

# Inter-Coronary Communication: A Rare Anomaly in Unusual Site

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### Abstract

Intercoronary connection is a rare variant of coronary anomalies with a direct continuity between two main coronary arteries. It may function as an alternative pathway to blood flow in compromised coronary circulation. 64 years old male presented with 4 weeks history of retro-sternal chest pain and shortness of breath; his risk factors were diabetes mellitus, hypertension and smoking. Physical examination was normal and he had no audible murmur; he had elevated cardiac enzymes; in echocardiography there was inferior wall hypokinesia, cardiac catheterization revealed complete occlusion of med right coronary artery and complete occlusion of the left main (LM) trunk. Blood flow to the entire myocardium came from large abnormal coronary connection between the right coronary artery ostium and the proximal left anterior descending artery. A smaller arterial communication maintained blood flow to the distal right coronary artery. Cardiac computed tomographic angiography confirmed the presence of a patent left main ostium followed by complete occlusion. This unusual anatomical variation has saved the life of the patient and allowed time for surgical revascularization. The patient underwent successful triple coronary artery bypass grafts with no postoperative difficulties or complications. On one-year follow-up, the patient is asymptomatic, fully active with no new ECG or echocardiography changes.

## **Keywords**

Coronary Arteriovenous Fistula, Coronary Artery Continuity, Myocardial Ischemia, Congenital Coronary Vessels Anomalies

## **1. Introduction**

Coronary artery anomalies include anomalies of origin, termination, structure or course; it is present in less than

1% of the population. One of its rare varieties is intercoronary communication/continuity which connects two coronary arteries bypassing the myocardial capillary bed and is believed to be congenital in origin. Its incidence is 0.002% [1]. In the absence of coronary atherosclerosis it has no clear functional significance and the patients are likely to be asymptomatic, while in the presence of coronary atherosclerosis it may protect the myocardium when it bypasses the diseased coronary segment.

#### 2. Case Report

64 years old male presented with 4 weeks history of retro-sternal chest pain and shortness of breath, his risk factors for ischemic heart disease are non-insulin dependent diabetes mellitus (NIDDM), hypertension and smoking. Physical examination was normal and he had no audible murmur and no evidence of congestive heart failure, based on his 12 lead ECG (**Figure 1**), mild elevation of cardiac enzymes, he was admitted as a case of NSTEMI, there was inferior wall hypokinesia. In echocardiography with ejection fraction of 45%, cardiac catheterization (**Figure 2**, **Figure 3**) revealed complete occlusion of med right coronary artery and complete occlusion of the left main trunk, a large intercoronary communication between the proximal right coronary artery and proximal left anterior descending artery provided the supply to the entire left coronary system including a terminal circumflex artery communication with distal right coronary artery maintained flow to the posterior descending artery. Cardiac computed tomographic angiography (CCTA)—(**Figure 4-6**) confirmed the presence of a patent left main ostium followed by complete occlusion.

The patient underwent successful triple coronary artery bypass grafts (Figure 7) with no postoperative difficulties or complications. On one year follow up he is asymptomatic and fully active with no new ECG or echocardiography changes.

#### 3. Discussion

Intercoronary communication (ICC) is a rare variety of coronary artery anomalies; its blood flow may be unidirectional or bidirectional connecting two coronary arteries. It is usually discovered incidentally during cardiac catheterization or cardiac computed tomography with an incidence of 0.002% [2]. It has no clear function but was reported to serve as a safety valve for the left ventricle [3]. Intercoronary communication continuity/(also known as open ended circulation pattern) is large in size > 1 mm, single, straight vessel; it may serve as a safety valve for the left ventricle and its wall has a distinct muscular layer [4].



Figure 1. 12 lead ECG on admission to the coronary care unit.



**Figure 2.** [Cardiac Catheterization] Coronary artery communication from the right coronary artery (RCA) ostium to proximal left anterior descending artery (LAD) with occluded left main coronary artery (LM) and occluded med RCA, posterior intercoronary communication (ICC) connecting the left circumflex artery (LCX) and the RCA.



**Figure 3.** [Cardiac Catheterization] Anterior arterial communication from right coronary artery (RCA) ostium to proximal left anterior descending artery (LAD) with occluded left main (LM) trunk and med RCA.



Figure 4. Cardiac computed tomography (CCT): patent left main coronary ostium with subsequent occlusion, the abnormal arterial coronary communication is evident along the anterior epicardial surface of the right ventricle.



Figure 5. Pre-operative cardiac computed tomography (CCT); the intercoronary continuity.



**Figure 6.** Preoperative cardiac computed tomography (3D reconstruction): the abnormal coronary communication is evident along the anterior epicardial surface of the right ventricle connecting the right coronary artery and the left anterior descending artery.



Figure 7. [Intraoperative Picture] The abnormal coronary communication is evident along the anterior epicardial surface of the right ventricle (black arrows).

More than 20 cases of ICC are reported in the literature; most of the reported cases (about 20 cases) are between the distal ends of the main right coronary and circumflex arteries with unidirectional blood from the RCA to CCX more common than bidirectional flow [4] [5] [7] [8]. Best reviewed in 2003 (15 cases) by Fournier *et al.* [5], the remaining few reported cases are between the distal RCA (PDA) and distal LAD [8] [9].

On the other hand the coronary collaterals typically have a small diameter of less than 0.5 mm, epicardial or intra-myocardial, carrying blood from a vessel with normal flow to a vessel segment after the occlusion or sever stenosis. The extent of these collaterals is related to the angina duration, usually disappearing after revascularization and reappearing if stenosis or occlusion reoccurs [10]. In our case the large anterior epicardial > 1 mm vessel originates from the right coronary ostium and runs along the anterior surface of the right ventricle to the end in the proximal segment of the left anterior descending artery, and in the same time there is posterior intercoronary continuity between the right coronary artery crux and the distal left circumflex artery. Due to occlusion of the left main trunk one cm after the left coronary ostium, the abnormal anterior epicardial vessel carried the blood from the RCA to the LAD providing flow to the entire left coronary system, despite the fact that this vessel is different in site to the reported ICC, but all other criteria of intercoronary continuity apply to it; in the same time the posterior intercoronary communication carried blood back to the distal RCA and its posterior descending branch. This abnormal pattern of coronary blood flow maintained adequate perfusion to the left ventricle and saved the patient life when he occluded the RCA in its med segment. Most of the intercoronary communications are unidirectional carrying the blood from the RCA to LCX or LAD [5]-[8]. The presence of these 2 coronary anomalies has saved the life of the patient; the posterior communication kept him asymptomatic and active for so many years despite disease and occlusion of the left main artery, and the anterior uncommon site coronary communication protected his heart when his RCA occluded.

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