Case Report

Double Right Coronary Artery Originating from Separate Ostia: A Report of Two Cases

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Abstract

Context: Coronary artery anomalies are uncommon and most are incidental findings. Double right coronary artery (RCA) is a very rare coronary artery anomaly. **Case Report:** We report two cases of double RCA incidentally found in electrocuted patients. Both cases showed double RCA arising from separate ostia. On microscopy, both right coronaries showed no significant pathology in the first case while in the second case, the posterior RCA showed features of obliterative arteritis. **Conclusion:** Although double coronary artery has been regarded as hemodynamically insignificant, it may be associated with atherosclerosis, acute coronary syndromes, and other anomalies. It is important to know the anatomic variants. Meticulous grossing and careful observation could unearth hidden anomalies.

Keywords: Anomalies, double right coronary artery (RCA), electrocution, microscopy, ostia

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Introduction

Coronary anomalies affect approximately 1% of the general population.[1] In an autopsy study of 18,950 patients, Alexander and Griffith identified 54 anomalies and classified them into those of ostial origin and those of distribution.[2] Double right coronary artery (RCA) arising from two separated ostia in the right sinus of Valsalva is an extremely rare anomaly.[3] The first report about double RCA anomaly in the literature was by Barthe *et al*. Coronary artery anomalies are usually incidentally diagnosed at the time of coronary angiography or autopsy.[4] The understanding of pathophysiological mechanisms leading to sudden cardiac death is still far from clear and so is the role of anomalous coronary anatomy.[1]

The importance of coronary anomalies varies from minor to life-threatening.[1] Double RCA is not necessarily benign as it has been associated with atherosclerosis, life-threatening arrhythmia, and myocardial infarction (MI). The knowledge about anatomic variants of the coronary arteries is of great help for their identification.[3] Most cases present with double RCA arising from a single ostium.[5] We, hereby, report two cases of double RCA arising from two separate ostia.

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Case Presentation

Case 1

A 20-year-old male was found dead in a function hall with history of electrocution. We received a specimen of the heart, two pieces of lungs, one half of each kidney, skin piece over electric contact mark, and control skin piece. On autopsy, all organs showed minimal congestion. Petechial hemorrhages were present in the heart, the lungs, and the brain.

The heart was grossed by the inflow and outflow method along the course of blood flow. The external surface showed soldier's plaques over the right lateral border. The weight and measurement values of the heart are depicted in Table 1. The pulmonary arterial trunk and the valves were normal. However, on dissecting the aorta, right coronary ostia were two in number [Figure 1] and

Table 1: Weight and measurement values of the heart in cases of double RCA

Parameters	Case 1	Case 2
Weight (g)	325	50
Tricuspid valve circumference (cm)	9	5
Free wall thickness of the right ventricle (cm)	0.3	0.2
Mitral valve circumference (cm)	7	4.4
Free wall thickness of the left ventricle (cm)	2	0.5

left coronary ostia was only one in number. The ostia and course of the two coronary arteries were traced. Anterior RCA arising from one of the ostia coursed anteriorly. Anterior RCA coursed anteriorly descending downward, directed toward the apex. Posterior RCA from the other ostia coursed toward the junction between the right atrium and the right ventricle. The aorta also showed numerous foci of atheromatous plaque up to 0.5 cm from the root of the aorta. All the arteries appeared patent. Microscopy showed foci of neutrophil aggregates in the anterior wall of the left ventricle. The aorta showed features of atherosclerosis. However, sections from both the RCAs, left coronary artery, left anterior descending artery, and left circumflex artery revealed no significant pathology.

Sections from the lungs showed evidence of areas of patchy consolidation, areas of congestion, edema, and hemorrhage. Sections from the kidneys showed areas of congestion, edema, and hemorrhage. Sections from the skin tissue labeled as skin showed features of electric current injury. The control skin showed no significant pathology.

Case 2

A 6-year-old female had history of electric contact and expired after 1 h. We received the heart, four pieces of the lungs, and one half of each kidney. The heart and the lungs appeared congested on autopsy.

The weight and measurement values of the heart are depicted in Table 1. The pulmonary arterial trunk and the semilunar valves were normal. The aorta showed two right coronary ostia [Figure 2]. The courses of the arteries from two right coronary ostia were similar to that of the first case. The posterior RCA that coursed toward the junction between the right atrium and the right ventricle showed partial obliteration. Other coronary arteries and their branches were patent. Microscopy of the posterior RCA revealed obliterative arteritis with neutrophilic infiltration in the intima and media [Figure 3]. Sections from the rest of the myocardium and other arteries showed no significant pathology. Sections from the lungs and the kidneys showed areas of congestion, edema, and hemorrhage.

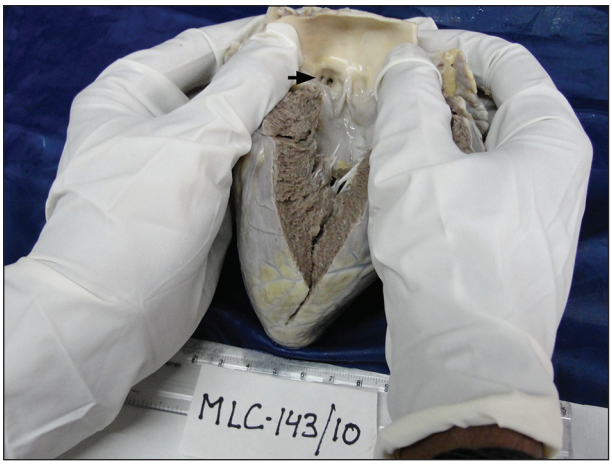

Figure 1: Gross photograph of the heart showing double RCA arising from separate ostia (arrow) in Case 1

Figure 2: Gross photograph of the heart showing double RCA arising from separate ostia (arrow) in Case 2

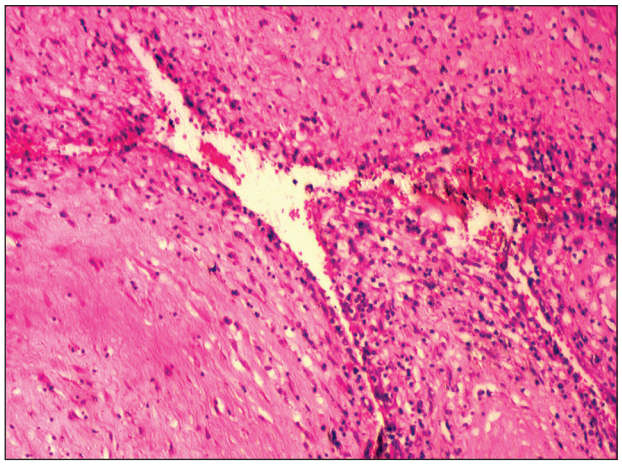

Figure 3: Photomicrograph of the posterior RCA showing obliterative arteritis (H&E, ×400)

Discussion

Double RCA is a very rare coronary artery anomaly. Most of the reported cases of double RCA are those

of radiological diagnosis in patients presenting with cardiorespiratory symptoms. In contrast, the present case reports are incidental autopsy findings in electrocuted individuals. Alexander and Griffith documented five cases of double RCA originating from two separate ostia. The causes of death mentioned in their study were metastatic cancer (two cases), lobar pneumonia (one case), cerebral hemorrhage (one case), and congenital heart disease (one case).[6]

Majority of the cases of double RCA originated from single ostia. In contrast, both cases in our observation showed double RCA arising from two separate ostia. The course of one RCA corresponds to anterior RCA, while that of the other RCA corresponds to posterior RCA. Capunay *et al*.[3] observed a similar course of double RCA. In contrast, Karabay *et al*.[7] and Harikrishnan *et al*.[8] documented superior and inferior RCAs.

Altun *et al*. concluded that it is very difficult to interpret as either double RCA arising from a single ostium or a high take of a large right ventricular branch. Sawaya *et al*. claimed that split RCA is the same anomaly, improperly named as double RCA. They also concluded that instead of two RCAs, there were split portions of the RCA branches with two separate courses. There is no distinct definition between double RCA and the separate conus branch or the right ventricular branch from the right sinus of Valsalva. Regardless of whether the anomaly is double RCA or a separate right ventricular or conus branch, it is rare with few case reports.[5]

Rare variations in the presentation of double RCA have been described. Young-hyman *et al*.[2] reported a new anomaly in which the RCA originated above the coronary sinus, giving off circumflex artery. Akcakoyun *et al*.[9] described double RCA coexisting with separately originating left anterior descending and circumflex arteries. Rohit *et al*.[10] described a case of double RCA with acute inferior wall infarction.

Although coronary artery anomalies were regarded as being benign and hemodynamically insignificant, in recent reports, it is considered to be the second most common cause of sudden death in the United States.[7] It has been reported to be associated with atherosclerosis, life-threatening arrhythmia,[10] and acute coronary syndrome including MI and sudden death.[7]

In summary, double RCA is a very rare coronary anomaly. Although many of the primary congenital coronary anomalies are hemodynamically insignificant, it is important to know the anatomic variants. Meticulous grossing and careful observation could unearth hidden anomalies.

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