

Case 4

Anomalous Left Main Coronary Artery: Exclusion of a Malignant Variant using Coronary CT Angiography

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History

A 62-year-old female patient suffering from hypertension and obesity (body mass index 31.6 kg/m²) was referred to a nearby hospital for exclusion of coronary artery disease (CAD) by invasive coronary angiography. The patient suffered from exertional dyspnea, chest discomfort and palpitations in recent weeks. Her physical examination was unremarkable and the transthoracic echocardiography were normal. Invasive coronary angiography revealed mild atherosclerosis without hemodynamic relevant stenosis. Furthermore the left main coronary artery (LM) showed an anomalous course and the patient was referred to our department for coronary CT angiography (CTA) to further clarify the course of the LM in relation to the adjacent large vessels to rule out malignant coronary anomalies.

Diagnosis

Coronary CT angiography demonstrated an anomalous origin of the LM arising from the proximal segment of the right coronary artery (RCA) (Fig. 1A). The anomalous LM then followed a sub-pulmonic course (Fig. 1B) and subsequently bifurcated into a left anterior descending artery (LAD) and left circumflex artery (LCx), with a normal course (Figs. 2, 3, and 4). The LAD and LCx showed no evidence of coronary plaques or stenosis. The RCA showed non-calcified plaque without stenosis.

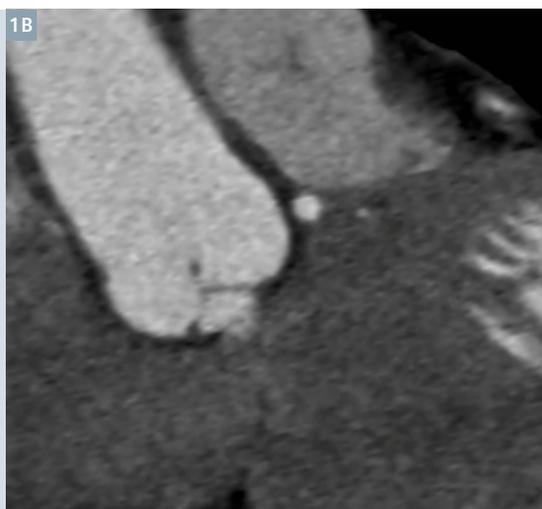
Comments

Precise characterization of congenital coronary artery anomalies is essential due to their potential association with myocardial ischemia and sudden death. Coronary anomalies are a rare occurrence with a reported incidence of 0.3–1.3%.^[1,2] The incidence of

an anomalous origin of the LM from the right sinus of Valsalva or from the RCA is approximately 0.1% in patients undergoing coronary angiography.^[3,4]

Among these patients, an inter-arterial course of the LM between the aorta and the pulmonary artery can be found in up to 75% of cases.^[3,4] This inter-arterial course can lead to stretching of the intramural segment, an acute angle of the artery from the aortic ostium or compression of the LM during systole resulting in myocardial ischemia or sudden cardiac death (> 50%), particularly during or shortly after exercise.^[5]

In the case of our 62-year-old female patient, an acute angulation near the ostium or malignant inter-arterial course directly between the aorta and pulmonary artery was excluded by coronary CT angiography, the method

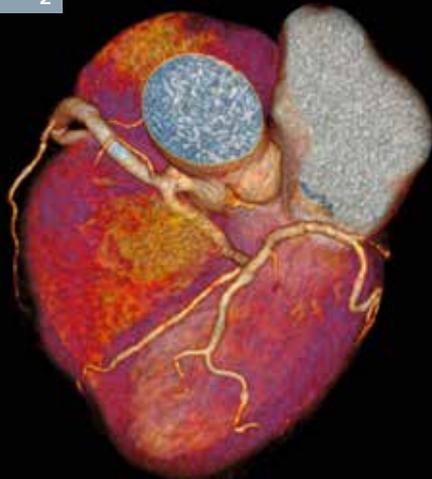


1A

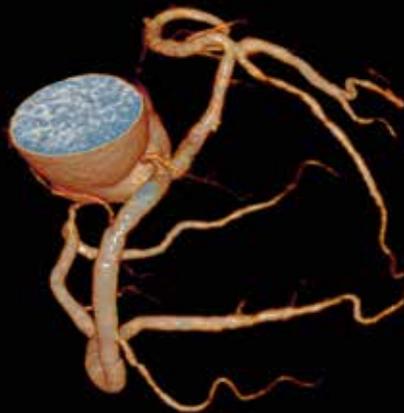
Curved MPR image shows LM which arises from the proximal RCA and non-calcified plaque without stenosis in the RCA.

1B

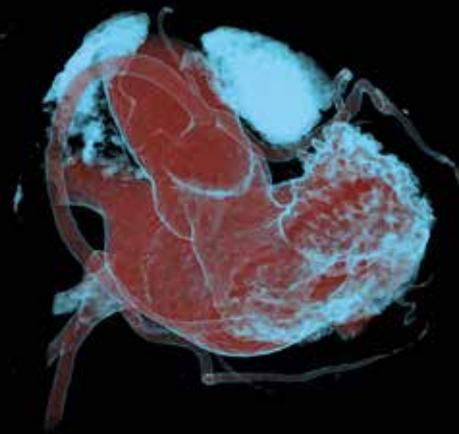
MPR image shows the sub-pulmonic course of the LM.



2 VRT shows the pathway of LM, LAD, RCA and LCx and excludes an inter-arterial course.



3 VRT of coronary tree shows anomaly of the LM and the course of LCA, LAD, RCA and LCx.



4 VRT of coronary tree shows the sub-pulmonic course of the LM.

of choice for the evaluation of coronary anomalies. In comparison to conventional coronary angiography, coronary CT angiography provides true volumetric visualization of the coronary arteries with better definition of their origin, course, and relation to adjacent cardiac structures. No further follow-up examinations were necessary and the patient could be discharged directly after coronary CT angiography. ■

References

- [1] Roberts WC. Major anomalies of coronary arterial origin seen in adulthood. *Am Heart J* 1986; 111:941-963.
- [2] Yamanaka O, Hobbs RE. Coronary artery anomalies in 125,595 patients undergoing coronary angiography. *Cathet Cardiovasc Diagn* 1990; 21:28-40.
- [3] Donaldson RM, Raphael M, Radley-Smith R, et al. Angiographic identification of primary coronary anomalies causing impaired myocardial perfusion. *Cathet Cardiovasc Diagn* 1983; 9: 237-249.
- [4] Kimbiris D, Abdulmassih SI, Segal BL, et al. Anomalous aortic origin of coronary arteries. *Circulation* 1978; 58: 606-615.
- [5] Kim SY, Seo JB, Do KH, et al. Coronary artery anomalies: classification and ECG-gated multi-detector row CT findings with angiographic correlation. *Radiographics*. 2006; 26(2):317-33.

Examination Protocol

| Scanner | SOMATOM Definition Flash |
|--------------------------|---|
| Scan area | Heart |
| Scan mode | Prospective ECG-triggered sequential scan |
| Scan length | 138 mm |
| Scan direction | Cranio-caudal |
| Scan time | 6.3 s |
| Tube voltage | 120 kV |
| Tube current | 400 mAs/rot. |
| Dose modulation | ECG pulsing |
| CTDI _{vol} | 14.35 mGy |
| DLP | 198 mGy cm |
| Effective dose | 2.8 mSv |
| Rotation time | 0.28 s |
| Slice collimation | 128 × 0.6 mm |
| Slice width | 0.6 mm |
| Reconstruction increment | 0.6 mm |
| Reconstruction kernel | Bv40 (ADMIRE) |
| Heart rate | 58 bpm |
| Contrast | 350 mg/mL |
| Volume | 65 mL + 50 mL saline |
| Flow rate | 6.5 mL/s |
| Start delay | Test bolus + 2s |

The outcomes by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results. In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.