

A complex coronary arteriovenous fistula

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History

A 75-year-old male patient, a known long-term smoker, was hospitalized due to an acute cerebral infarction. He was complaining of chest discomfort and his blood pressure was 190/110mm Hg. An echocardiography examination was performed, revealing no abnormalities. A coronary CTA (cCTA) was requested for further evaluation.

Diagnosis

CT images showed a right coronary artery (RCA) dominant system. The left main coronary artery (LM) was moderately dilated. Its branches, the left anterior descending artery (LAD) and the circumflex artery (Cx), showed normal calibers and courses. The LM extended tortuously as an anomalous fistula with multiple aneurysmal changes, passing in front of the main pulmonary artery (MPA) and then joining the ascending aorta (AA) near the origin of the RCA. Four other fistulas originated therefrom – the first, with a clear “jet sign”, drained into the MPA suggesting a left to right shunt; the second, coursing in between the MPA and the ascending aorta (AA), as well as the innominate artery (IA) and the left common carotid artery (LCCA), drained into the root of the IA posteriorly; the third, passing along the anterior aspect of the MPA and the aortic arch, connecting posteriorly with the proximal left subclavian artery (LSA) with a bulbous change

at the entrance and finally the fourth, going behind the MPA and draining into a dilated bronchial artery (BA) arising from the descending aorta (DA). Two small fistulas from the distal RCA were also seen draining into the middle cardiac vein (MCV). There were no other accompanying anomalies present and the diameter of the MPA was normal.

CT findings suggested a complex coronary arteriovenous fistula (CAF), Sakakibara type A. The patient was not recommended for immediate intervention but for follow ups, considering his age, mild cardiac symptoms, and no other structural and functional abnormalities.

1 An axial (Fig. 1a) image shows a fistula draining into the MPA with a clear “jet sign” (arrow). A MIP image (Fig. 1b) shows a dilated LM extending into a tortuous anomalous fistula.

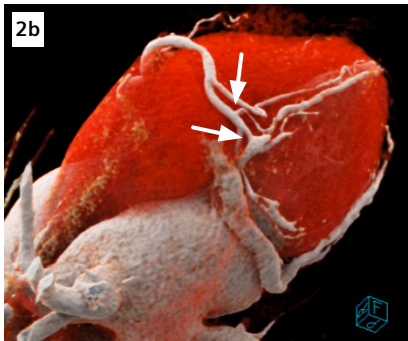
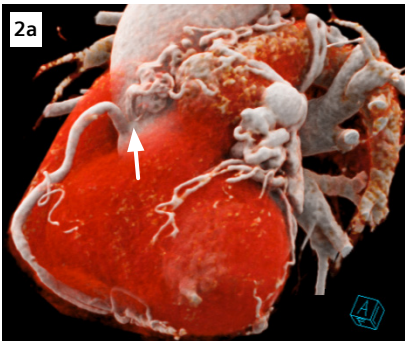


Comments

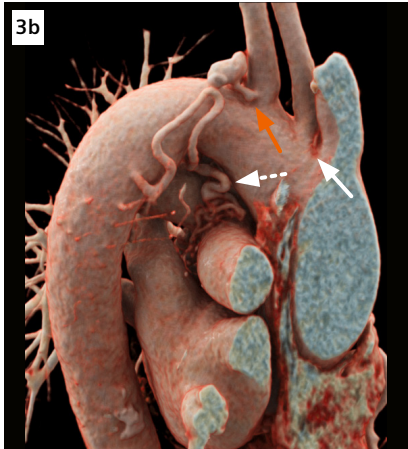
A complex CAF involves entangled blood vessels with multiple fistulous structures with which coronary arteries drain into any segment of the pulmonary or systemic circulation. Occasionally, it may have multiple origins and drainage sites with complex communications, such as this case, making the diagnosis very challenging. Coronary CTA with cinematic volume rendering technique (cVRT) allows for excellent visualization of anatomic details of multiple fistulous tracts to various thoracic vessels. In this case, the multiple fistulas draining into the AA, IA, LSA, BA and MCV are clearly identified. The other challenge is that the patient could not comply with breathing instructions due to his critical situation. Therefore, an ultra-fast scanning technique – Turbo Flash mode – is applied to acquire a scan range of 29.5 cm in just 0.4 seconds at free breathing. This also facilitates the reduction of radiation exposure



2 cVRT images show an anomalous fistula with multiple aneurysmal changes, passing in front of the MPA and joining the AA near the origin of the RCA (Fig. 2a, arrow). The LAD and the Cx are branched out, with normal calibers and courses. Two small fistulas from the distal RCA are seen draining into the MCV (Fig. 2b, arrows).



and the amount of contrast agent needed. Although CAFs are usually asymptomatic, they can alter coronary hemodynamic parameters causing serious complications, including heart failure and myocardial infarction, making surgical ligation or percutaneous transcatheter closure necessary. In such cases, it is crucial to have pre-procedural knowledge concerning the characteristics of the CAFs, with cCTA playing an important role. ●



3 cVRT images show three fistulas – two coursing anteriorly and one posteriorly – draining into the root of the IA (white arrows), the proximal LSA with a bulbous change at the entrance (orange arrows) and a dilated BA arising from the DA (white dotted arrow).

Examination Protocol

Scanner	SOMATOM Force
Scan area	Thorax
Scan mode	Turbo Flash mode
Scan length	295 mm
Scan direction	Cranio-caudal
Scan time	0.4 s
Tube voltage	70 kV
Effective mAs	240 mAs
Dose modulation	CARE Dose4D
CTDI _{vol}	0.67 mGy
DLP	22.4 mGy*cm
Rotation time	0.25 s
Pitch	3.2
Slice collimation	192 x 0.6 mm

Scanner	SOMATOM Force
Slice width	1.0 mm
Reconstruction increment	0.7 mm
Reconstruction kernel	Bv40, ADMIRE 3
Heart rate	96 bpm
Contrast	370 mg/mL
Volume	40 mL + 40 mL saline
Flow rate	4 mL/s
Start delay	Bolus tracking triggered at 100 HU in the ascending aorta + 4 s

The statements by Siemens Healthineers' customers described herein are based on results that were achieved in the customer's unique setting. Because there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT and/or automation adoption) there can be no guarantee that other customers will achieve the same results.