

## Intercoronary Communication between the Circumflex and Right Coronary Arteries Coexisted with Coronary Vasospasm

Soo Hyun Kim, MD<sup>1</sup>, Dae-Hyeok Kim, MD<sup>2</sup>, Woong Gil Choi, MD<sup>1</sup>, Seoung Il Woo, MD<sup>2</sup>, In Suk Choi, MD<sup>3</sup>, Jun Kwan, MD<sup>2</sup>, Keum Soo Park, MD<sup>2</sup>, and Sung-Hee Shin, MD<sup>2</sup>

<sup>1</sup>Division of Cardiology, Department of Internal Medicine, Konkuk University College of Medicine, Chungju,

<sup>2</sup>Division of Cardiology, Department of Internal Medicine, Inha University College of Medicine, Incheon,

<sup>3</sup>Division of Cardiology, Department of Internal Medicine, Gachon University, Incheon, Korea

Intercoronary arterial connection between normal coronary arteries is a rare variant of coronary anatomy in which there is open-ended circulation. It is distinguished from collaterals seen in the occlusive coronary artery disease. We report a case of bidirectional intercoronary communication between the left circumflex artery and the right coronary artery without occlusive coronary artery disease, but with left anterior descending artery spasm. (**Korean Circ J 2013;43:488-490**)

**KEY WORDS:** Coronary vessel anomalies; Coronary vasospasm.

### Introduction

The incidence of coronary artery anomalies in a routine coronary angiography series is between 0.5% and 1.0%.<sup>1,2</sup> Intercoronary communication is a rare coronary artery anomaly with unidirectional or bidirectional blood flow between two coronary arteries. Yamana and Hobbs<sup>2</sup> reported the incidence of intercoronary connections to be 0.002% in a study comprising 126595 patients. It is suggested that a defective embryological development allowed the existing intercoronary channel to remain prominent.<sup>3-5</sup>

### Case

A 45-year-old male presented with chest pain that was aggravated in early morning. He was a current smoker with 20 pack-years

**Received:** October 11, 2012

**Revision Received:** December 13, 2012

**Accepted:** December 24, 2012

**Correspondence:** Sung-Hee Shin, MD, Division of Cardiology, Department of Internal Medicine, Inha University College of Medicine, 27 Inhang-ro, Jung-gu, Incheon 400-711, Korea

Tel: 82-32-890-2440, Fax: 82-32-890-2447

E-mail: sshin@inha.ac.kr

• The authors have no financial conflicts of interest.

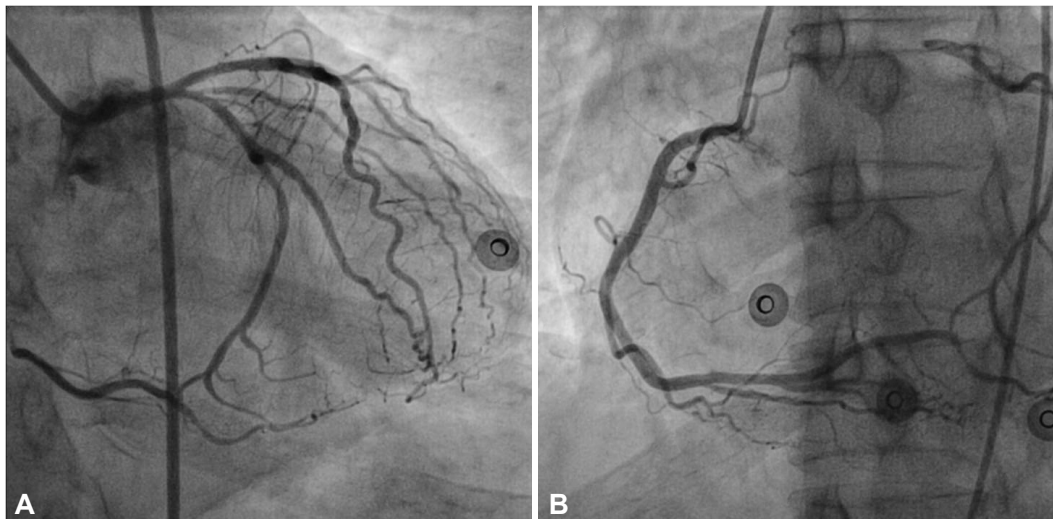
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

and used to have chest pain on exertion intermittently. Electrocardiogram showed ST elevation on leads from V 1-3, and chest X-ray was normal. Laboratory findings revealed mildly elevated cardiac enzyme; creatine kinase-MB and troponin I level were 6.9 ng/mL (0.0-5.0) and 0.3 ng/mL (0.00-0.16), respectively. Transthoracic echocardiography demonstrated hypokinetic mid anteroseptum with preserved left ventricular global systolic function. Coronary angiography was performed and revealed no significant luminal narrowing or occlusion of coronary arteries. However, selective injection of left coronary artery showed retrograde filling of the distal right coronary artery (RCA) from distal left circumflex artery (LCX), and right coronary injection visualized RCA and distal and mid portion of LCX simultaneously visualized (Fig. 1). Retrograde filling was not related to collaterals, but to a bidirectional intercoronary communication.

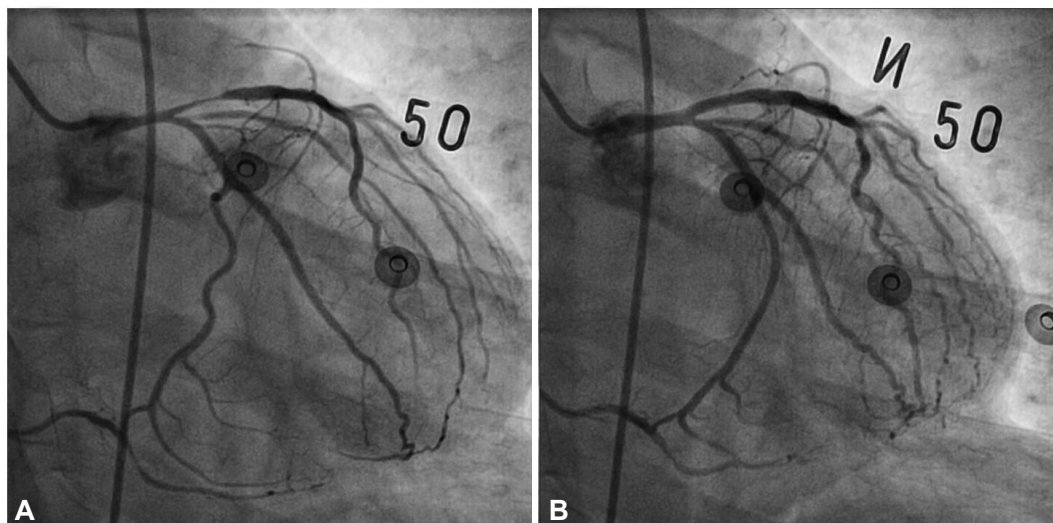
When ergonovine was administered intravenously in a dose of 50 ug, the significant spasm of proximal left anterior descending artery (LAD) was provoked with chest pain (Fig. 2A). The spasm and chest pain subsided promptly after intracoronary injection of 200 ug of nitroglycerin (Fig. 2B).

### Discussion

Intercoronary communications are rarely seen during coronary angiography in patients with and without coronary artery narrowing. They are distinguished from coronary collaterals that are seen in the patients with occlusive coronary artery disease by angiographic



**Fig. 1.** A: left selective coronary angiogram shows no significant obstructive disease of left coronary artery and retrograde filling of the right coronary artery (RCA). B: right selective coronary angiogram shows direct connection between the distal part of RCA and the left circumflex artery (LCX), without a critical lesion involving RCA and LCX.



**Fig. 2.** A: the significant stenosis of proximal LAD develops when ergonovine is administered intravenously in a dose of 50 µg. B: LAD spasm resolves with the injection of intracoronary nitroglycerine. LAD: left anterior descending artery.

features and histological structure. Intercoronary arterial communications are single, extramural, straight and larger in diameter (>1 mm) compared to collaterals. The histological structure of the connecting vessel has the characteristics of a normal arterial wall, with a well defined muscular layer.<sup>6)</sup> Two types have been reported, which are a communication between LAD and posterior descending artery in the distal interventricular groove, and a communication between LCX and RCA in the posterior atrioventricular groove, as shown in our case.<sup>4)</sup>

The predominant symptom at presentation is chest pain, which is usually atypical, and non-invasive diagnostic procedures have often doubtful results.<sup>4)7)</sup> There are controversies regarding functional significance of intercoronary connections. Sometimes, these con-

nections may play a protective role for myocardium, if the coronary artery obstruction has developed in one of the two connecting vessels.<sup>4)6)</sup> On the other hand, myocardial ischemia can be resulted from a coronary steal by the unidirectional intercoronary communication.<sup>5)9)</sup>

Our case presented bidirectional intercoronary communication having coronary spasm on provocation test without significant coronary narrowing. Takatsu et al.<sup>10)</sup> reported similar cases of intercoronary communications with vasospastic angina. They proposed the intercoronary communications were useful in at least partially protecting myocardium from ischemia during spasm. Whereas spastic coronary artery was related to the intercoronary connections in their report, it was not directly related to intercoronary communication

in our case. Although the relation between intercoronary connection and coronary artery spasm is not clear, consideration of provocation for coronary vasospasm can be useful if intercoronary communication without significant coronary obstruction is found in patients with chest pain.

## References

1. Chung SK, Lee SJ, Park SH, Lee SW, Shin WY, Jin DK. An extremely rare variety of anomalous coronary artery: right coronary artery originating from the distal left circumflex artery. *Korean Circ J* 2010;40:465-7.
2. Yamanaka O, Hobbs RE. Coronary artery anomalies in 126,595 patients undergoing coronary arteriography. *Cathet Cardiovasc Diagn* 1990; 21:28-40.
3. Atak R, Güray U, Akin Y. Images in cardiology: intercoronary communication between the circumflex and right coronary arteries: distinct from coronary collaterals. *Heart* 2002;88:29.
4. Gavrielatos G, Letsas KP, Pappas LK, et al. Open ended circulation pattern: a rare case of a protective coronary artery variation and review of the literature. *Int J Cardiol* 2006;112:e63-5.
5. Sengül C, Ozveren O, Oduncu V, Değertekin M. Unidirectional intercoronary communication: a very rare coronary anomaly and cause of ischemia. *Turk Kardiyol Dern Ars* 2011;39:344.
6. Reig J, Jornet A, Petit M. Direct connection between the coronary arteries in the human heart. Intercoronary arterial continuity. *Angiology* 1995;46:235-42.
7. Fournier JA, Cortacero JA, Díaz de la Llera L, Sánchez A, Arana E, Morán JE. [Distal intercoronary communication. A case report and medical literature review]. *Rev Esp Cardiol* 2003;56:1026-8.
8. Özlü MF, Özcan F, Sen N, Çağlı K. An intercoronary connection serving as a safety valve for the left ventricle. *Turk Kardiyol Dern Ars* 2010;38: 416-8.
9. Gur M, Yılmaz R, Demirbag R. Unidirectional communication between the circumflex and right coronary arteries: a very rare coronary anomaly and cause of ischemia. *Int J Cardiovasc Imaging* 2006;22:339-42.
10. Takatsu F, Osugi J, Sugiishi M, Suzuki A, Nagaya T. Intercoronary and intracoronary communications in four cases of vasospastic angina. *Cathet Cardiovasc Diagn* 1989;16:103-8.