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Left Main Coronary Artery Aneurysm Complicating Percutaneous Coronary Intervention: A Case Report And Literature Review

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Abstract
Background: *Coronary artery aneurysms (CAAs) are uncommon findings, particularly when involving the left main coronary artery, and may complicate the course of coronary artery disease. Their etiology is often multifactorial, including atherosclerosis and iatrogenic causes such as stent-related vascular injury. We report a case of left main coronary artery aneurysm following percutaneous coronary intervention of the proximal left anterior descending artery.*
Keywords: *Left main coronary artery; Aneurysm; Coronary Angiography*

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I. Introduction:

Coronary aneurysms are rare in adults and result from various etiologies including atherosclerosis and iatrogenic causes such as stent-related vascular injury. Its pathogenesis remains understood. We report a case We report a case of left main coronary artery aneurysm following percutaneous coronary intervention of the proximal left anterior descending artery

II. Case Report:

We report the case of a 48-year-old male patient with poorly controlled type 2 diabetes mellitus, treated with oral antidiabetic agents and without other notable medical history. He was diagnosed with coronary artery disease in August 2024 following the onset of crescendo exertional angina. Coronary angiography revealed significant stenosis of both the right coronary artery (Figure 1) and the proximal segment of the left anterior descending artery (LAD) (Figure2). These lesions were managed by percutaneous coronary intervention with implantation of two drug-eluting stents.

One week later, the patient presented to the emergency department with an anterior ST-elevation myocardial infarction (STEMI), secondary to stent thrombosis in the LAD (Figure3). Management included the deployment of a second stent within the initial stent (stent-in-stent technique).

Three months post-procedure, the patient reported recurrence of exertional chest pain. A submaximal exercise stress test was positive for ischemia. Repeat coronary angiography demonstrated an aneurysm of the left main coronary artery associated with critical ostial stenosis of the LAD (Figure4). The patient subsequently underwent coronary artery bypass grafting (CABG), with favorable postoperative recovery.

III. Discussion

An aneurysm of the left main coronary artery (LMCA) is the rarest form of coronary artery anomaly (CAA), a condition that is itself uncommon.

It is defined as localized coronary artery dilations greater than 1.5 to 2 times the diameter of the adjacent segments [1]. Incidence of CAA is between 0.15% and 4.9% among all patients who underwent coronary angiography [2].

Aneurysms may manifest as either fusiform or saccular configurations. Saccular aneurysms, characterized by a transverse diameter surpassing their longitudinal axis, are associated with an elevated risk of thrombosis and rupture. Fusiform aneurysms, by contrast, are defined by a longitudinal dimension that exceeds their transverse diameter. True aneurysms involve all three histological layers of the arterial wall, whereas false aneurysms, typically resulting from traumatic, iatrogenic, or infectious insults, reflect a disruption in the arterial integrity. Giant aneurysms are conventionally defined by a diameter exceeding 20 mm in adults and 8 mm in pediatric patients. [3]

In adults, atherosclerosis is the most frequent cause, whereas in children, Kawasaki disease is the leading cause. Other potential causes include congenital heart defects, polyarteritis nodosa, systemic lupus

erythematosus, percutaneous coronary intervention (balloon angioplasty, stenting, atherectomy), Ehlers–Danlos syndrome, Behçet's disease, scleroderma, Marfan syndrome, and Takayasu arteritis.

Predisposing factors include hyperlipidemia, hypertension, and smoking, with a higher prevalence observed in men [4]. Among the coronary arteries, the right coronary artery (RCA) is most commonly affected, while the left main coronary artery (LMCA) is the least frequently involved [5].

The pathogenesis of ACAD remains incompletely understood; however, it is thought to involve medial degeneration, thinning of the arterial wall, and increased wall stress [6,7]. Progressive dilatation of the affected arterial segment occurs as the vascular diameter enlarges, further exacerbating wall stress [8]. Histopathological examinations of aneurysmal tissue have revealed significant inflammatory cell infiltration [9].

The majority of patients with ACAD are asymptomatic, with coronary abnormalities often uncovered incidentally through coronary imaging or during post-mortem examination [10].

When symptoms occur, they resemble typical coronary artery disease presentations such as angina, dyspnea, myocardial infarction, and sudden death [11].

Coronary angiography is the gold standard for diagnosing aneurysms, providing detailed information on their size, shape, location, and number. Another imaging modality is coronary CT angiography, which is reliable for detecting aneurysms, stenoses, and occlusions. Cardiac MRI, combined with angiographic analysis of the coronary network, also enables the detection of aneurysmal lesions, along with the assessment of myocardial kinetics and the measurement of right and left ventricular ejection fractions [3].

The most important complications of the CAA are myocardial infarction and sudden cardiac death [1]. Rupture of the aneurysm is a rare complication. It can rupture into the pulmonary artery, the right ventricle, or the coronary sinus, leading to an arteriovenous fistula with a left-to-right shunt, a hematoma, or an intramyocardial mass. Rupture into the pericardial space can result in pericardial tamponade[3].

The treatment of the coronary aneurysm is not well established. Medical management primarily aims to prevent thromboembolic complications in patients with aneurysmal arteries, who are at heightened risk of thrombosis, through the use of antiplatelet and anticoagulant therapies [12]. In cases of vasculitis-induced ACAD, treatment strategies focus on improving outcomes with immunosuppressive therapy.

Percutaneous treatment with polytetrafluoroethylene (PTFE)-covered stents has gained popularity due to their ability to effectively limit expansion of coronary aneurysms by reducing blood flow within the dilated segments thereby preventing their rupture. Some authors have proposed that PTFE-covered stents should be reserved for patients with aneurysms smaller than 10 mm in diameter or for those requiring closure of a fistula [13,14]. Other percutaneous treatment options include coil embolization and autologous saphenous vein-covered stent grafting.

Surgical management is appropriate for ACAD three times or larger than the original/reference diameter, patients with obstructive coronary artery disease, and those with evidence of embolization leading to myocardial ischemia despite antithrombotic therapy. Surgical techniques including aneurysm ligation, resection, marsupialization with interposition graft, and coronary artery bypass surgery with ligation or resection of the aneurysm [15].

IV. Conclusion:

Coronary aneurysm constitutes an uncommon and distinctive manifestation of coronary atherosclerosis. An in-depth understanding of its pathophysiology and clinical implications is imperative for refining diagnostic approaches, customizing imaging protocols, and ultimately enhancing the precision of therapeutic interventions.

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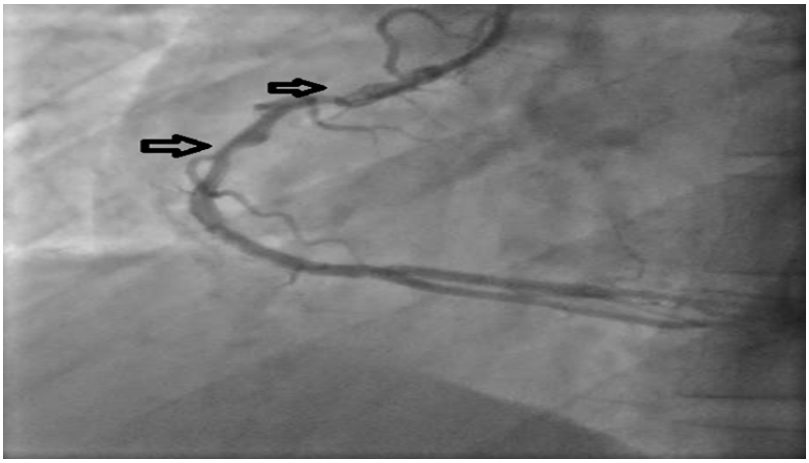

Figure 1: Left anterior oblique (LAO) view shows two stenoses in segments 1 and 2 of the right coronary artery. (Flèches)

Figure 2: Right anterior oblique (RAO) view shows a stenosis of the proximal LAD. (Flèche)

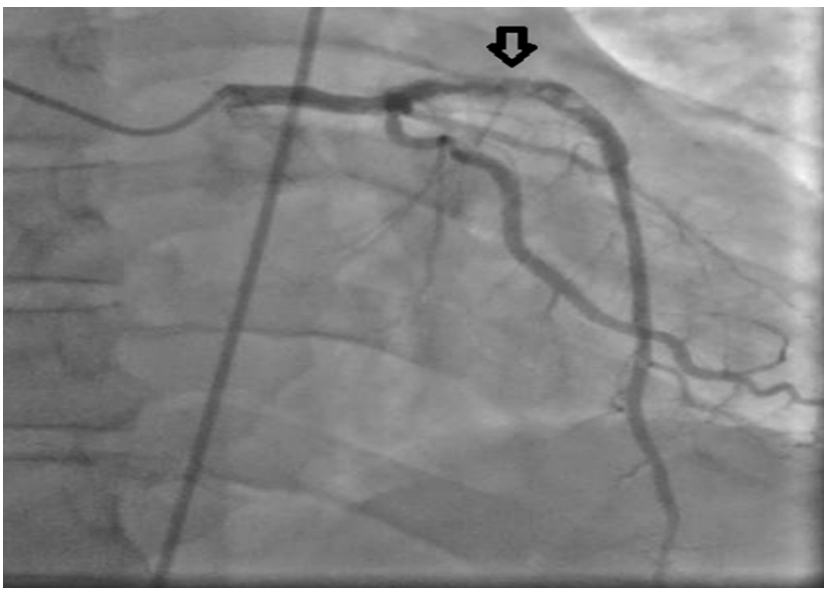

Figure 3: Right anterior oblique (RAO) view shows stent thrombosis in the proximal LAD. (Flèche)

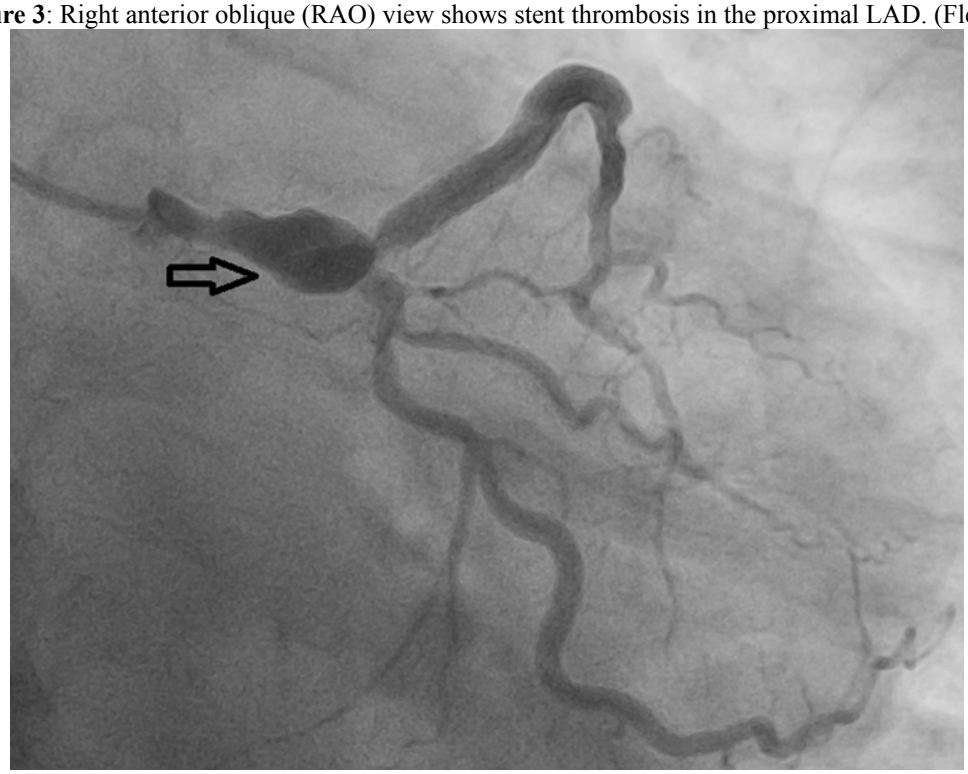

Figure 4: Spider view shows a left main aneurysm and stenosis of the LAD ostium. ((Flèche)