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Minimally Invasive Mitral Valve Repair Complicated By Intraoperative Right Coronary Artery Occlusion

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Abstract

Introduction: Iatrogenic injury of coronary arteries can complicate mitral valve replacement or repair. Direct injury to the circumflex coronary artery can occur due to the proximity of these vessels to the mitral valve. Acute injury of the right coronary artery on the other hand is seen during tricuspid valve repairs and is almost never seen with mitral valve surgery given its distance from the mitral valve.

Case: We describe an interesting case of minimally invasive mitral valve repair which was complicated by intraoperative right coronary artery occlusion. It was managed by angiography and percutaneous intervention.

Conclusion: While myocardial infarctions are rare in patients undergoing valvular surgery with normal preoperative coronary angiography, it must be suspected in patients with difficulty weaning from cardiopulmonary bypass and sudden reductions in cardiac function. In minimally invasive procedures with thoracotomy incisions, intraoperative angiography can be an indispensable tool. Swift intervention for revascularization and the use of postoperative cardiac assist devices can lead to favorable outcomes.

Mitral Valve

The MV comprises two leaflets (anterior and posterior) with an annular attachment, tendinous chords and the papillary muscles. Clefts divide the leaflets into scallops and Carpentier's nomenclature describes the most lateral segment as P1, P2 is central, and the most medial is the P3 segment.

Carpentier also classifies the types of mitral regurgitation into type 1, 2, 3a and 3b according to leaflet motion. The options for surgical repair depend on the underlying lesion.

For type 1 with normal leaflet motion, options include annuloplasty or patch repair of a leaflet perforation.

Type 2 MR is associated with prolapsed leaflets and repair includes triangular or quadrangular resections, commissural sutures, chordal transfers or the use of neochords.

In type 3 with limited leaflet movement, options include commissurotomy, chordal division or fenestrations or annuloplasty repair.

Case

A 55 year old male with a history of anxiety and tuberculosis presented with chest pain

Work up included troponins, ECG, chest CT angiography which were negative

Echocardiography showed an ejection fraction (EF) of 65% with severe mitral valve regurgitation due to P2 scallop prolapse with reversal of flow in pulmonary veins

Cardiac catheterization showed no coronary artery disease

He presented for minimally invasive mitral valve repair through a right mini-thoracotomy with right fem-fem cardiopulmonary bypass. The repair was done by placement of a 26 mm Physio annuloplasty band, quadrangular resection of P2, sliding plasty of P1 and P3, and placement of 2 PTFE neochords attached to A1.

Upon completion of the repair, transesophageal echocardiography revealed moderate mitral regurgitation which required resuming bypass and re-opening of atriotomy for re-evaluation of repair. With improvement in valve function following modification of the repair, the patient was weaned off CPB again with a total aortic clamp time of 101 minutes.

The patient developed sudden hemodynamic instability and was found to have ST elevations in the inferior leads with regional wall abnormalities of the right coronary artery (RCA) territory.

Images

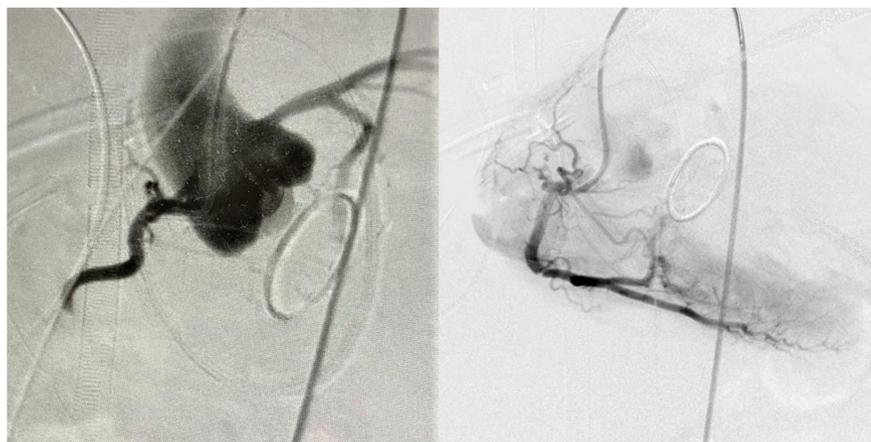


Figure 1. Images of intraoperative coronary angiography showing right coronary artery before (left) and after stenting (right)

Outcome

With concern for embolism of the RCA, cardiology was consulted intraoperatively for confirmation with angiography

Coronary angiography showed abrupt cessation of flow in the RCA 3 to 4 cm from the orifice with arterial tortuosity. Given the procedure was performed under thoracotomy, the decision was made to avoid midline sternotomy and instead proceed with percutaneous intervention.

Stenting was required with 2 overlapping drug-eluting stents in prox-mid and distal RCA

He was started on a cangrelor infusion. TEE showed an EF 25% with inferior, inferoseptal and antero-septal akinesis and severely reduced right ventricular function

The decision was made to transition from CPB to venoarterial extracorporeal membrane oxygenation for postoperative support.

He was transported to the intensive care unit on VA ECMO and milrinone

Postoperatively, he was weaned off of cardiac support and underwent ECMO decannulation on postoperative day 3

Repeat transthoracic echo showed an EF 45% with no valvular dysfunction and a small to moderate size pericardial effusion which later resolved without intervention

He was discharged home on day 16

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