A Case of Intercoronary Communication Mistaken for Obstructive Coronary Artery Disease Successfully Diagnosed Using Microcatheter and Intravascular Ultrasound


Intercoronary communication is a condition in which there is an open-ended circulation with bidirectional blood flow between two coronary arteries in the absence of coronary artery disease.1, 2) Two types of intercoronary communication have been identified: (1) between the right coronary artery (RCA) and the left circumflex artery (LCX), which is the most common; and (2) between the distal left ascending artery (LAD) and the distal posterior descending branch. It is distinguished from the collateral flow by its distinct angiographic features. However, it can be misinterpreted as a functioning collateral vessel indicative of unrecognized severe proximal coronary artery obstruction. A 69-year-old male presented with intermittent complete atrioventricular block. Coronary angiography was performed to rule out ischemia. Standard angiography revealed what was suspected to be coronary artery obstruction; however, intravascular ultrasound did not show any stenotic lesions. Microcatheter angiography successfully diagnosed this to be a case of intercoronary communication. Here we report our case along with some background regarding of intercoronary communication.

KEY WORDS: intercoronary communication, coronary anomaly, atrio-ventricular block, acute coronary syndrome

I. Introduction

Intercoronary communication is a condition in which there is an open-ended circulation with bidirectional blood flow between two coronary arteries in the absence of coronary artery disease.1, 2) Two types of intercoronary communication have been identified: (1) between the right coronary artery (RCA) and the left circumflex artery (LCX), which is the most common; and (2) between the distal left ascending artery (LAD) and the distal posterior descending branch. It is distinguished from the collateral flow by its distinct angiographic features. However, it can be misinterpreted as a functioning collateral vessel indicative of an unrecognized severe proximal coronary artery obstruction.1, 3) We report a case, in which suspected obstructive coronary artery disease was successfully diagnosed using a microcatheter and an intravascular ultrasound (IVUS).

II. Case report

A 69-year-old Japanese male experienced dizziness while watching television and was taken by ambulance to a nearby emergency department. En route to the hospital he had 5 episodes of intermittent complete atrioventricular (AV) block leading to syncope. The patient was put on a temporary pacemaker and coronary angiogram was done, the result of which were suspicious for total occlusion of the distal LCX with collateral flow from the RCA. The patient was transferred to our hospital for further management.

Physical examination on admission was normal, with a blood pressure of 110/75 mmHg, a regular heart rate of 67 beats per minute, and oxygen saturation of 98% on room air. His past medical history included hypertension, dyslipidemia, AV-node reentry tachycardia, and suspected old myocardial infarction. Medications included atenolol 25 mg, atorvastatin 5 mg, candesartan 8 mg, aspirin 100 mg, nifedipine 10 mg. His labs showed a positive troponin T and a brain natriuretic peptide (BNP) of 182.4 pg/ml. His chest X-rays showed cardiomegaly with a cardiothoracic ratio of 60%. Electrocardiogram (ECG) at our hospital showed sinus rhythm with complete right bundle branch block and no ST change. Echocardiography showed posterior wall hypokinesis, which was present in the prior exams as well.
The patient underwent emergency coronary angiography. Distal LCX occlusion was suspected (Fig. 1), and percutaneous coronary intervention (PCI) was performed. The guidewire and balloon passed the distal portion without any resistance. After predilating with a 1.5-mm balloon, IVUS was performed that revealed no stenotic lesion (Fig. 2). Since the guidewire, the balloon and the IVUS probe had passed the lesion without any resistance and IVUS clearly showed that the wire was inside the true lumen, we decided to place a microcatheter and inject contrast through its tip. Angiography showed anastomosis between the distal RCA and LCX; and the patient was diagnosed as having intercoronary communication (Fig. 3). No further intervention was performed and he was admitted with a cardiac monitor, which did not show any further AV blocks. The cardiac enzymes did not increase in the follow up laboratory examinations with the peak CPK being 356 U/l at the time of admission. The posterior wall hypokinesis also did not improve in the follow up echocardiogram. The patient was put on a permanent pacemaker before being discharged.

Fig. 1  A) Right coronary artery angiography showing retrograde filling (arrows) of distal left circumflex artery (anterior-posterior view); B) Left coronary artery angiography showing no flow in the distal left circumflex artery (arrows) (anterio-posterior view). PDA, posterior descending artery; LCX, left circumflex artery; RCA, right coronary artery, LAD left anterior descending artery

Fig. 2  Schematic diagram of coronary arteries and intercoronary communication. PDA, posterior descending artery; LCX, left circumflex artery; RCA, right coronary artery

Fig. 3  Simultaneous angiography through Judkins left and microcatheter tip showing intercoronary communication (black arrows) (anterior posterior view). The microcather tip (white arrow) is in the distal posterior descending artery. PDA, posterior descending artery; LCX, left circumflex artery
III. Discussion

There are anatomic and angiographic differences between collateral vessels and intercoronary communications. Angiographically, collateral vessels are usually less than 1 mm in diameter and appear tortuous with a corkscrew shape, whereas intercoronary anastomoses tend to be straight or gently curved. Histologically, collateral vessels are composed of endothelium supported by poorly organized collagen, muscle, and elastic fibers, whereas intercoronary communications are similar to epicardial vessels, with a well-defined muscular layer.4)

In our case, angiographically the artery was straight, without any torsion. In the IVUS recording we could clearly see the hypoechogenic region indicative of the external elastic membrane (EEM), which is located at the media-adventitia border at 10–12 o’clock (Fig. 4, 5), suggesting that the artery was a well-defined epicardial vessel.5)

Angiography through the guiding catheter did not provide enough information regarding the distal coronary anatomy because there was flow competition between the distal RCA and LCX, but angiography through the microcatheter was diagnostic. However, care should be taken during micro angiography to ensure that the microcatheter is in the true lumen in order to avoid complications, including dissection.

We believe the patient’s inferior wall hypokinesis and intermittent complete AV block was due to ischemia in the intercoronary region. Intercoronary communications are usually thought to be protective in the event of ischemic attack; however, myocardial ischemia can occur due to coronary steal phenomenon. Almost all reported cases demonstrated chest pain suggesting of myocardial ischemia.6–8) We found one case with ischemic ECG changes during exercise electrocardiography9) and one case with perfusion defect during exercise myocardial perfusion imaging.10)

We did not perform spasm provocation test as the symptoms did not occur in the early morning typical for the coronary spasm. Takatsu, et al.11) reported four cases of intercoronary and

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Fig. 4 Schematic diagram of coronary arteries and intercoronary communication with corresponding intravascular ultrasound images.

Fig. 5 Enlarged IVUS image of intercoronary communication showing external elastic membrane (EEM) (white arrow) at 10–12 o’clock. The blood vessel is 1.8 mm in diameter at the EEM layer. IVUS, intravascular ultrasounds
intracoronary communications with vasospastic angina and suggested that intracoronary communications can develop in reaction to ischemia due to coronary spasm. Another reason for ischemia in case of intracoronary communication can be due to coronary spasm, which cannot be ruled out in this case as provocative test was not performed.

Elevated cardiac enzymes in this case could be due to ischemia or circulatory failure as a result of intermittent AV block or coronary spasm. Eventhough the patient did not show further AV block during hospitalization we decided to place a permanent pacemaker before the discharge since the patient was symptomatic and we were not sure we could prevent a future event with balloon angioplasty alone of the distal small vessel.

IV. Conclusion

Intercoronary communications is a condition that can be confused with obstructive coronary artery disease. Angiography through a microcatheter can provide enough information about the distal coronary anatomy when standard angiography data are not sufficient.

References