Mitral Valve Surgery
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Patients with mitral valve disease requiring surgical intervention may have mitral stenosis, mitral regurgitation, or mixed disease. Mitral regurgitation is by far the more common pathology, and etiology falls into two main categories. These include mitral valve prolapse and ischemic mitral regurgitation; left ventricular dilatation and reduced function may exist in both states. The etiology of mitral regurgitation does not significantly impact the anesthetic management, although patients with ischemic heart disease must be managed accordingly. General anesthesia is generally well-tolerated in patients with isolated mitral regurgitation. The cornerstones of optimization are reduced systemic vascular resistance and maintenance of adequate heart rate.

Mitral stenosis is most commonly related to rheumatic heart disease and is rare in the United States. Anesthesia may be poorly tolerated in patients with mitral stenosis and these patients must be treated gently. Sudden changes in status should be avoided, afterload must be maintained, and tachycardia avoided. These patients are at risk for atrial fibrillation, which is poorly tolerated, especially in the setting of a rapid ventricular response. Surgical treatment of mitral stenosis almost requires replacement. Post-operative management may be influenced by the degree to which the subvalvular apparatus was involved.

First-time mitral valve surgery is most-often performed via a median sternotomy. The standard cardiac setup can be applied. Intraoperative TEE is used pre-CPB to determine the nature of the valvular dysfunction and whether or not the valve can be salvaged with a repair or needs to be replaced with a prosthetic valve. After CPB, TEE is crucial for evaluation of the adequacy of repair or to check the function of the prosthetic valve.

In some cases, especially re-operations, mitral valve surgery is approached through the right chest using an anterior thoracotomy incision. The heart may be allowed to fibrillate during cardiopulmonary bypass. Approaching the left atrium via the right chest avoids the potential complications of re-entering the pericardial space through the adhesions and scar tissue of the previous median sternotomy incision.

**Anesthetic Management for repair/replacement of regurgitant mitral valve via sternotomy**

- Use the standard cardiac setup
- Consider using an antifibrinolytic
- Although there is little evidence for the routine use of PAC’s, they assist in identifying pulmonary hypertension, monitoring volume status and right heart function before and after CPB, and in the differential diagnosis of post-operative hypotension.
- Standard cardiac induction with attention to maintaining preload and heart rate, as well as avoidance of increased afterload
- Patients with acute mitral regurgitation, such as following a myocardial infarction or balloon valvuloplasty, will be hemodynamically unstable and possibly have pulmonary edema. Plan accordingly for minimal apneic time during induction and consider intra-aortic balloon pump and/or inotropic support prior to induction.
Consider inotropic support and afterload reduction for separation from bypass. In the absence of excision of the subvalvular apparatus, ventricular function will commonly improve once the volume-overload state of mitral regurgitation has been removed. However, pre-existing ventricular function may be unmasked by the correction of the low afterload conditions created by the incompetent mitral valve.

**Pre Mitral Valve Repair TEE Exam**

- Perform standard ASE/SCA recommended intra-operative TEE examination.
- Strongly consider the use of live 3D TEE if the technology is available.
- Describe mitral valve leaflet motion, including restriction, prolapse, and specific leaflet involvement, and any left ventricular wall motion abnormalities (see figure).
- Describe current severity and direction of regurgitation.
- Measure the mitral valve annulus diameter in several views, and measure the left atrial size.
- Quantify the peak and mean pressure gradient across the mitral valve.
- Evaluate for risks for post-repair systolic anterior motion (SAM) of the anterior mitral leaflet, especially a myxomatous anterior leaflet.
- Consider cardiology consultation if uncertain regarding necessity or feasibility of repair.

**Post Mitral Valve Repair TEE Exam**

- Describe mitral valve leaflet motion.
- Check for residual mitral regurgitation.
Check for the presence of paravalvular leak (regurgitation outside the perimeter of the annulus).
Quantify the peak and mean pressure gradient across the mitral valve.
Rule out systolic anterior motion (SAM) of the anterior mitral leaflet or subvalvular apparatus leading to LVOT obstruction.

Additional considerations for Surgical Therapy of Mitral Disease via Thoracotomy:

- Lung isolation using a double-lumen endotracheal tube or single-lumen tube with a bronchial blocker is required (to provide exposure to the heart by deflating the right lung).
- Position for right thoracotomy.
- Consider CPAP and PEEP during one lung ventilation to prevent hypoxia.
- The DLT can become dislodged while manipulating the TEE probe; use caution while moving the TEE probe.
- If a DLT was used, it may be necessary to exchange for a single lumen ETT prior to transport to the ICU. This can be extraordinarily dangerous after a long bypass run with significant edema. The risk of losing the airway under these circumstances needs to be carefully weighed.

Anesthetic Management for Surgical Therapy of Mitral Stenosis:

- Use the standard cardiac setup.
- Consider using an antifibrinolytic.
- Although there is little evidence for the routine use of PAC’s, they assist in identifying pulmonary hypertension, monitoring volume status and right heart function before and after CPB, and in the differential diagnosis of post-operative hypotension.
- Standard cardiac induction with attention to minimizing hemodynamic impact and avoiding tachycardia. Use vasopressors as needed to avoid sudden vasodilatation. Patients with paroxysmal atrial fibrillation may require cardioversion if atrial fibrillation occurs prior to CPB. Use crystalloid as needed to maintain intravascular volume while recognizing that left ventricular filling is limited by the stenotic mitral valve.
- Left ventricular function is typically well-preserved in patients with mitral stenosis. However, in patients with severe rheumatic disease, excision of the subvalvular apparatus may be necessary and lead to post-operative ventricular dysfunction due to the interdependence of the left ventricular and the mitral valve.

For Further Reading:


Shanewise JS. Cheung AT. Aronson S. Stewart WJ. Weiss RL. Mark JB. Savage RM. Sears-Rogan P. Mathew JP. Quinones MA. Cahalan MK. Savino JS. ASE/SCA guidelines for performing a comprehensive