

Mitral valve repair complicated by left circumflex coronary artery occlusion: The vital role of the anesthesiologist

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ABSTRACT

The anatomical relationship between the mitral valve and the left circumflex coronary artery places this vessel at risk for occlusion during mitral valve repair or replacement. In view of the potential high morbidity and mortality of this complication, the anesthesiologist has a vital role in its prompt diagnosis. We present the case of a 47-year-old man who underwent a minimally invasive mitral valve repair, which was complicated by left circumflex coronary artery occlusion.

Keywords: 5-lead electrocardiogram, intraoperative transesophageal echocardiography, left circumflex coronary artery occlusion, mitral valve repair

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INTRODUCTION

Mitral valve (MV) repair or replacement is the treatment of choice for severe mitral regurgitation (MR).^[1,2] Because of the vicinity of the left circumflex coronary artery (LCx) to the mitral annulus (as close as 1 mm),^[3] this artery is at risk of being injured during MV surgery. The mechanisms described have been either by direct vessel injury by a surgical suture or by surrounding tissue retraction resulting in dynamic or fixed stenosis of the vessel.^[4]

Because of the morbidity and mortality of this complication, its prompt diagnosis is vital for the improvement of patient survival. We present the case of a 47-year-old man who underwent a minimally invasive MV repair for severe MR, which was complicated by LCx occlusion by retraction of the vessel wall. The complication was diagnosed intraoperatively by the anesthesiologist and prompted an immediate cardiac catheterization, which was both

diagnostic and therapeutic. Written consent was obtained from the patient prior to writing this report.

CASE PRESENTATION

A 47-year-old man with a past medical history of hypertension, hyperlipidemia, and severe symptomatic MR presented electively for minimally invasive MV repair or replacement. Preoperative workup included transesophageal echocardiography (TEE), which revealed severe MR with prolapse of the P1 portion of the posterior leaflet and preserved ejection fraction (EF) (approximately 60%–65%). Additionally, a preoperative cardiac catheterization showed no evidence of coronary artery disease and a left-dominant circulation. Preoperative electrocardiogram (EKG) showed a normal sinus rhythm with no ST-segment changes.

After induction of general anesthesia and tracheal intubation, an intraoperative TEE confirmed severe MR

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with significant prolapse of the P1 portion of the posterior leaflet, as well as an EF of 60%–65% and no regional wall motion abnormalities (RWMAs). The MV was repaired by the surgeon utilizing a size 30 mm mitral valve ring via a minimally invasive right anterolateral thoracotomy.

When the patient was being weaned from cardiopulmonary bypass (CPB), the 5-lead EKG showed a new ST-segment elevation in leads II, III, and aVF, associated with new-onset inferolateral wall hypokinesis and reduced EF (estimated to be 40%) evidenced on TEE. Initially, these changes were thought to be transient and related to air embolism in the coronary arteries (CA). However, due to the persistent nature of these changes, associated with the history of left-dominant circulation and recent MV repair, an LCx occlusion was suspected by the anesthesiologist. The patient was weaned from CPB successfully and after the closure of the surgical incisions, was transported to the cardiac catheterization suite with minimal vasopressor support.

Cardiac catheterization showed a 90% stenosis of the mid-LCx with an estimated thrombolysis in myocardial infarction (TIMI)-1 flow [Figure 1], and nonobstructive disease in the remaining vessels. Intravascular ultrasound of the LCx showed no signs of thrombus, atherosclerosis, or direct vascular damage. However, abrupt vessel stenosis from surrounding tissue retraction was evidenced. Balloon angioplasty was performed, and a 3.5 × 12 mm drug-eluting stent was placed. Repeat coronary angiography showed resolved stenosis with reinstated LCx antegrade flow (TIMI-3) [Figure 2]. Additionally, repeat intraoperative TEE showed evidence of MV repair with trace MR, resolved inferolateral hypokinesis, and normalized EF (60%–65%).

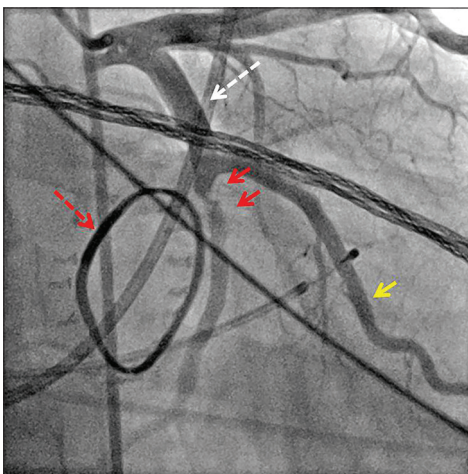


Figure 1: Coronary angiogram showing the left circumflex coronary artery (LCx) (*dashed white arrow*) with stenosis (*solid red arrows*) after the obtuse marginal branch takeoff (*yellow solid arrow*). The dashed red arrow shows the newly placed mitral ring

The 5-lead EKG showed resolved ST-segment changes. The patient remained hemodynamically stable throughout the procedure and was finally transported to the cardiac intensive care unit with minimal vasopressor support, where the trachea was extubated 3 h later without any further complications.

On postoperative day (POD) # 1, the patient was transferred to the stepdown unit. On POD # 3, a transthoracic echocardiogram showed evidence of MV repair with trace MR, no RWMAs and preserved EF (approximately 60%–65%). On POD # 4, the patient was discharged home.

DISCUSSION

LCx occlusion after an MV repair or replacement has a prevalence of 1.8%–2.7%.^[5] Approximately 90% of the published cases (including the case presented in this report) have been reported in patients with left-dominant or co-dominant circulation,^[4] which has been suggested as a potential risk factor secondary to the anatomical vicinity of the vessel to the MV annulus.^[6]

Because transient cardiac ischemic changes are common findings during cardiac surgery cases, it may be challenging to make this diagnosis intraoperatively. Moreover, these changes may vary depending on the degree of coronary artery (CA) obstruction (partial versus total), location (proximal versus distal), pattern (fixed versus dynamic), and the amount of myocardium compromised.^[7] However, when myocardial ischemic changes persist, it is crucial for the anesthesiologist to recognize the likelihood of this complication and make a prompt diagnosis.

The availability and skillful interpretation of intraoperative monitors are vital in order to rapidly detect cardiac

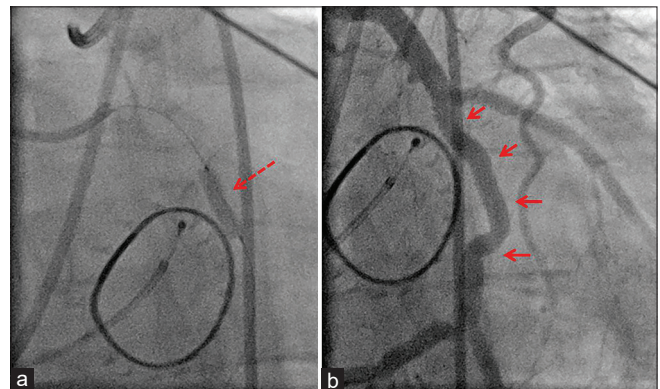


Figure 2: (a) Coronary angiogram showing a drug-eluting stent placed across the left circumflex coronary artery (LCx) stenosis area (*dashed red arrow*). (b) Follow-up coronary angiogram showing resolved LCx stenosis with adequate antegrade flow (*red solid arrows*)

ischemic changes. By continued assessment of RWMA as well as global left ventricular function, TEE has shown to be valuable in early myocardial ischemia detection.^[8,9] Additionally, the 5-lead EKG provides a sensitivity between 96%–100% for the detection of intraoperative myocardial ischemia.^[10] In this case, both monitors indicated new-onset ischemia in the LCx territory. This, together with the patient's history of left-dominant circulation and recent MV repair, made the anesthesia provider highly suspicious of an LCx occlusion.

In summary, it is important to be aware of the risk of LCx occlusion during mitral valve repair or replacement. The availability of intraoperative TEE and 5-lead EKG are valuable resources that provide the anesthesiologist a pivotal role in the prompt diagnosis of this complication, thus helping minimize its sequelae.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his image and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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