Imaging of the Normal Mitral Valve and Mitral Valve Disease with 3 –D Echo

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Mitral Valve: One of the Most Complex Structures in the Human Body
Challenges in Imaging a Structure with Complex 3-D Geometry with 2-D Imaging
The Complex Structure of the Mitral Annulus Cannot be Fully Imaged in 2D
3D Acquisition Methods: 
Wide Sector Zoom is the Preferred Mode for Mitral Valve Imaging.
Full Volume Acquisition and Cropping
3D Volume Rendering

3D Object

Gain
Compress
Vision
Smoothing
Brightness

2D Image
Transthoracic versus Transesophageal Echo
3D Full Volume Mode versus Live 3D Zoom

TTE full volume 31 Hz
+ high frame rate
+ large region
- limited resolution
- stitch artifacts
- needs cropping

TTE live 3D zoom 9 Hz
+ direct live 3D view
+ one-beat acquisition
+ no stitch artifacts
+ independence of rhythm and breathing
- limited resolution
- low frame rate
- small region

TTE full volume 30 Hz
+ excellent resolution
+ high frame rate
+ large region
- stitch artifacts mainly from breathing

TEE live 3D zoom 12 Hz
+ very good resolution
+ direct live 3D view
+ one-beat acquisition
+ no stitch artifacts
+ independent of rhythm and breathing

Preferred Method for MV

Low Frame Rate Small Region
The Importance of Spatial Orientation
Normal Mitral Valve 3D Anatomy
Degenerative Mitral Valve Disease

- Affects 2% of population
- Leaflet prolapse most common finding
- A wide spectrum of degenerative disease resulting in MR
- In contrast to functional MR, which is a disease of the LV, degenerative MR is a disease of the valve and therefore repair of the valve results in cure of the disease.
Functional Mitral Valve Disease
Volumetric Quantification of the Mitral Valve

- Annular diameters
- Annulus area
- Annular height
- Posterior leaflet area
- Posterior leaflet angle
- Tenting volume
- Anterior leaflet area
- Anterior leaflet angle
A case of P3 prolapse
A case of flail P2 cusp.
Mitral Valve Repair Techniques
A Case of Flail Posterior Leaflet
Mitral Valvuloplasty Ring

LA view

LV view
Echocardiographic Evaluation of Morphology of Mitral Leaflets is Critical for Good Patient Selection for Mitral Clip
Prosthetic Valves
Quantitative Assessment of Mitral Regurgitation
Challenges in Measurement of VC and EROA with 2-D
Mitral Stenosis: 3D provides en face images for MV area measurement
EAE/ASE Recommendations for Image Acquisition and Display Using Three-Dimensional Echocardiography

Three-dimensional TTE and TEE assessments of mitral valve pathology should be incorporated into routine clinical practice as they provide the best physiologic and morphologic information regarding the mitral valve. Three-dimensional transesophageal echocardiography is recommended for guidance of interventional mitral valve procedures.