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CASE REPORT

A Rare Coronary Artery Anomaly: Double Left Anterior Descending Artery

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ABSTRACT

Double left anterior descending coronary artery arising from the left and right coronary arteries is one of the rarest of coronary anomalies. In this report, we present a case of double left anterior descending coronary artery with one originating from the left main stem and the second one originating from the same ostium with the right coronary artery, passing to the left side following an inter-arterial course between aorta and right ventricular outflow tract and spreading to the anterior wall of the left ventricle. The diagnosis was made with multislice computed tomography angiography. To our knowledge, only a few such cases have been published in the literature so far.

Key words: Coronary artery anomaly, computed tomography coronary angiography, double left anterior descending artery

INTRODUCTION

Coronary artery anomalies are usually detected incidentally during coronary angiography or autopsy.[1] The clinical impact of coronary artery anomalies depends on the capability of anomalous arteries to provide adequate blood supply to the myocardium.[1-3] Double left anterior descending coronary artery arising from the left and right coronary arteries is one of the rarest of coronary anomalies.[2,3] It is usually clinically silent but the recognition of this rare anomaly is important because it may mislead to wrong clinical diagnosis as well as surgical complications.[2-5] In this report, we present a case of double left anterior descending coronary artery with one originating from the left main stem and the second one originating from the same ostium with the right coronary artery, which is diagnosed with multislice computed tomography (CT) angiography.

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CASE REPORT

A 36-year-old male patient was admitted to our hospital with the complaint of non-specific chest pain. He had a history of smoking and hypertension, potential risk factors for coronary artery disease. Also his father at the age of 46 years had died suddenly with unclear etiology. At the time of the evaluation, the patient had been on antihypertensive therapy with beta blocker for 2 years.

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The chest pain was not typical for angina pectoris but the patient was very nervous due to his family history.

The physical examination did not reveal any abnormal findings. Blood pressure was 140/90 mmHg and pulse 72 beats/min. Cardiac and lung auscultation were normal. The electrocardiogram (ECG) and chest X-ray were normal. Routine blood and biochemical laboratory tests were within normal limits. Transthoracic echocardiograpic examination revealed normal left ventricular size and contractility. The left ventricular ejection fraction was 65%. For further evaluation an exercise test was required but this was not possible as the patient had recently undergone knee surgery for meniscopathy. Therefore, to evaluate chest pain and to detect or rule out coronary artery disease, the patient underwent computed tomography coronary angiography (CTCA). CTCA was performed using a 64 slice CT scanner (Siemens Sensation 64, Germany). Scan parameters were as follows: Slice collimation, $32 \times 2 \times 0.625$ mm; rotation time, 0.33 mins; tube voltage, 120 kV; tube current, 600 mA; and pitch, 0.2. The average heart rate was 71 bpm during the scan. The scan time was 7 sec. CT angiography was triggered automatically by the arrival of the contrast bolus (automatic bolus tracking). A prescan was taken at the level of the aortic root and a region of interest (ROI) was placed on the ascending aorta. As soon as the signal density level in the ascending aorta reached the predefined threshold of 120 Hounsfield units (HU), the scan started. We injected 80 ml nonionic contrast medium (Iomeron 400/ml; Iomeprol, Bracco, Italy) at a flow rate of 5 ml/s in the left antecubital vein. This was followed by a 40 ml saline chaser bolus at a flow rate of 4 ml/s to wash out contrast from the right ventricle. During the scan, the ECG was recorded simultaneously. The reconstruction interval for the coronary arteries with the fewest motion artifacts was determined (images at 75% of the R-R interval) and used for further analysis. For reconstruction of axial images, we used a slice thickness of 0.75 mm and a slice width of 0.5 mm. A medium soft-tissue reconstruction kernel (B30f) was used for reconstruction. For post-processing, an external workstation (Leonardo, Siemens, Germany) was used. In addition to the transverse source images, multiplanar reformations (MPRs), curved MPR images, maximum intensity projections (MIPs), and volume rendered (VR) images were utilized for the evaluation. VR reconstructions depicted the vascular anatomy well and were used for 3-dimensional (3D) orientation.

Coronary CTA demonstrated an anomalous left anterior descending artery (LAD) arising from the same ostium with the right coronary artery, which coursed downwardly along the interventricular sulcus, and another LAD arising from the left main coronary artery, which spread to the anterior wall of the left ventricle toward the left ventricular apex [Figures 1 and 2]. The right coronary artery (RCA) and the left circumflex artery (LCX) were normal. There were no significant coronary stenoses or occlusions. However, the anomalous LAD was coursing between right ventricular outflow tract and aorta which should be considered to be critical because of the potential to provoke myocardial ischemia or even sudden cardiac death [Figure 3]. These CTCA findings were consistent with double LAD, with one vessel arising from the ostium of right coronary artery and the second one arising from the left main coronary artery. The patient was informed about the anomaly and the potential complications. He did not want to undergo a surgical revascularization. He is now on follow up with no signs of myocardial ischemia.

DISCUSSION

The incidence of congenital coronary artery anomalies ranges from 0.6% to 1.3% in most of the reported series.[1]

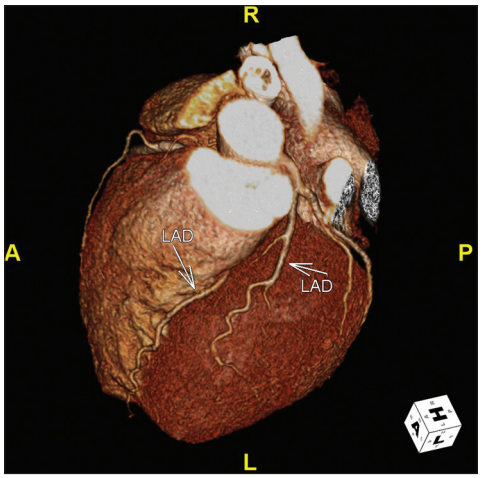

Figure 1: The 3-dimensional (3D) volume rendered image demonstrates both of the left anterior descending arteries (LAD), one originating from the left main coronary artery and the second anomalous one from the right side and spreading to the anterior wall of the left ventricle toward the left ventricular apex.

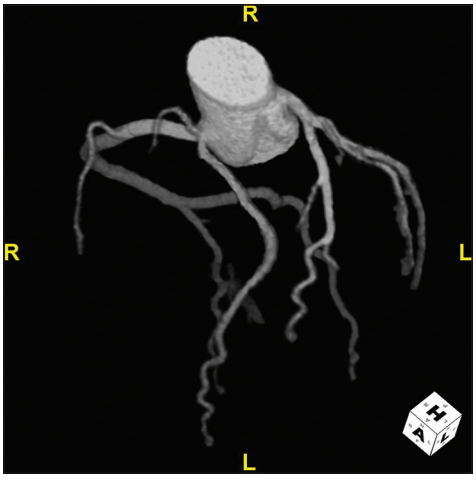

Figure 2: The segmented 3D image demonstrates both the left anterior descending arteries (LAD), their origin and course.

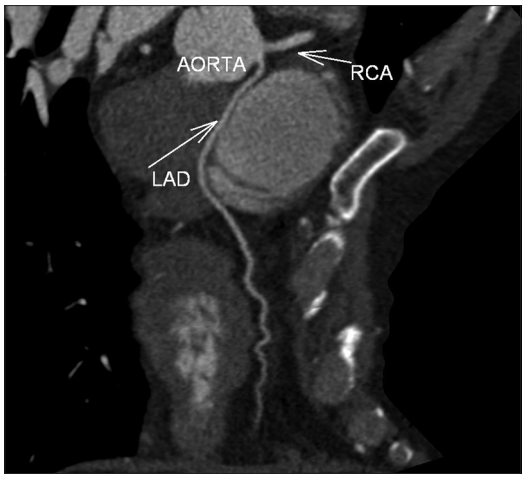

Figure 3: The curved multiplanar reformatted (MPR) image demonstrates the interarterial course of anomalous left anterior descending artery (LAD) originating from the right side and passing between aorta and right ventricular outflow tract (RVOT).

Some of these are of clinical interest because they can cause ischemic complications or even sudden death.[1-3] However, other coronary artery anomalies do not cause symptoms and their detection during coronary angiography is an incidental finding.[1,3,4] Double LAD originating from both the right coronary and the left main coronary artery is an extremely rare congenital coronary artery anomaly with an angiographic prevalence ranging from 0.01 to 0.03% in the published studies.[3-7] According to the origin and anatomical course from the left and right coronary arteries Spindola Franco et al., have reported that double LAD can be classified into four types.[2] Types I, II, and III have a similar pattern; all of them arise separately from the proximal part of the left anterior descending artery and/or are divided into two left coronary arteries. Type IV is defined as the presence of two separate LADs, a short LAD arising from the left main coronary artery and a long LAD arising from the right coronary artery or right sinus of Valsalva.[2] According to this classification, our case is consistent with Type IV.

Identification of the presence of a double left anterior descending artery is important both for diagnostic and therapeutic reasons.[3-6] Conventional coronary angiography is still considered as the Gold Standard for the diagnosis of coronary artery disease. However, detection of coronary artery anomalies is frequently difficult with conventional coronary angiography because of the lack of 3D information which is necessary to locate the origins and courses of the coronary arteries.[3-5] Consequently, it is often difficult to differentiate total occlusion of the medial or distal portion of the LAD from this anomaly during routine coronary angiography.[3,4,6] This lack of 3D orientation becomes even more important when the anomalous vessel courses between the aorta and the right ventricular outflow tract because this condition may provoke myocardial ischemia and sudden death and this information can be missed with conventional angiography.[1-3,5-7] Recognition of coronary artery anomalies prior to coronary artery by-pass surgery is of great importance. The cardiac surgeon must be aware of the abnormal anatomy inorder to avoid accidental ligation or transection at the time of surgery.[3-6]

Multidetector row CT allows 3D comprehension of the coronary artery system and it is extremely useful to identify congenital coronary artery anomalies, regarding both their origins, courses and also relationships with other cardiac structures.[3-7]

In our patient, CT angiography provided direct visualization of the dual LAD distribution of the Type IV variant of Spindola-Franco and colleagues classification in which first LAD originated from the left main, and the second LAD originated from the same ostium with the RCA. In addition, the interarterial course of the second LAD arising from the right side was also clearly depicted.

CONCLUSION

In conclusion, we present a very rare coronary artery anomaly, called double LAD Type IV, detected during CT coronary angiography. Recognition of this anomaly is important because it may lead to misinterpretation of coronary angiograms and severe intraoperative complications during coronary artery by-pass surgery such as incorrect placement of an arteriotomy, inadvertent cutting or ligation of the aberrant vessel during operation.

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