CASE REPORT

DISTINGUISH BETWEEN PERFORATION OR CORONARY CAMERAL FISTULA: A RARE FINDINGS DURING PERCUTANEOUS CORONARY INTERVENTION

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ABSTRACT

Background: Coronary cameral fistula (CCF) is a rare abnormal communication between a coronary artery and a cardiac chamber, often asymptomatic and discovered incidentally during coronary angiography.

Case report: We report a case of a 49-year-old male with exertional dyspnea and occasional leg swelling who underwent an elective standby coronary angiogram (SBCA). Angiography revealed a chronic total occlusion in the medial LAD and significant stenoses in the RCA. A drug-eluting stent was deployed in the LAD.

Results: After stent deployment, contrast extravasation was observed flowing directly into a heart chamber from the distal LAD, consistent with a CCF. Bedside echocardiography showed no pericardial effusion, ruling out coronary perforation. Further imaging was not pursued due to insurance limitations. This case emphasizes the utility of bedside echocardiography to differentiate between CCF and procedural complications during PCI and highlights the importance of clinical awareness of such rare anomalies.

Keywords: cardiac imaging techniques, coronary angiography, transcatheter closure, coronary anomalies

INTRODUCTION

Coronary cameral fistula (CCFs) is a connection between the coronary arteries and a chamber of the heart.[1,2] CCFs are often found incidentally in the 6th decade of life, and it is often asymptomatic.[1,2,3] It is an exceptionally rare finding, encompassing only a minute portion of congenital heart diseases (only 0.2-0.4%), and the prevalence in the general population is expected to be about 0.002%, with a predominance in females (about 58-63%).[1,2] While congenital origins are most common, acquired cases secondary to iatrogenic procedures or trauma are increasingly recognized.[1,2,4] This case report discusses a patient with symptoms in whom CCF was incidentally found on CAG.[1,2] Furthermore, this report aims to raise awareness of this rare anomaly, highlight the importance of thorough evaluation in symptomatic patients, and contribute to a better understanding of its clinical implications.

CASE REPORT

A 49-year-old male patient came to our hospital to undergo an elective standby coronary angiogram (SBCA). The patient initially complained of severe shortness of breath, especially during activities such as long-distance walks or climbing stairs. These complaints had started 3 months before. Additionally, his legs would sometimes swell but were ignored by the patient. Currently, the patient denied experiencing chest pain, palpitations, and/or cold sweats. However, the patient had a significant history of a non-ST elevation myocardial infarction (NSTEMI) 1 month prior and thus had been scheduled for routine SBCA.

The patient has previously undergone echocardiography with an ejection fraction of 17%, a tricuspid annular plane systolic excursion (TAPSE) of 18mm, a left ventricular (LV) end diastolic diameter of 64mm, an LV end systolic diameter of 57mm, and spontaneous echo contrast (SEC) was identified at the LV. Regional wall motion abnormality was also found. Additionally, there was mild

mitral regurgitation and mild tricuspid regurgitation. The patient has currently consumed aspirin 80mg OD, clopidogrel 75mg OD, ramipril 2.5mg OD, bisoprolol 2.5mg OD, atorvastatin 20mg OD, spironolactone 25mg OD, furosemide 20mg OD, and nitroglycerin 2.5mg BD since 1 month ago.

A vital signs examination was conducted, and blood pressure was found to be 118/89 mmHg, heart rate 84 bpm, respiratory rate 18 times per minute, and oxygen saturation at 98% room air. No rales were found in both lung fields, no increase in jugular vein pressure, and no pitting edema was found in both lower extremities. Laboratory tests are within normal limits. Therefore, the patient underwent SBCA with right femoral artery access. We used 5500 mg of intracoronary heparin. During SBCA, no plaque was found in the LM and LCx; however, a chronic total occlusion (CTO) in the medial LAD was found (noted on Figure. 1), as well as 60% tubular stenosis in the proximal and 75% tubular stenosis in the distal RCA. Afterwards, we planned to revascularize the LAD CTO.

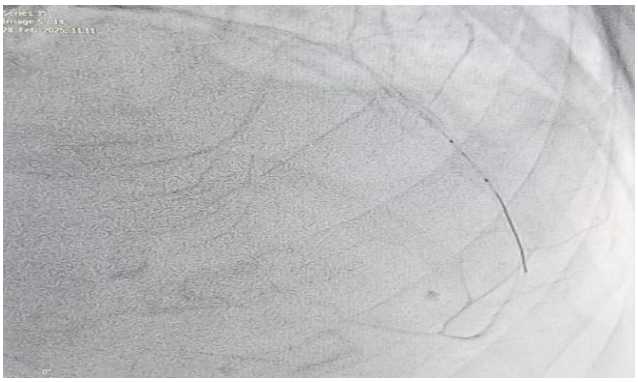

Figure 1. Chronic total occlusion in the medial left anterior descending (LAD) artery

We used a Sapphire II Pro 1.5 x 15 mm balloon and dilated it to 18 atm in the medial-distal LAD. Stent Superflex Cruz 2.75 x 48 mm (drug eluting stent) was placed up to 20 atm in mid-distal LAD (shown in Figure. 2). Post stent dilatation was performed with a Sapphire II Pro 1.5 x 15 mm balloon up to 20 atm in mid LAD, continued with an Aperi SC 2.5 x 15 mm balloon up to 8 atm in distal LAD with a good result. TIMI 3 flow was achieved (shown in Figure. 3).

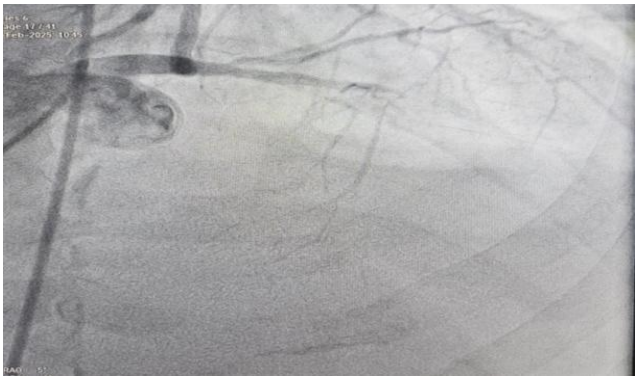

Figure 2. LAD in the process of ballooning and stenting

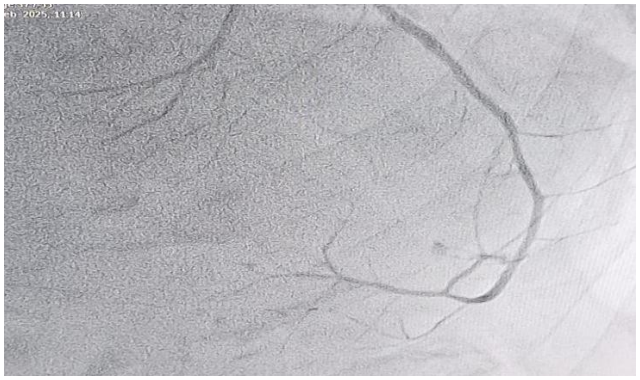

Figure 3. TIMI Flow III on LAD achieved

The procedure had gone according to plan; however, we found contrast-dye extravasation that emptied directly into the heart chamber from the distal LAD. This image can be seen as an opaque shadow in several distal parts of the LAD artery (shown in Figure. 4). We did not find any signs of pericardial effusion from the bedside echo performed after the procedure, thus reinforcing the diagnosis of CCFs. However, due to the limitations of insurance coverage, we did not proceed with further imaging examination to assess the fistula itself. The patient's condition was stable, and he had no complications after the procedure. The patient was sent back to a regular room and discharged one day after the procedure. There were no abnormal ECG findings or ischemic symptoms observed following the intervention. Routine medication was unchanged, and the patient was scheduled for a routine follow-up.

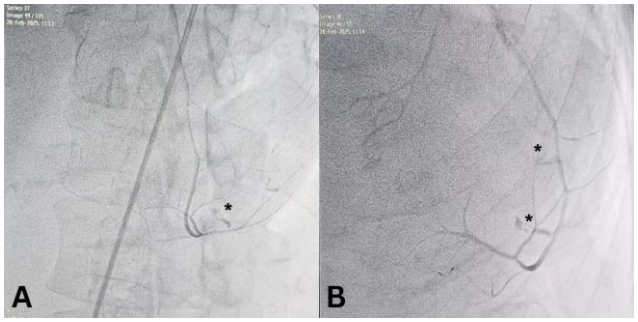

Figure 4. Several extravasations of contrast dye in distal branch: (a) right anterior oblique view, (b) left anterior oblique view.

ETHICAL APPROVAL

This case report has been approved for publication by Yayasan Intervensi Sekat Struktural Indonesia, with ethical clearance number 2025/KEP/2a/01/22072025.

DISCUSSION

Coronary cameral fistulas (CCFs) represent rare cardiovascular anomalies characterized by abnormal connections between coronary arteries and cardiac chambers or major vessels.[5,6] These fistulas, which occur in approximately 0.1–0.2% of the population, pose diagnostic and therapeutic challenges due to their heterogeneous

clinical manifestations and anatomical complexity.[5,6] CCFs arise from embryological malformations during coronary vascular development, typically involving failed regression of primitive myocardial sinusoids.[6,7] The right coronary artery (RCA) serves as the most frequent origin (55–60% of cases), followed by the left anterior descending artery (30–35%) and circumflex artery (5–10%)[6,8] Congenital fistulas often terminate in the right ventricle (40%), right atrium (25%), or pulmonary artery (20%), creating left-to-right shunts that progressively dilate receiving chambers.[6] The shunt physiology of CCFs creates a "coronary steal" phenomenon, diverting blood flow from myocardial microcirculation to low-pressure cardiac chambers.[5,9]

Approximately 50–60% of adults with CCFs remain asymptomatic, with incidental diagnosis during imaging for unrelated conditions.[6] When symptomatic, presentations range from angina (38%), dyspnea (30%), and palpitations (12%) to serious complications such as fistula rupture or infective endocarditis.[5] Symptoms such as pitting edema and shortness of breath, which were experienced by the patient, as well as a history of NSTEMI, are related to the complication of CCFs.[10,11] Angina can occur due to the phenomenon of coronary steal, where there is a shift in blood flow in the heart vessels, resulting decreased perfusion of the myocardium distal to the fistula, causing ischemia in myocardium.[10,11,12,13] This lead to symptoms of angina especially when the oxygen demand is higher such as exercise.[6,7]

Currently, the gold standard for diagnosing CCFs is using a coronary angiogram.[11] However, several modern modalities, such as Transthoracic echocardiography (TEE), CT coronary angiography (CCTA), and magnetic resonance imaging (MRI), which are less invasive, can be used to establish the diagnosis.[11,14] TEE remains first-line, detecting indirect signs like chamber dilation (sensitivity 68%) and turbulent flow jets (specificity 92%).[5,6,15] Cardiac CT angiography provides critical anatomical details for intervention planning.[4]

Untreated CCFs carry a 20% risk of major adverse cardiac events over ten years, including heart failure (12%), myocardial infarction (5%), and sudden death (3%).[6,12] The management of CCFs is adjusted according to the anatomical size of the fistula, accompanying symptoms, and the patient's age.[7,17] If CCFs are found in symptomatic young patients weighing less than 5 kg, surgical repair is recommended.[7,13,17,18] Percutaneous transcatheter closure such as Amplatzer vascular plugs (42%), coils (33%), or PDA occluders (25%) are recommended for the majority of patients, but surgical ligation can also be performed according to individual indications.[7,13,17,19]

Transcatheter closure is indicated for fistulas located proximally, with a single drain site, and where the distal part of the fistula can be bypassed by a catheter.[7,13,19] This procedure is also indicated for elderly patients with a high risk of perioperative complications, and for patients without other cardiac problems.[7,13] On the other hand, ligation may be indicated in patients with symptoms where large fistulas causing symptoms and high flow are found, complex and branched fistulas with multiple outlets, tortuous fistulas with aneurysms, the need for simultaneous distal bypass, and if there are large blood vessels at risk of embolism.[7,13]

During SBCA in our patient, it was discovered that some contrast dye had appeared in several distal branches of LAD. A similar case presented by Marginean et al. also found a contrast overflow image in post-CABG with inferior STEMI patients who underwent PCI. Intra-PCI, they performed an echocardiographic examination and right heart catheterization, and it was confirmed by the findings of drainage of the fistula at the base of the right ventricle.[20] However, in our case, due to insurance coverage limitations, we are unable to perform further cardiac imaging, such as TEE, MRI, or CCTA. Therefore, to guide definitive treatment and the best time for fistula closure or ligation, a multidisciplinary approach and tight coordination between the clinical, imaging, and interventional teams are essential.

CCFs represent rare cardiovascular anomalies characterized by abnormal connections between coronary arteries and cardiac chambers or major vessels. RCA serves as the most frequent origin, followed by the left anterior descending artery and the circumflex artery. Bedside echocardiography is a rapid modality to differentiate perforation from CCFs and can be performed intra-PCI. Although CAG is the gold standard for diagnosing CCFs, TEE, MRI, and CCTA have many advantages for assessing CCFs, including clearly visualizing the anatomy of the fistula, as well as assisting in further assessment and management. There are so many options for treating this disease, such as transcatheter closure or surgical ligation, with their own indications. A multidisciplinary approach and close collaboration between the clinical, imaging, and interventional teams are paramount to guide definitive treatment and optimal timing for fistula closure or ligation.

IMPLICATIONS OF THE FINDINGS

This case highlights the clinical importance of promptly recognizing CCFs during PCI, even in patients who do not report active ischemic symptoms. As illustrated in this patient who denied chest pain, palpitations, or diaphoresis at the time of presentation despite a recent history of NSTEMI, CCFs may be discovered incidentally and yet carry significant diagnostic and management implications. The identification of contrast extravasation from the distal LAD into a cardiac chamber raised an immediate concern for coronary perforation. However, bedside echocardiography, performed immediately after the intervention, demonstrated no pericardial effusion, allowing for a rapid differential diagnosis and confirmation of CCF. The ability to differentiate CCF from life-threatening procedural complications such as perforation using real-time

imaging is clinically significant, particularly when more advanced diagnostic modalities such as TEE, MRI, or CCTA are not accessible due to insurance or financial constraints. Furthermore, the patient's hemodynamic stability, absence of post-procedural complications, and continued use of optimal pharmacological therapy support the effectiveness of conservative management in select CCF cases. These findings underscore the importance of clinician awareness and the utility of bedside echocardiography in acute decision-making during PCI.

STRENGTHS AND LIMITATIONS OF THE STUDY

A major strength of this case is the detailed procedural documentation and the successful use of bedside echocardiography to differentiate between CCFs and coronary perforation in real-time. The patient's stable clinical course, both during and after the PCI procedure, combined with appropriate post-intervention pharmacologic therapy including aspirin, clopidogrel, ramipril, bisoprolol, atorvastatin, spironolactone, furosemide, and nitroglycerin, further supports the safety and efficacy of conservative management in asymptomatic CCFs cases. Additionally, the incidental nature of the finding in a patient without ongoing chest pain but with a recent NSTEMI reinforces the need for vigilance even in seemingly low-risk PCI procedures.

However, the case also has notable limitations. Due to constraints in insurance coverage, further advanced imaging studies such as TEE, MRI, or CCTA could not be performed to fully characterize the fistula. This limited our ability to assess the anatomical extent and functional impact of the CCFs in detail. Moreover, the absence of long-term follow-up data restricts the generalizability of this case to broader patient populations. Despite these limitations, the case remains informative for clinicians encountering similar procedural findings in resource-limited settings.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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DECLARATION OF USING AI

The authors affirm that artificial intelligence (AI) tools were used to assist in the writing process solely for language enhancement purposes, such as grammar checking, paraphrasing, and improving clarity. No AI tools were employed to generate original content, conduct data analysis, or interpret research findings. The authors take full responsibility for the content, interpretations, and conclusions presented in this manuscript.

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