Mitral Interventions
A New Challenge for Structural Interventions
How to Learn Mitral Interventions

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How to Learn Mitral Interventions

1. Mitral interventions are particularly challenging
2. Training should be aimed to a Board Certified or Eligible interventional cardiologist, or Board Certified or Eligible cardiac surgeon, well trained and familiar with coronary interventional techniques and invasive hemodynamics. Skills acquired during interventional training include but are not limited to:

- Coronary diagnostic procedures
- Coronary interventions
- Peripheral vascular diagnostic procedures
- Peripheral vascular interventions
- Balloon aortic, mitral and pulmonic dilatation
- Stent implantation in right ventricle outflow tract and pulmonary arteries
- IABP and other cardiac support device placement, including initiation of percutaneous cardiopulmonary bypass
- pVAD placement
- EVAR or TEVAR procedures
- Transseptal techniques
- Coronary sinus access
- Large vessel access and closure
How to Learn Mitral Interventions

Particular emphasis and additional training focused in:

• Detailed knowledge of cardiac anatomy
• Detailed knowledge of mitral valve pathology and its effects on the other cardiac structures and chambers
• Experience in transseptal catheterization techniques, angio-guided, TEE–guided, and ICE-guided
• Advanced TEE and CT/MRI imaging of all cardiac structures, especially the mitral valve and its pathology
• Hands on experience in established procedures in a structured structural heart disease fellowship program, as well as practice in medical simulators and computer based programs
# SCAI/AATS/ACC/STS Operator & Institutional Requirements for Transcatheter Valve Repair and Replacement, Part II – Mitral Valve

<table>
<thead>
<tr>
<th><strong>INSTITUTIONAL</strong></th>
<th>1000 CATH/400 PCI PER YEAR*</th>
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<tbody>
<tr>
<td><strong>INTERVENTIONALIST</strong></td>
<td>50 STRUCTURAL PROCEDURES PER YEAR (including ASD/PFO and trans-septal punctures)</td>
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<tr>
<td><strong>SURGICAL PROGRAM</strong></td>
<td>25 TOTAL MITRAL VALVE PROCEDURES PER YEAR, OF WHICH AT LEAST 10 MUST BE MITRAL VALVE REPAIRS ¶</td>
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| **TRAINING** | OPERATOR MUST BE BOARD CERTIFIED IN INTERVENTIONAL CARDIOLOGY OR BOARD CERTIFIED/BOARD ELIGIBLE IN PEDIATRIC CARDIOLOGY OR SIMILAR BOARDS FROM OUTSIDE THE UNITED STATES. CARDIAC SURGEONS MUST BE BOARD CERTIFIED IN THORACIC SURGERY, OR SIMILAR FOREIGN EQUIVALENT. |

| ALL CASES MUST BE SUBMITTED TO A SINGLE NATIONAL DATABASE | |

2014
Anatomy
Anatomy
Anatomy
Mitral Valve Details

Normal mitral valve function depends on perfect function and complex interaction between various structures. The broader concept of “mitral valve complex” allows a better characterization of both normal and abnormal valvular function.

<table>
<thead>
<tr>
<th>Mitral annulus</th>
<th>Mitral leaflets</th>
<th>Mitral valve</th>
<th>Mitral valve complex</th>
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<tbody>
<tr>
<td></td>
<td>Chordae tendineae</td>
<td>Sub valvular apparatus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Papillary muscles</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Left Ventricular wall</td>
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<td></td>
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<tr>
<td></td>
<td>Left atrium</td>
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</table>
Mitral Valve Details

- The largest part of the atrial floor is formed by the anterior mitral valve leaflet.
- Normal leaflets are thin and pliable structures with a thickness < 5 mm
- Normal mitral valve area is 4 to 5 cm²
Cardiac Fibrous Skeleton
Multimodality Mitral Valve Imaging
Imaging (TTE)

Analysis of the mitral valve by conventional sectional planes in TTE

LAX

4CV

2CV

Anterior A1, A2, P1

Medial A3, P2, P3

Lateral
Imaging (TTE)

Analysis of the Mitral Valve in the apical 4-chamber view

View to the anterior suspension zone (LVOT)
- oblique ventral 4-chamber view (A1/P1)

View to the posterior suspension zone (ostium of the coronary sinus)
- oblique dorsal 4-chamber view (A3/P3)
TEE Views

![TEE Views Diagram](image-url)
The Standard TEE Views

ME AV SAX
ME AV LAX
ME AV LAX c CD
ME Bicaval
ME RV In-Outflow
ME RV In-Outflow c CD
ME 4 Chamber
ME 4 Chamber c CD
ME 4 Chamber c CD
ME 2 Chamber
ME LAX
TG mid SAX
TEE Mitral Valve Interrogation
TEE Mitral Valve Interrogation
Transseptal Catheterization
Mullins Sheath and BRK Needle
1. Advance sheath + dilator over 0.032” wire to SVC
2. Advance BRK needle to 1cm of end of dilator
3. Withdraw the TS catheter in PA view until it moves medially, then advance and it will “stick” in the foramen ovale.
Advancing the needle across the foramen ovale
Trans-septal puncture

Echo-guided puncture
Superior and Posterior - Mid fossa

3 echo steps

1. tenting in the Bi-caval view
2. Observe tenting in SAX at Base
3. Observe tenting in 4-CH view (0°) (Height)
Mitral Valve Pathology
Mitral Valve Pathology

- Ischemic LV distortion
- Papillary muscle displacement
- Mitral valve tethering
- Restricted closure
- Annular dilation

Images showing echocardiographic views of LV and LA.
MitralClip Simulation

Figure 1. The MitraClip Virtual Procedure software trains operators on the MitraClip procedure. This software runs on a personal computer and simulates the use of the device delivery system, transesophageal echocardiography, and fluoroscopy. There is also a unique three-dimensional surface rendering showing the relationship of the device, heart structures, and transesophageal echocardiography probe (upper right panel).
Training for Mitral Interventions
Best Possible Suggestions

- Additional training of an interventional cardiologist, or a cardiac surgeon trained in percutaneous interventional techniques in a structural heart disease program meeting the minimum requirements in valve volume
- Proficiency in transseptal catheterization techniques and transapical approach to the mitral valve
- Proficiency in cardiovascular imaging including CT and particularly TEE
- Detailed knowledge of mitral valve pathology and its surgical treatment (learn from the surgical experience)
- Training and minimum number of interventional treatment of mitral valve cases
- On going study, training and practice, including simulation training
- Detailed enrolment of cases into a national data base
- Follow guidelines and requirements of the National Boards on structural heart and particularly mitral valve disease percutaneous treatment, as they emerge with more utilization and experience