Single Coronary Artery With Anomalous Origin of the Right Coronary Artery From the Left Anterior Descending Artery With a Unique Proximal Course

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SUMMARY

A 62-year-old man with hypertension and hypercholesterolemia was referred to our unit for evaluation of chest pain. A very rare variant of single coronary artery, in which the anomalous right coronary artery originated as a separate branch from the left anterior descending artery, was incidentally found on his coronary angiography. The anomalous right coronary artery in our case appears to be unique in that it courses intraseptally rather than rightwards proximally and has obstructive atherosclerotic lesions resulting in inferior ischemia. Moreover, the acute angle made by the anomalous right coronary artery to turn toward the atrioventricular groove may have reduced the flow velocity and contributed to the development of inferior ischemia. (Jpn Heart J 2004; 45: 521-525)

Key words: Coronary artery anomaly, Right coronary artery, Single coronary artery

CORONARY artery anomalies are detected during 1.3% of routine cardiac catheterizations and in rare cases have been associated with myocardial ischemia.1) Anomalous origin of the right coronary artery (RCA) from the left anterior descending coronary artery (LAD) is relatively uncommon and generally of no clinical significance.2-9) We describe a patient in whom the exertional angina and reversible inferior perfusion defect in technetium-99m radionuclide myocardial perfusion imaging are likely to be the result of an anomalous right coronary artery arising from the left anterior descending artery that differs from those reported previously because of its unique proximal course.

CASE REPORT

The patient is a 62-year-old Turkish man with hypertension and hypercholesterolemia as risk factors for coronary heart disease. He had had retrosternal pressure-like chest pain on heavy exertion, relieving with rest, in the previous 6
months. Physical examination, chest X-rays, and resting ECG were normal. Exercise treadmill testing was positive and a technetium-99m sestamibi study revealed a reversible perfusion defect in the inferior region of the left ventricle, for which we planned coronary angiography (Figure 1).

The left ventricle, as assessed in the right anterior oblique and left anterior oblique projections, was of normal size with good global and segmental contractility. The left ventricular end-diastolic pressure was 9 mmHg. Aortography obtained in a left anterior oblique projection revealed the absence of a right coronary ostium in the right sinus of Valsalva (Figure 2). The left coronary ostium was located normally in the left sinus of Valsalva. Selective left coronary arteriography displayed normal courses of the left main, left circumflex, and the left anterior descending arteries. The anomalous right coronary artery was visualized, originating from the first septal branch of the left anterior descending artery. It courses intraseptally, probably at the crista supraventricularis, before reaching the right atrioventricular groove. Angiographically, there were atherosclerotic lesions in the proximal right atrioventricular groove portion of the anomalous right coronary artery (Figures 3 and 4).

Figure 1. Technetium-99m sestamibi scan showing inferior ischemia (arrows).
In the largest angiographic review reported by Yamanaka and Hobbs, the incidences of coronary artery anomalies and anomalous right coronary artery in 126,595 American people were reported as 1.3% and 0.26%, respectively, with no mention of anomalous right coronary artery arising from the left anterior descending artery. The incidence of anomalous RCA in congenital coronary
anomalies is variable in different populations, with the highest incidence in Indian and the lowest incidence in German populations (0.46 and 0.04%, respectively).\textsuperscript{10,11} It was reported to be only 0.09% in the Turkish population by Ayalp, \textit{et al} in their retrospective study consisting of 5253 patients with no mention of single coronary artery.\textsuperscript{12} A variety of anomalous origins for the RCA have been reported, including the descending thoracic aorta, left main coronary artery, left circumflex coronary artery, above or from the left sinus of Valsalva, the pulmonary arteries, or below the aortic valve.\textsuperscript{1,10-18} Most of the coronary anomalies remain asymptomatic and are found as an incidental finding with coronary angiography. However, myocardial perfusion can be affected, extending from exertional angina to sudden death, in different subtypes of these anomalies, such as a coronary artery arising from the pulmonary artery and a single coronary artery arising from either the left or right sinus of Valsalva.\textsuperscript{1,18,19} Although the exact pathophysiological basis of the angina, myocardial infarction, or sudden death is unclear in cases of single coronary artery without obstructive lesion arising from either the left or right sinus of Valsalva, it might be related to mechanical compression of the anomalous coronary artery between the aorta and pulmonary root or great vessels, especially during exercise.\textsuperscript{1,18,19}

The incidence of single coronary artery in the general population is approximately 0.024%.\textsuperscript{19} The anomalous origin of the right coronary artery arising from the left anterior descending coronary artery, a subgroup of single coronary artery, is relatively rare and more benign than other types of anomalous origin of the right coronary arteries. Only eight adult cases have been reported in the literature.\textsuperscript{2-9} However, our case has two unique aspects which we think are worth mentioning and differs from previously reported cases. First, the left coronary artery had no significant disease and there were significant lesions on the mid portion of the anomalous right coronary artery, causing inferior reversible perfusion defect. Second, the anomalous right coronary artery originating from the first septal branch of the left anterior descending artery appeared to be unique because its proximal portion courses intraseptally. In addition, the acute angle made by the anomalous right coronary artery to turn toward the atrioventricular groove may have reduced the flow velocity and contributed to development of the inferior ischemia.

The patient did not accept coronary intervention after being informed of the options and potential risks associated with this anomaly and preferred long-term medical therapy. His course has been uneventful under medical therapy during 6 months' close follow-up.

In conclusion, we present a case with myocardial ischemia that was caused by obstructive atherosclerotic lesions in an anomalous right coronary artery with a distinctive proximal course and angle. To the best of our knowledge, such a
combination of an anomalous origin and course of the right coronary artery with obstructive atherosclerotic lesions resulting in inferior ischemia has not been published before.

REFERENCES