10/8/2017
11:30 AM- 11:50 AM

3D Cases: Application in Practice Valvular Heart Disease



Rebecca T. Hahn, MD
Director of Interventional Echocardiography
Columbia University

Disclosures

- Core Lab Director for multiple tricuspid device trials for which I receive no direct compensation:
  - SCOUT Trial
  - Triluminate Trial
  - Tri-Repair Trial
- Speaker: Abbott Structural, GE, Philips, Boston Scientific
- Consultant: Gore&Associates, NaviGATE, Abbott Structural, GE, Philips

ASE/SCA GUIDELINES AND STANDARDS

Guidelines for Performing a Comprehensive Transesophageal Echocardiographic Examination: Recommendations from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists

Rebecca T. Hahn, MD, FASE, Chair, Theodore Abraham, MD, FASE, Mark S. Adams, RDCS, FASE, Charles J. Bruce, MD, FASE, Kathryn E. Glas, MD, MBA, FASE, Roberto M. Lang, MD, FASE, Scott T. Reeves, MD, MBA, FASE, Jack S. Shanewise, MD, FASE, Samuel C. Siu, MD, FASE, William Stewart, MD, FASE, and Michael H. Picard, MD, FASE, *New York, New York; Baltimore, Maryland; Boston, Massachusetts; Rochester, Minnesota; Atlanta, Georgia; Chicago, Illinois; Charleston, South Carolina; London, Ontario, Canada; Cleveland, Ohio*

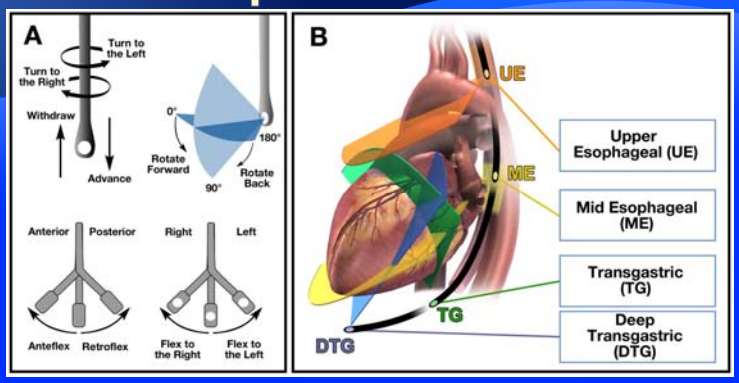
(J Am Soc Echocardiogr 2013;26:921-64.)

Keywords: Transesophageal echocardiography, Comprehensive examination

http://www.onlinejase.com/article/S0894-7317(13)00562-2/fulltext

Hahn RT J Am Soc Echocardiogr 2013;26:921-64

Probe Manipulation

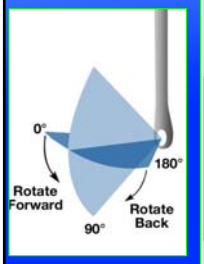


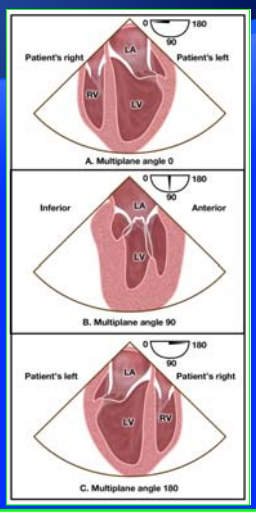
5 tools for optimizing imaging:

1. Advancing and withdrawing the probe
2. Turning probe (clockwise to the right chest, counter-clockwise to the left chest)
3. Anteflexion and retroflexion (large "wheel")
4. Right and left flexion (small "wheel")
5. Mechanical rotation of the multi-plane probe (0-180°)

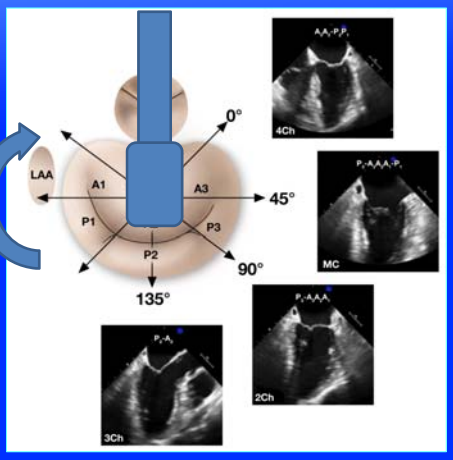
TEE Manipulation

5. Mechanical rotation of the multi-plane probe (0-180°)



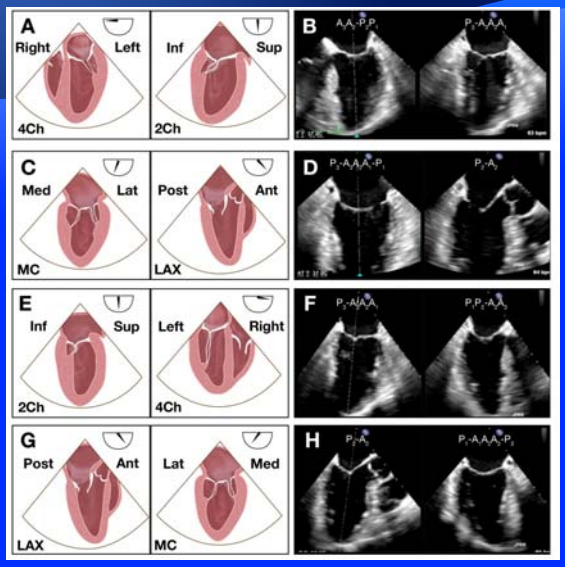


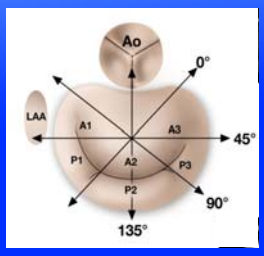
Looking at the face of the transducer, angle of rotation occurs in a "counterclockwise" manner when rotating forward from 0° to 180°.



Looking at mitral valve from the surgical view (thus "behind" the transducer) , angle of rotation occurs in a "clockwise" manner

Simultaneous Multiplane Imaging



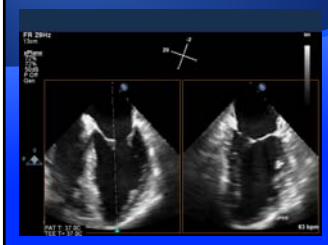


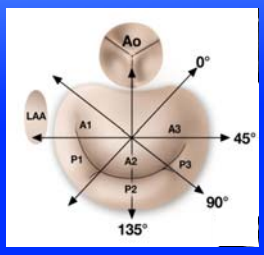
Clues or orientation:

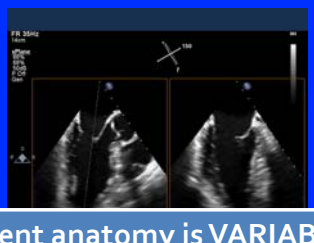
1. Coronary sinus is a posterior mitral annular structure
2. LAA is a lateral structure
3. The aortic root is an anterior structure

Hahn RT et al. J Am Soc Echocardiogr 2013;26:921-64

Simultaneous Multiplane Imaging







Clues or orientation:

1. Coronary sinus is a posterior mitral annular structure
2. LAA is a lateral structure
3. The aortic root is an anterior structure

Patient anatomy is VARIABLE!!
3D imaging is ESSENTIAL!

Mitral Valve

The heart is a 3-dimensional structure with infinite individual variability!!

GUIDELINES AND STANDARDS

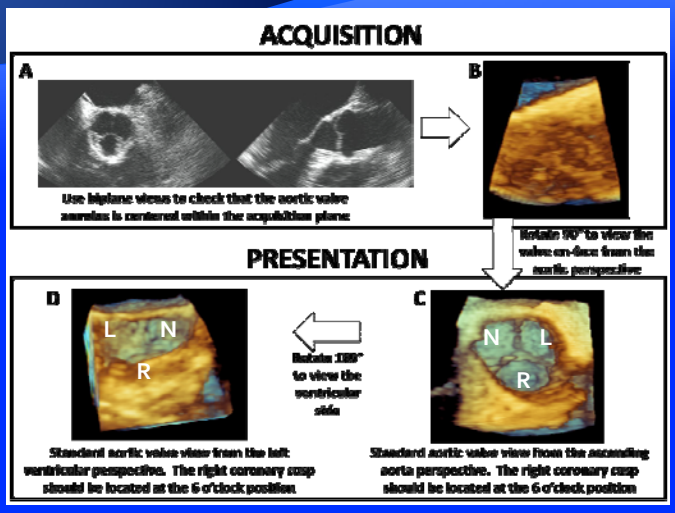
EAE/ASE Recommendations for Image Acquisition and Display Using Three-Dimensional Echocardiography

Roberto M. Lang, MD, FASE,*‡ Luigi P. Badano, MD, FESC,†‡ Wendy Tsang, MD,* David H. Adams, MD,* Eustachio Agricola, MD,† Thomas Buck, MD, FESC,† Francesco F. Faletra, MD,† Andreas Franke, MD, FESC,† Judy Hung, MD, FASE,* Leopoldo Pérez de Isla, MD, PhD, FESC,† Otto Kamp, MD, PhD, FESC,† Jaroslaw D. Kasprzak, MD, FESC,† Patrizio Lancellotti, MD, PhD, FESC,† Thomas H. Marwick, MBBS, PhD,* Marti L. McCulloch, RDCS, FASE,* Mark J. Monaghan, PhD, FESC,† Petros Nihoyannopoulos, MD, FESC,† Natesa G. Pandian, MD,* Patricia A. Pellikka, MD, FASE,* Mauro Pepi, MD, FESC,† David A. Roberson, MD, FASE,* Stanton K. Shernan, MD, FASE,* Girish S. Shirali, MBBS, FASE,* Lissa Sugeng, MD,* Folkert J. Ten Cate, MD,† Mani A. Vannan, MBBS, FASE,* Jose Luis Zamorano, MD, FESC, FASE,† and William A. Zoghbi, MD, FASE*, *Chicago and Oak Lawn, Illinois; Padua and Milan, Italy; New York, New York; Essen and Hannover, Germany; Lugano, Switzerland; Boston, Massachusetts; Madrid, Spain; Amsterdam and Rotterdam, The Netherlands; Lodz, Poland; Liege, Belgium; Cleveland, Ohio; Houston, Texas; London, United Kingdom; Rochester, Minnesota; Charleston, South Carolina; New Haven, Connecticut; Morrisville, North Carolina*

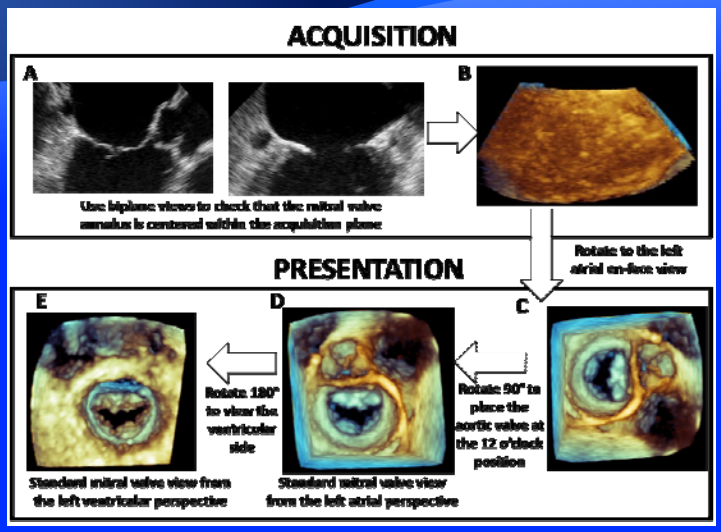
(J Am Soc Echocardiogr 2012;25:3-46.)

Lang RM et al JASE 2012;25:3-46

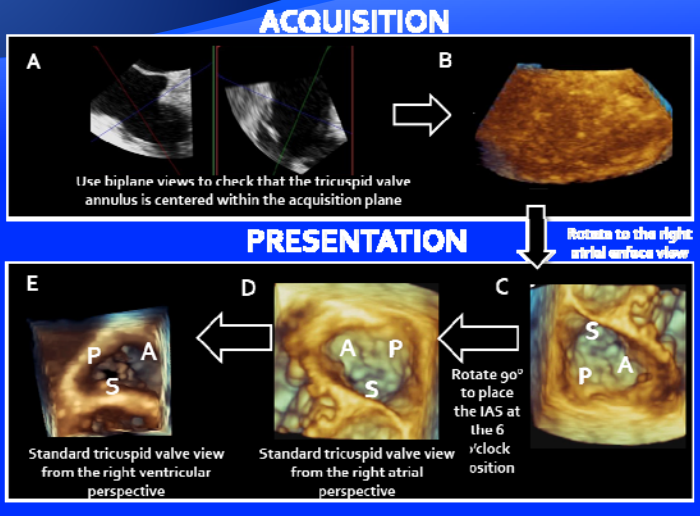
3D AV Acquisition



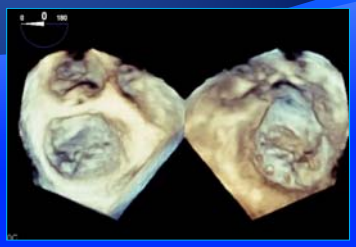
3D MV Acquisition



3D TV Acquisition



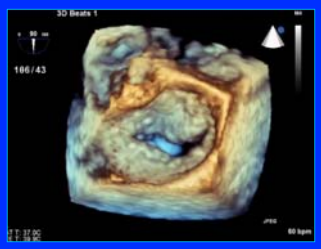
Variable Anatomy and Valve Morphology



? 5 Leaflets?

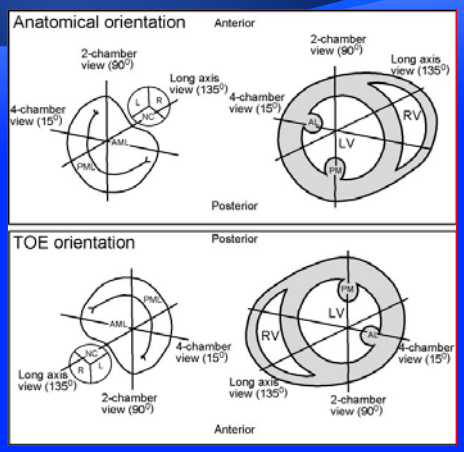
Large Aorta

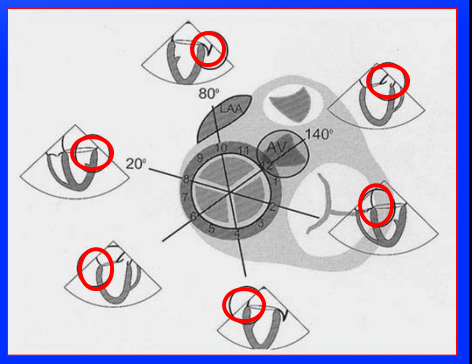
Focal Nodular Calcium



Skewed AV-MV relationship

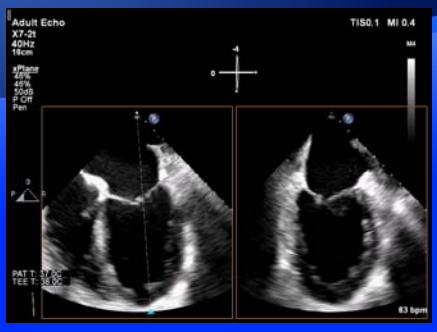
Determining Location of the Mitral Scallops and Annulus



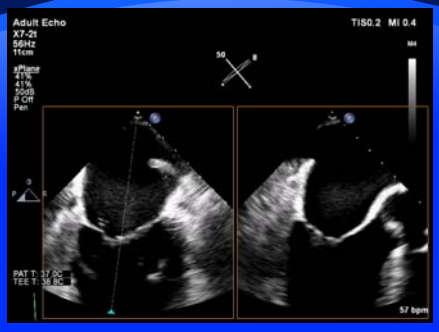


Foster GP et al. Annals of Thoracic Surgery 1998;65:1025-1031

Where is the lesion?



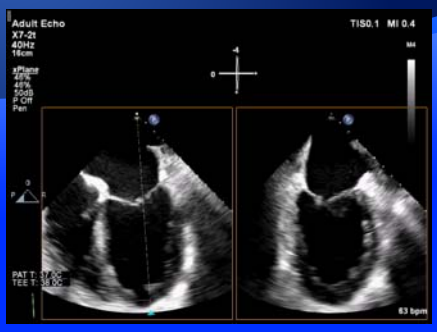
0 and 90 degrees



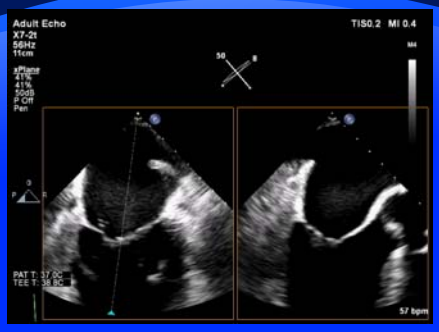
50 and 140 degrees

1. P1
2. P2
3. P3
4. None of the above
5. Can't tell

Where is the lesion?

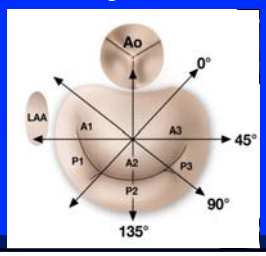


0 and 90 degrees

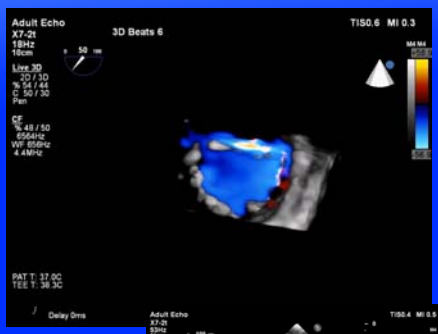


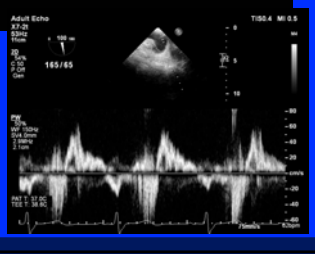
50 and 140 degrees

1. P1
2. P2
3. P3
4. None of the above
5. Can't tell



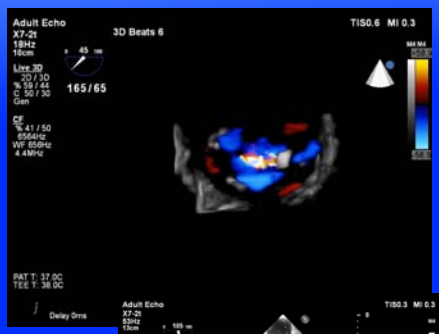
Where is the lesion?

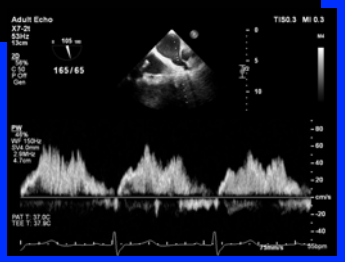




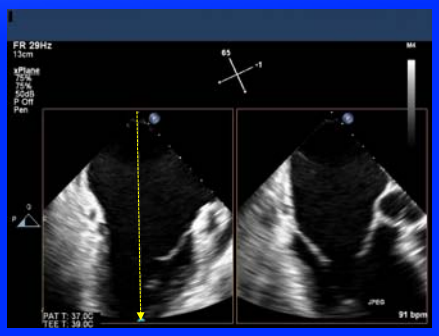
1. P1
2. P2
3. P3
4. None of the above
5. Can't tell

Single Medial MitraClip



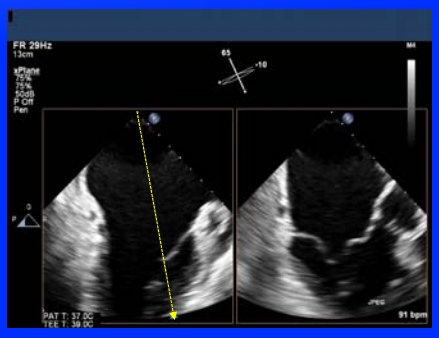


Case 2: Where is the lesions



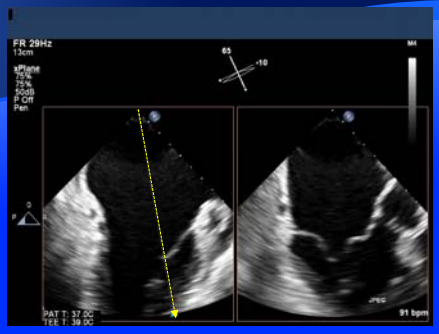
1. A1
2. A2
3. A3
4. None of the above
5. Can't tell

Case 2: Where is the Lesion?

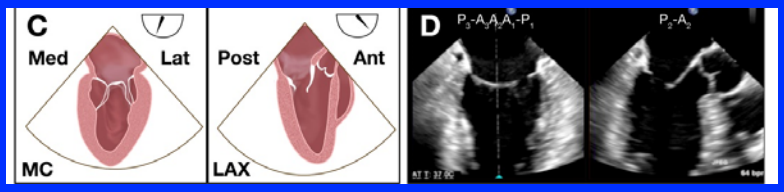


1. A1
2. A2
3. A3
4. None of the above
5. Can't tell

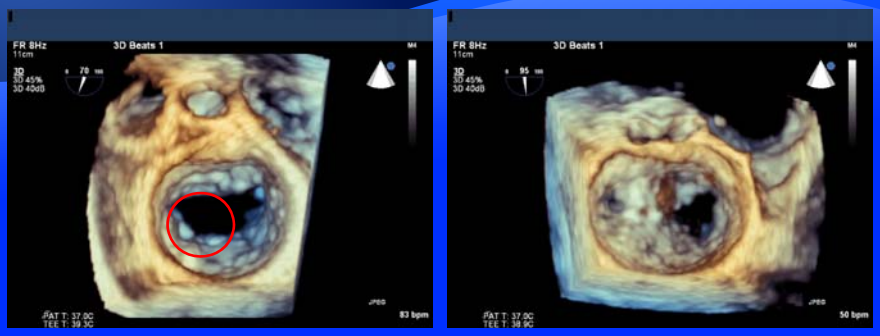
Case 2



1. A1
2. A2
3. A3
4. None of the above
5. Can't tell



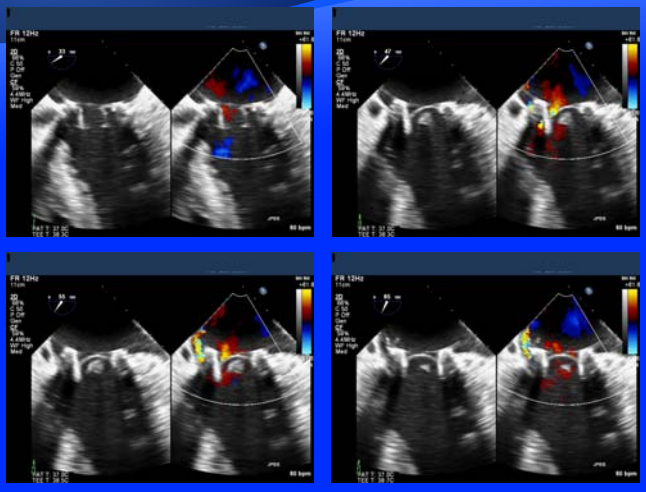
Case 2: Lateral portion of P2 Flail

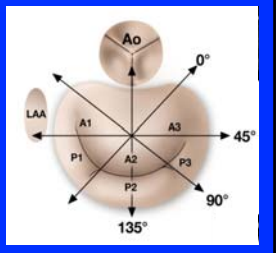


Why were we fooled?

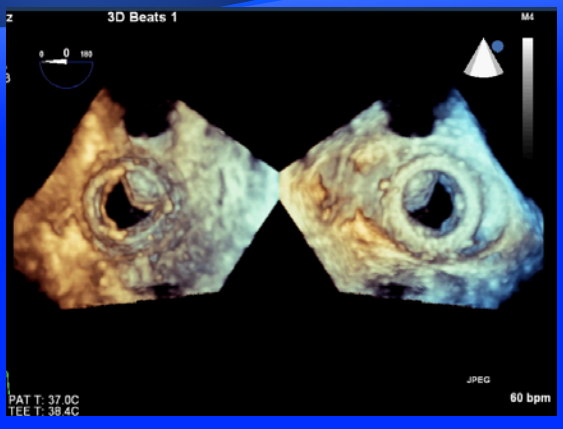
1. Long (radially), redundant posterior leaflet
2. Deep adjacent fold in the posterior leaflet

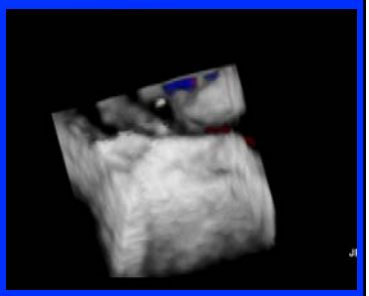
Case 3: Paravalvular Regurgitant Orifice





3D Localization





JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY
© 2017 AMERICAN COLLEGE OF CARDIOLOGY FOUNDATION
AND EUROPEAN SOCIETY OF CARDIOLOGY.

VOL. 69, NO. 16, 2017
ISSN 0735-1097/$36.00
http://dx.doi.org/10.1016/j.jacc.2017.02.038

THE PRESENT AND FUTURE

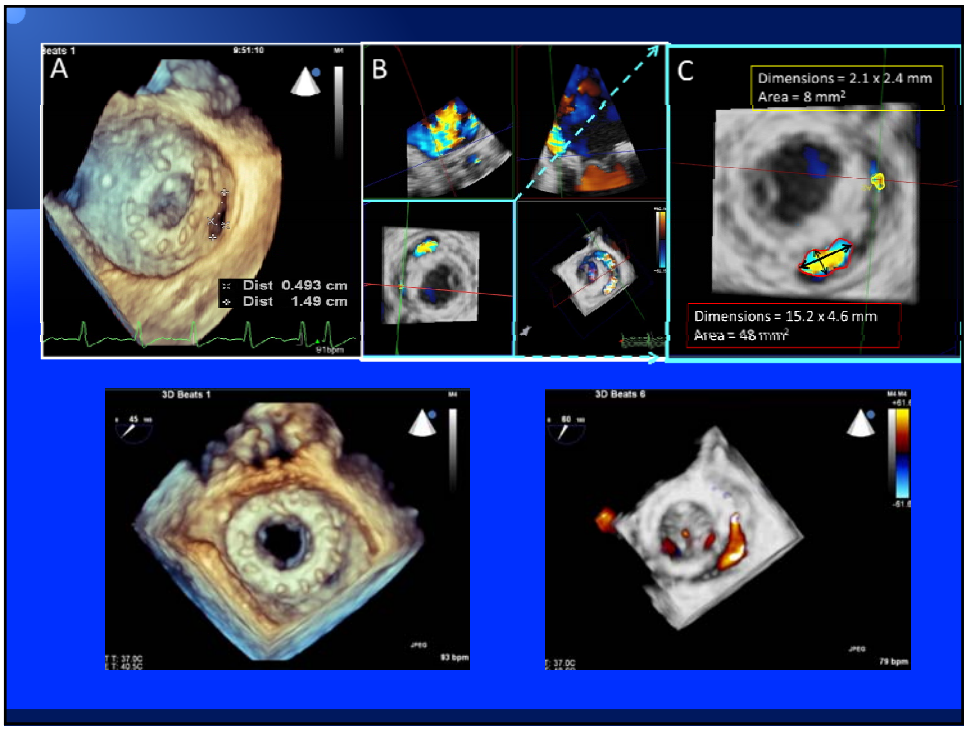
STATE-OF-THE-ART REVIEW

Clinical Trial Principles and Endpoint Definitions for Paravalvular Leaks in Surgical Prosthesis

An Expert Statement

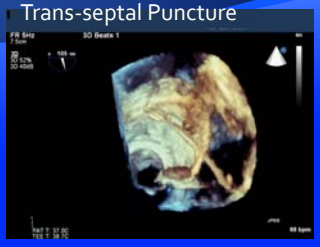
Carlos E. Ruiz, MD, PhD,[a] Rebecca T. Hahn, MD,[b] Alain Berrebi, MD,[c] Jeffrey S. Borer, MD,[d] Donald E. Cutlip, MD,[e] Greg Fontana, MD,[f] Gino Gerosa, MD,[g] Reda Ibrahim, MD,[h] Vladimir Jelnin, MD,[a] Hasan Jilaihawi, MD,[i] E. Marc Jolicoeur, MD,[h] Chad Kliger, MD,[j] Itzhak Kronzon, MD,[j] Jonathon Leipsic, MD,[k] Francesco Maisano, MD,[l] Xavier Millan, MD,[m] Patrick Nataf, MD,[n] Patrick T. O'Gara, MD,[o] Philippe Pibarot, DVM,[p] Stephen R. Ramee, MD,[q] Charanjit S. Rihal, MD,[r] Josep Rodes-Cabau, MD,[p] Paul Sorajja, MD,[s] Rakesh Suri, MD,[t] Julie A. Swain, MD,[u] Zoltan G. Turi, MD,[v] E. Murat Tuzcu, MD,[t] Neil J. Weissman, MD,[w] Jose L. Zamorano, MD,[x] Patrick W. Serruys, MD, PhD,[y] Martin B. Leon, MD,[b] of the Paravalvular Leak Academic Research Consortium

J Am Coll Cardiol 2017;69:2067–87

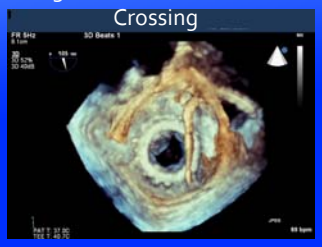


Intra-procedural Guidance

Trans-septal Puncture



Agilis Catheter and Wire Crossing

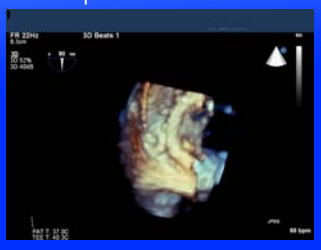


Mal-positioned Device

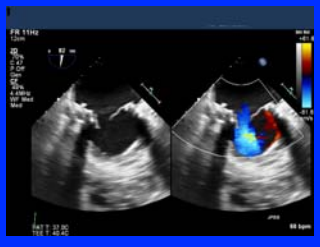
Intra-procedural Guidance

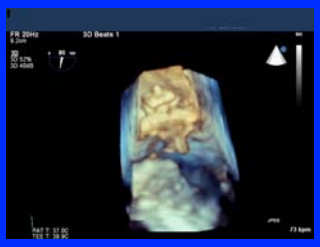
Mal-positioned Device

Repositioned Device

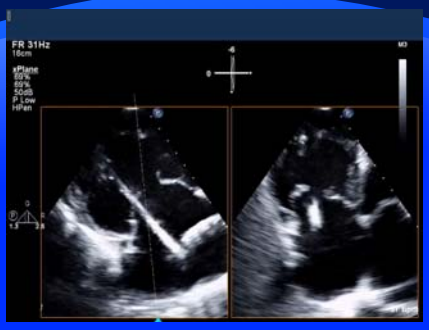


Final Device Position





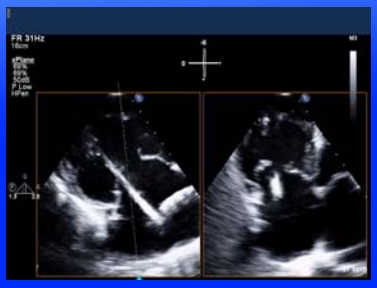
Case 4: Pacemakers and TR

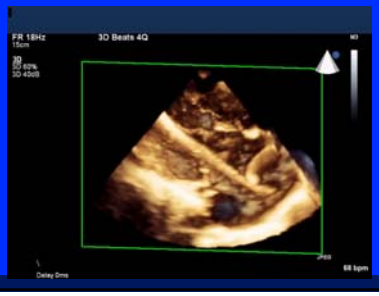


Is there Pacemaker Impingment

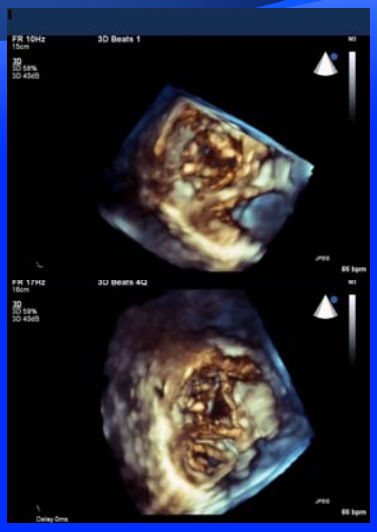
1. Yes
2. No

Case 4: Pacemaker Impingement

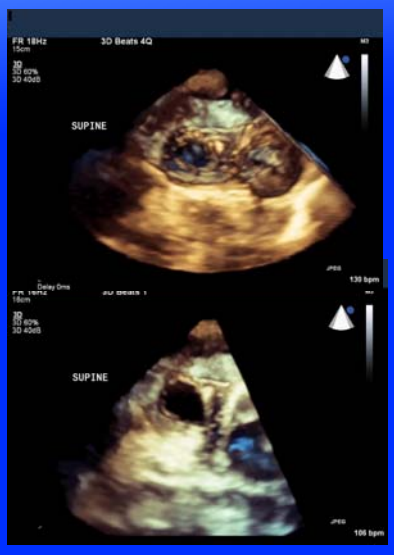




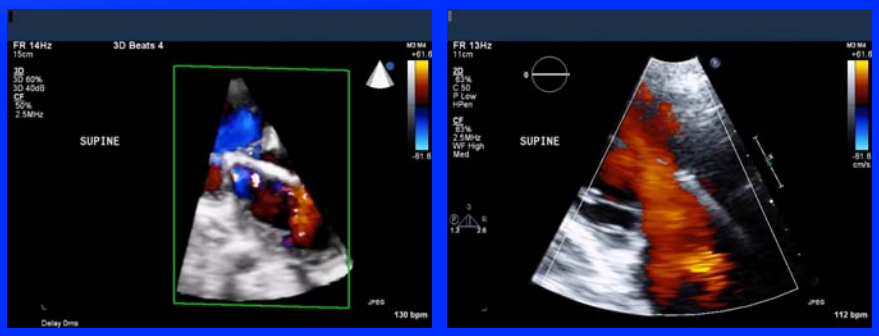
Case 4: Pacer Without Impingement



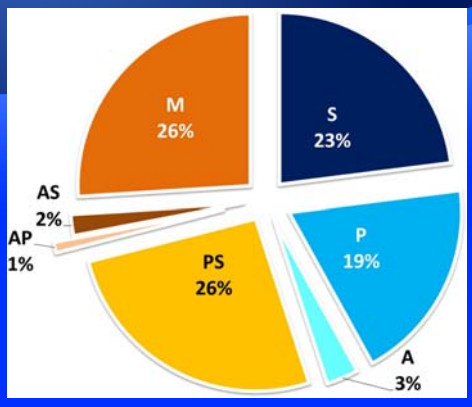
Example of Pacer Impingement



Example of 3D to determine Pacer Impingement



Incidence of Pacer Impingement

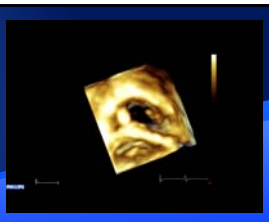


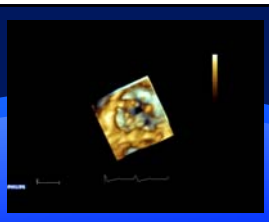
- **Interfering leads are in *blues*** (in the anterior [A], posterior [P], and septal [S]) positions on the *right-hand side* of the pie chart.
- **Noninterfering leads are in *yellows*** in the center of the valve (M), posteroseptal (PS), anteroposterior (AP), and anteroseptal (AS) positions on the *left-hand side* of the pie chart.

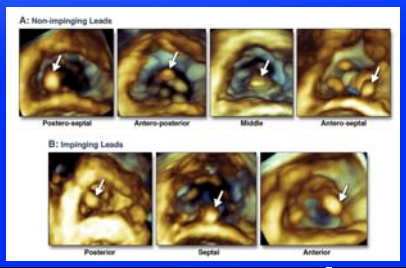
- Forty-five of 100 patients showed device lead tricuspid valve leaflet interference.
- The septal leaflet was the most commonly affected

Addetia K et al. J Am Soc Echocardiogr 2014;27:1164-75.

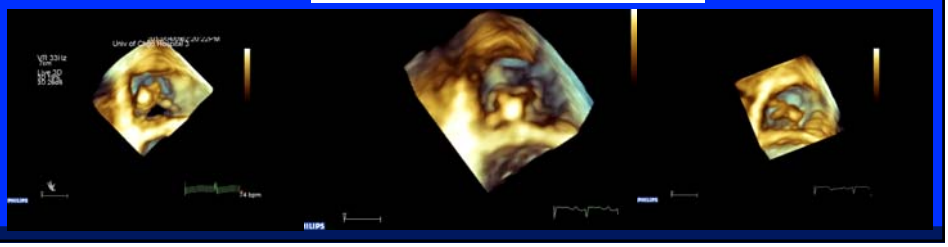
3D Echocardiographic Location of Implantable Device Leads and Mechanism of Associated Tricuspid Regurgitation







Mediratta A et al. J Am Coll Cardiol Img 2014;7:337–47



Thank you