



Coronary Steal Caused by a Rare Left Circumflex–Pulmonary Artery Fistula: A Diagnostic and Therapeutic Challenge — A Case Report from Ain Al Khaleej Hospital

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Abstract

Coronary artery fistulas are rare congenital anomalies but may be associated with significant clinical consequences, including myocardial ischemia secondary to the coronary steal phenomenon. The reported incidence of coronary artery fistulas is 0.1–0.2% among patients undergoing coronary angiography, with less than 5% being LCx–PA fistulas. We describe a case of a 39-year-old male presenting with exertional angina and dyspnea, in whom a large, tortuous fistula originating from the left circumflex artery into the main pulmonary artery was identified. A comprehensive diagnostic workup confirmed coronary steal physiology. The patient then underwent successful transcatheter coil embolization at Cleveland Clinic Abu Dhabi, with which he achieved complete symptomatic resolution and normal echocardiographic findings on follow-up.

Keywords: Coronary steal phenomenon, Coronary artery fistula, Left circumflex artery, Pulmonary artery, Coil embolization, Transcatheter closure

Introduction

Coronary artery fistulas are abnormal vascular communications between coronary arteries and cardiac chambers or great vessels, bypassing the myocardial capillary network. Although often discovered incidentally, large or haemodynamically significant fistulas can result in myocardial ischemia, arrhythmia, or heart failure. This is explained by the coronary steal phenomenon, whereby oxygen-rich blood is shunted away from the myocardium towards the low-pressure recipient vessel. Left circumflex-to-pulmonary artery fistulas are especially rare. Diagnosis requires a high index of suspicion and confirmation with multimodal imaging. This report describes a symptomatic LCx–PA fistula causing coronary steal that was successfully managed with percutaneous coil embolization.

Case Presentation

Clinical History

A 39-year-old male with no prior cardiac history presented to the Cardiology Clinic at Ain Al Khaleej Hospital with several months of exertional chest pain, shortness of breath (NYHA Class III), and easy fatigability. He denied palpitations or syncope. On examination, a continuous, machinery-like murmur was audible at the upper left sternal border. Blood pressure was 110/78 mmHg, heart rate 74 bpm, and oxygen saturation 98% on room air. There was no peripheral edema or other signs of heart failure.

Diagnostic Evaluation

The combination of clinical and imaging findings confirmed a large LCx–PA fistula producing coronary steal and myocardial ischemia (Table 1).

Interventional Management

Given his symptomatic presentation and demonstrable coronary steal, transcatheter coil embolization was recommended. The patient was referred to Cleveland Clinic Abu Dhabi, where the procedure was performed on 8 October 2025 under local anesthesia via right femoral arterial access. The tortuous course of the fistula required multiple wire exchanges — Finecross → SUOH03 → Runthrough → BMW → Synchro → Fielder XT-R → SION Black — to achieve stable cannulation. A 2.5 × 15 mm TREK balloon was used for wire trapping to stabilize the system. Through a Caravel microcatheter, five i-ED platinum coils were sequentially deployed within the fistulous tract:

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Received Date: 09 Dec 2025

Accepted Date: 22 Dec 2025

Published Date: 23 Dec 2025

Citation:

Hamad LMB, Al Azzoni A, Mubarak W.
Coronary Steal Caused by a Rare Left
Circumflex–Pulmonary Artery Fistula: A
Diagnostic and Therapeutic Challenge
— A Case Report from Ain Al Khaleej
Hospital. *Ann Clin Case Rep.* 2025; 10:
2807.

ISSN: 2474-1655.

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cited.

Investigation	Findings	Clinical Significance
ECG	Normal sinus rhythm with T-wave inversion in inferior leads	Suggestive of myocardial ischemia
Transthoracic Echocardiography	Normal LV size and systolic function (LVEF 60%); mild concentric LVH; subtle continuous flow signal near LCx region	Suspicious for abnormal coronary communication
Exercise Stress Test	Positive for ischemia with 1.5–2 mm ST depression in inferior leads and reproduction of symptoms at Stage 3 of the Bruce protocol	Confirms exertional ischemia
Coronary Angiography	Normal epicardial coronaries; large, tortuous LCx-PA fistula (Figure 1)	Definitive diagnosis of haemodynamically significant CAF
CT Coronary Angiography	Dilated LCx draining into main PA; 3D reconstruction delineated exact anatomy	Guided percutaneous closure planning
Laboratory Tests	Normal CBC, renal and hepatic function, troponin; mixed hyperlipidemia	No biochemical evidence of infarction
NT-proBNP	85 pg/mL (within normal range for age)	Normal level — no evidence of heart failure or volume overload

Table 1:

1. 5 × 10 cm
2. 5 × 10 cm
3. 4–10 × 10 cm
4. 4–10 × 15 cm
5. 3 × 4 cm

All coils were successfully positioned in situ, resulting in complete occlusion. Final angiography demonstrated restored antegrade flow in the native LCx and complete abolition of the coronary steal phenomenon (Figure 1 and 2). The procedure was uneventful, with no dissection, perforation, or residual shunt.

Outcome and Follow-Up

The patient recovered well post-procedure and was discharged the following day. At one-month follow-up at Ain Al Khaleej Hospital, he reported complete resolution of angina and dyspnea. The continuous murmur had disappeared, and repeat echocardiography confirmed normal LV function and no residual shunt, reflecting both anatomical and functional cure.

Discussion

This case describes a rare but clinically important cause of myocardial ischemia: an LCx-PA fistula with coronary steal in an otherwise healthy young man. The pathophysiological mechanism is simple but profound: blood preferentially flows through the low-resistance fistulous channel into the pulmonary artery during diastole, reducing perfusion pressure in the distal LCx and inducing reversible ischemia. The discordance at our institution between a normal resting ECG and the patient’s exertional symptoms prompted further investigation. Subtle continuous flow on echocardiography raised suspicion, with subsequent angiography confirming the diagnosis. This underlines the importance of correlating non-invasive findings with invasive imaging in cases where routine tests are inconclusive. Transcatheter coil embolization has become the preferred treatment for CAFs because it is minimally invasive and highly effective, with success rates of more than 90%. Success depends on meticulous technique: gentle wire manipulation, precise coil sizing, and maintenance of native coronary segment patency. In our case, the stepwise deployment achieved a dense packing with durable

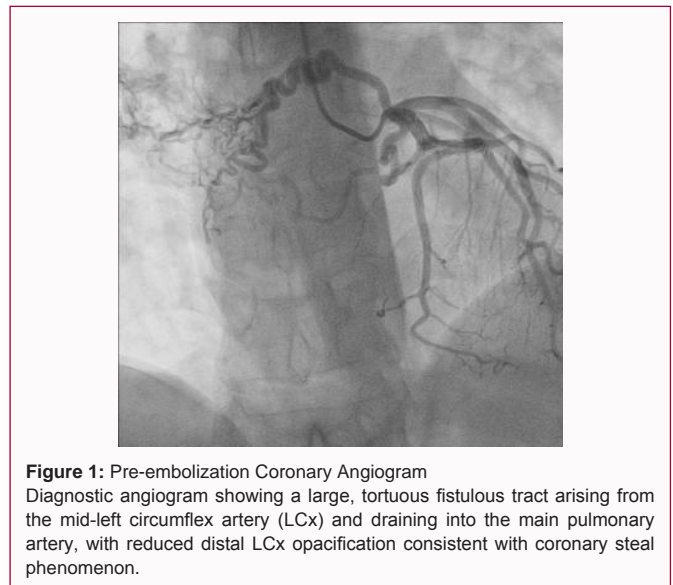


Figure 1: Pre-embolization Coronary Angiogram
Diagnostic angiogram showing a large, tortuous fistulous tract arising from the mid-left circumflex artery (LCx) and draining into the main pulmonary artery, with reduced distal LCx opacification consistent with coronary steal phenomenon.

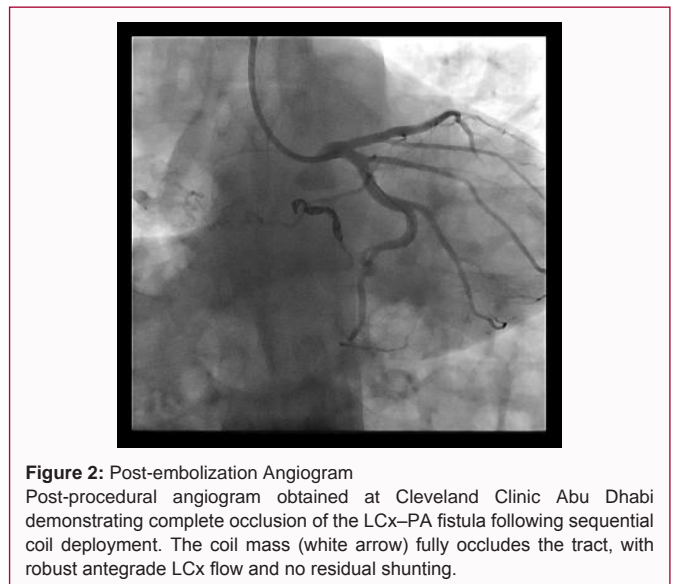


Figure 2: Post-embolization Angiogram
Post-procedural angiogram obtained at Cleveland Clinic Abu Dhabi demonstrating complete occlusion of the LCx-PA fistula following sequential coil deployment. The coil mass (white arrow) fully occludes the tract, with robust antegrade LCx flow and no residual shunting.

occlusion without compromising LCx flow. Despite the technical complexity, the procedure drives home the importance of teamwork, planning, and patience in all procedures of interventional cardiology. The professional reward was the completeness with which the patient recovered during follow-up, underlining the transformative impact of minimally invasive therapy. Recent literature continues to reinforce the role of multimodality imaging, especially cardiac CT and MRI, in defining complex CAF anatomy to guide closure strategies [1-7]. The development of modern detachable coils and vascular plugs has further improved procedural safety and long-term outcomes [5-7].

Conclusion

A left circumflex-to-pulmonary artery fistula is an extremely rare but reversible cause of myocardial ischemia. Prompt recognition and comprehensive diagnostic evaluation along with successful transcatheter coil embolization resulted in complete symptomatic and anatomical recovery. This case illustrates the importance of vigilance, multi-disciplinary collaboration, and innovation in modern interventional cardiology.

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