CASE REPORT

Coronary-pulmonary artery fistula diagnosed by multidetector computed tomography

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Coronary-pulmonary artery fistula is an uncommon cardiac anomaly, usually congenital. Most coronary-pulmonary artery fistulas are clinically and haemodynamically insignificant and are usually found incidentally. This report describes a case of complex coronary-pulmonary artery fistula with two feeding vessels of separate origins: one from the proximal part of the left anterior descending artery and another arising from the right aortic cusp. The complex anatomy of the fistula was shown in detail by multidetector computed tomography using multiplanar reconstruction and 3D volume rendering techniques.

Coronary-pulmonary artery fistula (CPAF) was first described by Krause in 1865.¹ It is a comparatively rare cardiac anomaly, characterised by a communication between a coronary artery having a normal origin from the aorta and a cardiac chamber or a large thoracic vessel such as pulmonary artery and superior vena cava.² The clinical presentation of CPAF is highly varied. Most patients, especially those with small fistulas are asymptomatic, and the lesion is discovered during coronary angiography performed for other reasons. Some of the CPAF can result in serious consequences including myocardial ischaemia or infarction, congestive heart failure, and sudden death.³ When complex anatomy or intervention is contemplated, conventional coronary angiography may not be sufficient. An ideal investigation technique should be non-invasive, safe, and provide a quality anatomical description of the fistula. We report a case of a fistula between the left anterior descending artery and the pulmonary artery in an asymptomatic adult subject diagnosed incidentally by multidetector computed tomography. The clinical case, imaging technique, and findings will be discussed.

CASE REPORT

A 58 year old asymptomatic man with intermediate risk for coronary artery disease was referred by his consultant cardiologist to our department for coronary computed tomography angiography. His physical examination was unremarkable. The electrocardiogram, chest radiograph, and transthoracic echocardiography were within normal limits. ECG gated coronary computed tomography angiography examination was performed using a 16-multidetector computed tomography scanner (16×0.625 mm detector collimation, gantry rotation time 0.42 second, tube voltage of 120 kV, and pitch 0,26) (Lightspeed 16 Pro, General Electric Medical Systems).

Images of the coronary arteries were reconstructed using curved multiplanar reformats, maximum intensity projection, and 3D volume rendering methods. Cardiac CT images showed a dilated left anterior descending artery coursing along the interventricular groove and terminating abruptly at

the mid-interventricular groove, where multiple fine tortuous vessels arise. This vascular plexus formed a network that encircled the LAD and eventually coalesced to form a major dilated vessel that ran horizontally across the anteroinferior aspect of the pulmonary trunk before draining into the pulmonary trunk (figs 1 and 2). A few small vessels of the same plexus were seen to drain directly into the right ventricle outflow tract. A similar plexus of fine tortuous vessels supplied by a different vessel arising from the right aortic cusp (separate origin from the right coronary artery) was found along the surface of the ascending aorta, consistent with another feeding vessel of the CPAF (fig 2). No chambers or myocardial abnormalities were found. The ejection fraction was found to be 60% by CT cardiac functional analysis, as well as by transthoracic echocardiography. Cardiac stress and nuclear perfusion tests performed a few weeks later were interpreted as within normal limits. To avoid an invasive procedure, and based on the diagnosis of CPAF made by the multidetector computed tomographic

Figure 1 Coronary computed tomography angiography. Maximum intensity projection (MIP) reconstruction shows a plexus of fine tortuous vessels (arrow) arising from the dilated proximal left anterior descending artery (LAD) at the level of atrioventricular groove. Note another feeding vessel (FV) arising from the right aortic cusp. Multiple calcified plaques are also noted along the proximal segment of the LAD. RVOT, right ventricle outflow tract; A, aorta; SVC, superior vena cava.

Abbreviations: CT, computed tomography; CPAF, coronary-pulmonary artery fistula

Figure 2 Coronary computed tomography angiography. 3D volume rendering reformat image shows the surface anatomy of the complex coronary-pulmonary artery fistula and its relations with the surrounding structures. A plexus of fine tortuous vessels arises from the proximal LAD to form a network of vessels (open arrow) that eventually coalesce to a major dilated draining vein (DV), crossing the anteroinferior aspect of the pulmonary trunk (PT). Note that the feeding vessel (FV) arising from the tight aortic cusp has a separate origin from the right coronary artery (RCA). AA, ascending aorta; LV, left ventricle; RV, right ventricle.

study, conventional coronary angiography was not performed. The patient was discharged and instructed to be followed up by his cardiologist.

DISCUSSION

Congenital anomalies of the coronary arteries are found not infrequently, affecting about 1% of the general population.⁴ CPAF is rare, detected in 0.1% to 0.2% of coronary angiograms.⁵ Most of them originate from the RCA and almost always drain into low pressure chambers of the heart (right ventricle 42.5%, right atrium 34%, and pulmonary artery 15%).⁶ Its aetiology is most frequently congenital⁷; however, acquired forms have been described after cardiac operations, secondary to endomyocardial biopsies, chest irradiation or as a complication of myocardial infarction. The condition is found with equal incidence in males and females and is frequent below 10 years of age. Most CPAF is clinically and haemodynamically insignificant and is usually found incidentally as in our case. The factors influencing the clinical presentation and prognosis of the CPAF are the size of the communication, the amount of blood drained through it, the resistance of the recipient chamber, and development of myocardial ischaemia or infarction (presumably resulting from the coronary steal phenomenon). Frank congestive heart failure is a frequent complication, especially in patients above 40 years of age; however other complications such as arrhythmias, infective endocarditis, rupture of an aneurysmal fistula, and sudden death have been described.^{3,4} The presence of symptoms, complications, and significant left to right shunt are currently the main indications for CPAF closure. Surgical closure has been the treatment of choice in younger patients and can be accomplished with a low

Learning points

- A rare and complex coronary-pulmonary vascular malformation detected by a new, safe, and non-invasive 3D diagnostic modality.
- To learn more about coronary-pulmonary artery fistula: prevalence, clinical presentation, radiological appearance, treatment, and prognosis.

mortality and morbidity.⁷ Transcatheter closure is an alternative therapeutic approach using different methods including detachable balloons, stainless steel, and platinum coils, the Amplatzer occluder and alcohol or foam injection and covered stents. In asymptomatic patients the indication for CPAF closure is still debated. The prognosis in asymptomatic patients is good and a conservative clinical follow up is recommended because of the low incidence of an adverse outcome.⁸ We do believe that in our patient at the moment the conservative approach is indicated taking into consideration the fact that he remained free of complaints during the follow up. For complex pathology as presented in our case, conventional coronary angiography may not be sufficient for a clear demonstration of the exact anatomy.

CONCLUSION

Coronary computed tomography angiography using multi-detector computed tomography is a non-invasive 3D imaging technique that provides an excellent overview of the cardiac and vascular anatomy that could be helpful for planning future cardiovascular therapeutic approach, interventional or surgical. This method is valuable particularly in complex vascular malformations, such as coronary pulmonary artery fistula, obviating the need for invasive procedures.

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REFERENCES

- 1 **Krause W**. Über den Ursprung einer akzessorischen a. coronaria aus a. pulmonalis. *Z Ratl Med* 1865;**24**:225-7.
- 2 **Kirklin JW**, Barrat-Boyes BG. Congenital anomalies of the coronary arteries. In: *Cardiac surgery*. 2nd ed. New York: Churchill Livingstone, 1993:1167-93.
- 3 **Levin DC**, Fellows KE, Abrams HL. Hemodynamically significant primary anomalies of the coronary arteries: angiographic aspects. *Circulation* 1978;**58**:25-34.
- 4 **Yamanaka O**, Hobbs RE. Coronary artery anomalies in 126 595 patients undergoing coronary arteriography. *Cathetr Cardiovasc Diagn* 1990;**21**:28-40.
- 5 **Fernandes ED**, Kadivar H, Hallman GL, et al. Congenital malformations of coronary arteries: the Texas Heart Institute experience. *Ann Thorac Surg* 1992;**54**:732-40.
- 6 **Tayama E**, Ohashi M, Fukunaga S, et al. Surgical treatment of coronary artery fistula with concomitant saccular coronary artery aneurysm: a case report. *Jpn Circ J* 1999;**63**:809-12.
- 7 **Bogers AJJC**, Quaegebeur JM, Huysmans HA. Early and late results of surgical treatment of congenital coronary artery fistula. *Thorax* 1987;**42**:369-73.
- 8 **Megan CS**, Sol R, Stever DC, et al. Prognostic significance of clinically silent coronary artery fistulas. *Am J Cardiol* 1999;**83**:407-11.