Advances in Cardiac Imaging
Focus On Valvular Heart Disease

Mani A. Vannan, MBBS, FACC
Professor of Clinical Medicine
Joseph M. Ryan Chair in CV Medicine
Director, Cardiovascular Imaging
Ohio State University Medical Center

3-D Echocardiography
Real-Time TEE of MV

Obtainable in > 80% of TEE studies

2-D Echocardiography
Real-Time TEE of MV Anatomy
Let us see what 3-D offers: Demonstration

Live 3-D Echocardiography

Impact on Clinical Practice

What is the abnormal anatomy?
### 2-D Echocardiography

**Real-Time TEE of Abnormal MV**

Now what is the abnormal anatomy?

### 3-D Echocardiography

**Real-Time TEE of Abnormal MV Anatomy**

P2 and P3 Prolapse; maybe P1 also

### 3-D Echocardiography

**2-D Vs. 3-D TEE for Localization of Abnormal Anatomy in MV Repair**

3-D Vs 2-D TEE in MV repair, Garcia-Orta R et al, JASE 2007 20(1):4-12

### 3-D Echocardiography

**Real-Time TEE of Posterior MV Leaflet Prolapse**

Diastole, Mid Systole, Late Systole
3-D Echocardiography
Real-Time TEE of Posterior MV Leaflet Prolapse

3-D Echocardiography
Real-Time TEE of Mitral Leaflets and Annulus

3-D Echocardiography
Localization and Quantification of MVP Volume

3-D Echocardiography
Real-Time TEE of Mitral Leaflets and Annulus

MVP
Normal
3-D Echocardiography
Quantitative Real-Time TEE of Mitral Leaflets and Ring

Mitral Valve Anatomy Report

<table>
<thead>
<tr>
<th>Anulus</th>
<th>Leaflet</th>
<th>Aortic-Mitral</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAP/m</td>
<td>56.3 mm</td>
<td># Ant 30.8</td>
</tr>
<tr>
<td>DAP</td>
<td>49.8 mm</td>
<td># Post 23.2</td>
</tr>
<tr>
<td>NPA</td>
<td>120.0</td>
<td># Coaptation</td>
</tr>
<tr>
<td>L2DAP/m</td>
<td>43.0 mm</td>
<td></td>
</tr>
</tbody>
</table>

What Does The Surgeon Need From The Imager?

Modified from: Tirone DE, JTCS1995; 109:345

3-D TEE of Aortic Valve and Root
73 year old man, TEE for Moderate Aortic Regurgitation

Ascending Aortic Aneurysm
What Does The Surgeon Need From The Imager?


Anderson RH doi:10.1510/mmcts.2006.002527
Ascending Aortic Aneurysm
What Does The Surgeon Need From The Imager?

Quantitative 3-D Echocardiography of The Aortic Valve and Aortic Root

Aortic Valve and Root Modeling
3-D Echocardiography

3-D Automated Quantification of Aortic Valve and Root
<table>
<thead>
<tr>
<th>3-D Automated Quantification of Aortic Valve and Root – TEE and CT</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Images" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3-D Automated Quantification of The Mitral Valve and The Aortic Root</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2.png" alt="Images" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3-D Automated Quantification of The Mitral Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3.png" alt="Images" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Real-Time Volume Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow-Function</td>
</tr>
<tr>
<td><img src="image4.png" alt="Images" /></td>
</tr>
</tbody>
</table>
Real-Time Volume Imaging
Flow-Function

Courtesy – Nathalie DeMichelis

Real-Time Volume Imaging
Flow-Function

Courtesy – Nathalie DeMichelis

Real-Time Volume Imaging
Flow-Function

Courtesy – Nathalie DeMichelis