Primary Percutaneous Coronary Intervention of Anomalous Circumflex Artery after Mitral Valve Replacement

Rafael Alexandre Meneguz-Moreno, Antônio de Castro Filho, Mário Barbosa Guedes Nunes, Emerson Gonçalo Pereira Filho, Ricardo Alves da Costa, Alexandre Abizaid

Instituto Dante Pazzanese de Cardiologia – São Paulo, SP – Brazil

Abstract

Anomalous origin of the circumflex coronary artery from the right sinus of Valsalva is the most frequent coronary anomaly. We report the case of a patient with anomalous circumflex artery originating from the right coronary artery, who underwent mitral valve replacement surgery evolving with cardiogenic shock and acute occlusion of the circumflex artery. Emergency percutaneous coronary intervention and bare-metal stent implantation were required. The patient improved clinically without any further cardiac complications.

Keywords: Percutaneous coronary intervention; Mitral valve; Thoracic surgery

Introduction

The prevalence of congenital anomalies of the coronary arteries in a population undergoing angiography is described in 0.6-1.5% and 0.3% of patients undergoing necropsy\(^1\). There is a wide variety of anomalies described. The most frequent one is the origin of the circumflex artery in the right sinus of Valsalva\(^2\).

Ischemic iatrogenic injuries can complicate the mitral valve replacement or repair surgery. Direct arterial injury or distortion of the circumflex artery can occur due to the proximity to the mitral valve\(^3\).

Case Report

Female patient, 64 years old, with a history of rheumatic fever, including mitral valve repair surgery at Instituto Dante Pazzanese de Cardiologia, SP; breast cancer with mastectomy on the left breast; systemic arterial hypertension; type 2 diabetes mellitus; bronchial asthma; bilateral pulmonary nodules and permanent atrial fibrillation without using anticoagulants.

On physical examination: holosystolic mitral murmur (3+/6+) spreading to the axilla with no other relevant changes. Preoperative electrocardiogram (ECG) with atrial fibrillation, right branch conduction disturbance, axis at +60\(^\circ\). Preoperative echocardiography: severe biatrial increase, severe eccentric reflux, maximum gradient of 20 mmHg, average gradient of 7 mmHg and valve area of 1.7 cm\(^2\), preserved biventricular function with left ventricular ejection fraction (LVEF) of 60%, pulmonary artery systolic pressure (PASP) of 71 mmHg.

Patient underwent mitral valve replacement surgery with bioprosthesis implant of 35 mm via right and...
left atrium and left atrial appendage exclusion, tricuspid valvuloplasty without complications.

Cardiopulmonary bypass (CPB) time of 80 minutes and anoxia time of 67 minutes.

The patient was admitted in the Intensive Care Unit (ICU) to receive dobutamine and noradrenaline, with mean systemic blood pressure (MSBP) of 79 mmHg, heart rate (HR) of 135 bpm, normal chest X-ray, coagulation, electrolytes or hematimetry.

Postoperative ECG with atrial fibrillation rhythm of high ventricular response, ST-segment depression in leads V3-V6, DII, DIII and aVF, ST-segment elevation of 2 mm in aVR.

Patient required increased doses of vasoactive amines and elevation of cardiac enzymes, characterizing perioperative infarction.

Preoperative coronary angiography with long left main coronary artery (LMCA) and description of anomalous circumflex (CX) coronary artery originated from the right coronary sinus, before the emergence of cone branch and proximal third of the right coronary artery (RCA) with previous path to the pulmonary artery and aorta directed to the left artery through the left atrioventricular sulcus and side wall (Figure 1). In this context, it was decided to restudy the patient.

 Coronary angiography revealed circumflex artery with occlusion in ostium. Other coronary arteries with no abnormalities. Angioplasty of the circumflex artery in its proximal third was conducted, with implantation of bare-metal stent. There were signs of recent thrombus on angiography, but the injury was easily crossed with coronary standard guide 0.014” and pre-dilatation with semi-compliant balloon 2.0/12 mm and bare-metal stent 2.5/12 mm was implanted with final result of TIMI 3 flow (Figure 2).

---

**Figure 1**
Preoperative coronary angiography

Left main coronary artery is long and the circumflex artery is not seen on the right caudal anterior oblique views (A), right cranial anterior oblique view (B) and left caudal anterior oblique view (C). Right coronary artery in right anterior oblique view and the circumflex artery has anomalous origin in the right coronary sinus (yellow arrow) (D).
Figure 2
Coronary angioplasty of anomalous circumflex artery
Angioplasty performed in the immediate postoperative period. In the right anterior oblique projection, circumflex artery presents occlusion in the proximal third (yellow arrow) (A). Implantation of bare-metal stent (B). Final result with circumflex artery presenting distal TIMI 3 flow (C).

Dual antiplatelet aggregation was initiated (ASA 100 mg/day and clopidogrel 75 mg/day). Loading doses of ASA 300 mg and clopidogrel 600 mg have been administered. Patient showed progressive improvement of hemodynamic parameters with reduced doses of vasoactive drugs.

Echocardiogram after angioplasty: moderate left ventricular dysfunction (LVEF 35%) without signs of right ventricular dysfunction or pulmonary hypertension. Patient developed progressive worsening of symptoms requiring high doses of dobutamine, norepinephrine, epinephrine and glyceemic control with insulin therapy IV. Intra-aortic balloon was deployed and, after two days, the patient presented clinical improvement, not requiring further ventricular assistance or vasoactive drugs.

The patient remained stable and was discharged, with no new cardiovascular events after a long stay in the ICU.

Discussion

The circumflex artery originating from the right coronary sinus or the right coronary artery with a retroaortic course or through the posterior atroventricular sulcus is the most common congenital anomaly of the coronary artery. Yamanaka and Hobbs described coronary abnormalities in 0.37% of patients.

There is controversy whether the anomalous origin of the CX would lead to worsening of myocardial perfusion. Although cases of myocardial infarction and sudden death in patients with this anomaly without evident atherosclerotic obstruction have been reported.

During mitral valve surgery, the risk of ischemic myocardial injury depends on the anatomical relationships between the coronary arteries and the posterior segment of the mitral ring. Cases of complete extrinsic obstruction do not seem accessible to endovascular treatment. Balloon dilatation or stent implantation may cause vascular rupture. The injury in this case was probably caused by a large annulus (≥30 mm).

The CX injury mechanisms during the intraoperative period are various and sometimes not entirely clear: a suture that surrounds and completely occludes the artery; vascular distortion; arterial laceration; coronary spasm or thrombus occlusion. Intravascular ultrasound (IVUS) may help clarify the mechanism of the injury.

In the reported case, the anomalous CX is not dominant and presents a moderate caliber. Percutaneous stenting...
was chosen. High preoperative SPAP collaborated with acute ventricular dysfunction and cardiogenic shock.

In conclusion, mitral valve surgery is associated with potential risk of iatrogenic myocardial ischemia. In case of postoperative ischemic complications, emergency coronary angiography is essential for diagnosing and treating these complications.

Potential Conflicts of Interest
This study has no relevant conflicts of interest.

Sources of Funding
This study had no external funding sources.

Academic Association
This study is not associated with any graduate programs.

References