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# Coronary Artery Pseudoaneurysm with Thrombosis of Distal Left Circumflex Artery: A Case Report

Atul Kapoor\*, Goldaa Mahajan\*, Aprajita Kapur\*

Department of Radiodiagnosis, Advanced Diagnostics and Institute of Imaging, Amritsar, India

## Email address:

masatulak@aim.com (Atul Kapoor)

\*Corresponding author

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**Abstract:** *Background:* Pseudoaneurysm of the coronary artery is a rare condition with an incidence of less than 6%. Only few cases have been reported in the literature. The etiology, treatment options and the use of noninvasive diagnostic tools like Computed tomography need to be discussed for understanding the diagnosis and management of this condition. *Case report:* We report a rare case of pseudoaneurysm of the left circumflex artery with distal thrombosis following one year after percutaneous coronary intervention in an adult male patient who presented to us as an asymptomatic follow up patient post percutaneous coronary intervention of left circumflex artery for coronary CT angiography. The CT angiogram showed a 2x2 cm pseudoaneurysm with patent proximal stent and distal segment thrombosis with a patent second obtuse marginal artery. We discuss the imaging findings along with the etiology and treatment options of this condition. *CONCLUSION:* This case highlights the potential risks of coronary stenting especially in complex cases which can result in iatrogenic vessel injury and pseudoaneurysm formation. The case was more challenging as the patient was asymptomatic and there was also distal occlusion of the involved vessel segment. The likely etiology in this case was insertion of prior DES and the treatment options ranged from conservative management with short follow-up, embolization, inserting covered stents and open surgery with aneurysmectomy.

**Keywords:** Coronary Pseudoaneurysm, Coronary CT Angiography, Coronary Stenting

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## 1. Introduction

A coronary pseudoaneurysm (PSA) is an uncommon type of coronary aneurysm in which there is a single vessel wall and is commonly seen following percutaneous coronary intervention. Its incidence is less than 0.2–6%, and it may remain asymptomatic or present with angina-like symptoms, rarely as a cardiac emergency. Less than 20 patients have been reported in the literature so far. We would like to present a rare case of PSA of the left circumflex artery (LCX) with a proximal patent stent in situ and a distal thrombosed vessel in an asymptomatic patient and discuss the treatment options.

## 2. Case Report

We present the case of a 61-year-old male with a known

case of coronary artery disease who came for a routine follow-up CT coronary angiography (CTCA). He had a past history of percutaneous coronary angioplasty one year ago following chest pain for obstructive coronary artery disease of the left circumflex artery, for which a drug-eluting stent was inserted. The patient had no significant symptoms at the time of presentation for CTCA. The study was done on a 128 slice scanner (Siemens Go-Top, Forchheim Germany AG) system. After preparation with oral 5 mg oral ivabradine 1 hour before the examination. The scan was done using retrospectively gated ECG triggered spiral (pitch 0.3) CT acquisition with a rotation time of 0.33 ms using tube voltage of 70 KV along with automated tube current modulation using CARE Dose 4D. Bolus tracking was done after injection of 35 ml of intravenous iodinated contrast iomeprol 400 (IomeronBracco UK Ltd.) with dual head injector (MEDRAD, Stellant, Bayers, Munich, Germany). Image

reconstruction using iterative reconstruction (SAFIRE, Siemens healthineers level 3) was done with reconstruction kernel of BV36, BV 40 for lumen of stent visualisation. Multiplanar and 3 D virtual rendered images were reconstructed and analysis of the images done by the authors. The scan showed a patient with a 2-cm-long stent in the midleft circumflex artery (LCX) with a 2-x2-cm pseudoaneurysm at the distal end. The remaining LCX was not opacified. The second obtuse marginal artery showed normal filling likely through collaterals (Figures 1–3). The patient was advised to undergo surgery, which he refused as he had no current symptoms related to the disease.

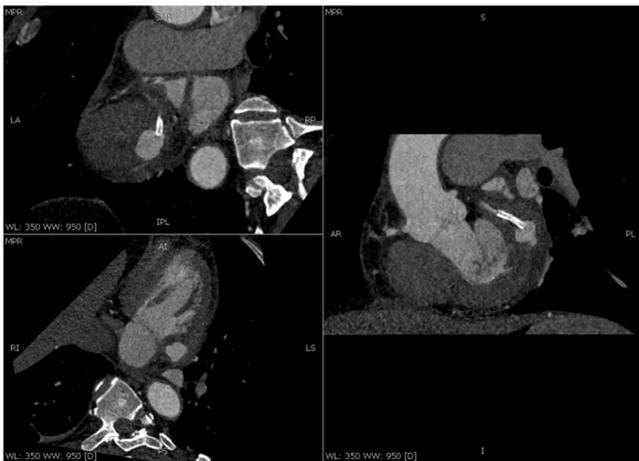


Figure 1. Multiplanar views of coronary CT angiogram showing stent in LCX with a distal PSA.



Figure 2. Coronal oblique multiplanar reformatted view showing PSA with distal occlusion of the vessel.



Figure 3. 3D-Virtual rendered view showing LCX stent with PSA and opacified 2<sup>nd</sup> Obtuse marginal artery.

### 3. Discussion

Pseudoaneurysm (PSA) of the coronary artery is an uncommon condition with an incidence of less than 6% [1]. Occurrence of PSA's in LCX is 23.4% which is comparable to that of left anterior descending artery i.e 32.3% and less than the right coronary artery which has the highest incidence i.e. 40.3%. The left main coronary artery has the lowest incidence of 3.5% [2]. Unlike true aneurysms, PSAs do not have the entire vessel wall layers and are most commonly seen as a complication of percutaneous coronary angioplasty, leading to damage to the vessel wall. Rarely PSA can be occur spontaneously without any past history of intervention as a result of mucoid degeneration of the vessel wall [3]. The PSA may be asymptomatic like this patient's or present with recurrent angina. Rarely PSA has been reported to present as an intracardiac mass in ten patients so far and all the PSA's occurred in the right coronary artery [3]. Spontaneous PSA occurrence can therefore mimic clinically a true aneurysm which is seen in atherosclerosis, Kawasaki disease, Marfan's disease, Takayasu's disease. On imaging also it may not possible to distinguish between the two and histopathological examination may be the only way to differentiate them. However the common causes leading to PSA following coronary intervention are vessel injury causing necrosis of vessel wall, presence of complex atheroma, complex anomalous vessel anatomy, improper catheter placement and stent deployment, or rapid injection of contrast during angiography [3-5]. In one study it was shown that Palmaz stent was associated with presence of an increased incidence of PSA i.e. 3.9% as compared to drug eluting stents (DES) and the incidence of PSA's further increased to as high as 32% when corticosteroids or colchicine were concomitantly administered after the stent [6]. The study presumed that the use of these drugs caused incomplete stent strut apposition. The role of DES in the formation of PSA's also remains controversial even though the incidence of PSA formation after DES implantation is low 0.2-2.3% especially within the first six to nine months of implantation- a rate similar to that reported after bare metal stents (0.3-3.9%) [6-8]. In another study done by Stabile et al [9] it was suggested that patient-specific sensitivity to sirolimus caused aneurysmal dilation and incomplete apposition resulting in PSA formation. The

same study also suggested even Paclitaxel eluting stents may also contribute to re-endothelialisation and delay the positive vessel remodeling which can also lead to PSA formation by hindering cell proliferation. The polymer of the DES in which drug is embedded can also cause hypersensitivity reaction, inflammation with macrophage infiltration which can erode the vessel wall and weaken it to lead to PSA formation. Since in our case the PSA formation was adjacent to the distal end of the DES it was difficult to rule these etiological factors as one of the causes especially when the patient presented one year after intervention which suggests the above process to be a slowly occurring indolent one and the patient also did not have PSA's are also known to occur after bypass graft surgery especially when venous grafts are used [8]. These tend to develop early, within weeks to a few months, after surgery and may rupture with drastic clinical consequences and may be fatal. PSA's usually occurred at the proximal or distal anastomoses of the sapheno venous grafts, but may occasionally affect the body of the graft. Its pathophysiology points towards inflammation, endothelial dysfunction, platelet aggregation, and adhesion and can therefore trigger thrombosis with distal embolisation [10]. The actual course of PSA's is largely unknown; however if left untreated, PSAs can rupture and cause cardiac tamponade, infection or thrombosis as was seen in this case with thrombotic occlusion of the distal LCX. Our case also highlights the enigmatic nature of disease, with a likely slow development of the PSA along with distal embolisation of the vessel resulting in total occlusion, which also explains the lack of symptoms in the patient. The indication for treatment and the best modality for aneurysm therapy remain to be defined [11].

There are several treatment options for the management of such patients, but no standard treatment guideline exists for PSAs occurring after a PCI [12]. Factors which influence the treatment for an aneurysm are based upon its size and rate of growth. However in our patient there was the first time it was detected hence it was difficult to determine its time of growth. Moreover comorbid conditions of the patient also need to be determined as they may influence the procedural risk. Treatment options in a case of PSA of the coronary artery included simple observation, surgery, PTFE covered stent insertion or coil embolization. Obviously, simple observation can prove to be dangerous for the simple risk of rupture and cardiac tamponade but yet if the patient is asymptomatic, like in this patient, a conservative observational approach with pharmacological therapy (anti-platelets, anti-coagulants, calcium channel blockers, or long-acting nitrates and/or beta-blockers) may be used. However, we advised a surgical approach consistent with aneurysmectomy with vessel graft to the second obtuse marginal artery since the distal LCX was completely non-opacified [13]. The reason for preferring this approach was primarily due to no pre morbid risk factor in the patient, presence of distal occluded segment of the LCX, good left ventricle systolic function with normal size of left ventricle and a patent second obtuse marginal artery. The third approach is the use of PTFE-covered stents. The latter

are more popular these days due to their easy deployment in PSAs, especially those after DES implantation. These covered metal stents are single-layered stents that can be rolled into a thin, multi-layer cover four to five times their original diameter without causing laceration to the vessel wall. Use of a coated stent is particularly suitable for young patients with an aneurysm of a single coronary artery branch and normal left ventricular function. The negative charge on the stent also prevents thrombus formation [14]. The neo-intima on the stent surface also facilitates the process of sealing of the aneurysm by reducing blood flow into the PSA and promotes thrombosis. At the same time PTFE covered stents carry some disadvantages such as late thrombo-occlusive events and edge re-narrowing [15-16]. In our patient although the use of such a stent appeared to be an attractive option but due to absence of a good landing zone for the deployment of the PTFE-stent this option was not considered viable and any such an attempt could have resulted in loss of the proximally placed patent stent. Lastly in some patients retrograde coil embolization procedure have also been tried by some [17] however due to presence of a proximal patent stent in the same vessel and wide neck of the aneurysm it was not kept as preferred choice in our case.

## 4. Conclusion

To conclude, the case highlights the rarity of the condition and its etiology which was likely due to prior coronary intervention. Our case highlights the use of CTCA as a non-invasive tool to diagnosis of this rare condition and discusses the various treatment options keeping in mind the overall condition of the patient and the vessel morphology. Conservative management of such patients can be an option in asymptomatic patient like this one but is a risky one and the patients would need a close follow up.

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