VISUALIZATION OF A GIANT CORONARY ARTERY ANEURYSM BY MULTI-DETECTOR COMPUTED TOMOGRAPHY

Ummara Siddique Umer[1], Shahjehan Alam[2], Syed Ghaus[3], Seema Gul[4]

[1-4] Department of Radiology, Rehman Medical Institute, Peshawar- Pakistan.
Address for correspondence:
Dr. Ummara Siddique Umer
Senior Registrar,
Department of Radiology, Rehman Medical Institute, Peshawar- Pakistan.
E-mail: ummara_81@hotmail.com

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ABSTRACT

The diagnostic criteria, Computed tomography (CT) appearances, and importance of multidetector CT in diagnosis of coronary artery aneurysms is reviewed in this case report. CT coronary angiography was performed using a 128-slice MDCT scanner in an adult male with chest pain and echocardiographic suspicion of a complex lesion in pericardial cavity. CT revealed giant aneurysm of first obtuse marginal (OM 1) branch of left circumflex coronary artery. It was partly thrombosed. There was mild pericardial effusion raising strong suspicion of aneurysmal leak. Results were confirmed on conventional coronary angiography performed later. MDCT can visualize coronary artery aneurysms very precisely and it provides an excellent view of the anatomy of the coronary artery as well as the surrounding tissues. This exact knowledge of the anatomy is crucial for planning a surgical or interventional approach. With the increasing use of multidetector CT (MDCT) to image the coronary arteries, aneurysms will be identified more frequently.

Key Words: Coronary artery aneurysm, Multi-detector computed tomography, Coronary angiography, Coronary CT angiography.

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INTRODUCTION

Coronary artery aneurysm (CAA) is defined as a coronary artery dilatation that exceeds the diameter of normal adjacent segments or 1.5 times the diameter of the patient's largest coronary vessel[1]. On rare occasions, a CAA grows large enough to be called giant. Although a precise definition of the term "giant" coronary artery aneurysm (GCAA) is still lacking, it generally refers to a dilatation that exceeds the reference vessel diameter by four times[2, 3].

Coronary artery aneurysms occur more frequently than previously realized and are seen in approximately 1.5% of patients with coronary artery disease[1]. The pathophysiology of aneurysm formation has been postulated to be weakening of the medial layer of the vessel wall, which in part may be due to chronic overstimulation of the vasodilator nitric oxide[4, 5].

Aneurysms may be complicated by thrombosis and rupture. Rupture is a rare event[3]. Thrombosis is more common[6, 7]. CAA are rare; with an estimated incidence of 0.3-5% among patients undergoing coronary angiography[8]. Giant CAA are usually associated with Kawasaki's disease in infants and children[8, 9]. Giant CAA are less common in atherosclerotic cases, with an incidence of 0.02% [9].

Detection of giant CAAs can be achieved by noninvasive and invasive methods, such as echocardiography, computed tomography (CT), magnetic resonance imaging (MRI), and coronary angiography[2,9]. Multidetector CT (MDCT) plays an important role in the diagnosis and treatment planning for GCAA. On CT images performed with a proper coronary artery protocol, the exact location, diameter, lumen and relationship with adjacent structures can be assessed as compared to conventional angiography where only the lumen and intimal wall assessment can be assessed.

We describe an interesting case of a 45-year-old patient who had a non-atherosclerotic giant CAA involving the branch of left circumflex (LCX) coronary artery.

CASE REPORT

A 45-year-old man with history of recurrent chest pain was referred to our Radiology department for coronary CT angiography. His pain was radiating to the back and left arm, lasting for more than 20 minutes. His familial history was unremarkable; he had no medical history of myocardial infarction and was not having any major risk factors. On admission he was hemodynamically stable. He had a blood pressure of 170/90 mmHg, without obvious difference between the right and left arms, a heart rate of 90 /min, and normal peripheral pulse status. Routine lab workup was normal. The electrocardiogram was unremarkable.

The two-dimensional echocardiogram revealed a moderate reduction in systolic left ventricular (LV) function and a complex neoplastic mass in pericardial cavity. Second echocardiography performed in another center raised suspicion of pseudo aneurysm of posterolateral ventricle wall.

CT coronary angiography was performed in our department for further evaluation of this lesion. There was a giant significantly thrombosed aneurysm in left upper paracardiac region measuring 8 x 5.6 x 5.7cm (CC x TR x AP) in size (Figure 1 and 2). Its upper part was getting filled from first obtuse marginal branch (OM 1) of left circumflex coronary artery (Figure 3). Its lower portion revealed intraluminal soft tissues along its inner margin which appeared to be a partial thrombus (Figure 2). The giant thrombosed aneurysm was causing mass effect on left atrial appendage. There was moderate volume pericardial effusion raising strong suspicion of leak (Figure 2). Remaining coronary arteries were found to be normal without any calcium or noncalcified plaques.

Conventional coronary angiography was performed immediately which confirmed the findings of the CT angiography, with an aneurysmal dilatation of the OM artery. In view of these findings, in combination with the clinical symptoms, the patient was treated with urgent surgery.

DISCUSSION

Detection of giant CAA can be achieved by noninvasive and invasive methods, such as echocardiography, CT, magnetic resonance imaging (MRI), and coronary angiography. Cardiac catheterization remains the gold standard tool, providing information about the size, shape, location, and coexisting anomalies such as coronary artery disease, and is also helpful for planning the strategy of surgical resection[3]. Limitations of the technique are that it is invasive, expensive and that the true size of the CAA may be underestimated if they contain substantial thrombus [4].

CT coronary angiography is a noninvasive, fast and relatively cheap technique for the diagnosis of CAA that is available in most centers[10]. Coronary CT enables high

Figure 1: Axial CT images of 45 years old male showing a large thrombosed aneurysm in left pericardial region. It is abutting the left atrial and left ventricular walls

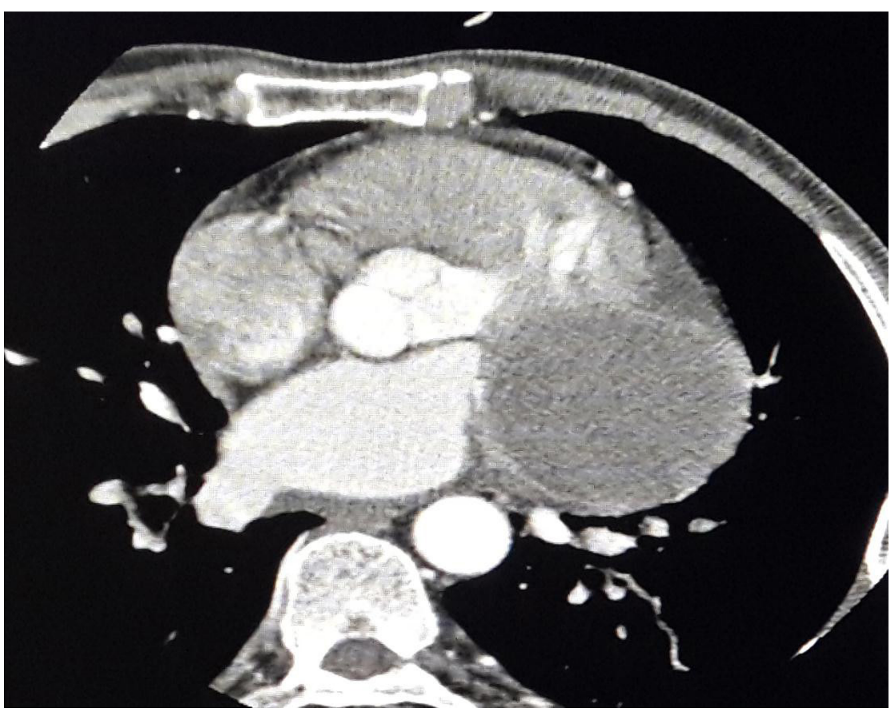

Figure 2: Sagittal reconstructed CT image showing large thrombosed aneurysm. Mild focal contrast opacification is noted in its upper part. Pericardial effusion is also seen

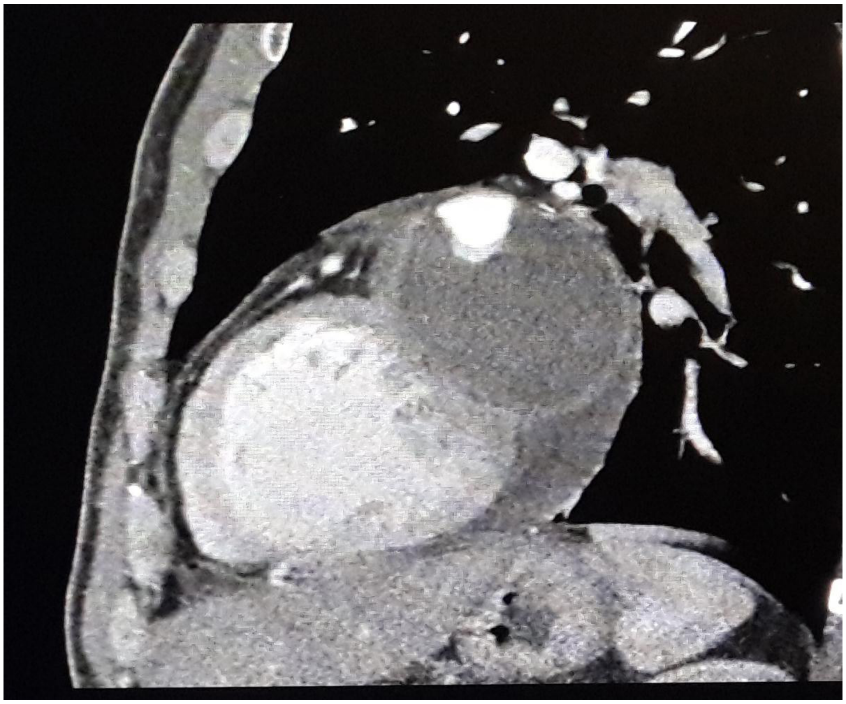

Figure 3: Coronal reformat of a coronary CT angiogram showing OM1 filling the aneurysm (arrow)

quality 2- and 3-D reconstructions that are valuable in the delineation of the topographical anatomy of CAA by displaying the spatial relationship of the aneurysms, large vessels and the heart. Three-phase CT arteriography has also been reported as helpful in confirming large CAA. This technique shows homogeneous and similar densities of a mass and cardiac chambers in the unenhanced and equilibrium phases, and turbulent enhancement in the arterial phase[11]. In addition, CT provides information regarding the extent of luminal blood flow. CT also appears particularly useful during follow-up imaging after CAA exclusion with poly tetrafluoroethylene-covered stents[11,12]. Thus, CT is a noninvasive alternative to catheter coronary angiography in the diagnosis and long-term follow up of patients with giant CAA. However, it may have limitations in delineating the distal part of the coronary arteries in demonstrating clots or thrombus inside the vessels and in simulating a large CAA as an inhomogeneous mass because of the blood turbulence within it[10].

MRI is an alternative noninvasive cross-sectional technique for the diagnosis and evaluation of CAA, obviating the large radiation dose associated with CT[12]. However, MRI is not available in all medical centers, has inferior spatial resolution compared to CT, and does not show the typical linear peripheral calcifications of the CAA, which are important for the correct diagnosis. Finally, intravascular ultrasound provides detailed, high-quality images that can be valuable in distinguishing CAA from coronary artery ectasia, as well as true CAA from pseudoaneurysms[4].

This case report focuses on a patient with a large aneurysm of the OM artery and it demonstrates the ability of multi-detector computed tomography to provide a precise overview of the anatomy in patients with coronary aneurysms. Aneurysms of the coronary arteries are a rare finding and they are frequently associated with significant artery disease. The largest study on coronary aneurysms is the Coronary Artery Surgery Study (CASS) which demonstrated a 4.9% incidence of coronary aneurysms out of 978 patients[10]. In some cases, they are associated with an inflammatory disease (such as Kawasaki`s disease)[13]. The incidence ranges from 0.37% - 4.9% of all patients undergoing coronary angiography in a review analyzing various studies[14]. They are most frequently located in the proximal and middle part of the right coronary artery[4,14]. In rare cases, they can be found in the left anterior descending coronary artery or the left circumflex coronary artery[15]. The right coronary artery was found to be the most frequent vessel involved[10].

Although coronary aneurysms are often asymptomatic, severe complications can occur in some cases[10]. The most serious complication found in previous studies was the rupture of an aneurysm. In addition, thrombosis and distal embolization of thrombotic material can occur resulting in myocardial infarction[11]. In our case the aneurysm was partly thrombosed and moderate volume pericardial effusion suggested leakage of aneurysm.

CT coronary angiography has a high sensitivity and specificity in detecting coronary artery aneurysms[5]. Invasive coronary angiography is considered the reference standard. However, only flow within the lumen can be evaluated, and conventional invasive coronary angiography provides no information about the vessel wall [20]. Thus, with conventional coronary angiography, the true size of the aneurysm may be underestimated, or the aneurysm may not even be seen when it is occluded or contains substantial thrombi or plaque[12]. State-of-the-art multidetector CT technology with higher spatial and temporal resolution provides a safe noninvasive approach to accurately delineate coronary artery anatomic structures, vessel wall, presence and extent of thrombus and integrity of wall of aneurysm[12]. In a study conducted in Japan, the sensitivity of Multislice Spiral Computed Tomography to detect coronary artery aneurysms was 100%[13]. In another study it was found that compared with invasive digital angiography, coronary CT angiography of the main coronary arteries demonstrated a sensitivity of 97% and a specificity of 96%, with a positive predictive value of 89%, and a negative predictive value of 99%[18].

The major problem is differentiating between aneurysm and ectasia. Currently, CAA is defined as a localized, irreversible dilatation of the blood vessel lumen that exceeds the diameter of the adjacent normal segment by more than 1.5-fold. In contrast, ectasia is used to describe a diffuse dilatation of coronary arteries that involves 50% or more of the length of the artery; this classification is made according to the appearance and number of vessels involved[9]. Ectasia has been subcategorized based on the topographical extent in the major epicardial coronary arteries into 4 types: type I, diffuse ectasia of two or three arteries; type II, diffuse ectasia in one artery and localized in another; type III, diffuse ectasia of one artery only; and type IV, localized and segmental ecstatic lesions. The existence of the last type causes confusion in separating aneurysms from ectasias; therefore, additional efforts to define specific anatomic substrates will help to standardize the reporting of this disease and minimize discrepancies in the literature regarding management[12].

CONCLUSION

In summary, this case report demonstrates that MDCT can visualize coronary artery aneurysms very precisely and it provides an excellent view over the anatomy of the coronary artery as well as the surrounding tissues. This exact knowledge of the anatomy is crucial for planning a surgical or interventional approach. . With the increasing use of MDCT to image the coronary arteries, aneurysms will be identified more frequently.

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