Percutaneous Mitral Valve Replacement And Pulmonary Hemorrhage

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Case Presentation:

A 72 year-old female with a past medical history of severe mitral stenosis (MS) with moderate mitral regurgitation (MR) status post bioprosthetic mitral valve replacement, chronic congestive heart failure (CHF), pulmonary hypertension, atrial fibrillation (AF), sick sinus syndrome (SSS) status post permanent pacemaker insertion, morbid obesity, chronic obstructive pulmonary disease (COPD) on home oxygen therapy, and obstructive sleep apnea (OSA) presented for evaluation of severe dyspnea. Due to her mitral valve anatomy she was not a candidate for mitral valve repair. Her STS Risk Score was 11% for repeat isolated mitral valve replacement (MVR), thus the decision was to proceed with percutaneous transcatheter mitral valve-in-valve replacement.

Intraoperative Course:

Following transseptal puncture and heparinization, the patient developed massive hemoptysis and could not be ventilated. The hemoptysis was attributed to wire puncture of a pulmonary vein. The heparin was reversed and the bleeding slowed from the endotracheal tube, but the patient remained hypoxic with limited ability to ventilate, thus the patient was placed on veno-venous extracorporeal membrane oxygenation (VV ECMO).

Case Conclusion:

The patient was decannulated from VV ECMO on hospital day 2 but failed weaning from the ventilator due to her mitral valve stenosis and regurgitation. On hospital day 9 she underwent a successful transapical transcatheter mitral valve-in valve replacement. She was discharged to a rehabilitation facility on hospital day 19.

Discussion:

- Mitral regurgitation is the most common valve pathology. The mitral valve has a higher rate of degeneration compared with the aortic valve due to its exposure to a systolic pressure gradient while the aortic valve is exposed to a diastolic pressure gradient.[1]
- Mitral regurgitation has two types: degenerative and functional. Over 60% of patients who undergoing mitral valve surgery have a mitral valve repair and the remainder undergo mitral valve replacement.[2,3]
- Up to 35% of patients require repeat intervention in the first 10 years following initial mitral valve surgery. Repeat mitral valve surgery, whether it is repair or replacement, is risky especially in patients with severe comorbities.[1]
- Transcatheter approaches are divided into surgical (via thoracotomy and direct atrial or transapical approach) and fully percutaneous access (via femoral vein or jugular vein and atrial septal puncture).[4]
- Fully percutaneous techniques exist to both repair as well as replace the mitral valve.[4]
- While transcatheter aortic valve replacement is a well established treatment for severe aortic stenosis in patients who are intermediate or high risk for surgical intervention, transcatheter mitral valve replacement (TMVR) remains in its early stages as an alternative to surgical mitral valve replacement (SMVR).[2]
- The complex anatomic structure of the mitral valve including both its shape, sub-valvular apparatus, as well as pathology have been important challenges in the development of a successful percutaneous technique.[2]
- Transapical approaches while more invasive have also lead to other complications seen in this population.[5]
- Complications with transapical approach include: deterioration in ventricular function (permanent or transient), pleural effusions, bleeding, atrial fibrillation, and prolonged intubation. Thus recommendations exist that the percutaneous approach should be considered first for transcatheter aortic valve as well as mitral valve replacement.[5]
- While outcomes are better with transseptal approach, there are characteristics that may lend itself to a transapical approach (see table 1). [5]

Table 1: Characteristics favoring Transapical versus Transseptal Approach to Transcatheter MV Replacement

Favor Transapical	Favor Transseptal
Combined mitral and aortic	Combined mitral and pulmonary/tricuspid
Need precise positioning	Shorter hospital stay
Crossing the valve is predicted to be difficult	Chest wall deformity requiring avoiding thoracotomy
Future transseptal procedures planned	Need to avoid general anesthesia
Left atrial thrombus	Apical scar
Mitral valve characteristics	LV systolic dysfunction
Device only can be implanted retrograde	Device can only be implanted antegrade

References:

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