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Functional Coronary Collateral Circulation in Severe Aortic Stenosis with the Absence of Coronary Artery Disease

The coronary collateral flow remains a highly investigated issue in cardiology. We describe a 43-year-old male who presented with functional collateral flow between normal coronary arteries as a result of severe aortic stenosis.

He had been experiencing exertional dyspnea and angina pectoris for 4 months. We performed transthoracic echocardiography, which revealed a calcified bicuspid aortic valve with severe stenosis. A maximum gradient of 77 mm Hg was measured on the aortic valve, with a mean gradient of 51 mm Hg. The aortic valve diameter was calculated as 0.7 cm^2 using a continuity equation. Based on these findings, we recommended aortic valve replacement surgery. Preoperative coronary angiography revealed the functional collateral circulation within the normal coronary arteries. There was a grade 3 collateral circulation from the circumflex artery (Cx) to the right coronary artery (RCA) in the left anterior oblique (LAO), the right anterior oblique (RAO), as well as anterior–posterior projections (Figure 1)

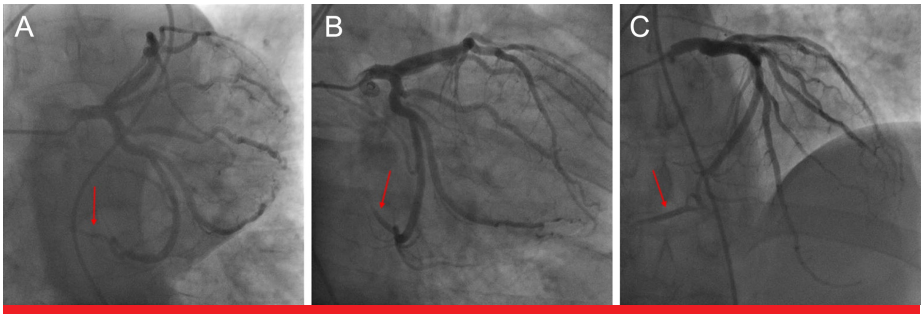

Figure 1. Coronary angiography of the left coronary arteries: (A) left anterior oblique caudal angulation; (B) right anterior oblique caudal angulation; (C) anteroposterior cranial view. Red arrows show the collateral artery from the right coronary artery to the circumflex artery.

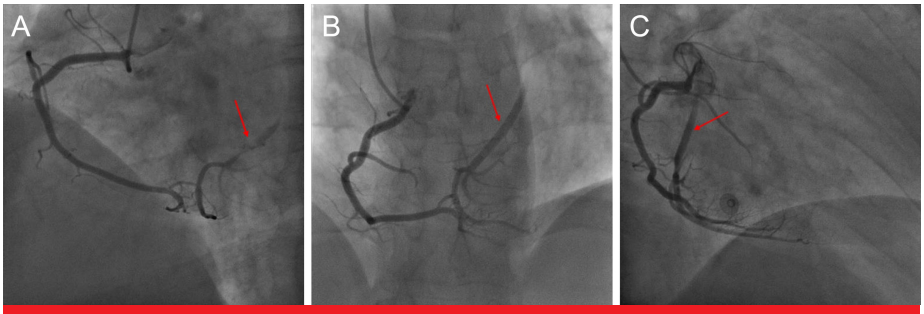

Figure 2. Coronary angiography views of right coronary artery (RCA). (A) The left anterior oblique (LAO) projection of RCA. (B) Cranial angulation of left anterior oblique projection demonstrated the RCA artery with grade 3 collateral circulation. (C) The right anterior oblique projection of RCA. Red arrows show the collateral artery from circumflex artery to RCA.

E-PAGE ORIGINAL IMAGE

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(Videos 1, 2). Additionally, LAO caudal and cranial projections of RCA indicated the presence of grade 3 collateral arteries from RCA to Cx (Figure 2).

Coronary collateral circulation plays a critical role in coronary artery occlusions. It may also occur in the absence of coronary artery disease.

Several studies have shown that left ventricular hypertrophy can positively influence the state of intercoronary connections. Particularly, left ventricular hypertrophy due to severe aortic valve stenosis may lead to increases in myocardial oxygen demand and coronary artery compression. Consequently, these conditions may contribute to myocardial ischemia and subsequent coronary collateral formation, as observed in our patient.

Informed Consent: An informed consent was obtained from the patient.

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Video 1: The coronary collateral artery from circumflex artery to the normal right coronary artery is visible in the left anterior oblique cranial projection.

Video 2: A prominent grade 3 coronary collateral circulation was visible from the distal RCA to the CX coronary artery.