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Arteriovenous Fistula from the Left and Right Coronary Arteries -to- Pulmonary Artery Presenting with Acute Myocardial Infraction

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Abstract. This is a review of a case study of a bilateral coronary artery fistulae originating from the left anterior descending artery, plus the right coronary artery to form a spiral shape arteriovenous malformation, and draining into the pulmonary artery. The patient presented with an acute coronary syndrome and a myocardial infarction due to a complete occlusion of the left anterior descending, distal to the origin of the fistula branches arising from the proximal left anterior descending. The left anterior descending was grafted with left internal mammary graft with surgical resection of the fistula; the post operative course was uneventful. After 2 years, the patient continues to be asymptomatic and was back to heavy work with no complaints.

Keywords: Thromboembolism, Inferior vena cava, Filters.

Introduction

Coronary artery fistulae (CAF) are rare vascular anomalies, The abnormal communication can be between the coronary arteries and cardiac chambers (coronary cameral fistulae) or to other vessels (coronary artery fistulae)[1].

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Case Discussion

This is a case of a 52-year-old mechanical driller patient presented with progressive dyspnoea and chest pain for two months after he suffered anterior wall myocardial. He was previously healthy with no risk factors of atherosclerosis. On admission his physical examination was essentially normal, except for systolic murmur at the left fourth intercostal space (recognized after the actual diagnosis by coronary angiography). The ECG showed signs of an old anterolateral infarction, and an echocardiography revealed mild anterior wall hyperkinesias. Selective cardiac catheterization showed a coronary arteriovenous malformation in the form of bilateral coronary to pulmonary artery fistulae. The first and the second feeding branches were from the proximal segment of the left anterior descending (LAD), and the third was from the right coronary conal branch (Fig. 1-3).

These fistulae form a large cauliflower spiral vascular malformation. The LAD was totally occluded distal to the fistula. The coronary arteries otherwise, looked normal in size and had no narrowing. Because of the ongoing ischemia, it was decided to do surgical excision of the fistulae and graft the occluded LAD artery.

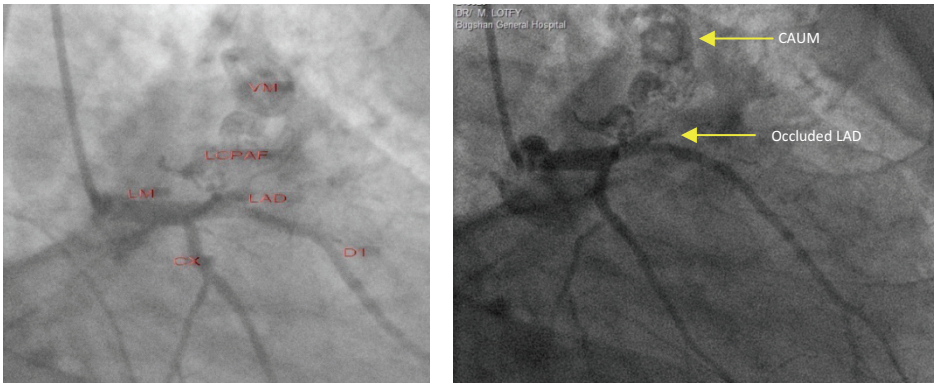


Fig. 1. **LM(left main), CX(circumflex), D1(diagonal, LAD(left anterior descending), LCPAF(left coronary pulmonary artery fistula), VM(vascular malformation), RCA (right coronary artery), RCPAF(right coronary pulmonary artery fistula.**

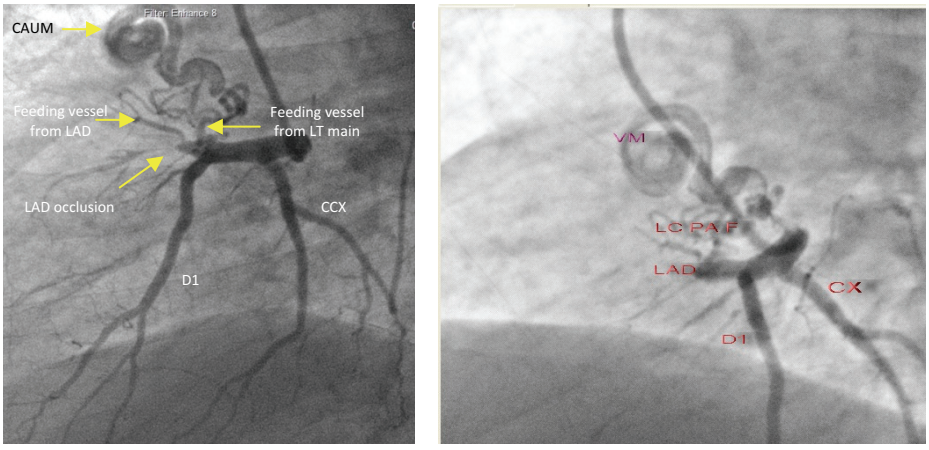


Fig. 2. **Spiral CAVM with feeding vessels from the left main (LM) and left anterior descending (LAD) coronary arteries and complete occlusion of the LAD after the first diagonal branch.**

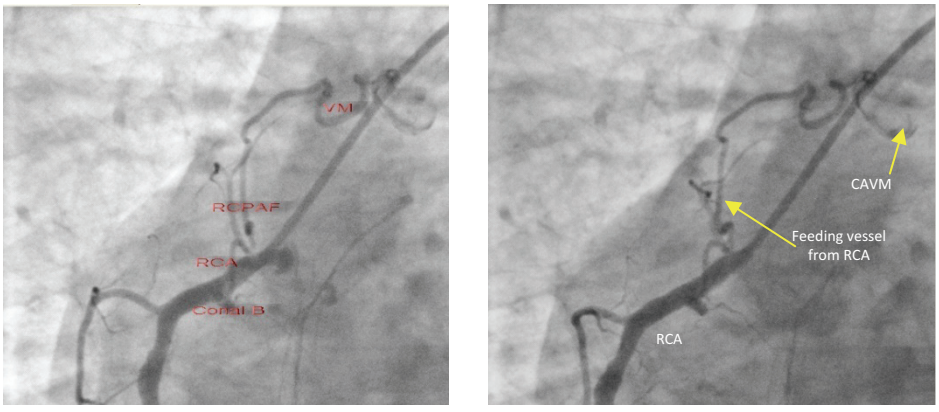


Fig. 3. **Coronary arteriovenous malformations (CAVM) with a feeding vessel from the proximal right coronary artery (RCA).**

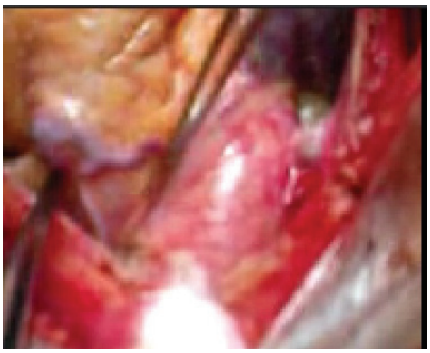
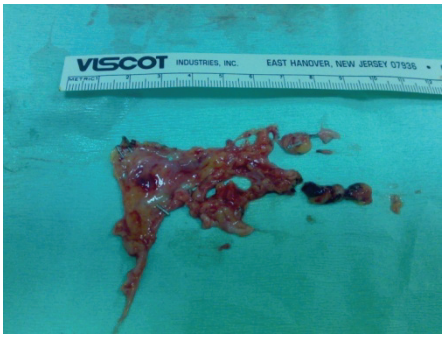


Fig. 4. Intra-operative view of the vascular malformation.



A. Dorsal view

B. Ventral view

Fig. 5. Specimen of the vascular malformation.

Intra-operatively by using cardiopulmonary bypass and blood cardioplegic arrest. The right coronary fistula was ligated followed by ligation of the LAD fistulae. An excision of the vascular malformation which measured about 9 x 4 centimeter, and extending from the conal part of the right ventricle to the main pulmonary artery, and in the space between the aorta and the pulmonary artery (Fig. 4 and 5). There were multiple entry sites to the pulmonary artery which was repaired by direct suture closure.

The LAD was grafted using the left internal mammary artery. The patient did not require any in otropic support, and was weaned off the ventilator in 2 hours. Postoperative course was uneventful and he was discharged after 4 days. The patient resumed his physically stressful duties after 3 month and continued to be asymptomatic one year after surgery.

Discussion and Reviews

Coronary artery fistulae (CAF) or coronary arteriovenous malformations (CAVM) are abnormal vascular communications connecting the coronary arteries to the pulmonary artery and other cardiac structures; relatively small number of papers reported and described these cases in the literature.

There can be a considerable variation in the size and the course of a coronary artery fistula. The major sites of origin are the right coronary artery (55%), the left coronary system (35%), and both coronary arteries (5%). The major site of termination with right and left coronary origins are the right ventricle (40%), the right atrium (26%) and the pulmonary arteries (17%). However, the CAFs less frequently drain into the superior vena cava or the coronary sinus, and least likely to the left atrium or the left ventricle[2].

Only 0.1%–0.2% of all patients who undergo selective coronary angiography is diagnosed with a CAF[3]. It accounts for 0.2–0.4% of all congenital cardiac defects, it is rare in adults (incidence only 0.11%) than in children[4].

CAF most commonly involve the right coronary artery (60%), but can also involve both coronary arteries (5%)[5]. It can be congenital or acquired. However, congenital CAF are thought to arise as a result of incomplete embryonic development; normally the coronary arteries communicate with the great vessels and chambers of the heart *via* sinusoids. During the development these sinusoids, it transforms into a normally calibrated capillary network. It has been postulated that incomplete closure of these sinusoids can result in CAF[6].

Acquired CAF can occur as a result of an inflammation, atherosclerosis, and trauma, or a collagen vascular disease[7]. Its symptoms, complications and presentations depend on multiple factors that affect the volume of the shunt across in taking the blood flow away from the coronary circulation that include:

- The termination site (whether it is to the systemic venous side or to the left side cardiac structures).
- The size of the fistula (the larger the size the more likely are the symptoms).

o The differences between the systemic resistance and the resistance in the terminating vessel or chamber.

Most patients with CAF are asymptomatic, especially during childhood. Symptoms and complications increase with aging. Adults with CAF are more commonly associated with angina, typical chest pain, and dyspnoea, without audible murmur. Coronary atherosclerotic heart disease is often misdiagnosed and most cases are incidentally diagnosed during routine coronary angiography. Although symptoms and the complications of CAF are rare, operative closure of coronary artery fistulas is necessary if the patients have severe symptoms and complications[4].

Natural history of CAF in young patients below 20 years of age: only19% develop symptoms or CAVF-related complications (congestive heart failure in 6%, subacute bacterial endocarditis in 3% and sudden death in less than 1%). Whereas in patients older than 20 years of age, 63% develop symptoms or complications of CAVF (congestive heart failure 19%, subacute bacterial endocarditis 4%, myocardial infarction 9%, sudden death 14% and fistula rupture in less than 1%)[8,9].

Coronary CTA is a relatively new imaging modality that has been used for non-invasive coronary artery imaging since 2000 [10,11]. ECG-gated dual tube 128-slice MDCT is capable of producing high quality images, with the ECG-gated image reconstruction algorithms allowing phase-correlated image data sets[12].

CAVF are often diagnosed by coronary angiogram, however with the advent dual tube multi-detector CT superior imaging, non-invasive diagnosis including the course and communications of these fistulae can be made using coronary CTA[13].

Elective closure of coronary artery fistulas by surgery or percutaneous trans-catheter techniques is generally accepted in the presence of symptoms, but controversies exist in the management of asymptomatic patients[14]. Surgical methods of closure are associated with low mortality and morbidity; long-term outcome is excellent and most patients remain asymptomatic[15].

Closure during cardiac catheterization has become the method of choice. Various percutaneous catheter techniques have been employed, including Gianturco coils, interlocking detachable coils, detachable

balloons; polyvinyl alcohol foam, double umbrellas, the Amplatzer duct occluder, and the Amplatzer vascular plug[16]. Risks of fistula closure with these devices include, myocardial infarction and migration of coils or discs to extracoronary vascular structures, or within the coronary artery branches[17]. Percutaneous interventional closure of CAVF is an acceptable alternative, except in patients with other cardiac conditions that will require surgical closure and in cases with multiple fistula drainage sites[18].

Surgical closure for all patients with coronary artery fistulas and demonstrable shunting is recommended in view of minimal operative risks. Small asymptomatic fistulas without demonstrable shunting should be left alone[4]. The relatively high incidence of residual or recurrent fistula makes long-term follow-up mandatory[16].

The risk of endocarditis in patients with CAVF is unclear, however endocarditis prophylaxis is not indicated[19].

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ناسور وراثي ثنائي المنشأ من الشرايين التاجية الأيمن والأيسر يصب في الشريان الرئوي ويسبب احتشاء في عضلة القلب

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المستخلص. التقرير يستعرض حالة مريض مصاب بناسور وراثي حلزوني الشكل ناشيء من اثنين من شرايين القلب التاجية (الأيمن والهابط الأمامي الأيسر) ليصب في جذع الشريان الرئوي. وقد أتى المريض يشتكي من ذبحة صدرية غير مستقرة، واحتشاء عضلة القلب بسبب انسداد الشريان الهابط الأمامي الأيسر بعد منبع الناسور. وقد أجريت له عملية جراحية لاستئصال الناسور وترقيع الشريان الهابط الأيسر باستخدام الشريان الثديي الأيسر. تمت العملية بنجاح وبدون أي مضاعفات وعاد المريض لمزاولة عمله الشاق، وهو الآن بعد سنتين، بدون أي شكوى أو أعراض.