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Case Report

Giant Right Coronary Artery Aneurysm With Coronary Sinus Communication: Challenges In Surgical Management.

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Abstract

We report a rare case of a giant right coronary artery (RCA) aneurysm (56 × 58 mm) with a fistulous communication to the coronary sinus, causing right atrial and ventricular compression in a 47-year-old female presenting with heart failure. Multimodality imaging confirmed the diagnosis. Surgical management included aneurysm resection, fistula closure, and saphenous vein grafting to the distal RCA. Despite initial stabilization, the patient developed low cardiac output and died postoperatively. This case highlights the diagnostic and surgical challenges of giant RCA–coronary sinus fistulas and underscores the need for early recognition and timely intervention to prevent fatal outcomes.

Keywords: Coronary artery aneurysm, Coronary fistula, Right coronary artery, Coronary sinus, Aneurysmectomy, Case report.

INTRODUCTION

Coronary artery aneurysms (CAAs) are uncommon abnormalities characterized by a dilatation of ≥1.5 times the adjacent normal segment, with a reported prevalence ranging from 0.02% to 4.9% (1, 2). Etiologies include atherosclerosis, congenital malformations, vasculitis, connective tissue disorders, trauma, and iatrogenic injury. Although many CAAs remain asymptomatic, giant aneurysms may present with thromboembolism, ischemia, rupture, or compression of adjacent structures (1).

Giant right coronary artery (RCA) aneurysms are particularly prone to mass effect because of their anatomic relationship with the right atrium (RA) and right ventricle (RV). Previous reports have described cases mimicking intracardiac tumors, producing inflow obstruction, or causing arrhythmias (3, 4). Rarely, CAAs may coexist with fistulous communications into cardiac chambers or the coronary sinus; drainage into the coronary sinus is exceptionally rare but has been documented, leading to hemodynamic compromise and heart failure (5, 6). Given the unpredictable course and absence of standardized management, timely recognition of giant CAAs is crucial. Multimodality imaging, including echocardiography, coronary computed tomography angiography, and invasive angiography, guides diagnosis and surgical planning. We present a rare case of aneurysmal dilatation of the RCA with a right coronary sinus aneurysm draining into the coronary sinus, producing significant RA and RV compression.

CASE PRESENTATION

A 47-year-old female presented with progressively worsening shortness of breath, NYHA class IV, and recurrent palpitations for six months. She denied chest pain, syncope, or history of rheumatic fever. Her past medical history was unremarkable. On admission, she was tachycardic with an irregular pulse and had elevated jugular venous pressure. A systolic murmur was audible over the left parasternal border. Laboratory investigations, including cardiac enzymes, were within normal limits.

DIFFERENTIAL DIAGNOSIS

The differential diagnosis for this presentation included conditions causing right-sided cardiac failure and systolic murmurs, such as tricuspid regurgitation, pulmonary

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hypertension, and mitral stenosis with secondary right heart overload. Other possibilities considered were atrial septal defect, constrictive pericarditis, and right ventricular cardiomyopathy.

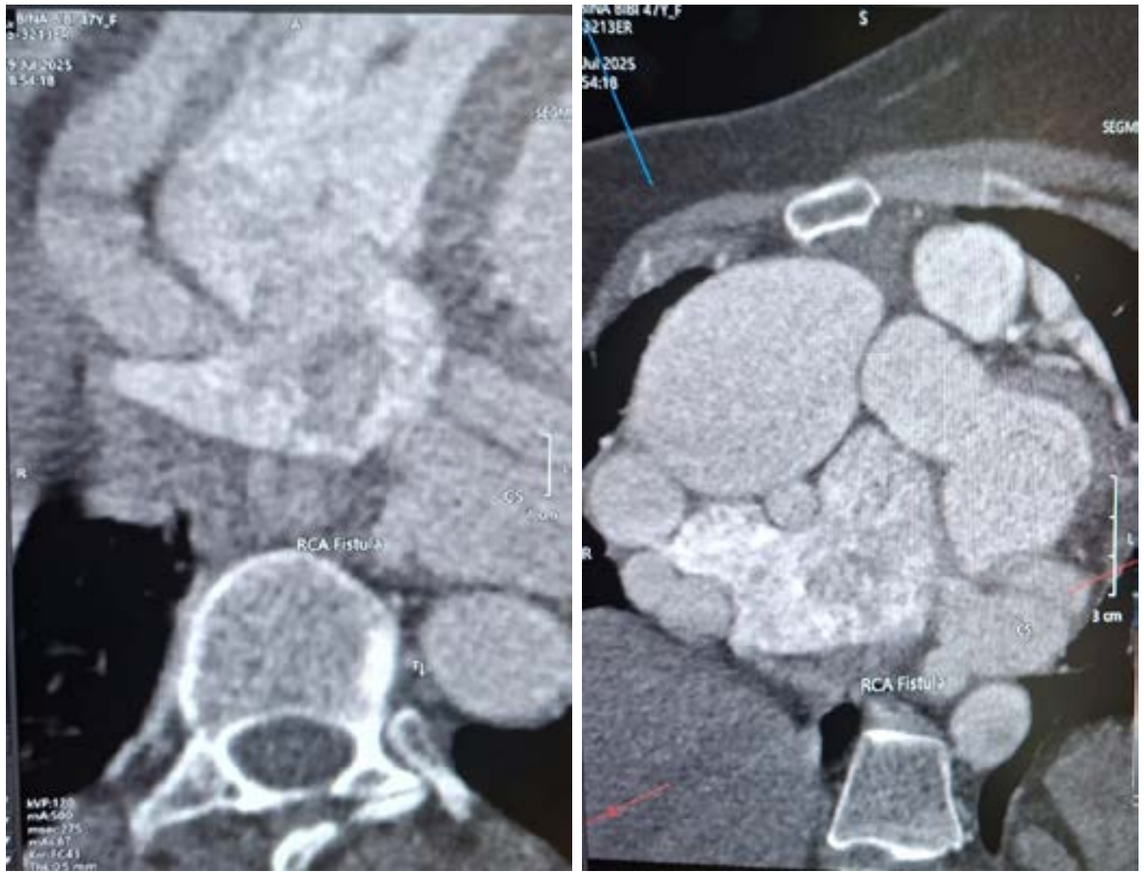
INVESTIGATION

Transthoracic echocardiography suggested a ruptured sinus of Valsalva with a cystic mass compressing the right ventricle, while biventricular systolic function was preserved.

Contrast-enhanced computed tomography angiography demonstrated a dominant right coronary artery (RCA) with a large proximal aneurysm measuring 56 × 58 mm, associated with a fistulous communication draining into the coronary sinus. The aneurysm caused significant extrinsic compression of the right atrium and right ventricle. The aneurysmal RCA and RCA fistula is shown in **Figures 1** and **2** and **Videos 1, 2** and **3**.

Coronary angiography demonstrated a normal left coronary arterial system, while the right coronary artery could not be visualized despite multiple contrast injections.

Figures 1. showing the opening of RCA into the coronary sinus, (A, B); Right Coronary Artery labelled as RCA, opening into Coronary Sinus labelled as CS ; (C); Yellow arrow shows the opening of RCA into the Coronary sinus.



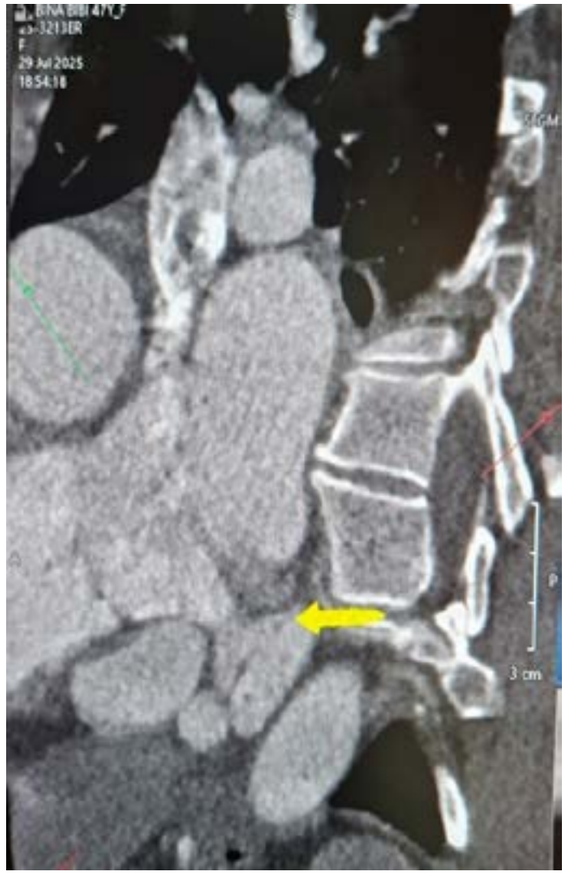
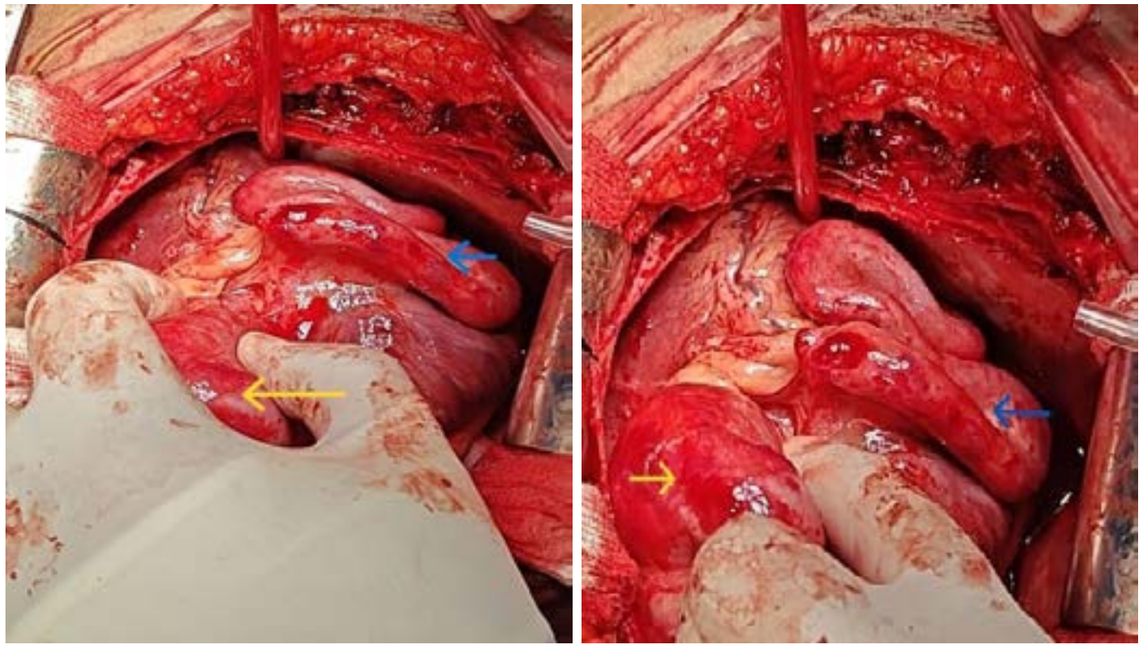


Figure 2. Yellow arrow shows RCA fistula in surgeons hand; Blue arrow shows dilated/aneurysmal RCA.



SURGICAL TREATMENT

She was clinically in high-output cardiac failure preoperatively, likely due to long-standing coronary sinus fistulous shunting. In view of severe symptoms and high risk of rupture, surgical intervention was planned. Written informed consent was obtained from the patient after a detailed counseling session regarding the nature and severity of the disease, its rarity, and the potential risks and outcomes associated with surgical intervention. The patient demonstrated understanding of the information provided and consented to proceed with surgery. Using median sternotomy and cardiopulmonary bypass, the aneurysm was dissected and resected. The fistulous tract into the coronary sinus was closed primarily. To maintain distal perfusion, a saphenous vein graft was placed from the ascending aorta to the distal RCA.

The patient was initially weaned off bypass without difficulty. However, she developed significant bleeding postoperatively and required surgical re-exploration on postoperative day one, where the source was identified as bleeding from the right atrium, which was repaired.

OUTCOME AND FOLLOW-UP

Following fistula repair, she developed high inotrope dependency and low cardiac output syndrome. Rising cardiac enzymes accompanied this, suggestive of perioperative myocardial ischemia, possibly due to abrupt withdrawal of the chronically increased coronary flow from the fistula, compounded by perioperative myocardial injury. Despite maximal supportive measures, she succumbed on the sixth postoperative day.

DISCUSSION

Coronary artery aneurysm (CAA) associated with a coronary artery fistula (CAF) represents a rare but clinically significant anomaly within the spectrum of congenital and acquired coronary malformations. The incidence of CAFs is reported in approximately 0.1–0.2% of patients undergoing coronary angiography, with coronary sinus drainage occurring in only about 5–7% of cases (12, 17). The coexistence of a giant right coronary artery (RCA) aneurysm with a fistulous communication into the coronary sinus is therefore exceptional and has been described only in isolated case reports (10, 11, 16).

In the present case, the aneurysm had attained sufficient size to produce extrinsic compression of the right atrium and ventricle, resulting in right-sided heart failure and hemodynamic compromise. Similar presentations have been described in prior reports of giant RCA aneurysms leading to chamber compression or shunt-related volume overload (8, 10, 11, 16). While non-invasive imaging such as echocardiography and CT angiography can establish the diagnosis, coronary angiography remains the gold standard for delineating feeding and drainage anatomy, which is critical for operative planning (19).

Several management strategies have been described for CAA–CAF complexes, depending on the patient's anatomy, symptoms, and hemodynamic status. Percutaneous closure using coils, detachable balloons, or occluding devices has been successfully performed in select patients with small or distal fistulas without significant compression or aneurysmal dilation (20, 27). However, surgical repair remains the treatment of choice for giant or symptomatic aneurysms, particularly those at risk of rupture, thrombosis, or significant left-to-right shunting. Surgical techniques described in the literature include aneurysmectomy or exclusion, ligation of the fistulous tract, and coronary artery bypass grafting to maintain distal myocardial perfusion (7–9, 22, 23). Hybrid and staged procedures have also been attempted for anatomically complex lesions, though these remain rare (21, 23).

In our patient, percutaneous closure was deemed unsuitable because of the giant aneurysm (56 × 58 mm), its mass effect on the right heart chambers, and the need to preserve distal RCA perfusion. The chosen surgical approach, aneurysm resection, closure of the coronary sinus fistula, and saphenous vein grafting to the distal RCA, was therefore the most definitive and safe strategy. This method is supported by earlier studies where combined aneurysm exclusion and revascularization provided excellent outcomes in giant aneurysmal CAFs (8, 10, 16, 23, 25).

Coronary artery fistulas draining into the coronary sinus have been described only rarely, with clinical manifestations ranging from asymptomatic murmurs to severe heart failure and myocardial ischemia (11, 16, 17). The presentation of progressive dyspnea and right-sided failure in our case aligns with the hemodynamic burden observed in other reports of large RCA–coronary sinus communications (10, 11, 16). Surgical correction is strongly recommended for symptomatic patients or those with aneurysms exceeding 30 mm in diameter, and aneurysmectomy with concomitant bypass grafting is preferable when the distal coronary segment cannot be safely preserved (7, 8, 9, 22, 23).

Postoperative hemodynamic instability and ischemia may occur following closure of long-standing fistulas, reflecting abrupt changes in coronary flow and reversal of the "coronary steal" phenomenon. This complication has been described even in cases with adequate myocardial protection (26). The transient ischemic changes observed in our patient likely reflected these pathophysiologic alterations, compounded by chronic high-flow shunting through the aneurysmal RCA. Early surgical referral before the onset of severe heart failure or irreversible myocardial damage remains essential to improve outcomes in such complex lesions (7, 8, 27).

In summary, this case illustrates a rare but surgically correctable cause of right heart compression due to a giant RCA aneurysm with a coronary sinus fistula. Although percutaneous closure is an emerging therapeutic option, surgical resection with fistula closure and distal coronary bypass remains the most definitive treatment for large, hemodynamically significant lesions. Awareness of this unusual presentation and timely surgical intervention are vital to prevent rupture, ischemia, or progressive cardiac dysfunction.

Conflict Of Interest: There is no conflict of interest between the authors and producers of this information because we only intend to use this information for the advancement of knowledge.

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