation of features such as ostial location, anatomical distribution, and the course of the transverse trunk (Table 1). Our patient's anomaly was consistent with the R-IIIC type according to this modified classification.[3]

The anomaly of single coronary artery may be associated with chest pain, sudden death, cardiomyopathy, syncope, ventricular fibrillation, or AMI.[2-4] The type R anomaly, as in our case, is involved in the development of myocardial ischemia.[2] Varying degrees of myocardial ischemia may occur when the single coronary artery becomes insufficient to support coronary circulation. Sudden death has been reported to be associated with a major coronary artery coursing between the aorta and the main pulmonary artery.[2] Constriction of the coronary artery by the great vessels or kinking near the origin may also lead to death.[2]

The coexistence of a single coronary artery with AMI is very rare. To our knowledge, the development of AMI in a patient with the R-IIIC type anomaly has hitherto been unreported. Ohta et al.[6] reported a similar case, but their patient did not have AMI and there was severe stenosis only in the proximal portion of the LCx. In our case, stenosis was detected in both the proximal portion of the LCx and the mid-portion of the RCA. Geyik et al.[7] have recently reported the development of AMI in a

patient with the R-IIA type anomaly. Aydınlar et al.[8] reviewed 12,059 coronary angiography images and detected nine cases of single coronary artery originating from the right sinus of Valsalva. Of these, only one patient had RII type anomaly and none had AMI. Göldeli et al.[9] reported a case of L-I type single coronary artery, in which coronary artery disease was not present.

Recently, PCI has been performed with high success.[6,7] However, there is a definite procedural risk, which might result in a catastrophic event in patients with a single ostium. Occlusion of the ballooning site due to dissection or thrombus may compromise blood flow to a significant portion of the myocardium. As another treatment option, coronary artery bypass grafting may be considered.[10] In our case, the patient refused our recommendations for elective PCI or coronary bypass.

In conclusion, single coronary artery coexisting with AMI is a very rare anomaly and it should be kept in mind among the causes of AMI.

REFERENCES

1. Von Kodolitsch Y, Franzen O, Lund GK, Koschyk DH, Ito WD, Meinertz T. Coronary artery anomalies. Part II: recent insights from clinical investigations. Z Kardiol 2005;94:1-13.
2. 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.
3. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. Cathet Cardiovasc Diagn 1990;21:28-40.
4. Desmet W, Vanhaecke J, Vrolix M, Van de Werf F, Piessens J, Willems J, et al. Isolated single coronary artery: a review of 50,000 consecutive coronary angiographies. Eur Heart J 1992;13:1637-40.
5. Van de Werf F, Ardissino D, Betriu A, Cokkinos DV, Falk E, Fox KA, et al. Management of acute myocardial infarction in patients presenting with ST-segment elevation. The Task Force on the Management of Acute Myocardial Infarction of the European Society of Cardiology. Eur Heart J 2003;24:28-66.
6. Ohta H, Sumiyoshi M, Suwa S, Tamura H, Sasaki A, Kojima T, et al. Primary coronary angioplasty with stenting for acute coronary syndrome in patients with isolated single coronary artery: a report of 2 cases. Jpn Heart J 2003;44:759-65.
7. Geyik B, Ozeke O, Deveci B, Maden O, Senen K. Single coronary artery presenting with cardiogenic shock due to acute myocardial infarction. Int J Cardiovasc Imaging 2006;22:5-7.
8. Aydinlar A, Cicek D, Senturk T, Gemici K, Serdar OA, Kazazoglu AR, et al. Primary congenital anomalies of the coronary arteries: a coronary arteriographic study in Western Turkey. Int Heart J 2005;46:97-103.
9. Goldeli O, Badak O, Kirimli O, Aslan O. Single coronary artery: a case report. [Article in Turkish] Türk Kardiyol Dern Arş 1999;27: 647-51.
10. Kamata S, Mieda T, Funaki S, Okada T, Kawada T, Yamate N. Coronary artery bypass grafting for a patient with single coronary artery. Nippon Kyobu Geka Gakkai Zasshi 1994;42:629-31. [Abstract]